

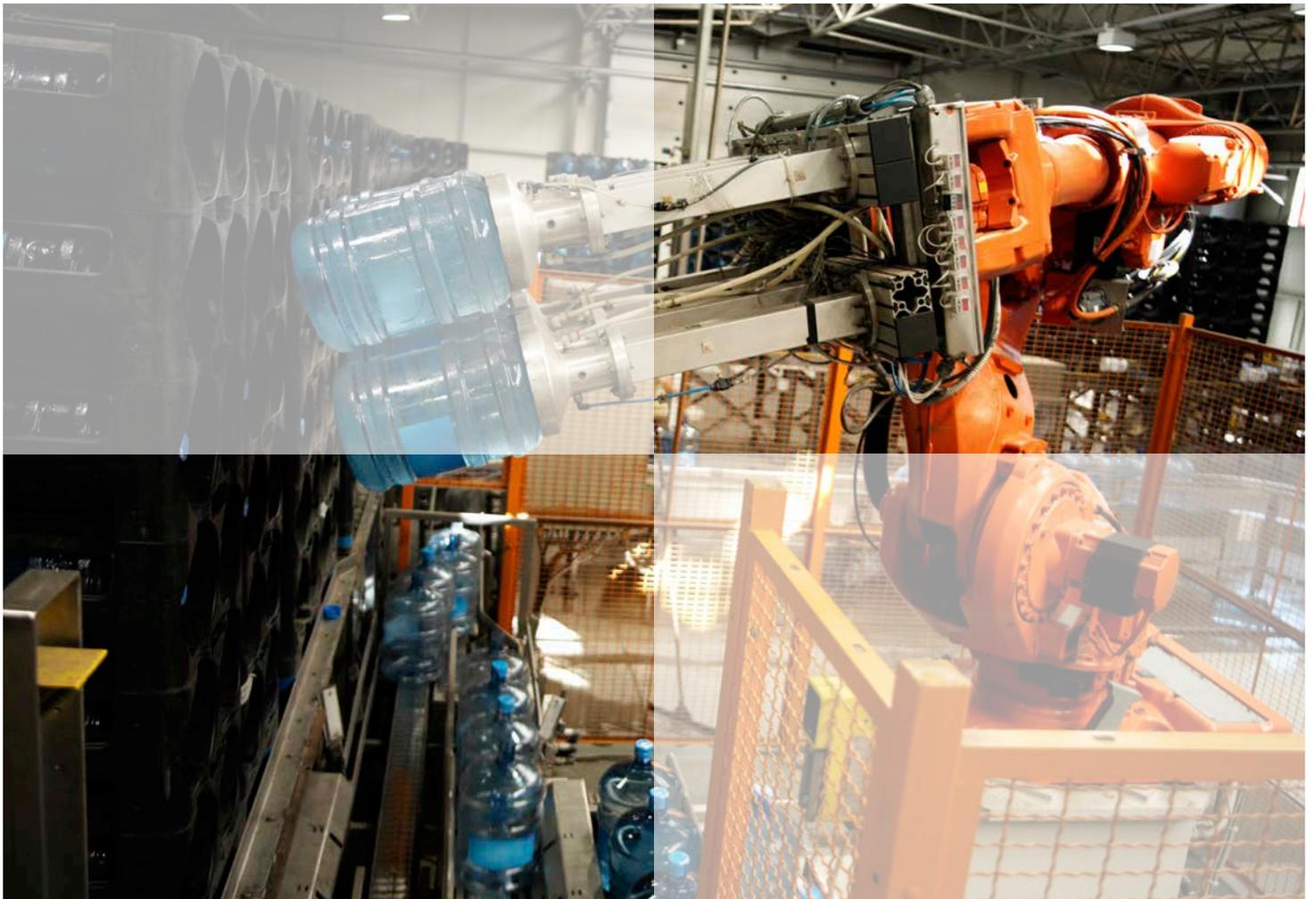
Manufacturing for Growth

Strategies for Driving Growth and Employment

Volume 1: Globally Competitive Policy

A World Economic Forum Report

in collaboration with Deloitte Touche Tohmatsu Limited



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Disclaimer

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Introduction

The Future of Manufacturing report (April 2012) identified a number of factors that will shape the future of competition between countries and companies. Three areas rose to the top as the most critical: human capital and talent development; innovation and technology advancement; and strategic use of public policy emphasizing collaboration between policy-makers and business leaders. This series of Manufacturing for Growth reports addresses these key competitive factors and defines ways to drive economic growth and high-value job creation through manufacturing industry sectors.

The Manufacturing for Growth series comprises three volumes:

- **Volume 1: Globally Competitive Policy** seeks to define the features of effective, comprehensive national industrial policy. This volume focuses on six countries chosen to represent both historic manufacturing giants and new and emerging manufacturing powerhouses. This cross-section was selected as representative of developed and emerging economy nations to showcase the unique aspects of each and, more often than not, the similarities in what manufacturing executives recommend to policy-makers.

Volume 1 was informed by discussions with over 70 chief executives of multinational manufacturing companies, which resulted in:

- Policy recommendations common across all interviews conducted in support of this project
- Specific country policy recommendations for:
 - Emerging economies – China, Brazil and India
 - Developed economies – Germany, Japan and the United States
- An outline of various policy instruments that are available to policy-makers and significantly influence competitiveness
- An analysis of some critical policy areas most frequently cited by chief executives around the world as having a direct impact on their companies' ability to compete

In addition, an appendix comparing tax, energy and environmental policy instruments for the six focus countries discussed in Volume 1 is available for download at www.deloitte.com/us/policyframework.

- **Volume 2: Partnering for Competitiveness** examines case studies of public-private collaboration from around the world that enable innovation and technology advancement and promote talent development.
- **Volume 3: Manufacturing Value Chains Driving Growth** illustrates the value and jobs created by specific industry sectors – aerospace, automotive and chemicals – from a global macro-view as well as a micro-view of the impact that a single product value chain or single production facility can have on a location.

To access the entire series electronically, visit <http://wef.ch/mfgla13>.

Project Methodology

During the World Economic Forum Annual Meeting 2012, the Forum-Deloitte LLP project team presented key findings from *The Future of Manufacturing* report, the culmination of a one-year project that explores why manufacturing is a key driver of economic growth, how the global manufacturing ecosystem has changed and continues to change, and what the key factors for both companies and countries will be to compete in the future.

In a largely unified response, project stakeholders – senior manufacturing executives, policy-makers and civil society leaders – directed the Forum-Deloitte team to continue the project by defining specific, effective, near-term ways to react to these future competitive factors. The resulting project, *Manufacturing for Growth*, defines key strategies for driving growth and high-value job creation through manufacturing industry sectors, and provides best practice examples for reacting to universal challenges in the area of talent development and innovation.

The Manufacturing for Growth project brings together extensive primary and secondary research from industry, academic and policy leaders. The extended global project team conducted face-to-face interviews around the world with over 70 chief executives of multinational manufacturing companies. Insights from these interviews were supplemented with input collected during workshops hosting senior manufacturing leaders, including members of the Project Consultative Group, in the following locations:

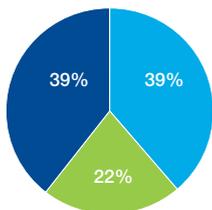
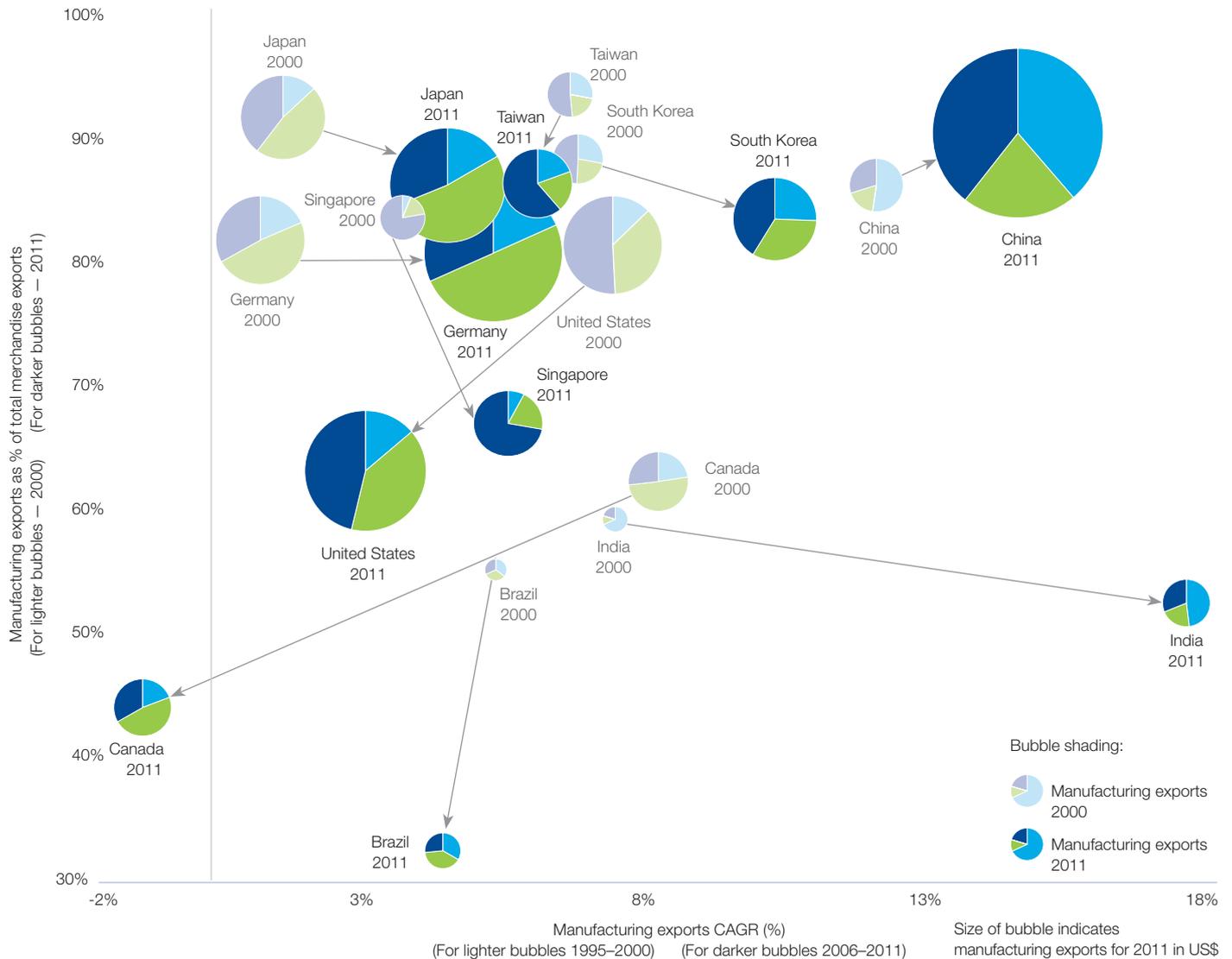
- World Economic Forum private session in Tokyo, Japan: 24 April 2012
- Manufacturing & Society in the 21st Century, in collaboration with the Aspen Institute, Aspen, USA: 17 August 2012
- World Economic Forum private session in Berlin, Germany: 17 October 2012
- World Economic Forum private session in New Delhi, India: 6 November 2012
- Talent-Driven Innovation Symposium, in collaboration with the Manufacturing Institute and Alcoa Foundation, Washington DC, USA: 28 November 2012
- World Economic Forum private session in Davos, Switzerland: 24 January 2013

The project team also gleaned findings from the Forum's official sessions on manufacturing during the Annual Meeting of the New Champions in Tianjin, People's Republic of China, in September 2012 and the World Economic Forum on India in Gurgaon, India, in November 2012.

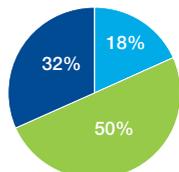
Additionally, this effort benefited from the invaluable time and content developed with a number of experts in the areas of policy, value chain analysis, human capital and specific manufacturing sectors: Deloitte Tax LLP; Deloitte Consulting's Energy Practice; the National Association of Manufacturers; Duke's Center on Globalization, Governance & Competitiveness; The Dow Chemical Company; and Nissan.

Comparative Economic and Related Data

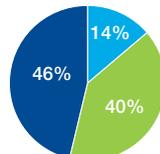
2011 manufacturing export competitiveness by size, skill and technology



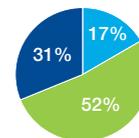
China
\$1,768.5 billion (2011)
\$219.3 billion (2000)



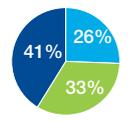
Germany
\$1,226.3 billion (2011)
\$459.2 billion (2000)



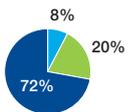
United States
\$952 billion (2011)
\$644.6 billion (2000)



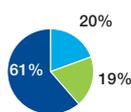
Japan
\$724.8 billion (2011)
\$449.4 billion (2000)



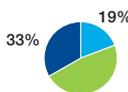
South Korea
\$473.5 billion (2011)
\$154.9 billion (2000)



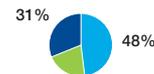
Singapore
\$279 billion (2011)
\$117.5 billion (2000)



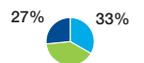
Taiwan
\$270.7 billion (2011)
\$141.0 billion (2000)



Canada
\$202.3 billion (2011)
\$175.4 billion (2000)



India
\$151.7 billion (2011)
\$26.0 billion (2000)



Brazil
\$84.2 billion (2011)
\$31.6 billion (2000)

Source: Deloitte Touche Tohmatsu Limited analysis ^(iv)

Key: Exports of manufactured goods with high skill and technology intensity

Exports of manufactured goods with medium skill and technology intensity

Exports of manufactured goods with low skill and technology intensity; and labour-intensive and resource-based manufactured goods

Note: The classification of goods into different degrees is based on Standard International Trade Classification (SITC) codes, UNCTAD ^(v)

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index



Volume 1

Globally Competitive Policy

Public Policy as a Catalyst for Growth

In today's global economy, government actions and public policy play a critical role for both country- and company-level competitiveness. The impact government policies can have across a number of competitiveness drivers – including trade; financial and tax systems; infrastructure development; labour and workforce productivity; research and innovation; energy and materials costs; intellectual property protection; environmental and other regulations; the tort system; and the cost of capital – are significant. They directly create both advantages and disadvantages for countries, relative to other nations and to companies working within their borders, and relative to other domestic and global competitors. The high level of influence public policy now has on manufacturing competitiveness is highlighted in *The Future of Manufacturing* report which stated: “The strategic use of public policy as an enabler of economic development will intensify resulting in a competition between nations for policy effectiveness and placing a premium on collaboration between policy-makers and business leaders to create win-win outcomes.” Helping to facilitate that collaboration through constructive dialogue – to create win-win outcomes – is the centrepiece of the Manufacturing for Growth project.

In this section, the report takes step one on the path to developing a primer for public policy dialogue and collaboration between business and government leaders regarding manufacturing competitiveness and the role of government. It explores public policy through subjective, opinion-based analysis and policy recommendations coming from business leaders, as well as objective, fact-based analysis and country comparisons. In this volume you will find the information described below.

From a subjective perspective:

- **Themes Regarding Effective Public Policy:** From the CEO interviews and recommendations as well as the input gathered through the workshops conducted around the world, several common and recurring themes emerged regarding what constitutes effective public policy as well as the corollary of what defines problematic policy environments. The report attempts to synthesize all the input and distil the overarching themes of both effective and dysfunctional policy through the lens of business leaders.

- **CEO Recommendations:** The six sets of country-level policy recommendations – from chief executives to policy-makers in those countries – were provided by more than 70 executives around the world in face-to-face discussions from August 2012 through early January 2013. These represent policy imperatives that they believe would improve the competitiveness of the countries in which they reside or where they have major operations, and thereby their companies and industries. All recommendations have been synthesized from the one-on-one discussions and no attribution has been made to any individual business leader. In addition to the individual country-level recommendation summaries, the report highlights five public policy areas where common recommendations emerged. These five policy areas – and the consistent recommendations which emerged – should be viewed as relevant for policy-makers regardless of country or relative competitive position today.

From an objective perspective:

- **Country Policy Comparisons Table:** The report compares country-level policies for the six focus countries that serve as the basis for this section and the overall report – Brazil, India and China, all considered emerging economy nations with a significant and growing role in shaping the global manufacturing competitiveness landscape; and the United States, Japan and Germany, the three most dominant developed economy nations from a manufacturing competitiveness perspective. This objective comparison is carried out through a comprehensive Country Policy Comparisons Table, developed through extensive research and a number of collaborative discussions convened by the National Association of Manufacturers. This section also highlights country comparisons in two key policy areas which consistently appeared high on the list of CEO recommendations and have an almost direct and immediate impact on competitiveness: tax and energy. The appendix provides excerpts from the Country Policy Comparisons Table.
- **Comparative Economic and Related Data:** Throughout Section 1, the report includes key country-level economic and related data and analysis drawn heavily from the *2013 Global Manufacturing Competitiveness Index*.¹ This data comparing the most globally competitive manufacturing nations, including the six target countries, helps to provide a fact-based foundation to augment the Country Policy Comparisons Table as well as the more subjective CEO recommendations and themes analysis.

The Importance Manufacturing Plays in Economic Development and Job Creation

More and more, the factors that influence the competitiveness of countries and companies extend beyond traditional production inputs such as the cost of labour and materials. Today, manufacturing executives view competitiveness and the drivers that influence their companies' ability to compete through a much broader lens to include public policies that impact economic, trade, financial, tax and legal systems.

As stated in *The Future of Manufacturing*, globalization of manufacturing has been a key driver of higher-value job creation and a rising standard of living for the growing middle class in emerging economies around the world such as China, India, South Korea, Mexico and Brazil. Developed countries have also benefited from sourcing lower-cost products from emerging economy nations that produce at lower wage rates. Based on this dynamic, the relationship between emerging and developed economy nations has dramatically changed, creating competition as well as co-dependency.

But it is not just emerging economy nations that see the benefit of manufacturing and its ability to drive high-value job creation. Developed economy nations, such as Germany and more recently the United States, have also embraced the higher-value job creation powers of advanced manufacturing. Just how much of a positive impact do strong manufacturing sectors have on the economic prosperity for countries and their citizens?

Figure 1 illustrates the strong association between manufacturing GDP and overall GDP for a number of countries. The figure highlights the fact that higher manufacturing growth whether representing a large or small portion of a nation's economy, drives higher total *real* GDP.

While the strength of the relationship seems to be especially true for emerging economies, which have relatively high rankings in manufacturing and real manufacturing compound annual growth rate (CAGR), the correlation is also true for developed economies, which have experienced slow manufacturing GDP CAGR and equally slow overall real GDP CAGR. Further, the correlation appears to hold true whether manufacturing GDP as a per cent of total GDP is high (i.e. over 30%) or low (i.e. less than 16%).

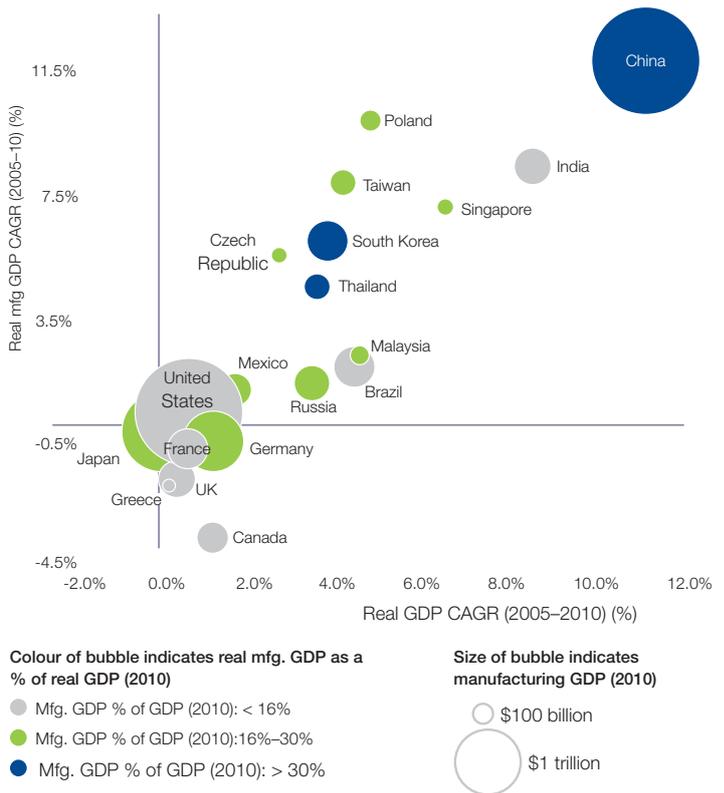
The Future of Manufacturing included an overview of recently released research by Ricardo Hausmann and Cesar Hidalgo (Harvard and MIT)² which looks in detail at the association between advancing manufacturing knowledge and capabilities and increasing economic prosperity for countries. Their extensive examination of manufacturing export trade data of nearly every nation in the world over the past 60 years indicates that as a nation begins to build the knowledge and capabilities necessary to manufacture goods – and trade those goods on global markets – its path to prosperity begins.

Further, Hausmann and Hidalgo show that acquiring more knowledge and producing more complex products, and developing and deploying more advanced manufacturing processes, lead to greater economic prosperity for a country and its citizens. Finally, their research argues that the link between the knowledge networks and capabilities necessary to drive advanced manufacturing and the economic prosperity of a nation is a better predictor of the variation in incomes across countries than any other leading indices. More simply put, manufacturing matters: advanced manufacturing is a key driver of high-value job creation and economic prosperity.

It is no wonder that government policy-makers have become more active in pulling the levers that might bolster the relative competitiveness of their country. The levers that are most effective at improving manufacturing competitiveness are relative to a nation's current competitive position, balanced against the costs to and societal demands of the nation.

But what really drives the manufacturing competitiveness of a country? And which policy areas may require extra attention from government leaders?

Figure 1: Manufacturing and the Impact on Economic Prosperity
Real GDP versus Manufacturing GDP (CAGR)



Source: Deloitte Touche Tohmatsu Limited analysis⁽⁶⁾

Notes:

- CAGRs are calculated at constant 2005 prices and exchange rates
- "2010 manufacturing GDP" and "2010 manufacturing GDP as percent of total GDP" are at 2010 prices and exchange rates

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

The Drivers of Manufacturing Competitiveness for a Nation: A Mosaic of Strengths and Weaknesses

In the 2013 *Global Manufacturing Competitiveness Index*, over 550 chief executives of manufacturing organizations were asked to rank 10 key drivers of competitiveness for a nation and 40 sub-drivers using a survey framework first developed in 2010. These 10 key drivers significantly overlap with and reinforce the key trends identified in *The Future of Manufacturing*. In addition, for 2013, these chief executives were asked to compare the six target nations – the US, Germany, Japan, China, India and Brazil – on the 10 key drivers of manufacturing competitiveness for a country. As shown in Figure 2, these chief executives, many of whom participated in the face-to-face interviews, have a nuanced and detailed perspective differentiating the relative strengths and weaknesses of each nation along a series of complex dimensions. The mosaic that emerges clearly demonstrates the advantage Germany, the US and Japan hold relative to talent-driven innovation as well as against most other drivers, with the exception of the cost of labour and materials. Not surprisingly, the survey revealed emerging economy nations hold an advantage with regard to the low cost of labour and materials; however, compared to their developed nation counterparts, they lag far behind when it comes to healthcare systems and legal and regulatory environments.

Importantly, what also emerges from the CEO rankings shown in Figure 2 is the transformation that China is undergoing across its competitiveness drivers, clearly separating itself from India and Brazil. Further, the CEO ratings seem to suggest China is becoming more and more a developed nation competitor than its emerging economy counterparts. As China, India and Brazil continue to bolster their advanced manufacturing knowledge over the coming years, fascinating new patterns will emerge.

Public policy can and does play a significant role in defining the strengths and weaknesses of a country relative to other countries. And because public policy threads wind through all the drivers that executives

believe create competitive advantages or disadvantages for their companies, a significant portion of the various discussions around the world centred on balancing the need for effective government action and public policy without creating bureaucracy, raising structural costs unnecessarily or disrupting markets.

In the rest of this section, the basic structure of the Country Policy Comparison Table is laid out. Also, based on the face-to-face CEO interviews and additional supplemental research, the report takes a deeper look into two specific policy areas that business executives deemed critically important to their ability to compete globally – tax and energy policy.

Figure 2: Country-level Ratings for Key Drivers of Competitiveness

| Selected country/manufacturing competitiveness drivers | Germany | U.S. | Japan | China | Brazil | India |
|--|---------|------|-------|-------|--------|-------|
| Talent-driven innovation | 9.47 | 8.94 | 8.14 | 5.89 | 4.28 | 5.82 |
| Economic trade, financial and tax system | 7.12 | 6.83 | 6.19 | 5.87 | 4.84 | 4.01 |
| Cost of labour and materials | 3.29 | 3.97 | 2.59 | 10.00 | 6.70 | 9.41 |
| Supplier network | 8.96 | 8.64 | 8.03 | 8.25 | 4.95 | 4.82 |
| Legal and regulatory system | 9.06 | 8.46 | 7.93 | 3.09 | 3.80 | 2.75 |
| Physical infrastructure | 9.82 | 9.15 | 9.07 | 6.47 | 4.23 | 1.78 |
| Energy cost and policies | 4.81 | 6.03 | 4.21 | 7.16 | 5.88 | 5.31 |
| Local market attractiveness | 7.26 | 7.60 | 5.72 | 8.16 | 6.28 | 5.90 |
| Healthcare system | 9.28 | 7.07 | 8.56 | 2.18 | 3.33 | 1.00 |
| Government investments in manufacturing and innovation | 7.57 | 6.34 | 6.80 | 8.42 | 4.93 | 5.09 |

Scores on a 10 point scale, where 1 being "least competitive" and 10 being "most competitive" — adjusted for country, size, and industry

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

CEO Recommendations

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Neeraj Kanwar
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Haruo Kawahara
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USA

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USA

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Ferbasa
Brazil

Marcos A. de Marchi
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Elekeiroz SA
Brazil

Sergio Marchionne
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Wolfgang Reitzle
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Gordon Riske
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KION Group GmbH
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Siegfried Russwurm

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Themes Regarding Effective Public Policy

Given the influence of public policy and its importance to business, it is of no surprise that executives participating in the working sessions and one-on-one interviews were both passionate and clear when sharing their perspectives and recommendations on improving government policy to serve as a catalyst for manufacturing growth. While the specific CEO recommendations vary based on country and the unique circumstances of that country, and in most cases the industry sector(s) where the chief executives' organizations primarily compete, several common and recurring themes emerged regarding what constitutes effective public policy – as well as the corollary of what defines problematic policy environments.

A striking observation based on all the interviews and discussions convened in support of this report is that most executives touched on a set of themes that were similar when describing concerns with public policy and outlining their desired state for the future public policy environment. Specifically, executives identified one or more of the following overarching themes in providing their input and recommendations to policy-makers:

- **Consistency, stability and certainty:** A consistent and stable policy environment, freed from election cycles, providing longer-term certainty for business investment decisions. As capital investment and workforce hiring decisions have long-term consequences – often 10- to 20-year or more time horizons – establishing policy stability over longer time periods facilitates the setting of business and investment strategies with greater confidence and enhances the ability to commit to stakeholders.
 - **Common concern:** Uncertainty was the number one concern mentioned by executives regarding public policy. Many executives said the level of uncertainty regarding the direction of key public policy decisions has reached epic proportions.
- **Globally competitive, fair and enforced:** Establishing policies that are globally competitive with other nations and which do not create competitive disadvantages for businesses (“do no harm”). Further, policies should strive to help level the playing field and be rigorously enforced for all global competitors. Policy-makers have a critical role to play regarding the establishment of fair and competitive global markets. Strong enforcement is essential particularly in the areas of intellectual property protection, currency manipulation and trade violations.
 - **Common concern:** Policies that result in a competitive disadvantage with other nations impacting an industry sector or the broader business community, e.g. higher tax rates; limited or poor infrastructure investments; unique and burdensome labour or environmental standards.
- **Developed through dialogue and collaboration:** The development of policies based on meaningful dialogue and collaboration between business leaders and policy-makers contributing to more informed and thoughtful policy development, limiting unintended negative consequences.
 - **Common concern:** Policies which significantly impact businesses but are established without the benefit of a dialogue and exchange of ideas with business leaders, resulting in either costly or otherwise competitively disadvantageous policy environments, often with unforeseen or unintended consequences.

- **Creates institutional legitimacy, credibility and market confidence:** Policy that creates institutional legitimacy – in the court systems, the financial systems and markets, for intellectual property protection, for asset protection, for enforcement, and for fair and consistent consequences of infractions and violations – is essential for advanced economic markets to thrive and grow and to attract investment of capital and talent. Corruption should find no home in free markets.
 - **Common concern:** Environments that do not instill confidence for investors regarding government institutions – impacting the banking system, the court system, or legislative or regulatory processes.
- **Harmony and alignment:** Policy-makers should strive to reduce the fragmentation and complexity of today's policy environment through the synchronization and harmonization of national, state, and/or local policies and across agencies and branches of government.
 - **Common concern:** Government actions which are uncoordinated across responsible agencies or departments and which inadvertently undercut and work against one another. Also unnecessary complexity that adds greatly to the cost of compliance, further inhibits business investment and reduces competitiveness.
- **Financially prudent; balance costs versus benefits:** Individual policies and the overall policy bundle must be financially affordable and reasonable for business and society. The costs associated with policies – even those that may be well intentioned and arguably necessary – should not outweigh the benefits.
 - **Common concern:** A burdensome high-cost policy or policy environment where the costs to implement and pay for the policy objective outweigh the benefits to society. Additionally, concern was expressed for policies which create a long-term fiscal burden (deficit) that becomes a drag on business investment and competitiveness.

Common policy recommendations essential to growth

Our face-to-face CEO interviews provided perspectives from six different developed and emerging economy nations (United States, Japan, Germany, China, India and Brazil), each with unique policy frameworks and relative strengths and weaknesses, resulting in six sets of country level recommendations from CEOs to policy-makers in those countries. Throughout these discussions, there were five public policy areas where common themes emerged and consistent recommendations were given from executives around the world. As such, these five policy areas and the consistent recommendations which surfaced should be viewed as relevant for policy-makers regardless of country or relative competitive position today.

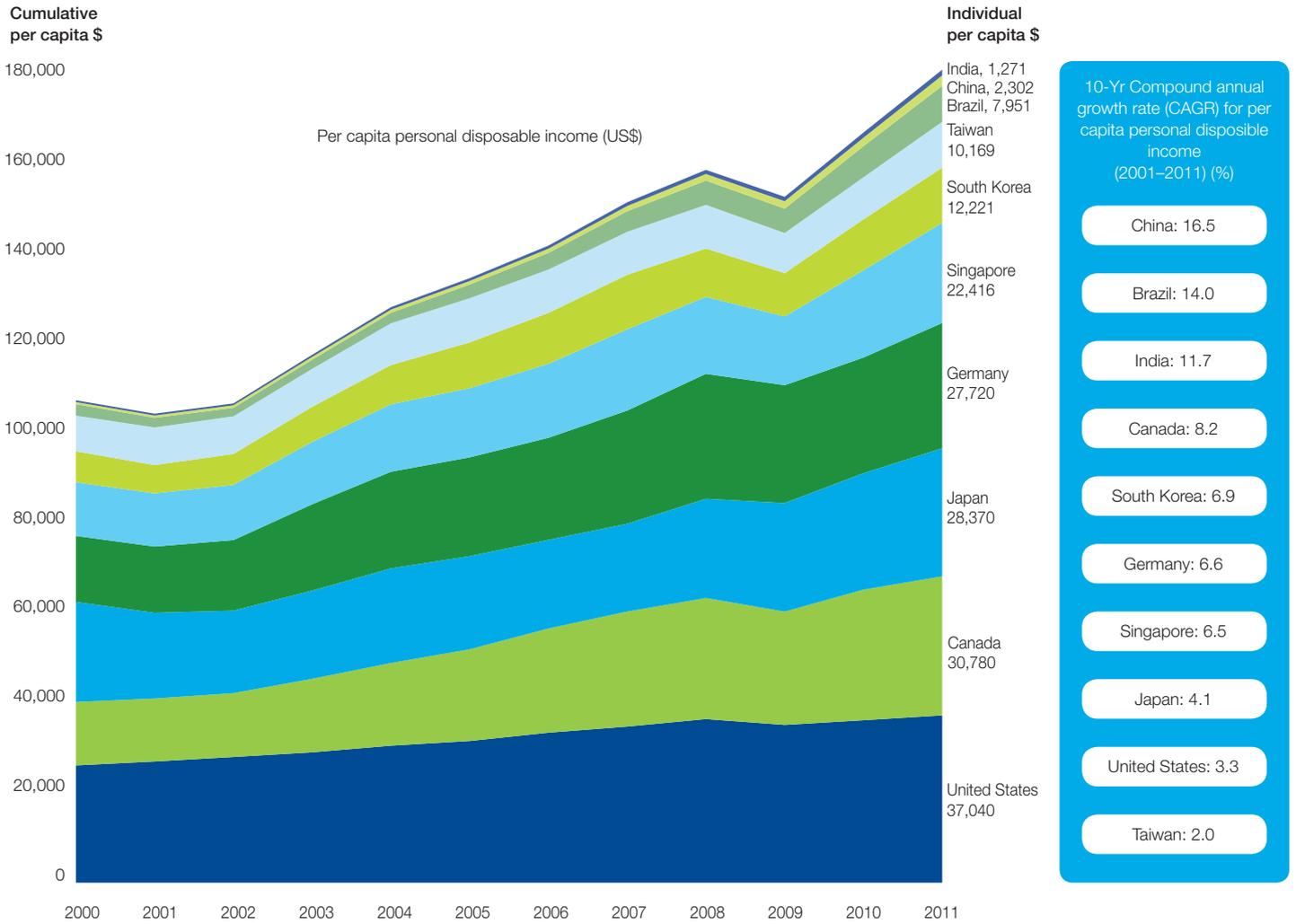
- 1. Competitive tax policy applied within simplified tax systems:** Executives participating in our discussions, regardless of where in the world their companies were located or maintained operations, consistently expressed concern with both business tax policy and complex national tax systems that negatively impact competitiveness. While specific country tax systems varied, country-to-country, executives broadly felt that those countries that could offer competitive advantages in lowering an organization's overall effective tax rate, as well as remove resource and cost burdens often associated with compliance, would be the winners. Eliminating double-taxation or redundant taxes and creating tax incentives for innovation, research and development, workforce development and other capital investments were viewed as important levers and when effectively applied, could significantly improve a country's competitive advantage.
- 2. Policy that promotes and protects free and fair trade:** Trade was frequently and passionately mentioned by almost all of the executives participating in our discussions. Participants consistently called for policy-makers to increase both the number of free trade agreements and the pace at which new agreements are formed and ratified. While most executives preferred an effective global WTO solution and noted the important objectives of the Doha rounds, many were skeptical that would be accomplished. Executives were equally passionate about trade agreements being fair along multiple dimensions and considerate of broader elements than are normally included, addressing labour practices and working conditions for example. Finally, the subject of trade agreement enforcement was also a common theme. Executives felt effective trade policy must address enforcement of existing agreements. Ensuring a fair and level playing field was equally as important, if not more important, than the number of and speed with which new agreements are forged.
- 3. Energy policy promoting efficiency, security, strong infrastructure, and low cost:** Energy policy was consistently mentioned in our discussions with manufacturing executives around the world – both from a cost perspective and from an energy security, stability of supply perspective. Executives broadly felt that countries that could provide clean and sustainable sources of energy at a competitive cost would offer a significant advantage over other nations. They also felt it was incumbent on policy-makers to develop comprehensive national energy policies that effectively and responsibly build a portfolio of strategic sources of energy, ensured efficient delivery through world class infrastructure, and supported appropriate R&D efforts into alternative sources of clean energy. Given rapid growth globally in the demand for energy, rigorous efficiency standards, research in

alternative sources of energy, and appropriate and responsible development of current sources of energy were all very important to manufacturing executives. Often, executives further suggested that effective energy policy should also drive opportunities for innovation and economic development. Finally, executives generally supported efforts by policy-makers to establish a price on carbon emissions and to develop effective mechanisms to engage all nations around the world on a reasonable march toward clean energy sources.

- 4. Education and workforce policy which develop superior talent:** The ability to develop and attract the world's most talented workers was critical to every executive participating in our discussions regardless of where in the world they resided. Executives consistently felt that their ability to drive innovation was directly linked to their ability to access highly educated workers. And while STEM (science, technology, engineering and mathematics) literacy was important, it is interesting to note that executives consistently felt STEM is not, by itself, sufficient. Many commented that creativity and imagination are key ingredients to producing great innovation. As a result, they stressed manufacturers need STEM educated, multidisciplinary thinkers that are also creative and can problem solve in a team environment. Executives consistently felt that public policy must ensure high quality education for students at all levels and support effective industry- led workforce training and development.
- 5. Science, technology and innovation policy which promote advanced manufacturing:** Finally, executives felt a highly educated workforce with strong STEM and creativity skills combined with policies that consistently promote superior science and technology research and development through to commercialization - including the development of advanced manufacturing processes - were essential to national competitiveness. Policies which support long term funding for research institutions and public-private research partnerships as well as promote the strong connectivity between research institutions and manufacturing enterprises were considered key ingredients to the development of powerful "manufacturing-innovation ecosystems", enhancing overall workforce productivity and competitiveness and driving prosperity for the citizens of a nation.

Comparative Economic and Related Data

Historical trends of personal disposable income per capita (US\$)



Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

CEO Policy Recommendations for Emerging Economy Nations

China

Evolving to Advanced Manufacturing

China is today the world's largest manufacturing economy and considered to be one of the most competitive nations in the world. Driven initially by its ability to deliver low-cost labour and materials, China quickly advanced across a number of other competitive drivers – including infrastructure, favourable policies, a large consumer base, and established supplier network – over the past 10-15 years and evolved its manufacturing capabilities from low-cost goods to more advanced products.

According to executives participating in the interviews and working sessions, China is at a crossroads as it works to maintain its cost advantage and core low-cost production base while also building the more complex capabilities that are required for advanced manufacturing. Executives also said that the economic growth momentum that China gained by opening markets and enacting reforms has weakened, and that China needs breakthroughs to spur a new round of economic growth.

Many executives agreed that China's 12th Five-Year Plan and its focus on seven strategic emerging industries (e.g. energy saving and environmental protection, new generations of IT technology, biotechnology, high-end equipment manufacturing, new energy, new materials, new energy vehicles), as well as many of China's current policies, are moving in the right direction and are important actions to revitalize the economy. In addition, they said that the strategic directions from the World Bank China 2030 report³ provide useful insights regarding the path forward for China as it seeks to maintain and expand its presence as one of the most competitive countries in the world.

However, executives cited concerns with a number of policy areas where improvements would further advance China's competitiveness: promotion of innovation; reforms to local politics and bureaucracy; and regulations related to environment and health. And while executives generally applauded the speed at which policy is enacted, they said that implementation lags behind and noted that improvements could be made in terms of execution. They also believed that policy-makers could be more forward-thinking and strategic in making long-term resource distribution and environmental plans. Executives expressed significant concern with energy and environmental challenges in China, ranging from the cost of energy to China's ability to provide clean and sustainable sources of energy.

Executives believed that the following set of recommendations would enable China's pursuit of more advanced manufacturing capabilities.

Recommendations

Develop a basis of differentiation beyond low cost by transforming to high-end manufacturing

Almost all of the executives recommended that China move from low-cost, labour intensive manufacturing to high-end, technologically advanced manufacturing. They agreed that China cannot abandon its core competency in low-cost manufacturing, but advised policy-makers to find another basis of differentiation, such as technology and innovation.

To facilitate the move to high-end manufacturing, executives believed there is an urgent need to redefine the role of state-owned enterprises. An independent Chinese study has found that if all the government's grants and hidden subsidies were taken away, the state-owned enterprises would lose money,

which represents a drain on resources in China and impacts China's competitiveness.⁴ This redefinition would require a broad set of policy activities: deregulating many key sectors; marketizing the transfer pricing of goods and services along entire supply chains; and introducing more real competition in sectors that remain protected for and dominated by state-owned enterprises and "national champions".

Executives also suggested that policy-makers guide and encourage enterprises to explore modularized mass customization to meet the diverse needs of customers. Modularized mass customization could merge China's capabilities in mass production with innovations required to deliver customized, differentiated products domestically and globally.

Executives also believed that China is well-positioned to pursue intelligent manufacturing, which involves the development and implementation of artificial intelligence in production processes. Executives said that the government should increase the planned support for intelligent manufacturing to promote China's transition to make, use and sell more intelligent manufacturing equipment.

Many expressed that China's low-cost edge is fading as it loses ground on a cost basis to new low-cost manufacturing destinations such as Vietnam. Monetary policy was a noted concern. Additionally, executives said that China would be challenged on a wage basis, as the government recently proposed increasing the average wages of Chinese labour by over 80% by 2015. This would effectively reduce China's competitiveness in labour-intensive sectors, making the move towards more advanced manufacturing even more imperative.

To serve as a catalyst for China's transformation to high-end manufacturing, executives recommended the following:

- *Develop an industry-led strategic transformation plan that is focused on the industrial development of technological innovation and differentiation.*
- *Enact policies and strategies that bring in capital and technology-intensive industries from developed countries.*
- *Promote indigenous innovations, including original and integrative innovation, as well as improve on innovations imported from other countries, by encouraging local governments to set up venture funds, innovation awards and stock exchanges for innovation companies.*
- *Develop programmes that support and fund entrepreneurship.*
- *Shift from large-scale manufacturing to mass customization, which includes end-to-end modularization.*
- *Promote the system integration and application of intelligent manufacturing as well as support the R&D and innovation of core intelligent measurement and control devices.*

Develop an energy efficient, sustainable manufacturing environment

Executives predicted that environmentally friendly and energy efficient manufacturing will be the requirement for all nations in the future. Current manufacturing conditions in China are seen as damaging to the environment, energy intensive, and not aligned with this vision. Executives also said that Chinese policy-makers must consider how the country would like to position itself with respect to energy costs, and make changes now to remain attractive for manufacturing sites in the future. Making current investments in the energy industry can help to reduce environmental pollution now and positively impact China's future trajectory.

Executives' perception is that current Chinese enterprises are weak in green design capabilities and have large gaps in energy-saving product development and safety. Executives urged policy-makers to establish and optimize the technical specifications, standards and regulation system of green manufacturing; encourage enterprises to focus on the development of technology and equipment that can enhance the energy efficiency and resource utilization of traditional industries; and consider how to leverage the country's scale in its progress towards green development.

Executives cited the United States as a good example of where energy cost and availability provide a significant competitive advantage, pointing out that some manufacturing companies are thinking about moving production back to the US, based on the affordability and availability of energy.

To address the energy challenge, executives made the following recommendations:

- *Create specially designated funds that support energy consumption optimization and sustainability.*
- *Enhance the policy efforts in promoting energy conservation, emission reduction, environmental protection and clean production.*
- *Accelerate the R&D in alternative supplies of green energy.*

Improve intellectual property protection policies for both domestic and foreign manufacturers doing business in China

Not surprisingly, intellectual property protection was cited by both Chinese and non-Chinese executives as a critical need to continue the country's manufacturing industry growth. Executives said that policy-makers need to foster a "fair-play" environment to facilitate the long-term development of the Chinese market. Some Chinese executives believed that the lack of intellectual property protection has caused China's position to weaken relative to its key competitors, especially in a market that often requires joint ventures or strategic partnerships as a cost for foreign companies to operate in China.

Many executives were clear in their perspectives that the concern with intellectual property protection in China does not lie in lack of policy. Their concerns were primarily founded on lack of enforcement of those existing intellectual property protection laws as well as the current business culture and mindset regarding intellectual property. One business leader explained that legacy institutions tend to undervalue individual contributions, heavily favour seniority, and lack a risk-tolerant culture necessary to spur innovation. As a result, intellectual property (and other intangibles, such as services) is often undervalued. Most executives broadly believed this does not align with the values and priorities of manufacturing companies in the global market.

Still, China is viewed as having stronger intellectual property protection laws when compared to emerging low-cost countries such as Vietnam, Thailand and Indonesia. As a result, some executives said that China has the opportunity to make improvements in the enforcement of its laws and provide a strategic advantage for manufacturers operating in the region. Doing so, and given the other competitive drivers China delivers, would positively impact China's journey to advanced manufacturing.

Continue efforts in developing a highly talented workforce

Many executives saw China's abundance of engineers and scientists as a critical component of the country's current and future competitive capabilities. Executives also applauded China's various policies regarding talent development, such as the "1,000 Talents" and "10,000 Talents" programmes.

In 2012, China announced a 10-year campaign to cultivate 10,000 talented individuals in scientific and technological fields. The programme aims to support 100 scientists annually who have made breakthroughs in leading fields and have the potential to become "world-class scientists".⁵

And although executives support the current direction of these policies and see the increase in college enrolments, expansion of graduate programmes and coverage of vocational education as positive signs, they are concerned about the pursuit of superior talent. China's ability to develop and retain top talent is crucial to the country's transition in the value chain from low-end, low-cost manufacturing to high value-added, technologically driven manufacturing. To facilitate this transition, executives recommended the following:

- *Expand and continue programmes similar to 10,000 Talents which help to recruit and cultivate innovative, talented employees.*
- *Improve incentive mechanisms to cultivate technical leaders.*
- *Promote and deepen the cooperation between enterprises and academic institutions.*

Create policies and programmes to improve innovation capabilities and operational excellence

Executives had mixed perspectives about China's progress in the transformation from a low-cost manufacturing destination to a hub for manufacturing innovation. However, executives broadly agreed that operational excellence and the ability to innovate are critical for China to advance beyond its current success. They also said that policy-makers play a key role in creating an environment that facilitates a variety of innovation: technology, product, process and management practices.

Regarding operational excellence, executives suggested that increasing management transparency and promoting social progress would universally benefit enterprises in China. For example, one executive proposed that if companies were required to disclose on a monthly basis products that do not meet quality standards, the quality of life for the Chinese population would improve, the global markets would open further, and certain industry and business costs would actually decrease.

Executives said there is also a critical need to curtail market-distorting relationships between local governments and key local industries. For example, limiting subsidies and promoting more professional and commercial management, establishing technology neutrality for key regulators and state investors, and promoting transparency in the reporting and analysis of business results for manufacturers would improve overall competitiveness for the country.

China is seen as lagging behind developed countries in the synergies among the manufacturing industry chain, R&D systems and innovation processes. To improve in this area, executives recommended that businesses and policy-makers develop programmes that enhance organization and integration of downstream and upstream businesses in the industrial chain. Additionally, executives wanted to see increased attention to operational excellence at the business level, with evaluation of internal processes such as product and service innovation, cost control, human resources, risk management, and financing to improve China's manufacturing competitiveness.

Use the scale of the Chinese market to promote the adoption of advanced technologies

Plans outlined under China's 12th Five-Year Plan, particularly in the area of electric vehicles and supporting infrastructure investments, position the country well in terms of having the capabilities to drive mass adoption of electric vehicles on a global scale.

The electric vehicle related policies and trend bode well for domestic manufacturers and those foreign manufacturers looking to grow in China. It is expected that 5 million electric or plug-in hybrid vehicles will be on the road in China by 2020. Furthermore, annual production capacity is estimated to be 2 million cars by the same year. These volumes and demand create an attractive destination for both local production (from a cost perspective) and regional sales for both foreign and domestic manufacturers.

As Chinese automotive manufacturers work to establish local brands, they have a unique opportunity to introduce new innovative technologies in their local markets. Over time, if adopted on a mass scale within China, these manufacturers have the potential of becoming world leaders in introducing the same innovations in other global markets – thereby helping China's evolution to high-technology manufacturing.

Executives said that the automotive opportunities related to electric vehicles could also be easily applied to other high-technology sectors that align with China's 12th Five-Year Plan, including information technology and energy. As wages continue to rise and consumers desire more complex (and expensive) goods and services, demand for these advanced products and the rate of adoption will continue to rise. Executives believe policy-makers will play a role in the widespread adoption of new technologies.

Develop incentives that attract and improve the application of research and development investments in China

The Chinese government has recently set a series of objectives for industrial development, proposals for independent innovation, and urged large manufacturers to invest research and development dollars in China for up to 3% of sales.⁶ Executives stated that some Chinese companies are effectively leveraging this: for example, some companies are investing in original technology by providing capital, market opportunities, sales channels, management resources and consulting services to smaller companies, and then benefitting from the innovations or discoveries generated by their investment.

On the other hand, according to executives in the working sessions, some Chinese companies are not effectively abiding by the intent of the policy. Some manufacturing companies may not have rigorous or specific objectives focused on maximizing or measuring the value of R&D investments. For example, some companies utilize R&D funds to acquire prototypes and conduct peripheral testing, but spend little on core technology or true innovation. This is another case where the implementation and enforcement of the policy is the greatest concern for executives in advancing China's manufacturing competitiveness.

There is evidence that some foreign-operated research and development facilities are successful in China, which demonstrates that certain kinds of innovation are strong. For executives and policy-makers alike, the first step is to understand the factors that drive success in foreign-operated R&D centres and leverage these competitive advantages in other locations, as well as foster a business and cultural environment that encourages risk-taking and an innovative mentality among its employees.

To learn from and expand on the R&D facility successes, executives recommended the following activities:

- *Develop incentives such as pre-tax deductions, 150% deduction rates, and depreciation for R&D equipment that work to attract multinational corporation investments to establish global research and development centres in China.*
- *Increase investments in technology, build up the public platform for the R&D of generic technologies, and build on the strengths of existing programmes, like the National High-Tech Research and Development Program and the National Basic Research Program.*
- *Enact and consummate laws and regulations that are advanced in terms of promoting technology innovation.*
- *Provide greater support to key enterprises, leading enterprises and backbone enterprises.*

Develop more favourable corporate tax policies

Executives participating in the discussions expressed concerns with tax policy in China and said the government should consider additional ways of reducing the burden on enterprises.

To address this need, executives outlined the following recommendations:

- *Develop tax incentives for sectors deemed strategic (e.g. high-tech firms). Example incentives include a tax-free window for the first two years after becoming profitable and 15% thereafter, duty-free import of equipment for national key projects, or accelerated depreciation for R&D instruments and equipment.*
- *Attract businesses to set up advanced manufacturing operations and provide various incentives for land, building, facilities, etc.*
- *Develop stable tax policies that favour the long-term development of enterprises.*

Leverage fiscal policy to encourage the development of the Chinese manufacturing industry

Executives broadly agreed that China's financial institutions could do more to encourage the development of the manufacturing sector. They generally believed that there is a crucial need to reform and restructure capital markets, equity investment funds, and banks. As one business leader indicated, capital resources are often directed towards the less productive sectors of the economy, while small and medium-sized enterprises (SMEs) and entrepreneurial companies are often underserved. Although some progress has been made, more changes are required to foster the deep reform of channels for capital that are needed for real market players. To make steady progress towards financial reform, executives recommended developing a multi-level capital market, accelerating the internationalization of the renminbi, encouraging the economic development of non-public sectors, and promoting private investment.

Additional recommendations offered by executives include government-backed bonds for corporations with significant scale and competitiveness, foreign currency exchange rules, and financing for merger and acquisition activities that target foreign research institutions and corporations.

Finally, executives broadly agreed that fiscal policy in China must provide long-term financing for creative and innovative new industries and their research and development components. In providing this recommendation, executives were clear in saying that fiscal policies should support research and development activities as well as education and training programmes that deliver a highly skilled workforce capable of driving innovation.

India

A Rising Star

Over the last quarter century, India has moved away from its traditional socialist system and accelerated efforts to liberalize economic reforms. As a result, India today is recognized as one of the most competitive nations in the world, providing a strong talent pool in the areas of science, technology and research, as well as some of the lowest labour costs in the world. However, key challenges loom if India is to build on its achievements over the past 25 years. Namely, the country's healthcare systems, under-developed physical infrastructure, and policy and regulatory environment still create significant concern.

To improve its policy and regulatory environment and spur economic growth, India in 1950 established the Planning Commission, which is charged with formulating a strategy for the most effective use of the country's resources to improve the standard of living for Indian citizens. In support of its objectives, the Planning Commission has since its establishment implemented 11 Five-Year Plans, and implemented its 12th plan in March 2012 to target faster, sustainable and more inclusive growth.⁷

A Focus on Manufacturing

In 2011, India announced its National Manufacturing Policy and its objective of increasing manufacturing sector growth to 2-4% more than GDP growth, increasing manufacturing's share of GDP to 25% by 2025 and creating 100 million new jobs.⁸ Manufacturing currently contributes approximately 14.2% to India's total GDP, which is lower than other emerging economies recognized for delivering significant competitive advantages for manufacturers, including China (32.4%).⁹

In a highly collaborative, multistakeholder process, more than 26 working groups were involved in developing the current manufacturing policy, including ministry verticals and cross-sector groups. As part of the efforts of this report, the team conducted interviews with chief executives of Indian manufacturing companies and held a workshop during the World Economic Forum on India to understand what executives believe are the most critical aspects of the current Manufacturing Policy and the challenges of achieving the goals outlined in both the 12th Five-Year Plan and India's National Manufacturing Policy, and to understand their recommendations on overcoming those challenges.

Recommendations

Executives interviewed for this report consistently recognized the high level of stakeholder collaboration and effort that went into developing India's National Manufacturing Policy, yet believed implementation was analogous to a composer and maestro. Executives said the Planning Commission had and continues to play the role of the composer, but that the role of the maestro – who or what organization may be responsible for leading implementation (or the orchestra) – was still in question. Executives noted that the large number of stakeholders in India and the federal structure would result in wide variations in both the effectiveness and pace of implementation across India's states, yet urged strong leadership at the state level since much of the regulatory burden and business hurdles are created there.

The Indian Backbone Implementation Network (IBIN) is the Planning Commission's answer to the implementation challenge. A relatively newly announced initiative, the IBIN is a set of tools designed to manage dialogue, resolve conflicts, coordinate among stakeholders and manage implementation.

In addition to the broad policy implementation recommendations outlined by executives, those participating in the discussions also offered the following specific recommendations for improving India's competitive advantage.

Design effective ways to scale quality training for the workforce of the future

Executives consistently said skill development is the most pressing challenge to the manufacturing sector in India. Although the Indian government has put in significant effort over the past 50 years to develop its science and technical infrastructure, executives said the current capacity for workforce development does not meet the country's aggressive growth targets. Unlike Japan and Western European countries, India has a large young workforce, which all participants noted is a key strength to be leveraged. Executives almost unanimously supported the National Manufacturing Plan's approach to skills development; they stressed that the following actions would do much to scale workforce training initiatives.

- *Build skills among the large population of minimally educated workforce:* Executives stressed the need to develop creative ways to address the workforce challenge, including leveraging digital technology.
- *Establish industry training institutes in the form of public-private sector partnerships to provide relevant vocational and skill training:* Executives emphasized the need for both the private and public sectors to take responsibility, particularly for vocational and operator-level training. India's National Skills Development Corporation was cited as a good example.
- *Create additional polytechnic institutes focused on delivering higher education in vocational or technical subjects.*
- *Develop targeted training and development for the general management and technical supervisory level:* Executives consistently said that businesses need workers with strong critical thinking, leadership skills, and highly technical manufacturing skills. The challenge, however, is to comprehend manufacturing at a factory and product design level, management level, and value chain level.

Develop less restrictive labour laws

Executives participating in the discussions said that labour laws in India are "fairly rigid and cumbersome", making it difficult for companies to hire and lay off workers according to seasonality and volatility in demand. The rigidity of legacy labour laws results in companies hiring fewer people than they need and requiring the people they do hire to work overtime.

To improve in this area, executives said policy changes need to be enacted that focus on improving workforce relations and allowing greater flexibility for companies to react to changes in demand. Furthermore, executives agreed strongly that the labour costs in India must remain competitive. Some executives pointed to the Mahatma Gandhi National Rural Employment Guarantee Act, which gives adults living in rural areas a guaranteed period of work each year at a minimum wage on a public project, as a significant *disadvantage* to the manufacturing sector in terms of keeping the cost of labour low, as manufacturers compete with the agriculture sector to attract talent.

Invest in globally competitive infrastructure

While India has achieved a lot in terms of infrastructure, many executives noted concerns with the quality of India's infrastructure, and more concerning, believed the country still has a long way to go for achieving an infrastructure environment that enables competitiveness.

Infrastructure challenges that present hurdles for industry in India are primarily focused on supply-side constraints. For example, power supply is a challenge, as is the high cost of capital and controversies that often accompany land acquisition.

The World Economic Forum ranks Indian infrastructure 84th out of 144 countries. Not surprisingly, executives want to see tremendous effort and focus in this area from both policy-makers and public-private partnerships. In fact, there is demand for a greater level of private involvement to increase competition. Some executives said that the nation's policy framework itself is lower priority than some of the basic factors that make India competitive as a manufacturing destination. In discussing the hard infrastructure challenges in India, one executive stated, "We don't have a clue how this is going to happen."

- *Develop infrastructure to bring industry, not vice versa:* The prevailing sentiment was that it is irrelevant whether government, public-private partnerships or industry develop infrastructure. Historically, the model in India has been for industry to begin establishing itself in a location, and power supply, roads, water and other capabilities are added until the grid is overloaded. Executives said that this is the wrong way to build domestic capabilities and attract foreign direct investment.

Executives consistently noted that specific industries have specific needs when it comes to infrastructure. For example, auto executives and other consumer product companies called for improved roads to spur customer demand and efficiently deliver products to market. For technology industry executives, telecommunications infrastructure is critical. Regardless of industry, the overriding message was to invest heavily in all forms of hard infrastructure, both for domestic purposes and to attract foreign direct investment.

- *Create industrial clusters that result in integrated industrial townships with state-of-the art infrastructure:* Beyond direct measures that government can pursue in a country's infrastructure development (building ports, highways, power grids, etc.), executives were generally highly supportive of clusters that provide infrastructure and land use on the basis of zoning, clean and energy-efficient technology, necessary social infrastructure, skill development facilities, etc., to provide a productive environment to persons transitioning from the primary sector to the secondary and tertiary sectors.
- *Support the creation of industrial clusters by enacting regulatory improvements that remove complexity and uncertainty in areas that include land acquisition improvements, labour laws and taxation.*
- *Develop showcase clusters to immediately demonstrate the benefits through such initiatives:* Executives supported the creation of two or three showcase clusters developed quickly and immediately to illustrate the benefits that result in these integrated environments. Citing Tianjin, China, as an example, many executives believed that states would be more inclined to buy into the concept of national manufacturing zones. Said one executive: "If we wait for all stakeholders to be aligned, we will wait forever."

Relax policies defining reasonable levels of foreign direct investment

Executives consistently believed that key to growing India's manufacturing sector faster than GDP is an environment that promotes both private and foreign investment. These perspectives are supported by the National Manufacturing Policy, which states, "Foreign investments and technologies will be welcomed while leveraging the country's expanding market for manufactured goods to induce the building of more manufacturing capabilities and technologies within the country." However, many executives believed current laws are restrictive to supporting the objectives outlined in the policy and noted the following recommendations.

- *Review and reform regulatory restrictions on foreign investments in sectors deemed important and strategic to India's growth objectives:* In the face of the economic downturn in Europe and the United States, India receives more and more attention from international developers, investors and financial institutions. However, the perceived lack of commitment from the government to relax regulatory controls and other factors are contributing to an environment of uncertainty among these stakeholders. Achieving the growth objectives outlined in the National Manufacturing Policy will be driven in large part by participation from international organizations, and removing restrictive barriers of entry and regulatory controls is critical to the process.
- *Enact basic financial sector and capital market reforms to attract private investments:* While executives said India's growth is appealing to private investors, many also believed that current policies work against growth by adding risk and cost to private investments, which discourages capital inflow to the manufacturing sector. Specifically, cost of capital is extremely high, and private equity investors have limited exit strategy options.

Remove uncertainty from India's regulatory and legal environment

Most executives participating in the discussions agreed that the "regulatory goalposts" need to stop moving in India and that the inconsistency and arbitrariness of regulations is a hindrance to making investments.

Executives said the lack of transparency diminishes private sector confidence and opens the door for increased levels of corruption. Many noted that the National Manufacturing Policy cites regulatory reform as a key pillar in strengthening the manufacturing base, as it aims to centralize and rationalize business and environmental regulations among the various states and federal agencies. Executives also applauded Web enablement under the policy on matters related to business application, reporting and regulatory compliance. These measures, once implemented, would resonate with business leaders.

Other recommendations noted by executives include the following.

- *Implement laws that build trust among stakeholders, rather than laws that reinforce an environment of distrust.*
- *Address the basic hurdles and fundamental issues that keep businesses from growing, developing and investing in India:* Executives said regulatory reform, land acquisition reform and financial sector regulation are needed to spur investment and growth. Participants consistently supported environment and safety regulations that are in the best interest of society, but encouraged limiting the scope of such regulation to not impose overly burdensome regulation on business.

- *Remove and rationalize regulations to accelerate the pace of decision-making and approvals:* Executives said that accelerating the pace at which decisions and approvals are made would significantly benefit the Indian economy. Interestingly, executives noted the importance of improvements in this area in the context of foreign organizations looking to invest in India, as well as domestic companies looking to reinvest in the country. One executive noted, “Some large companies in India seem to be focusing more on investment overseas than investing in India due in part to the regulatory burden and slow pace.”

Develop a more liberal and simplified tax structure with a greater level of transparency to improve consistency of interpretation

Executives participating in the discussions consistently called for improving tax policy in India – both in terms of facilitating more consistent interpretation and in terms of providing greater tax incentives and benefits related to priority areas that support competitive manufacturing. Vocational training, infrastructure and R&D were cited as specific areas that would benefit from such tax incentives.

Create a sustained competitive advantage by encouraging technological innovation and movement up the value chain

While India’s technical talent is recognized the world over, many executives noted significant gaps in promoting interaction between industry and research institutions. Executives said the following actions would help to facilitate the connections that are required to create an environment that results in the ability to sustain the development of technological innovations.

- *Improve the intellectual property filing process and create an environment that results in an increase in the number of filings.*
- *Develop industry-led standards and create activities that result in global acceptance of those standards.*

India’s approach to the automotive industry, which is a leading manufacturing sector, was noted as a success story in efforts to develop industry-led standards. The automotive industry took up policy entrepreneurship to bring all stakeholders together to work towards a common vision. As a result, an ecosystem was created in which auto-producing hubs in Chennai, Pune and the National Capital Region each benefitted from clusters of allied industries supplying components and parts to enable the big companies to mass produce.

- *Encourage and fund risk taking to create an environment which rewards efforts that drive and support activities that move technological innovations from R&D, through applied research to full commercialization.*
- *Create inspirational science and technology goals and make attainment of requisite skills needed to attain those goals an aspiration.*
- *Build India’s Department of Science & Technology into a world-class organization to encourage greater collaboration with industry.*
- *Share and apply best practices and knowledge across states to encourage innovation.*

Provide government incentives for small and medium-sized enterprise manufacturers

The role of small and medium-sized enterprise manufacturers cannot be overstated in the development of a strong manufacturing base. SMEs in India contribute approximately 22% to GDP¹⁰ and an estimated 40% of manufacturing value-add, as well as 35% of merchandise exports.¹¹ Due to their size, these manufacturing organizations often face challenges that are less pressing or simply non-existent for larger manufacturing organizations. Fortunately, the National Manufacturing Policy recognizes this problem and identifies a series of policy proposals for improving access to finance for SMEs in the manufacturing sector. Executives participating in the discussions – primarily leaders of large, multinational Indian firms – were supportive of special treatment for SMEs and emphasized the following to benefit micro, small and medium-sized manufacturers.

- *Provide access to the basics beyond access to adequate and timely financing, to include availability of suitable technology, marketing resources and skilled workers.* Executives cited the critical role that SMEs play in the manufacturing ecosystem, including their ability to take risks on a smaller scale to promote innovation. The cluster approach will significantly promote SMEs and address some of their unique challenges related to access to credit, adoption of new technologies and development of human resources. Finally, it is important to note trade policy came up during the interviews and working sessions in the context of policy-maker support in boosting exports to meet India’s aggressive growth targets, and energy policy was touched upon by executives commenting on the criticality of infrastructure. However, these topics were not regarded as priority in the face of the more pressing policy issues previously noted.



Baba Kalyani, Chairman and Management Director, Bharat Forge, India and Seo Bo Shin, Managing Director and Chief Executive Officer, Hyundai Motor India (HML), India take part World Economic Forum working session on 6 November 2012.

Source: World Economic Forum

Brazil

The Americas' Emerging Powerhouse

Brazil's manufacturing competitiveness is expected to strengthen over the next several years. Driven by ongoing investment in infrastructure in preparation for the 2014 World Cup and 2016 Olympic Games, relevant changes in the energy sector and other recent policy reforms, Brazil appears to be favourably positioned for the future regarding manufacturing competitiveness.

From a policy perspective, the country's recently announced Brasil Maior (Bigger Brazil) industrial plan is expected to create favourable tax advantages for Brazilian manufacturers, as well as reduce lending and energy costs. Under the plan, the Brazilian government hopes to address a set of fiscal, legal, financial and infrastructure obstacles, commonly referred to as the "Brazil Cost", that have undermined the competitiveness of Brazilian companies within the domestic market as well as the ability of importers and exporters to deal with international competition.¹²

The World Cup and Olympics are expected to accelerate the planned infrastructure improvements and bring in foreign investment, which will likely have a positive influence on improving the country's manufacturing industry and competitive position.¹³ Brazil is one of the few countries with a sufficiently large natural resource base coupled with a relatively advanced research infrastructure. This places the country in a unique position to capture more profitable stages of the value chain through the use of alternative energies that are ecologically sustainable – something noted as critical by the executives participating in the interviews.

Many executives said the current administration in Brazil is headed in the right direction, noting specifically how policies are now creating an aura of competitiveness, improving the quality of basic infrastructure and working to face the high cost issue. This sequence, many said, generates a positive growth potential to enter into the global economy. They also mentioned that Brazil could not "walk alone" on this journey and needed to work closely with other nations, noting the potential negative impact on Brazil resulting from the crisis in the Eurozone and slower growth in China.

Costs, however, were frequently cited by executives as a concern. Specifically, many executives said that labour costs pose a significant competitive disadvantage. Despite the tax improvements outlined in the Brasil Maior industrial plan, many also said that Brazil's high corporate tax rate hampers the competitiveness of Brazilian companies and the country's attractiveness for foreign investment coming from North America, China and South Korea.

From a monetary perspective, executives noted cost concerns with continued appreciation of the Brazilian real, which is making imports cheaper and exports more expensive. Executives mentioned capital goods, automotive, textiles and footwear as specific sectors that have already been negatively impacted by appreciation.

Executives further explained that the unfavourable exchange rate and the high cost of production in Brazil, coupled with global economic uncertainty and overall cooling of long-term outlooks, have resulted in a change in the entire production chain in Brazil and caused frequent substitutions of domestic products with imports. As a result, part of the local consumption has been captured by imported products and the level of national production has remained stagnant.

Finally, when it comes to talent, the executives were consistently disappointed with the education system in Brazil and considered the lack of skilled talent as the most important factor limiting Brazil's future competitiveness.

Executives almost unanimously said that policy-makers are a key to overcoming these challenges and to driving Brazil's growth. They consistently noted the importance of public policy and its connectivity in the "manufacturing ecosystem" with respect to setting the rules on trade, flow of capital, regulatory rules and barriers, floating exchange rates, taxes, educational policies, and research and development incentives.

At the same time, they were concerned with what is described as two levels of public policies – one focused on national measures that seek to relieve payroll pressures, reduce the price of electricity and reduce taxes, and another focused on the "policies of protectionism", which many believed are harmful to all sectors and do little to drive innovation or improve Brazil's place in the global manufacturing economy.

To address these challenges, executives outlined the following recommendations.

Recommendations

Focus on talent development, innovation and education with special emphasis on elementary education and science and technology disciplines

Executives almost unanimously agreed that talent training is a key issue for Brazil. Many expressed strong support for the competitive advantages talented workforces can provide for countries and companies, and said that Brazil today is at a significant disadvantage when compared to countries such as the United States, Germany and China. These countries have their own self-described education challenges, but have created programmes that foster strong STEM (science, technology, engineering and mathematics) education at the elementary level, have created world-class universities, and/or have established programmes that create partnerships and collaboration between the public and private sectors (thereby fostering the "manufacturing ecosystem" that drives research and development and resulting innovations).

In outlining recommendations for improving education in Brazil, executives consistently described a number of challenges that begin at the lowest levels of public education and progress through the university level. They also noted concern with limited connections in Brazil between educational institutions and corporations, and the resulting limited ability to drive innovation. In addressing these challenges, executives broadly described two main areas that they believe require focus:

1. Policies and investments in talent and human capital development
2. Policies and investments in science, technology and innovation

Policies and investments in talent and human capital development

First and foremost, executives consistently and passionately believed there are significant problems in the elementary school system that need to be addressed, and specifically noted Brazil's poor rankings internationally with respect to its education system.

Executives also outlined several concerns at the technical school and university level. For instance, executives said that Brazil has capacity constraints in its ability to build a robust pipeline of talent with degrees or advanced technical certifications. Many also voiced long-term concerns relative to a skills shortage for engineers, noting increased interest from students in non-science courses versus pursuing technical careers that are in high demand in Brazil and around the world.

Finally, some executives said that universities in Brazil today do not offer curriculums in fields that the market demands. Executives described a “huge gap” in this area, noting that there is more demand in sciences but the supply is growing faster in the humanities. Moreover, there is a decrease in the quality of existing curriculums because of reduced time requirements for earning engineering degrees and teaching models that are outdated and, according to some, going backwards.



In Brazil, where the costs of labour associated with low productivity are factors that erode competitiveness, it is essential to maintain high quality, technical knowledge not only at the level of engineering, but also in occupations critical to the country such as machine operators, welders and construction professionals.



– Executive interview

In outlining an action plan for the development of education in Brazil, executives described concerns regarding labour at all levels of an organization, and how the lack of a clear educational agenda negatively impacts Brazil's future.

To address these challenges, executives offered the following recommendations:

- *Develop long-term talent and human capital development policies and investments that clearly define how policy-makers will improve education in Brazil.*
- *Create programmes that identify deficiencies in specific skills in demand by employers and deemed strategic to Brazil's competitiveness, and provide incentive for educational institutions and students to fill any skills gaps.*

Policies and investments in science, technology and innovation

Some executives said that the academic world in Brazil is disconnected from the real world, and also from an environment where academics, policy-makers and business leaders are working collaboratively to develop and drive Brazil's science, technology and innovation future.

Many of those participating in the discussions highlighted Brazil's abundant supply of natural resources and healthy mix of many cultures and ethnicities, and outlined a point of view that positions education and knowledge as the necessary link between people and natural resources to generate innovation.

To take advantage of the opportunities that result from such strong links and in response to an inadequate educational system, many companies have taken on the burden of training to develop the next generation of innovative thinkers. Many executives described the expensive education programmes that their companies have created to train and empower employees.

Executives overwhelmingly said that even employees from good universities required some initial training to transition and operate effectively in the “real world”.

From a company perspective, executives consistently said that people make the difference in a company's ability to drive innovation. As a result, many intend to continue and expand their training programmes, as they believe these investments will bring future innovative processes and products. Executives also called for policy-maker support in advancing Brazil's innovative potential through the following actions.

- *Enact long-term science, technology and innovation policies and investments that evaluate the quality of the education that is being taught in the classroom today and improve technical schools and centres of excellence.*
- *Move away from being a “commodity country” and improve the promotion of strong links between education and natural resources as a driver of value-added manufacturing.*
- *Develop formal programmes designed to bring companies together with universities (both in Brazil and abroad) to seek innovative technologies for products and processes.*

Invest in infrastructure projects that improve logistics and transportation, and therefore overall competitiveness

Lack of quality infrastructure and the absence of policies that outline a strategic approach to infrastructure improvement were cited by many executives as negatively impacting Brazil's overall competitiveness.

Executives broadly believed that logistics is a central theme uniquely important to Brazil because of the country's position as an important hub for the rest of the continent. While the World Cup and Olympics are helping to improve the state of infrastructure in Brazil, many executives said the current structure of ports, airports and railways is not adequate for the needs of the country and must be updated more quickly.

In fact, some executives said they have seen a slowdown in infrastructure improvement, and that the pace at which companies seek to develop markets is today much faster than the speed of infrastructure projects. Some of this slowdown, according to executives, is the result of an unclear “mapping” of the infrastructure projects that Brazil actually needs, as well as few public-private partnerships that encourage the private sector to step in where the government may need assistance.

To address these challenges, executives outlined the following recommendations:

- *Develop plans and policies that provide an ability to consistently execute infrastructure initiatives at a pace that is in line with industrial development and trade.*
- *Perform a mapping of the real needs of infrastructure projects in Brazil and set a schedule for these undertakings.*
- *Develop programmes that increase the involvement of the private sector in infrastructure development within a safe and legal environment.*

Invest in energy availability, reliability and efficiency

With respect to energy, executives said Brazil's abundance of natural resources positions the country well for long-term competitiveness and recognizes the positive impact from past investments that resulted in Brazil becoming a self-producer of energy. Executives specifically highlighted the oil and gas sector and its "local content" policy, which some described as a fundamental instrument of industrial policy that serves as a tool for strengthening competitiveness and sustainability of the domestic industry throughout the supply chain of oil and natural gas. They considered this a worthwhile incentive for Brazil's continued journey towards advanced manufacturing and more sophisticated products within Brazil.

Still, executives expressed concern because Brazil's policies have seemed to move away from an approach that encourages continued investment in clean, reliable and efficient alternative sources of energy.

Many executives called for initiatives that result in energy policies that not only leverage Brazil's supply of oil and gas in the most competitive manner, but also set long-term objectives for research and development of more sustainable energy. Advancements in the use of paper and pulp as energy sources were specifically noted.

In fact, many executives said Brazil could take a global leadership role in the research and development of alternative energy sources, as well as set the standard for efficient and effective use of natural resources. For example, the country could establish incentives that promote the exchange of equipment to newer models that consume less energy.

Executives consistently said the government needs to take a central role in outlining how to better use today's energy sources, as well as support the development of renewable energy alternatives. Some executives noted that today, energy policy in Brazil is largely focused on oil, gas and derivatives.

They further expressed concern that Brazil has no strategy for "back-up" sources of energy (and that the government may need to explore other natural resources), highlighting specifically the devastating impact of the natural disasters in Japan.

Executives hoped success similar to Brazil becoming a self-producer of energy could be achieved in developing new energy policies, and offered the following recommendations in working towards those objectives:

- *Develop government measures to encourage the creation of methods to improve Brazil's energy network through targets to increase the use of clean energy.*
- *Create government programmes that encourage a technological upgrade when changing old machines and equipment to new machines with lower power consumption.*
- *Increase investment in and prioritize infrastructure efforts that result in the efficient generation and distribution of renewable energy.*

Simplify the tax system and reduce the tax burden on corporations

Executives participating in the discussions almost unanimously expressed concern with the tax system in Brazil and the negative impact that both its complexity and costs have on competitiveness. While all applauded policy improvements over the past three years, many still considered the tax system as a critical area that needs additional focus.

Executives broadly discussed challenges of interpreting and complying with Brazil's complex tax structure. They also expressed concern with current labour policies that place a high tax burden on employers. Although many applauded the recent improvements in tax-related labour policies that provided an exoneration of payroll tax (and said the initiative was a step in the right direction), almost all believed that in the long term, current "archaic" legislation would also need to be addressed. Many executives said the ripple effect of current labour policies is perhaps the most negative consequence impacting competitiveness. Specifically, executives cited labour laws that require hiring and the resulting tax burden placed on employers in their efforts to comply with those labour policies.

Executives outlined a number of recommendations they believe would improve Brazil's tax system and lower the country's high tax burden – thereby improving Brazil's overall global competitiveness.

- *Enact tax policies aimed at reducing Brazil's high taxation rates. Place specific focus on import taxes, interest rates, electricity tariffs and labour laws that impact tax rates.*
- *Overhaul the entire tax system to remove bureaucracy and create a more simple tax code, which will also result in reduced compliance costs that companies bear.*
- *Consistently enforce legal consequences for violations, thereby creating certainty regarding tax policies and proactively addressing frequent occurrences of fraud and tax evasion.*
- *Provide tax incentives that promote and encourage research and development initiatives that focus on sustainable, alternative energy.*
- *Reduce the tax burden on domestic industries and sectors deemed strategic to Brazil's long-term growth, thereby also attracting more foreign investments in those sectors.*

Establish political, legal and regulatory stability

Executives consistently called for the establishment of a business environment that is well organized and appropriately regulated, and respects legal contracts between private enterprises and government. Doing so, according to many participants, is critical to removing uncertainty associated with doing business in Brazil and offering a sense of security for foreign investors.

Executives also said Brazil needs adequate public policies and measures that encourage domestic production, not protectionism.

Some executives expressed concern with a slow legislative process in Brazil. Executives were cognizant that certain policy areas, such as labour policy, are highly complex and require careful action, but they also want to see such issues addressed with pragmatism and agility.

In the context of agility, bureaucracy was noted as putting the country at a disadvantage. Many cited a lack of dynamism in terms of policy adjustments and creation to protect long-term trading (within WTO rules), plus some difficulties regarding the compliance of existing rules which undermines the competitiveness of companies – and further inhibits them from making more investments.

Overall, from a domestic and global perspective, executives said it is essential for people interested in investing in Brazil to have security in the legal and regulatory framework. Many said Brazil needs to focus on this area to attract opportunities and investments.

Develop initiatives focused on moving Brazil from a commodities export nation to value-added manufacturing economy

Today, the Brazilian economy is highly dependent on commodities exportation, and executives expressed concern with the lack of measures directly linked to industry that works to adjust this fundamental structure and focus on a path to value-added manufacturing.

Executives recognized recent efforts by the government to promote Brazil's industrial sector, and said they were starting to see positive results stemming from those efforts. They applauded recent efforts focused on reducing energy costs to drive competitiveness, and said that programmes like Reintegra Brasil Maior, which provides tax incentives for entities that export goods that are manufactured in Brazil, also helped in creating manufacturing competitiveness.

And while they recognized the strategic and competitive advantages offered through its abundant access to natural resources, executives also said continued focus on these sectors would only support commodity exports and not help to accelerate movement of the manufacturing sector towards the production of more complex goods.

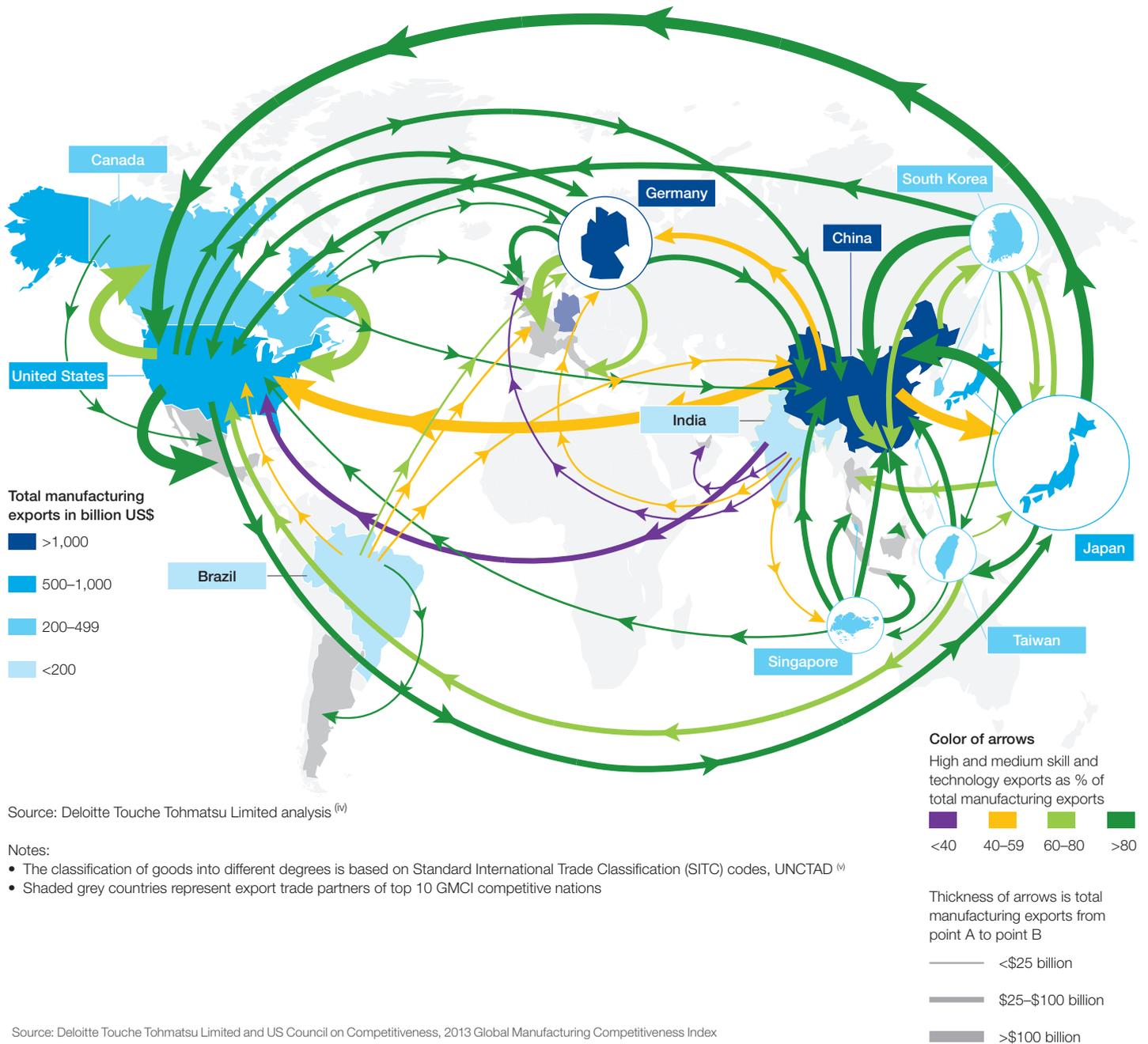
Almost all of those participating in the discussions called for manufacturing to leave the area of commodities and focus on driving business innovation. They expressed that natural resources need to be a basis for value, but are not essential for industrial growth.

Many executives said that focusing on value-added manufacturing would also lead to economic prosperity of Brazilian citizens, who would then have the purchasing power and demand for more complex goods, which would result in increased foreign investment and growth of Brazil's domestic manufacturing industry. Not surprisingly, many cited China as a market where this process is currently underway.

Executives broadly said that taking this opportunity to move Brazil up the manufacturing ladder requires a set of policies that addresses the cost, talent, infrastructure, energy and regulatory challenges previously discussed. Overall, executives believed that Brazil has strengths and opportunities to grow, but that the challenges that persist are complex and require significant effort to improve the country's overall competitiveness.

Comparative Economic and Related Data

Movement and levels of manufacturing products to and from top manufacturing economies and their trading partners, by product type



CEO Policy Recommendations for Developed Economy Nations

United States

Opportunity in the Land Of Uncertainty

Although recognized as one of the world's leading manufacturing nations for much of the 20th century, the United States has witnessed a rapid paradigm shift in the 21st century, with its dominance challenged in nearly every area of manufacturing competitiveness, from research and development to shop floor process technology and worker productivity. A slow and steady decline of manufacturing's contribution to the US economy over the past 25 years has begun to challenge the prosperity of its middle class as well as its long-held status as a global manufacturing and innovation leader. The decline was in part self-inflicted and in part the consequence of rapid globalization – and of the rise of significant competitors in Asia.

Still considered one of the most competitive nations today, the United States is expected to increasingly be challenged by emerging economy nations over the next decade as those countries rapidly build their manufacturing capabilities. Until recently, much of the real issue for the US has been the philosophical debate on whether or not manufacturing even mattered to America's economic prosperity, as its capabilities and middle class jobs drifted away. More recently, however, US policy-makers, educators and business leaders have taken a renewed interest in – and developed a deeper appreciation for – the important links between manufacturing, innovation, economic growth and high-paying middle-class jobs. The real questions now before American leaders are these: Is it too little, too late? If not, what is the path forward?

Driven significantly by manufacturing, the slow but steady emergence from the Great Recession illustrates that manufacturing does indeed matter and that the United States still possesses many of the ingredients in the “secret sauce” that helped to create America's vibrant industrial base – a resilient entrepreneurial spirit, world-class innovation capabilities, a strong legal and regulatory environment, and systems that support the free flow of capital, ideas and people.

Chief executives participating in the face-to-face interviews and in the roundtable working session conducted by the Aspen Institute broadly viewed the US economy as having grown and improved over the past several years, and generally described 2012 as a good year for their manufacturing enterprises. At the same time, many executives expressed moderate to significant caution regarding prospects for the economy in the United States and in many other parts of the world in 2013.

With respect to global economic conditions, most US chief executives saw Europe as very troublesome for the next two to five years, and that there are significant issues that will continue to dampen economic growth for the entire Eurozone that will take time to address. In China and other parts of Asia, executives saw more moderate growth compared to the double-digit growth over the past five years. While many said exports would continue to be strong, they saw increasing labour and material costs, currency issues, and rising structural cost burdens clouding the economic outlook for Asia. Changes in leadership in China and Europe and unrest in the Middle East all contributed to an overarching sense of uncertainty among the executives participating in the discussions.

As for the US economy, uncertainty dominated CEO concerns: uncertainty regarding the direction of energy, legal and regulatory policy; the continued debate on tax policy and the fiscal cliff; and the slow housing sector rebound across America.

Fundamentally, many did not see how economic growth would be achieved over the coming year or two, which left most questioning whether the US can sustain the heady manufacturing growth experienced over the most recent past.

One chief executive provided a backdrop of what he views as a significant rise in competition between countries and the inevitable disintegration of the “flat, free world” – accompanied by greater policy restrictions in the flows of capital, talent and trade – and thus ushering in a new era of fierce competitiveness between nations.

Executives participating in the interviews and roundtable working session broadly expressed the following concerns when providing their perspectives on the current state of America's ability to compete in today's global marketplace.

Policy and Regulatory Uncertainty

Executives frequently described the debilitating consequences of uncertainty, including delayed investment and hiring decisions, and the resulting negative impact on US manufacturing competitiveness. Executives noted the fiscal cliff debate as just another example of seemingly endless uncertainty on key policy issues, and called for an environment characterized by constructive and meaningful dialogue that seeks compromise on an ongoing basis versus an environment often seen as rife with edicts and polarization. Executives also consistently stressed that the US needs to develop policies that provide better long-term clarity and are sheltered from election cycles.

Revive, Nurture and Protect America's “Secret Sauce”

Executives consistently noted concern with what they perceived as a lack of focus in the United States to protect and nurture America's “secret sauce” – the ability to connect a vibrant entrepreneurial spirit with world-class innovation capabilities and support them with a strong regulatory foundation and access to venture capital. The topic of access to venture capital was particularly concerning to executives. Many said that the current policy environment had damaged venture capital activity (which was viewed less robust than in the past), and generally believed that any policy action focused on reviving America's “secret sauce” should focus on making improvements that impact the areas mentioned above.

Government's Role in Spurring Manufacturing Competitiveness

Few of the executives advocated the need for a “manufacturing policy”. Most desired sensible business policies that stimulate investment and growth, allow free-market principles to sort out winners and losers, and create an environment where businesses can be successful. At the same time, nearly every executive understood the responsibilities they and their companies have to benefit and protect society and expect nothing more than an environment which attracts capital, talent and ideas and where businesses and individuals can thrive. Balance, unanimously, was essential.

US executives said government also has a primary role in levelling the playing field between countries by addressing cross-border issues in areas that include monetary policy, intellectual property protection, immigration, and free and fair trade, aggressively confronting trade violations.

One executive noted that policy-makers need to become comfortable with the notion of “creative destruction” – where focus is given to new manufacturing innovations, businesses and jobs in lieu of trying to save low value-add businesses and industries.

Recommendations

Reduce the deficit by broadly supporting a Simpson-Bowles type approach to tax revenue increases coupled with expenditure reductions and a slowed growth trajectory on entitlements

Executives repeatedly noted the deficit as a major concern and said action is needed to reduce the deficit and, as a result, the borrowing costs and long-term burdens for the United States. Executives generally believed that excessive federal debt would continue to be a drag on US manufacturing – which would only be exacerbated by uncertainty stemming from policy debates similar to those surrounding the fiscal cliff.

Lower corporate tax rates broadly and place the US in a more competitive position relative to other nations

Many of the executives said that if the overall corporate tax rate of the United States were lowered, American companies would be more competitive. Executives unanimously said high corporate taxes negatively impact competitiveness and result in a reduced ability to invest at a level comparable to the global competition. Executives consistently noted that a tax rate similar to other manufacturing-driven economies would improve US corporations’ ability to invest, innovate and compete.

At the same time, while most executives were comfortable with an overhaul of the tax code, concern was expressed by several that past credits and other “preferences” not be immediately eliminated as many companies and key sectors have investments and business operations structured around the existing tax code and its current complexity. As one executive said, “The devil is in the details.”

Interestingly, while many executives said permanency of R&D tax credits was important, those policy issues paled in comparison to the urgency many expressed relative to enacting tax policies that work to reduce the overall corporate tax, as well as policies that address concerns with territorial tax rates – something noted as particularly important to multinational corporations.

To address these concerns, executives recommended the following actions be considered:

- *Develop globally competitive corporate tax rates and institute widespread tax reforms that provide long-term clarity and stability on overall corporate tax policies to promote investment in the United States and strengthen competitiveness.*
- *Decrease the cost of repatriating earnings – either by creating a territorial tax policy or by minimizing the payback difference between foreign and US tax rates.*
- *Enhance and make permanent R&D tax incentives in an effort to remove uncertainty from making long-term investments in research and development.*

Develop energy policies that support the competitive advantage and head start the United States has in the area of shale gas production

Many executives were passionate in the dialogue on recently discovered shale gas opportunities in the United States and on energy policy. Most generally said policy emphasis and investment in alternative energies should not come at the expense of long-term innovation and the economic opportunities that shale gas represents. Executives said shale gas provides a clean, sustainable and affordable energy source, and delivers the BTUs that are essential to the manufacturing process. Many of the executives also believed shale gas provides a significant opportunity to reduce the United States’ dependence on foreign sources of energy, thereby improving the national security of the country and its overall competitiveness.

Executives said the following activities would help the US take advantage of the opportunities shale gas represents:

- *Create a comprehensive energy policy that encourages reinvestment in the US energy infrastructure, pursues energy efficiency and conservation, and balances investment across a diverse portfolio of current energy assets, such as shale gas, coal and offshore oil, while also investing wisely and responsibly in alternative energy sources including solar, wind and nuclear.*
- *Develop energy policies that support ongoing public and private investment into shale gas research and development, thereby creating opportunities for the United States to retain its leadership position and serve as a catalyst for job creation.*
- *Encourage the use of cleaner and abundant fuels such as natural gas to facilitate the transition away from the use of oil and coal.*
- *Modernize the US electric grid to grow capacity, improve reliability and integrate alternative energy sources as they develop.*
- *Moderate near-term government investments in alternative energy and the creation of artificial, high-cost and unsustainable markets.*

Create programmes that quickly establish free-trade agreements that are fair and equitable, and attack discriminatory policies imposed by other nations

As previously noted, executives participating in the discussions cited significant concern with trade policy, and said government plays a central role in driving the creation of free-trade agreements and ensuring a level playing field that supports the effectiveness of free-market principles.

Many of the participating executives said strong government support for free and equitable trade, especially in emerging markets, in conjunction with advocacy against protectionist policies such as mandated joint ventures in return for market entry or excessive tariffs would do much to improve the competitiveness of US manufacturers.

Executives also said that the United States could do more to accelerate the pace at which new trade agreements are adopted. While they widely supported recent agreements with Panama, Colombia and South Korea, they believed similar agreements are needed – specifically noting that beyond enhancing the flow of goods across borders, trade agreements also facilitate access to leading technologies and top talent located in foreign markets, which are critical to spurring domestic economic growth and job creation.

To address these concerns, executives recommended the following:

- *Develop a new trade promotion and fast-track authority to quickly establish bilateral or regional free-trade agreements with rapidly growing nations that are fair and equitable, while also ensuring US rights under existing trade agreements are enforced.*
- *Ensure US rights under existing trade agreements are enforced and aggressively confront obstructions to market access, currency manipulation, violations to intellectual property rights, and unfair labour practices.*
- *Build a comprehensive US-European Union trade and investment agreement.*
- *Pass permanent trade promotion authority.*
- *Work towards a market-based exchange rate with major trading partners.*
- *Expand export-promotion assistance to manufacturers and ensure that competitive finance is available.*

Develop education and workforce programmes that ensure the United States continues to have access to qualified graduates and other highly skilled workers

Executives overwhelmingly expressed concern with the brain drain in the United States and potential consequences for the future. Stemming the brain drain and ensuring science, technology, engineering and math deficiencies in the US primary **and** secondary education system are addressed were clear priorities for US executives participating in the interviews. Their emphasis was placed on ensuring America's education system continues to deliver a sustainable stream of qualified graduates in the fields of engineering, science and math.

Executives placed particular emphasis on what they described as today's "mobile" workforce. And many also viewed diversity as a key driver of innovation and, thereby, competitiveness. As a result, executives generally believed immigration policy must be enacted to allow for the retention of critical science and technology talent from other countries educated in American universities, as well as to attract the world's best talent to the United States.

Finally, executives said that the feedback loop between businesses and US educational institutions needs to be improved, thereby ensuring a proper mechanism is in place that would result in workers having the skills and certifications required to excel in today's (and tomorrow's) advanced manufacturing facilities. They stressed the need for US teachers to become their partners and more acquainted with modern manufacturing; both the considerable career opportunities it provides students and the rigorous foundation necessary in science, technology, math and critical thinking.

Executives passionately described the investments their businesses are making in workforce development. Many gave example after example of where they have set up in-house programmes, devoted significant investment to training and development, and invested both money and human resources in the local communities, high schools and community colleges.

To address these concerns, executives recommended the following activities:

- *Adopt policies that allow top students from other countries educated in US universities to remain in the United States upon graduation and to enter the US workforce.*
- *Change the focus of immigration reform discussions and craft policy that creates opportunities for talent born outside the United States to become an integral part of the US workforce.*
- *Build government-industry partnerships that encourage students to pursue careers in science, engineering and manufacturing.*
- *Adopt more stringent and consistent standards for STEM disciplines throughout the entire educational system in the United States, including developing educators who are subject matter experts and better able to prepare students for advanced degrees or certification programmes.*
- *Ensure adequate support for a closed-loop feedback process within the manufacturing "ecosystem" to ensure curriculums meet the changing needs of businesses.*

Create and support programmes that drive America's long-term science, technology and innovation initiatives

Executives participating in the discussions consistently noted a growing gap between universities (where basic research is performed) and the manufacturing sector (where development and applied research is conducted), and the negative impact on America's ability to drive new ideas through the "valley of death" to full commercialization. They almost unanimously called for the creation and long-term support of programmes that effectively and efficiently allow for the advancement of new innovative science and technology breakthroughs through the so-called "valley of death", which they believed are critical to the United States' long-term, global competitiveness.

In providing their perspectives, executives consistently pointed to other countries such as Germany and China, which they viewed as outperforming the United States in the early stages of the innovation process because they develop clear objectives that connect ideas and products with support from both the private and the public sector. China's 12th Five-Year Plan and Germany's Fraunhofer Institute were both cited as good examples of a government developing long-term science and technology goals, and a public-private partnership focused on transforming scientific findings and basic research into useful innovations.

An example in the US highlighted by one executive was SEMATECH. Formed in 1987, SEMATECH is focused on semiconductor and emerging technology research.¹⁴ Its membership and global network of alliances with equipment and material suppliers, universities, research institutes, consortia, start-up companies and government partners help to offset cost and risk, and leverage resources.¹⁵

Although the US is trailing other countries, some executives did highlight programmes in the United States that today do work towards supporting the commercialization of new ideas.

Specifically, executives at the working session hosted by the Aspen Institute highlighted the National Science Foundation (NSF), which in addition to having a number of programmes focused on bridging the gap between basic research and new products for market, released its five-year strategic plan in April 2011. The plan includes clearly articulated strategies for emphasizing the seamless integration of research and education; developing performance-based goals that make investments in emerging new fields of science and engineering; preparing and engaging a STEM workforce to participate in emerging fields; increasing international partnerships and collaborations to fuel US competitiveness; and making investments that are useful to society and address societal changes through science and engineering.¹⁶

Executives also recognized the world-class infrastructure within the United States supporting research and development initiatives, noting specifically that the United States has some of the best universities in the world. However, at the same time they expressed concern with the ability of those institutions to continue setting and driving long-term initiatives in an environment where federal and state funding is often subject to election cycles. Some executives said policy-makers do not fully understand the long horizon often associated with research and product development cycles, and said that certainty relative to funding would both attract investors into emerging fields and allow researchers and scientists to focus on their research efforts versus funding.

To address these challenges, executives recommended the following:

- *Establish a consortium of business, university, labour and public sector leaders tasked with establishing innovation goals with a 15- to 20-year development horizon. Then collaboratively support those goals with policies, investments, infrastructure, education and other related programmes.*
- *Develop a US innovation strategy that establishes programmes to feed an innovation pipeline through full life-cycle commercialization and that supports both basic and applied research. The strategy should also break down barriers to collaboration between universities, laboratories, and the private and public sectors.*
- *Create long-term mechanisms that insulate funding programmes from election cycles and changing administrations.*
- *Create a system that seeds innovation and helps to avoid multiple “valleys of death” by establishing clear objectives and direction that incentivize the private sector and venture capitalists, are supported by the public sector and include enabling mechanisms to drive innovative ideas and technologies through to commercialization.*
- *Provide incentives for investment in R&D equipment and infrastructure to ensure the US remains an attractive destination for long-term investment in innovation and manufacturing.*
- *Develop more industry clusters that co-locate research institutions, industry and the best talent, all focused on advancing research to full commercialization.*

Ensure a balanced legal and regulatory environment in the United States that does not place undue burden and costs on manufacturers

In discussing the legal and regulatory environment in the United States, executives consistently expressed frustration with how regulations have historically been developed – noting specific concerns with what they said was an absence of dialogue between business leaders and policy-makers when setting regulation, and unforeseen cost and complexity burdens on businesses as a result of new regulation. While the executives neither disputed the need for regulation nor their responsibilities as business leaders to contribute to the social well-being of society, many believed that both the number of policies and the cost of compliance with those policies place their organizations at a competitive disadvantage. Those costs, according to executives participating in the discussions, are only compounded when one considers overlapping federal, state and local regulation and the complexity associated with both understanding and compliance.

For example, recent research shared at the working session hosted by the Aspen Institute reveals that more than 2,000 manufacturing-related regulations have been adopted since 1981, an average of more than 70 per year.¹⁷ Furthermore, the cost of regulation has advanced at a pace much faster than GDP since approximately 1998, and even faster when compared to the physical output of the manufacturing sector.¹⁸ The cost of compliance for businesses also increased since 1998, growing 7.6% annually versus inflation-adjusted GDP (2.2%) and physical output of manufacturing (0.4%).¹⁹ Finally, and perhaps most disturbing, the research shared at the Aspen Institute working session reveals that the regulatory burden for manufacturers will reduce output in the United States by almost 6% over the next 10 years – thereby also raising production costs and negatively impacting America's overall competitiveness.²⁰

Executives participating in the interviews and the Aspen Institute working session consistently said improved dialogue between business leaders and policy-makers during the regulatory setting process was an important first step to addressing the regulatory concerns in the United States.

Executives also said that US policy-makers need to redefine the metrics when evaluating the impact of policy decisions. Executives broadly called for the development of a framework that includes input from all stakeholders impacted by the policy setting process. The framework would allow for collaborative discussions that focus on developing effective and balanced policies that minimize regulatory burden, can be implemented quickly and improve the competitiveness of the United States.

To address these concerns, executives outlined the following recommendations:

- *Create programmes that allow for the development of policy in a collaborative manner with business leaders and policy-makers so that policy decisions are evaluated on the basis of global competitiveness and do not result in unforeseen burden or cost.*
- *Benchmark other countries to better understand the positive and negative consequences policy decisions have on competitiveness.*
- *Identify opportunities to lower compliance costs by eliminating overlapping policies where multiple agencies have jurisdiction. Collaborate across agencies and various levels of government to harmonize policies to reduce monetary and compliance costs.*

Germany

Strength in the Midst of Economic Crisis

Germany's history for manufacturing excellence is renowned. From some of the world's most luxurious automotive brands to the country's continued dominance in the field of "mechatronics", the premium brand often associated with the moniker "made in Germany" has resulted in the country being recognized as one of the most competitive developed nations in the world.

Unlike emerging economies, however, Germany has taken a different approach in sustaining its global manufacturing prowess and is today in a position of strength while most of the Eurozone navigates the turbulent economic storm that engulfed the continent throughout 2012 and will continue to do so in 2013.

Germany's path to prosperity over the past decade has focused on the development of new technologies and its ability to drive innovation leveraging a highly skilled workforce that demands higher labour rates, resulting in economic benefits for the nation's economy, its citizens and companies operating in the market.

One specific example is Germany's leadership in mechatronics – a multidisciplinary field of science and engineering that merges mechanics, electronics, control theory and computer science to improve and optimize product design and manufacturing.²¹ Through this focus, and the technological advancements that result, Germany has created sustainable demand for its products from both developed and emerging markets around the world. In fact, Germany is the world's largest manufacturing exporter behind China.²²

Yet, challenges may loom for Germany in its ability to maintain its competitive advantage. There is no question that the country is a leader in its ability to innovate and develop a skilled workforce that is enabled by strong infrastructure, quality healthcare and other factors that contribute to a nation's ability to compete globally. However, executives who were interviewed for this report or participated in the working sessions consistently noted a number of challenges – particularly in the areas of energy and rising labour and material costs – that may undermine Germany's competitive advantage in the long term.

To address these challenges, executives offered the following recommendations.

Recommendations

Develop a realistic approach towards energy transition and lengthen the transition period over several decades

Germany's energy and CO2 emission policies were a key area of concern for a majority of the interviewees. Many of the executives participating in the discussions consider the energy transition in Germany to be an impediment for investments and expect it to lead to price increases.

They emphasized the importance of a cost-competitive energy policy and carbon emission standard that is consistent with the rest of the world. They also almost unanimously expressed concern with the risk of chasing industries out of Germany as companies seek manufacturing locations with lower energy costs. Some executives speculated that new production sites with high energy costs (e.g. foundries) may be built somewhere else, and believed that emerging markets may be viable sites not only because of cost advantages but also because of local sales in those regions.

To address these concerns, executives noted the following recommendations.

- *Urge policy-makers to develop a realistic approach towards energy transition and lengthen transition period to 20 years in order to reduce risk to the manufacturing industry.*
- *Develop competitive energy policies that are cost competitive and ensure stable supply.*

Invest in the education system and develop programmes that increase the number of qualified engineers, scientists and mathematicians

There were mixed views in terms of the German education system. Some executives said that the country's engineering tradition and strength in basic research are models for other countries to emulate. Others recommended a change in all elements of the education system (primary school, secondary school, university) and the formation of elite universities, as other countries such as the US have done. They mentioned that the German system results in a good general education, but that there are weaknesses at the top.

A number of executives also expressed concern that although the total number of university students has increased over the past few years, there is an increasing shortage of highly qualified German graduates in science and mathematics disciplines, such as engineering, natural science and informatics. One executive noted that the reform that introduced Master's and Bachelor's degrees in Germany was considered a setback for the engineering disciplines since the traditional German degree – Dipl. Ing. – was a worldwide hallmark of excellence.

Executives generally said this growing lack of qualified workers would not only limit Germany's ability to innovate, but also negatively influence the competitiveness of Germany as a manufacturing location.

To address these challenges, executives offered the following recommendations:

- *Maintain current education standards and provide more resources for education and qualification that focus on nurturing talented students and allow for the formation of elite institutions.*
- *Develop programmes that promote science and ensure a sustainable pipeline of qualified graduates with degrees in engineering, natural science, mathematics and informatics.*
- *Increase government support of basic scientific research to enable more cooperation between companies, universities and research institutions.*

Focus on innovation and differentiation in the area of high technology

Executives almost unanimously considered innovation as crucial to the future of German manufacturing. Furthermore, executives said that in order to continue differentiating itself, Germany must focus on becoming a global leader in advanced manufacturing – particularly in the area of high technology.

Executives consistently noted Germany's current competitive advantage with respect to the country's well-established technological networks that allow for the efficient exchange of knowledge and expertise. Executives also applauded the efforts of institutes such as Fraunhofer and the Max Planck Society. However, interviewees recommended the following measures to encourage innovation:

- *Invest in R&D programmes that support manufacturing, including funding for the infrastructure necessary to develop new technologies.*
- *Provide appropriate incentives to consumers so that they adopt new technology (e.g. electric vehicles).*
- *Establish demand-side innovation policies that result in business certainty and, as a result, create incentive for investment.*
- *Foster more regional growth clusters where private companies collaborate closely with the public sector, thus providing platforms for the development of innovation.*

Develop a long-term strategy to ensure Germany continues to have access to a supply of raw materials

Executives participating in the discussions expressed concern over German manufacturers' ability to access raw materials, and said that conflicts over rare earth materials could signal additional challenges on the horizon. The absence of a long-term concept for the supply of raw materials and energy for Europe may, according to executives, also limit the German economy's ability to stay ahead of the competition. Executives noted that while various nations take account of the fact that access to raw materials is becoming increasingly important, Germany remains largely inactive in securing direct access to raw materials and rare natural resources.

Address the rigidity of German labour laws to encourage continued investment in Germany's manufacturing sector

Almost all of the executives cited the strict German labour market regulation as a strong factor in limiting the competitive advantage of their country's manufacturing industry. The strength of the labour unions and the inflexibility of the wage determination, according to executives, make it difficult for manufacturers to react quickly to market changes and maintain a competitive edge in the global market.

Executives consistently mentioned the need to retain industrial competitiveness by liberalizing the labour market and reforming social policy.

Take an international leadership role in developing and standardizing intellectual property laws

To maintain an innovative environment, executives broadly said there is a need to have a clear understanding of how intellectual property rights work across borders. Executives said that taking a leadership role in ensuring intellectual property rights in Germany and other countries is a key driver for the success of German companies, the Germany economy (as a leading export nation) and, ultimately, the global economy.

Executives consistently noted concerns with the ease at which cost-intensive innovations can often be copied in foreign countries without legal consequence, and said that private companies may invest significantly in research and development if they are granted exclusive rights on their inventions in various global markets.

To overcome these challenges, executives recommended to following activities:

- *Advocate strongly for the development of cross-border intellectual property protection policies and the enforcement of consequences stemming from legal violations.*
- *Collaborate with policy-makers to develop a clear view of intellectual property rights in universities and other research and development partnerships to establish a foundation for companies, universities and technology clusters.*

Additional Challenges Impacting Germany's Manufacturing Competitiveness

In addition to the recommendations previously outlined, executives frequently touched upon a number of other challenges and broad recommendations on how to ensure Germany's long-term competitiveness. They include:

- *Limit regulation that is burdensome to entrepreneurial liberty and actionability.*
- *Adopt a simple tax plan that lowers corporate tax rates as well as individual tax rates.*
- *Ensure a stable democracy and build on Germany's strong social consensus of working together towards a common goal.*

Japan

Building Tomorrow's Manufacturing Dynasty

Although Japan is one of the largest economies in the world and is recognized internationally for its advanced research and development capabilities, its best practices in manufacturing and its leadership in key sectors such as electronics and automotive, there are several challenges that loom that could signal a potential drop in its overall competitiveness as a manufacturing destination.

For instance, Japan's ageing, shrinking population could adversely impact overall production of the Japanese workforce – which is critical to world-class competitive manufacturing. Other challenges include high taxes, high post-Fukushima energy costs, limited access to natural resources, and currency appreciation of the Japanese yen.

Still, recent government policy decisions suggest Japan is taking action to maintain its proud manufacturing dynasty and accelerate growth in new advanced manufacturing sectors. In 2010, the government approved an economic growth strategy (updated and re-released in July 2012), formally called the “Rebirth Strategy for Japan”, which lays out economic goals for 2020. This strategy takes advantage of Japan's strengths in manufacturing and technology, targeting the development of US\$ 1.3 trillion of new industries and 4.7 million jobs by 2020.²³ The government designated four key priority areas: innovative energy and environmental products, technologies and practices; the medical sector, including development of leading pharmaceuticals and medical equipment; agriculture; and small and medium-sized enterprises.²⁴

During the conversations with executives, many said that the “Rebirth Strategy” identifies the right topics to improve Japan's competitiveness but said they had not yet witnessed action and implementation. High expectations for economic recovery after the earthquake and tsunami are not yet realized and progress seems slow.

Executives' main concerns and recommendations reflect the major recommendations of the Keidanren (the Japanese Business Federation), whose membership comprises Japan's top companies and industry associations, and particularly the Keidanren's growth strategy 2011. This strategy outlines “economic measures aimed at achieving sustained economic growth exceeding 3% in nominal terms and 2% in real terms to go beyond disaster restoration and ensure prosperity for its citizens”.²⁵

To achieve these objectives, the Keidanren's 2011 growth strategy outlines five policy areas that focus on improving Japan's international competitiveness and enhance its attractiveness as a manufacturing destination. They are:

1. Fundamentally revising energy and environmental policies
2. Taking measures to combat deflation and stabilize exchange rates
3. Reducing the burden on companies, including corporate tax and social security premium
4. Participating in the Trans-Pacific Partnership and promoting other high-level economic partnerships
5. Developing employment policies based on a diverse labour market

During the one-on-one interviews and the Forum private session in Tokyo in April 2012, executives brought up the policy changes cited by the Keidanren and offered some additional recommendations and other areas of focus that would work further to improve Japan's competitiveness.

Recommendations

Ensure Japan has the long-term ability to provide cost effective, stable and clean sources of energy

Echoing one of the Keidanren's core recommendations, executives said that Japan has to fundamentally revise its energy and environmental policies. Many acknowledged Japan's traditional approach to energy and its focus on preventing climate change, but in the wake of the natural disasters, the policy focus needs to shift to providing stable and economically affordable energy – with a particular focus on electricity stability to prevent power outages detrimental to both people and businesses. Executives wanted to see Japan's energy supply depend on multiple, disparate sources to hedge against the risk of electric outages. They also called for regional collaboration to design a new grid system able to manage many sources of power.

Executives also said that in the process, Japan's strong research and development capabilities may also result in innovation and technological breakthroughs that could make Japan a world leader in new energy technologies.

With respect to nuclear energy, many executives cautioned policy-makers from making broad, sweeping policy changes that could negatively impact Japan's near-term competitiveness. Executives again urged policy-makers to develop a fully comprehensive energy plan for the country, including a specific approach to nuclear power and considering implications to the workforce currently employed in the sector, as well as the potential innovative breakthroughs that additional research into nuclear energy could deliver. In developing the approach, executives recommended that policy-makers look at all relevant and accurate data, current innovations and proposals in work in national laboratories, and consider all stakeholders, including consumers and manufacturers.

Develop monetary policies that help to stabilize exchange rates and address inflation

Executives participating in the discussions again consistently cited the challenges created by exchange rate fluctuations and deflation for Japan's overall competitiveness and said policy-makers must intervene to help stabilize exchange rates and stop deflation.

Executives regularly commented on the negative impact on businesses and employment as a result of the yen's strength, witnessing the supply chain and operations challenges facing their business managers because they cannot control the appreciation. Some executives suggested that the combination of the appreciating yen, the aftermath of the natural disasters and attractive opportunities in other markets are already redirecting investment outside of Japan. Executives broadly believed the Bank of Japan needs to do more to ease monetary policy and that the government needs to intervene in foreign exchange markets.

Furthermore, executives understood that much is dependent on economic conditions both domestically and internationally, and said the key to addressing the strong yen and deflation are policy measures that increase domestic demand, such as deregulation and increased participation in international economic partnerships.

Institute policies that lower tax burdens on corporations

Executives overwhelmingly noted Japan's high corporate tax rates, among the highest in the world, as a significant concern impacting the country's international competitiveness. Many also commented on the negative economic impact on the horizon as a result of increased social security benefits to Japan's large ageing population.

To address these concerns, executives supported corporate tax rate reductions recommended in the Keidanren's 2011 growth strategy, including a 5% reduction in effective corporate tax rates in the immediate term and a rapid cut of corporate tax rates to 30% to align with other major countries – with another near-term reduction to 25% to match other Asian countries.

Executives also said the government needs to lead the way in developing a globally competitive tax system that allows Japan to attract foreign investment that helps to create employment and expands personal incomes. Many noted that a system that allows for overseas profits to be returned to Japan would also improve Japan's competitiveness.

On the topic of social security, executives believed that the government needs a plan to identify new sources of funding and to allow the treasury to cover a larger share of social security costs.

Increase participation in the Trans-Pacific Partnership and encourage other economic partnerships

Executives broadly said that free-trade agreements and other economic partnerships are crucial to Japan's long-term economic competitiveness. They stressed that Japan's competitive advantage is in high value-add products that require significant craftsmanship, time and technology, and that free trade is fundamental to selling these products globally. Executives looked again for policy-maker leadership in opening overseas markets and reducing tariff and non-tariff barriers.

In general, executives called for swift and decisive action to move ahead with trade negotiations that are currently planned or in progress. For example, executives said the proposed Free-Trade Area of the Asia Pacific would eventually form, and as a result the government should, as soon as possible, begin negotiations to participate in the Trans-Pacific Partnership. Executives cited other specific examples, including the Japan-China-Korea Free-Trade agreement, the ASEAN+6 agreement, and discussions with the European Union. Each of these consumer markets is highly attractive to the executives interviewed, most of whom are anticipating growing demand in China and South-East Asia.

In addition, executives said the government should discontinue the practice of giving subsidies to less successful industries, as the practice is seen as neither helpful nor sustainable. Instead, executives said the government should reinforce strong industries that have high export potential for their products to overseas markets. Executives wanted to see policy-makers making clear and comprehensive policy that identifies sectors with promising manufacturing capabilities in Japan and provides the support those sectors need to flourish and grow. Examples included high-quality and safe food and agriculture; pharmaceuticals; and infrastructure development beyond selling equipment, instead providing overall system management and operations leadership to emerging markets in particular.

Develop employment policies and frameworks that take into account today's diverse labour market

Historically, the Japanese employment system has a history of "long-term employment and in-house labour-management relations."²⁶ However, in response to today's highly competitive, global, diverse workforce and marketplace, executives broadly pushed for more progressive labour policies. They said that to operate effectively, businesses and policy-makers alike must address the new workforce dynamics – a priority on work-life balance and corporate responsibility; imperatives to move towards greater workplace and work hour diversity; and the falling birth rate and ageing population in Japan.

Overall, executives pushed for a more flexible set of labour standards. They noted specific concern with current practices that pay subsidies to companies to retain workers when unemployment is high, believing that this lessens competitiveness in Japan. Many executives called for a policy environment that facilitates diverse employment arrangements that can react to changing corporate activity.

Finally, participants in the discussions said the government should encourage greater workplace diversity and provide more support for families with young children, to encourage increased work-life balance.

Promote vocational training and development of outstanding innovators

Overall, the executives interviewed believe that Japan faces challenges related to developing skilled talent, particularly given the ageing workforce and what is perceived as inadequate university training to prepare students for manufacturing jobs. Currently, the entrance exam for university is very difficult in Japan, but executives are concerned that students do not learn job-oriented skills during their four years of university and often require "re-education" when they enter the workforce.

Executives said policy-makers should create a "blueprint for talent" that outlines the skills and the workforce Japan would need to sustain its manufacturing competitiveness and meet future growth targets. Executives noted that any such blueprint of future talents should be reflected in the national education curriculum and be supported with stable funding.

Those participating in the discussions also called for the creation of policy focused on developing globally competitive "outstanding talents and innovators" for Japanese manufacturers. This workforce should include individuals who are not only technologically innovative and have the technical savvy to deliver a high-quality product efficiently and on time, but are also capable of operating in a global context with a diverse workforce and have excellent communication and leadership skills. Specifically, executives cited the need for workers who can speak more than one language and are willing to work internationally. Collaboration between schools, government and industry was cited as key to creating innovative, global thinkers. For many interviewed, it is not sufficient to have a small number of employees that are innovative and think about innovation in purely technical terms; the entire employee population must be empowered to innovate and think about the broad range of innovations, from highly advanced to more humble developments in product, process, working style and values.



Takahisa Miyauchi, Executive Vice-President and Group Chief Executive Officer, Chemicals, Mitsubishi Corporation, Japan

Source: World Economic Forum

Executives overwhelmingly said talent-driven innovation begins with education and called for specific improvements in science and technology education to regain technology competitiveness globally. They also called for the development of more policies devoted to vocational training, some citing the German Meister apprentice process as particularly attractive.

Overall, executives said diverse career education is necessary during the secondary and higher education periods, and vocational training is essential throughout one's career.

Finally, executives expressed concern that young people do not have sufficient opportunities to develop leadership and management skills, due in part to the educational system and in part to the delayed retirement of the ageing working population. This may ultimately inhibit development of the workforce of the future. Executives believed that policy-makers and business leaders should collaborate to provide youth with leadership experiences as well as a sense of confidence that the country is heading in the right direction and that the manufacturing sector offers exciting employment opportunities.

Strengthen policies supporting long-term investment in science and technology

Those involved in the policy discussions were concerned that Japan is falling behind other nations in its R&D, science and high-tech capabilities. They said that Japanese manufacturers must maintain their leadership in higher value-add products, not move towards commodities and low-end assemblies, due to Japan's historical core strengths, existing investments in facilities for time-intensive products, and relatively high cost of labour. Executives were seeking government support to help respond to the pressure to accelerate innovations and sustain this competitive advantage, particularly in sectors where Japan already has a strong base.

While Japan currently has a high investment to GDP ratio, most of the funding comes from the private sector. Acknowledging that the government has agreed to increase R&D funding to 1% of GDP (around 27 trillion yen), executives in the discussions advocated for effective use of that investment as part of a comprehensive investment strategy. They said even greater increases in overall government R&D spending and a change in the way the budget is allocated would be critical for Japan to retain its competitive edge. Currently in Japan, most of the R&D budget is allocated by the Ministry of Education. Executives said they prefer a model in which more of the R&D innovation budget is administered by an organization that is closer to industry.

Executives would also like to see more Japanese-style venture businesses that could take R&D risks and work aggressively to develop and commercialize new products. The Innovation Network Corporation of Japan was cited as an example of a public-private partnership that funds and provides managerial support to new, promising innovations and technologies.

Finally, many executives called for long-term certainty of lower taxes associated with R&D investment, not simply short-term tax incentives.

Since the regime change at the end of December 2012, the new Abe administration has been active in promoting concrete measures concerning the economic policy intended for Japan's revitalization. Amid growing expectations of citizens and industry regarding the new government, close attention should be paid to the implementation of the policy.

Country Policy Comparisons Framework

For policy-makers, the input provided by executives signals an increased demand and expectation from business leaders that their government leaders better understand the intended and unforeseen consequences policy decisions have on manufacturing competitiveness. The input also signals a call to action from executives to policy-makers to pull the levers their governments have at their disposal in creating regulatory environments that balance policy and competitive needs.

Figure 3 provides a framework of the various instruments and policy levers available to policy-makers in creating environments that promote manufacturing competitiveness. This framework shows the robustness and detail of the Country Policy Comparisons Table, provided, in part, in the appendix. Most importantly, however, is that these policy levers were deemed the most relevant to driving manufacturing competitiveness, based on both CEO input and subject matter expert analysis. The country comparisons in the preceding pages are the underlying fabric and fact base from which executives formulated their recommendations for improving the manufacturing competitiveness of a nation.

Figure 3: Instruments at the Disposal of Governments

| Instruments at the disposal of governments | | |
|---|--|---|
| <p>Energy and environmental policy</p> <ul style="list-style-type: none"> • Traditional energy <ul style="list-style-type: none"> - Country overview - Transmission policies - Regulatory practices - Illustrative tax incentive policies • Alternative energy/renewable energy <ul style="list-style-type: none"> - Feed in tariffs - Electricity supply portfolio standards - Wind - Hydropower - Other • Energy efficiency <ul style="list-style-type: none"> - Basic energy efficiency policies - Automotive fuel efficiency policies • Energy security <ul style="list-style-type: none"> - General - International - Strategic petroleum reserve - Nuclear - Oil - Coal - Natural gas - Ethanol - Other fuels • Climate control • Broad energy support • Incentives for environmental sustainability • Environmental regulations, compliance and targets <ul style="list-style-type: none"> - Water - Air - Waste - Carbon emissions - Toxic substances control - Clean-up - Enforcement | <p>Tax policy</p> <ul style="list-style-type: none"> • Corporate tax rates • Individual tax rates • Dividend and capital gains tax rates • Broad tax incentives • Corporate R&D tax incentives • Value-added tax (VAT) • Treatment of depreciation • Taxing of income earned abroad/ Territorial tax system | <p>Education/talent/innovation development</p> <ul style="list-style-type: none"> • Investment/support for science, technology, engineering, and mathematics (STEM) quality and adoption • Efficient visa/immigration processes • Processes to attract and retain top domestic and foreign professionals • Education training <ul style="list-style-type: none"> - Recruitment - Vocational training • Retention/retraining of workforce • Quality and availability of scientists, researchers, and engineers |
| | <p>Trade policy</p> <ul style="list-style-type: none"> • Trade agreements <ul style="list-style-type: none"> - New trade agreement negotiations - Existing trade agreements - Enforcement and facilitation of existing agreements • Import taxes/tariffs/quotas/duties • Single window trade system • Incentivize FDI inflows | <p>Healthcare policy</p> <ul style="list-style-type: none"> • Access to healthcare <ul style="list-style-type: none"> - Sufficient and affordable access - Basic vs high quality healthcare |

Source: DeloitteTouche Tohmatsu Limited analysis

Following the framework, the report takes a closer look at two policy issues consistently cited by executives as critical to manufacturing competitiveness, and that have a direct and immediate impact on their organization: tax and energy policy.

Interestingly, the very nature of these two areas and the policies (or lack thereof) addressing each provide a solid basis for an objective, fact-based country-by-country policy comparison. Moreover, the immediate impact of tax and energy policy decisions on business performance makes these two areas of particular importance.

Certainly, all policy levers are important; however, those regarding education initiatives, science and technology policy, and others often require a much more subjective approach in the absence of comparative data. Furthermore, the impact (positive or negative) for many of these other policy levers is also much less immediate – often not surfacing for years.

For these reasons, the report focuses on solely exploring tax and energy policy.

Instruments at the disposal of governments

| Regulatory policy (legal, financial, ease of doing business) | Infrastructure policy | Science and technology policy |
|---|---|--|
| <ul style="list-style-type: none"> • Financial regulation <ul style="list-style-type: none"> - Capital controls - Central bank policies - Exchange rates • Antitrust laws and regulations • Effective legal enforcement <ul style="list-style-type: none"> - Contracts and disputes • Product liability laws <ul style="list-style-type: none"> - Consumer safety - Product recalls • Tort law <ul style="list-style-type: none"> - Class action lawsuits - Punitive damage compensation • Ease of doing business <ul style="list-style-type: none"> - Regulatory cost and complexity - Business and government collaboration for new regulations - Ease of starting a new business - Permits for infrastructure - Government intervention - Stability and clarity in policies | <ul style="list-style-type: none"> • Water <ul style="list-style-type: none"> - Clean/drinking - Waste management • Transportation <ul style="list-style-type: none"> - Aviation - Ports and inland waterways - Rail - Roads, bridges, highways - Transit • Electric <ul style="list-style-type: none"> - Energy grid - Broadband infrastructure • Development of public-private partnerships (PPP) • Broad investment support | <ul style="list-style-type: none"> • Intellectual property <ul style="list-style-type: none"> - Patents - Patent protection • Information security <ul style="list-style-type: none"> - Cyber security - Data protection • Technology transfer programmes • Long-term investments/support for science and technology <ul style="list-style-type: none"> - Research grants - National labs - R&D investments - Innovation and knowledge transfer from public sources (universities, national research institutions, etc.) to industry - Public-private partnerships (PPP) |
| | <h3 data-bbox="579 1406 722 1440">Labour policy</h3> <ul style="list-style-type: none"> • Wages • Worker benefits <ul style="list-style-type: none"> - Health coverage - Retirement age - Social security/pension - Unemployment insurance • Labour unions • Workplace safety • Diversity/affirmative action • Severance/notice period • Worker rights <ul style="list-style-type: none"> - Leaves of absence - Working hours - Minimum age | <h3 data-bbox="1042 1429 1473 1507">Manufacturing-related policies promoting economic development (i.e. national manufacturing policy)</h3> <ul style="list-style-type: none"> • Export-import bank • Export incentives/support/restrictions • Government deemed strategic industries and businesses <ul style="list-style-type: none"> - Identification of strategic industries - Protection/promotion of strategic industries • Encouragement/incentives for small and medium enterprises • Development of special economic zones (SEZ) • Strategic role in overall economic development |

Going Deep on Critical Policy Issues

Competitive Tax Policy: A Strategic Lever

Few policy tools are more heavily debated within a country than the way in which the tax burden is distributed. A nation's tax policy informs the choices that individuals and corporations make in how they spend, invest, hire, research and produce. Chief executives – particularly of manufacturing companies – often cite national and local tax policies as a top consideration in assessing a region's attractiveness and as an influential factor in choosing where to locate or expand. The elements that comprise a nation's tax policy – rates, incentives, credits and treatment of foreign income, among others – go to the heart of a nation's economic competitiveness.

Table 1 provides a summary of five key attributes related to tax policy and a snapshot of how the six focus nations compare across dimensions. These are top-of-mind

policy considerations for manufacturing companies in evaluating a location's tax competitiveness. A more detailed version of this matrix is found in the appendix.

A corporate tax rate is the rate that corporations pay on their income. The level and stability of corporate tax levels has a tremendous impact on a country's overall economic competitiveness. An unduly high corporate tax level can inhibit expansion, encourage relocation of productive assets abroad, and discourage the inflow of foreign direct investment.

A territorial or worldwide system refers to the manner in which foreign income is treated for tax purposes. A territorial system means that only the corporate income earned in a home country is subject to that country's tax laws. A worldwide system subjects all of a given

corporation's income to the home country's tax policies, regardless of where it is earned. A worldwide system is often considered a form of "double taxation" in that the income earned by a foreign subsidiary is taxed by both the host country and the home country. As a result, the worldwide system often discourages repatriation of profits earned by foreign subsidiaries as a way for companies to mitigate this kind of double taxation. Also, this system can encourage foreign investment as opposed to bringing profits back to be reinvested domestically.

Value-added tax (VAT) is a method of taxation in which each member of the value chain is taxed based on its economic contribution at each stage of production. A VAT is used commonly throughout the world except in the United States. It is a form of "consumption tax", though it works differently than a sales tax. Only the end consumer ultimately bears the economic burden of the tax, like a sales tax. Unlike a sales tax, the collection and remittance of the tax to the government takes place at various points along the value chain. What this means is that only the "value-added" of the product is taxed at each point along the value chain, and the government receives taxes on the gross margin that each business along the chain earns.

Treatment of depreciation refers to the way that companies value the use of productive assets for tax purposes. There are several kinds of depreciation tax policies, and each has its own benefits and disadvantages. Companies' investments in buildings or state-of-the-art technology and equipment, which increase their ability to compete, are often influenced by the nature of a country's depreciation tax policies. This is especially true in the case of capital-intensive manufacturing companies for which the differences in the tax treatment of depreciation can have a significant impact on the bottom line.

Table 1: Comparison of Key Tax Policies across Nations

| | India | US | China | Japan | Brazil | Germany |
|--|--|---|--|---|--|--|
| Corporate tax rate | 30% (domestic companies); 40% (foreign companies) | Up to 35% | 25% | 25.5% plus 10% surcharge | 15% plus 19% surcharge | 30%-33%, including trade tax and surcharge |
| R&D incentives | 200% super deduction for in-house R&D; deduction for R&D salary and used materials for the three preceding years | Traditional credit 20%; alternative simplified credit 14% | 150% super deduction for qualifying R&D expenditures; reduced tax rate (15%) for HNTTE companies; and additional tax benefits for technology/ software companies | Tax credit of 8%-12% of R&D expenses | 160%-180% super deduction for eligible R&D expenses; additional 20% deduction for patent related expenses, and special depreciation/ amortization for R&D assets | Cash grants up to 50% eligible R&D project expenses; no tax incentives currently offered |
| Territorial or worldwide system | Worldwide system; limited foreign tax credit available | Worldwide system; foreign taxes offset dollar | Foreign tax credit available but only on the amount of China tax payable | Foreign tax credit available but with limitations | Worldwide taxation system; limited foreign tax credit available | Territorial tax system generally |
| VAT | Standard VAT rate is 12.5% | No federal value-added tax or sales tax; states only | Standard VAT rate is 17% with exceptions; VAT reform pilot programme implemented 1 January 2012 | Standard VAT rate is 12.5% | Average national VAT rate is 20% and the state VAT varies from 7% to 25% | Standard VAT rate is 19% with a reduced rate of 7% for specified transactions |
| Depreciation treatment | Declining-balance method is used | Modified accelerated cost recovery system (ACRS) | Straight-line depreciation method is generally used | Declining-balance method is used | Straight-line method is generally used | Straight-line depreciation method is generally used |

Source: Deloitte Tax LLP (MacNeil, Ellen; Goldbas, Michael; Zhang, Priscilla), (US analysis conducted in conjunction with The National Association of Manufacturers), © 2013

R&D Incentives: A Closer Review

There are many elements that shape a country's R&D competitive position in addition to incentive programmes – a qualified talent pool, a robust domestic market, world-class academic institutions, and transparent and predictable regulatory and financial systems, among others.

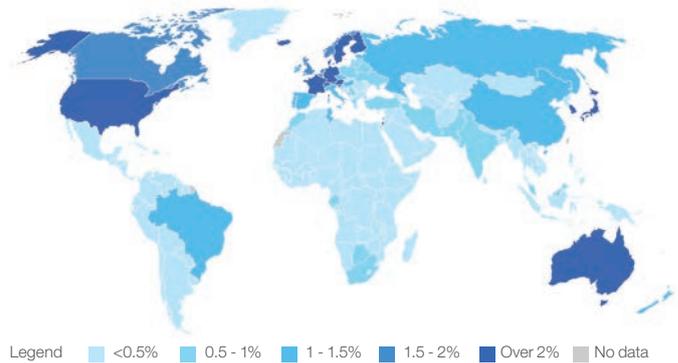
R&D incentives refer to the benefit that federal – and sometimes local – governments give companies related to their research and development activities. Some R&D incentives are directly linked to companies' tax liabilities while others take the form of grants, loans and other financial vehicles not directly related to tax liability. More recently, governments are showing a stronger focus on attracting research-intensive companies by offering the patent box, or innovation box, as part of the research incentives. A patent box either provides a favourable tax rate to income or allows a deduction from taxable income attributable to R&D projects, patents or other intellectual properties.

Companies rely on these incentives in determining what kind of R&D to perform and at what level. R&D incentives often serve to advance the research and innovation agenda of a country. They can also serve to promote private-sector innovation generally without "picking" winners or deciding the day-to-day manner in which the corporation carries out its R&D activities. It puts the control in the hands of the company and its leadership, allowing the private sector to determine the best investments to make – which is why executives frequently cite long-term R&D tax credits as an important factor in government policy. Because of the role that R&D incentives play in shaping a country's manufacturing competitive position, a closer review of each focus country helps to uncover some of the complexities associated with R&D incentive policies.

Incentives – and especially R&D tax incentives – play a particularly important role in determining a country's competitive position in research and innovation. Innovation thrives in an ecosystem. In many cases, competitive companies and countries enable an environment in which scientists, researchers and product designers are in close proximity to where products are actually produced, creating a transparent, adaptive and nimble ecosystem. Having the right incentive structure in place, such as long-term R&D tax incentives, helps innovation to flourish and increases the competitiveness of a country.

Countries offering R&D tax incentives are often regarded as favourable locations for internationally-mobile R&D. Companies can effectively leverage their global R&D infrastructure to develop a portfolio of valuable intellectual property for various consumers and markets. Highly innovative companies that have worldwide reach often view a country's R&D incentive programme as among the most important factors in deciding whether to expand their research capabilities in a given location or to invest there in the first place. In making that decision, organizations must evaluate how well a given country's incentive programme aligns with their technical competencies and strategic objectives.

Figure 4: R&D Spending as a Percentage of GDP, Annual Average (2005-2010)



Source: Maplecroft 2012, World Bank 2011

Although the basic definition of "research and development" is similar across many countries, distinctions do exist. Some programmes favour certain industries or technologies while others are neutral in this regard. Some incentive regimes reward increased R&D spending in and of itself, while others reward a basic threshold of R&D spending. Restrictions also vary in terms of what qualifies as R&D expenditures. While many countries provide R&D incentives in terms of tax breaks, others emphasize benefits that are not directly tax related.

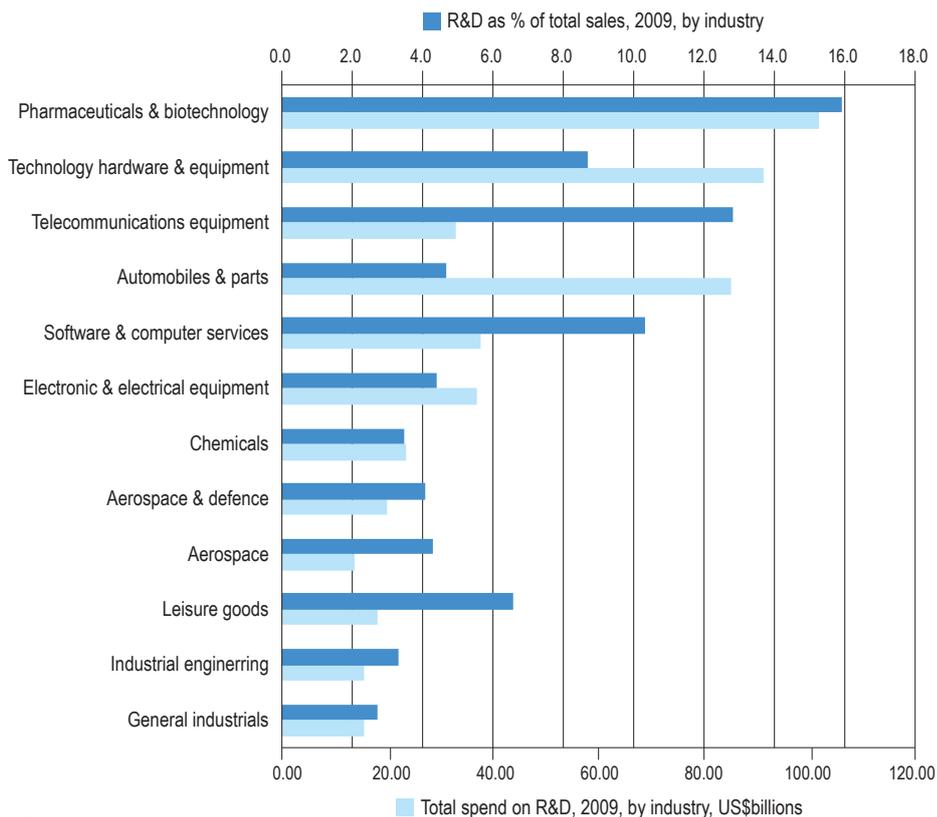
The collective array of global R&D incentive programmes is vast and always evolving. Below is a top-level discussion of R&D incentives – mostly tax incentives – for the six focus countries. The appendix includes a more detailed summary of the R&D incentive policies of these countries.

India²⁷

The country offers a 100% deduction for R&D expenses (other than land) that satisfy a set of basic criteria. However, the government offers a super deduction of up to 200% of qualifying R&D expenses that also favour certain industries and research activities. The R&D facility must be approved by the Department of Scientific and Industrial Research in order to qualify for the super deduction. India also allows a deduction of R&D employee salaries and materials consumed within three years immediately preceding the commencement of the business. Approval of the super deduction also depends on how the research is conducted, including the requirement that the research takes place in a separate facility with staff dedicated exclusively to the research activities. The unused benefits may be carried forward for the next eight years, but cannot be carried back to earlier years. This larger R&D deduction is set to expire in 2017 unless the law is extended.

Figure 5: Top Five R&D Companies by Total R&D Spend

| Top-5 R&D companies, by total R&D spend | |
|---|--|
| Aerospace | |
| EADS, The Netherlands | |
| Boeing, USA | |
| United Technologies, USA | |
| SAFRAN, France | |
| Rolls-Royce, UK | |
| Automobiles & parts | |
| Toyota Motor, Japan | |
| Volkswagen, Germany | |
| General Motors, USA | |
| Honda Motor, Japan | |
| Daimler, Germany | |
| Chemicals | |
| Bayer, Germany | |
| BASF, Germany | |
| Dow Chemicals, USA | |
| Sumitomo Chemical, Japan | |
| DuPont, USA | |
| Telecommunications equipment | |
| Nokia, Finland | |
| Cisco Systems, USA | |
| Alcatel-Lucent, France | |
| Ericsson, Sweden | |
| Motorola, USA | |



Source: Maplecroft 2012, UK Department for Business, Innovation and Skills, 2010

United States

The US offers two methods to calculate an organization’s R&D tax credit. First, the “traditional credit” is calculated as equal to 20% of the amount of the R&D expenditures exceeding a “base amount”. An alternative computational method (“alternative simplified credit”) is equal to 14% of the excess of the organization’s qualified research expenditures over 50% of the average of the three prior years’ R&D expenditures. The incentive is intended to benefit all industries conducting qualified research. As a result, all industries are eligible for the research credit. R&D costs that qualify for the credit include: wages for in-house labour, 65% of contract labour and supplies used in the research process. Overhead and capital expenditures are excluded. Qualifying activities must be performed within the US, and the related qualifying costs must be incurred by a US taxpayer (although such costs may be reimbursed by a foreign affiliate). Unused research credits can be carried back one year and carried forward 20 years (small businesses with less than US\$ 50 million in gross receipts can carry back 2010 credits five years and forward 20 years).

China

The Chinese R&D incentives are offered in the form of reductions in enterprise income tax rates. A reduced 15% (down from 25%) corporate tax rate is given to companies engaged in R&D activities that are otherwise granted high and new technology enterprise (HNTE) status. The reduced rate of 15% also applies to qualified technology advanced service enterprises in designated cities with over 50% revenue derived from providing qualified technology advanced services outsourced by foreign entities. (This incentive is available from 1 July 2010 through 31 December 2013.)

China offers special tax incentives for technology and software companies, such as the first RMB 5 million of income from qualified technology transfers are exempt from the enterprise

income tax (EIT), any income from technology transfers in excess of RMB 5 million is taxed at a 50% reduced EIT rate, and newly established software companies are often granted tax holidays. There is also a business tax exemption for the transfer of qualified technology.

The Chinese government provides the following list of eight state-encouraged industries that are considered in awarding HNTE status:

- Electronic information technology
- Biological and new medical technology
- Aviation and space technology
- New materials technology
- New energy and energy conservation technology
- High-technology service industry
- Resources and environmental technology
- Transformation of traditional industries through high-new technology

HTNE status is granted for three years and must be renewed every three years. To gain and keep HTNE status, the company must satisfy a set of qualifying criteria. Qualified activities include development of new technology, new products and new production techniques. Qualifying expenditures include staff costs, direct costs, supplies, depreciation and amortization, design costs, equipment installation costs, intangible asset amortization and contracted R&D costs.

For both HTNEs and those entities that do not qualify for HTNE status, the government offers a 150% R&D super deduction, provided that certain R&D spending requirements are satisfied. Tax losses attributable to R&D super deduction claims can be carried forward up to five years.

Japan

In Japan, the size of an R&D tax incentive is a function of the size of the organization. For companies whose capital value – or parent's capital value – is under 100 million yen, up to 12% of R&D expenditures are eligible, with a limitation of 20% reduction in tax liability. For larger companies, only up to 10% of R&D expenditures are eligible, with a similar 20% cap on the reduction in tax liability.

Japan offers an additional tax credit (for both SME and large companies) calculated as a percentage of current year research spending as compared to either the prior years' research spending or prior years' sales. This portion of the credit is limited to 10% of the company's national corporate income tax liability before the credit is applied. The additional tax credit is available in relation to fiscal years commencing on or after 1 April 2008 and up to 31 March 2014.

A tax incentive has been introduced for Japanese entities that are exclusively engaged in R&D activities. This incentive cannot be claimed in conjunction with the R&D tax credit. This incentive permits a qualifying entity to deduct 20% of its income that is attributable to the approved business activities for the first five years of receiving the research centre designation.

Generally, unused R&D tax credits may be carried forward one year. The unused R&D tax credits for the fiscal years beginning on or after 1 April 2009 through 31 March 2010 may be carried forward up to three years. Research credits for fiscal years beginning on or after 1 April 2010 through 31 March 2011 may be carried forward two years.

In Japan, research credits are not limited to any specific industry, though the activity must be technological and scientific in nature. Consequently, research conducted in non-technical fields will generally not qualify for the research credit. The expenses must be borne by the Japanese entity; if the funding is from another party (e.g. government agencies, customers, suppliers, etc.), the R&D tax benefit is not available for those funded expenses.

Brazil

As a general matter, Brazil offers a super deduction of between 160% and 180%, depending on whether the organization satisfies certain labour/headcount requirements. Brazil offers an extra 20% deduction for the qualifying costs incurred in developing a patent, but the super deduction is only allowed when a patent is registered. For corporate income tax purposes only, 100% depreciation is allowed in the year of acquisition for new machinery, equipment and instruments exclusively dedicated to research and development, as well as 100% amortization for intangibles used in research and development. Eligibility is broad and is not limited to particular industries. Activities undertaken to achieve technological innovation qualify for the R&D tax incentives. These activities include designing new products or processes, as well as the aggregation of new functionalities or characteristics to a product or process, resulting in incremental improvements in quality or productivity. Additionally, software development qualifies as an R&D activity as long as it is undertaken to advance scientific or technical goals. R&D expenditures include wages, salaries, and certain payments to third parties (e.g. laboratory tests), directly attributable to the execution of qualified R&D activities.

Companies must have a tax clearance certificate, regarding the whole calendar year in which the incentive is taken, to qualify for the super deduction. Specific accounting controls are also required. Furthermore, Brazil provides additional research incentives, such as equipment, machinery and tools dedicated to R&D receive a 50% reduction of the IPI due.

Germany

R&D tax incentives are not yet offered in Germany. Rather, the government offers two kinds of assistance programmes that take the form of grants and loans. R&D grants are non-repayable and are awarded on a "per project" basis, most frequently for collaborative projects. There is no legal claim for R&D funding. Grant rates can reach up to 50% of eligible project costs. Higher rates may be possible for small and medium-sized enterprises. The selection criteria for eligible projects include the levels of innovation, technical risk and economic risk.

R&D loans can be an alternative to R&D grants. R&D loans are not contingent on conducting R&D activities in a specific technology field and there are no application deadlines. R&D loans are provided under different governmental programmes. For instance, the ERP Innovation Program offers 100% financing of eligible R&D project costs up to € 5 million.

Eligibility for grants or loans is not limited to particular industries. However, companies in the following industries typically seek cash grants:

- Biotech and life sciences
- Information and communications technologies
- Manufacturing
- Energy and utilities

Qualified activities for grants or loans include:

- Fundamental research – experimental or theoretical work aimed at gaining new knowledge
- Industrial research – research with a specific practical objective aimed at developing new products, processes or services, or at improving existing ones
- Experimental research – research aimed at producing draft, plans and prototypes

What Does This Mean for Manufacturing Competitiveness?

Because virtually every aspect of tax policy affects a country's global manufacturing competitiveness, it touches upon the most important concerns of the manufacturing organization. A relatively high corporate tax rate discourages any organization from investing in that country in the first place. However, since the manufacturing organization often has productive assets in many countries, it is especially concerned with the manner in which the home country taxes money earned abroad. Differences in depreciation treatments among countries are important because manufacturing entities are often highly capital-intensive businesses. R&D incentives are important to manufacturing companies because innovation-based research is the lifeblood of the manufacturing organization. Given the impact to a manufacturer's bottom line, it is not surprising that chief executives cite tax policy as among the most important criteria in choosing where and how they will make capital investment decisions.

Energy as a Competitive Advantage

Energy Policy

As the demand for and cost of energy is slated to only increase with future population growth and industrialization, executives, especially in the manufacturing sector, are perceptive of the impact of a nation's energy policy on their business. The availability and cost of energy impact the way a company makes decisions regarding facility location, R&D investments, operational efficiency targets, and supply chain and logistics strategies. Many executives that were interviewed, regardless of their country of origin, believed that countries with the ability to provide access to clean and renewable energy at competitive costs will have an advantage over their competitors and therefore will be more attractive locations to conduct business. Executives in the discussions also indicated that the level of investment in energy infrastructure, as well as the comprehensiveness and efficiency of energy policy, also contributes significantly to a nation's competitiveness.

Evolution of Energy Policy

While expressed policies may cite "green" actions and intentions, the dominant theme in recent decades is national security and domestic economic development through reduction of reliance on foreign sources. Currently, there is a tendency towards policies that favour self-sufficiency. Countries are seeking to avoid economic risk associated with energy market volatility, political instability in key regions, and limited global supply. To create their own stable sources of energy, emerging economy nations are reprising in a hyper-compressed form over the past two decades (and especially in the new century) the 150-year history of the most developed nations in developing massive capacity, then dealing with reliability, transmission and other consequences. Developed nations and emerging economies alike are now driving towards policies that allow greater control over the supply and cost of energy for their citizens and the businesses located there.

Despite strongly expressed "green" policies – particularly following the Kyoto Protocol (1997) – basic economics dominate energy policies. The 1973-1974 oil embargo initiated policies of protecting national energy security by minimizing reliance on external sources. Most countries were provoked by the crisis to create or enhance an existing "strategic petroleum reserve" for which a standard fill is at least 90 days. International rules allow the presence of domestic production to substitute for a physical reserve volume. The self-sufficiency trend accelerated after 2000 as major and growing economies sought control over supply chains. Countries range from possible self-sufficiency to being almost fully dependent on world markets. Nations with the least reserves tend to have the highest focus on energy efficiencies in order to move as close as possible to energy self-sufficiency.

The legacy systems of the massive energy developments of early national growth periods, as well as the presence of accessible large-scale domestic reserves, also have significant determining effects on current policies. While much legacy is coal or other hydrocarbons from crude oil, hydropower (especially in Brazil) is also a determining legacy system. Existing national transmission grids (whether for fuels or electricity) hugely impact current energy decisions: nations weigh the need for energy reliability and the cost of improving or expanding current infrastructure as they review the attractiveness of new sources of energy. It is also noteworthy that many nations' intentions to subsidize green policies are potentially inhibited by their limited government budgets, especially due to the financial crisis in many regions.

Despite clean air concerns, the legacy presence of coal in facilities and existing technologies, as well as its relative cost advantage and abundance in many regions, means that coal remains a dominant source of energy, especially for electricity and major energy-dependent industries. Technology has driven oil and natural gas reserves radically upward, while rising demand drives production. Certain environmentally and politically driven decisions, such as closing a nuclear plant, can also increase reliance on traditional fuels. Oil and natural gas remain the primary sources of energy in a majority of regions and have an expanding role in the manufacturing sector.

Overall, high-level programmatic pronouncements can be a misleading representation of actual policies; concrete regulations by effective authorities have a more immediate and practical effect, though they are less visible in international forums. Given the very real impact of these regulations, the overall mix of fuels is becoming somewhat "greener" and energy efficiencies are increasing.

Technology Drivers of Energy Policy

The development of electric transmission system reliability and market access is a driving force in investments, developing access for renewables and increasing national energy efficiency. Across the six focus countries for this report, most have electric transmission systems with open access, which allows for renewable connection and/or enable wholesale markets, though only the US and Germany have connected national grids. An electrical grid is an interconnected network for delivering electricity from suppliers to consumers comprising three main components: power stations that produce electricity from combustible or non-combustible fuels; transmission lines that carry electricity to consumers; and transformers to reduce voltage for final delivery. As demand for electric energy grows, it becomes increasingly important for a country to have a connected grid that covers most or all of its regions.

Technological advances that lower energy costs or increase efficiency are continuously expanding reserves, not only for green investment policy (wind or solar photovoltaics, for example), but especially in hydrocarbons such as natural gas fracking. The growing hydrocarbon reserve, through increased knowledge of geology and technology to manage and explore, has driven energy policy for decades and is frequently underestimated in prospective impact. The term "reserve" refers only to the producible fraction of oil – the oil that can be brought to the surface – in an oil reservoir. The ratio of producible oil to the total amount is known as recovery factor. A recovery factor can vary vastly across different locations and can change over time based on operating history and technological or economic changes. For example, a recovery factor might rise over time if enhanced recovery techniques are used, such as gas injection, surfactants injection, water-flooding, or microbial enhanced oil recovery.²⁸ While new technologies have increased the accuracy of these techniques, significant uncertainties still remain. In general, most early estimates of the reserves of an oil field are conservative and tend to grow with time.²⁹ As technological advances in traditional and developing sources of energy production evolve and grow, so will the overarching energy policy of a given nation evolve to help ensure the industrial base has sufficient and affordable energy resources.

Economic Incentives as Energy Policy Tools

Governments sometimes use their policy and taxation schemes to influence the national focus and attention on specific energy aspects. Tax incentives strongly affect the rate of growth of energy technologies. For example, in the US, ethanol tax preferences, selected accelerated depreciation and the treatment of exploration and development (E&D) cost as capital that can be depreciated through amortization allowances encouraged increased national focus on ethanol.³⁰

Tax policies and incentives are extremely diverse across countries, and in most cases, politically and economically effective in shaping the direction of the nation's energy use. In addition to influencing the rate of technological growth, many governments use tax policies to incentivize selected energy producers by reducing otherwise effective taxes. In other cases, governments place special taxes on energy as a disincentive for consumers, or simply for revenues. In contrast, in some emerging nations, energy prices are set below costs, and major government subsidies still exist in many countries. The IMF estimated that in 2010, US\$ 250 billion was spent as subsidies to consumption of selected (mainly traditional) fuels.³¹

As discussed above, across the focus countries, most national markets are at least nominally opened for all fuels, including "alternative fuels". When it comes to encouraging the connection of new renewables to the existing grid, feed-in tariffs have become an almost universal device. A primary exception is Brazil, which is already highly dependent on hydropower for capacity and energy. Large-scale hydropower is typically used for economic reasons in a nation where suitable sites exist, and may be used secondarily for climate reasons. Even in open sectors, due to the size and resources involved, there often was and continues to be heavy direct government involvement in the design and implementation of nuclear, wind and solar, and in the development and operation of larger-scale hydro. Regarding solar and wind power, in the more open markets, there is a tendency for both to approach market levels for cost of capacity and to increase market share for energy. However, many nations have not fully managed the effects of new wind and solar sources on grid stability.

Other Key Mechanisms to Shape Energy Use

Governments employ a number of other policy tools to shape the direction of energy policy. Developed and emerging nations alike have adopted an energy efficiency law with at least a system for labelling and, in many cases, minimum efficiency standards. However, mandatory minimums apply to different industries, reflecting basic national priorities and policies. In the European Union, emissions trading is a key device to control carbon emissions, but some other markets have followed either as sellers of credits or in limited experiments for domestic purposes. In many nations, the pattern is to set "reduction targets" which are reached as an indirect consequence of some other policy or action. Examples include India which is committed to reducing carbon emissions to 20-25% below 2005 levels by 2020 as well as Japan's commitment to reduce carbon emissions to 25% below 1990 levels by 2020.³²

Creating energy policies that properly incentivize businesses and send clear market signals could also drive investments that ease dependence on fossil fuels in favour of clean energy sources, and lower the cost of energy when domestic resources become scarce.

And while executives support policies that provide environmental protection, many said results would be mixed unless such policies were applied equally on a global basis.

Certainly, developing global energy policies is a complex undertaking, given the significant differences in viewpoints worldwide. However, any approach to developing such treaties should include input from both developed and emerging markets, crafted to reduce dependence on fossil fuels in an equitable manner.

Executives also said carbon regulation is necessary to encourage change, though no consensus existed on the particulars of the regulatory process.

In the end, executives broadly believed a long-term, realistic, competitive energy policy would spur innovation on a massive scale and encourage prudent capital investments into their business operations.

What Do These Trends Mean for the Manufacturing Sector?

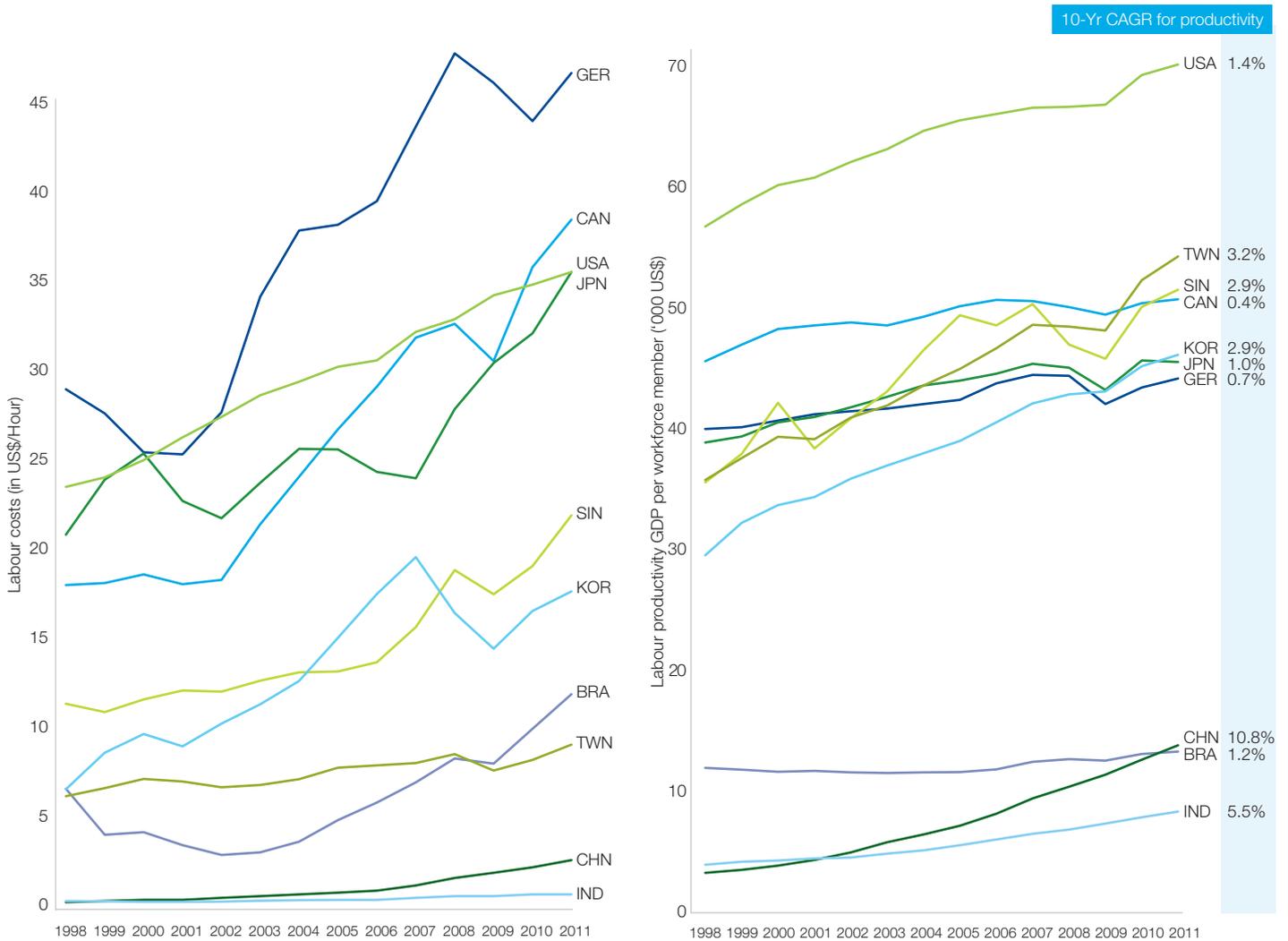
Global trends in energy use and policy will continue to drive energy-intensive industries towards greater efficiency to sustain a competitive advantage. The technology revolution – cited above in relation to tools that improve exploration and forecasting accuracy – will also contribute to the development of smart grids and enhance manufacturers' ability to manage logistics. The reduction of the average unit cost of transport, as infrastructure and logistical coordination technology improves (and associated lower average unit energy cost of shipment), increasingly separates physical production and assembly infrastructure from design and management centres. This has affected and will continue to affect some manufacturing sectors more than others, depending on the relative importance of energy compared to the advantages and risks associated with separating elements of the value chain.

The bottom line for manufacturers is an energy solution that yields a competitive advantage in the marketplace. For example, there are mandatory automotive fleet sales efficiency standards used in the United States, the European Union, China and Japan, but the key international tool for encouraging fuel-efficient vehicles seems to be market prices and high taxation on vehicle fuels (or often in Europe, taxes on engine sizes). Also, the role of energy infrastructure is crucial to a nation's overall vitality. Supplemental research reveals that ongoing investments in infrastructure drive innovation and in turn boost job creation, fostering a growth cycle within a country.³³ A recent estimate by the US Congressional Budget Office suggests that every dollar of infrastructure spending generates an additional 60 cents in economic activity (for a total increase of GDP to US\$ 1.60).³⁴

The role of policy decisions cannot be underestimated – the infrastructure for energy transmission to companies and consumers, as well as the greater focus on national independence and self-sufficiency, continues to require heavy government involvement. Equally important to ensuring a competitive business cost structure and further ensuring an uninterrupted supply of energy is setting long-term, realistic and competitive energy prices. Due, at least in part, to the sheer size and scale of energy infrastructure, production and transmission, as well as their ability to spur innovation and job creation, energy is one area in which most agree that government involvement is necessary – and vital. Chief executives from both developed and emerging countries emphasized the need for their nation to invest in energy infrastructure that would allow a reliable, sustainable and cost-effective supply of energy to help develop and retain a strong, competitive position in the global manufacturing marketplace.

Comparative Economic and Related Data

Labour cost versus labour productivity



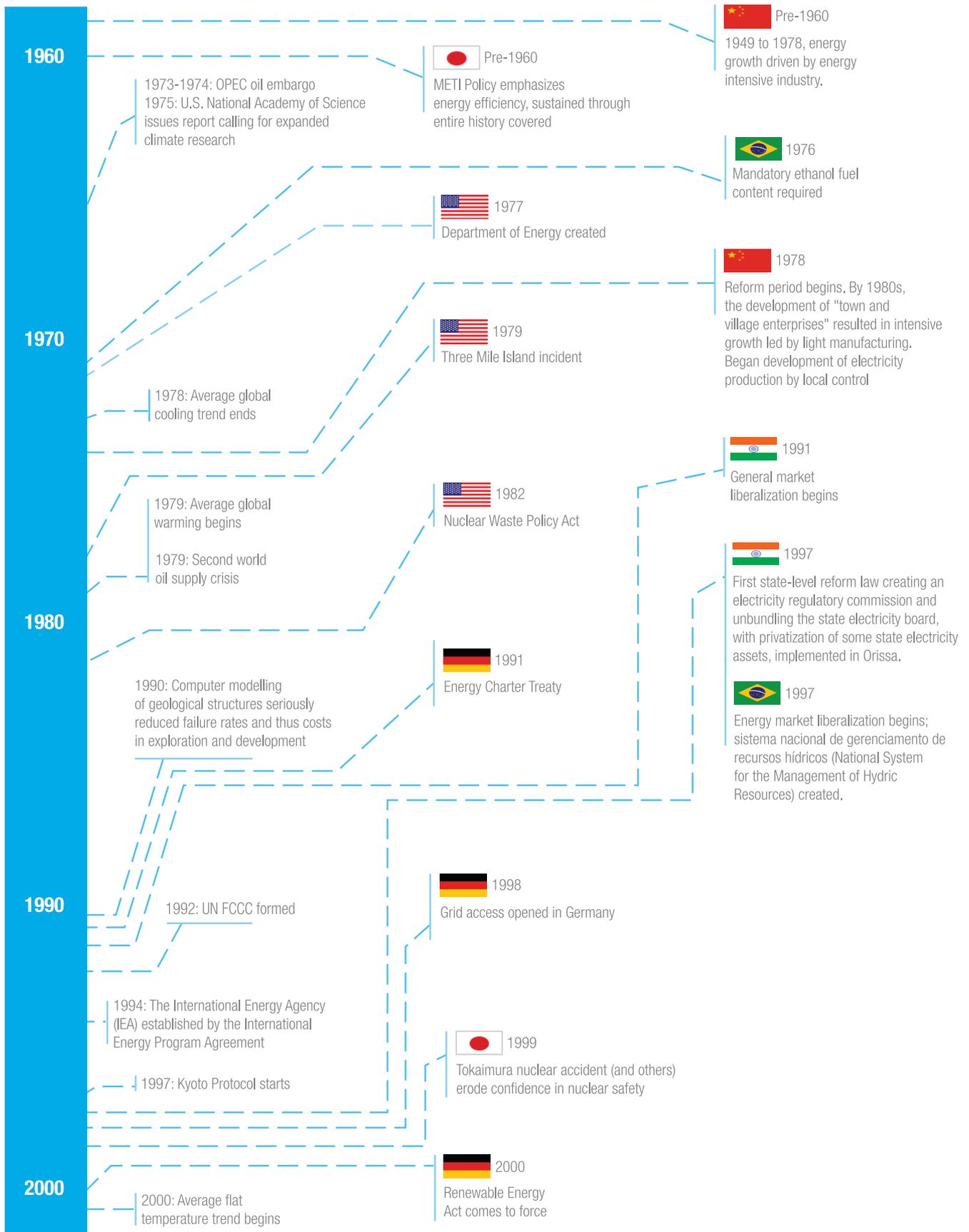
Correlation coefficient for labour cost and labour productivity: .75

Source: Deloitte Touche Tohmatsu Limited analysis ^(iv)

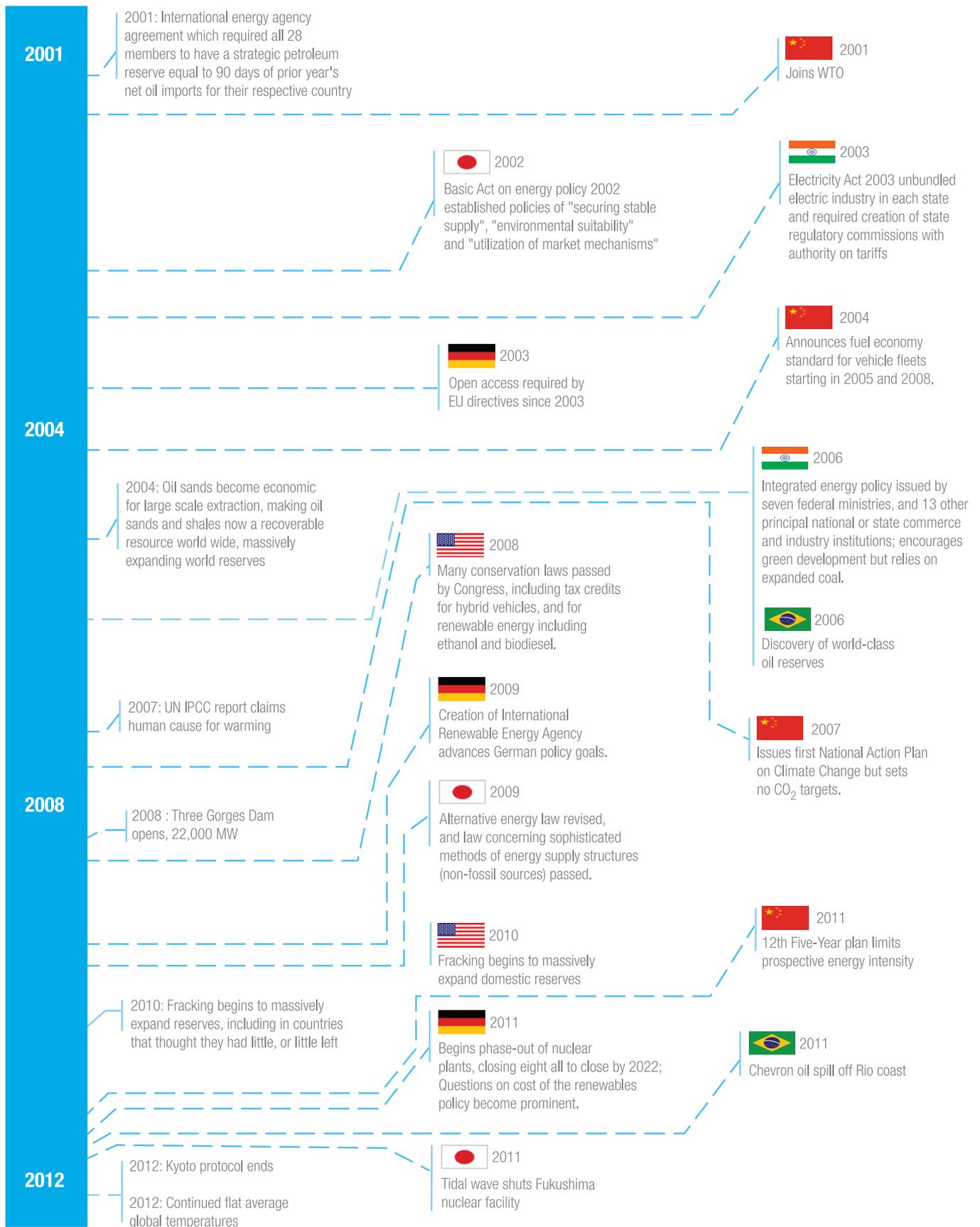
Note: Country Abbreviations: BRA=Brazil, CAN=Canada, CHN=China, KOR=South Korea, GER = Germany, IND=India, JPN=Japan, SIN=Singapore, TWN=Taiwan, USA=United States

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 6: Evolution of Energy Policy and Other Historical Events



Source: Deloitte Consulting LLP (Ranich Rebecca, Ballonoff Paul), (US analysis conducted in conjunction with The National Association of Manufacturers), © 2013



Source: Deloitte Consulting LLP (Ranich Rebecca, Ballonoff Paul), (US analysis conducted in conjunction with The National Association of Manufacturers), © 2013

Infographic End Notes

1. Figure 4: R&D spending as a percentage of GDP, annual average 2005-2010. Source: Maplecroft analysis based on data from World Development Indicators: Research and development expenditure (% of GDP), World Bank (<http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>), December 2012.
2. Figure 5: Top five R&D companies by total R&D spend. Source: Maplecroft analysis based on data from UK Department for Business, Innovation and Skills, 2010 R&D Scoreboard (http://webarchive.nationalarchives.gov.uk/20101208170217/http://www.innovation.gov.uk/rd_scoreboard/?p=1), December 2012.
3. Energy Timeline: Ranich Rebecca, Ballonoff Paul, Energy policy fact sheet, Deloitte Energy Working Series, 2013.

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