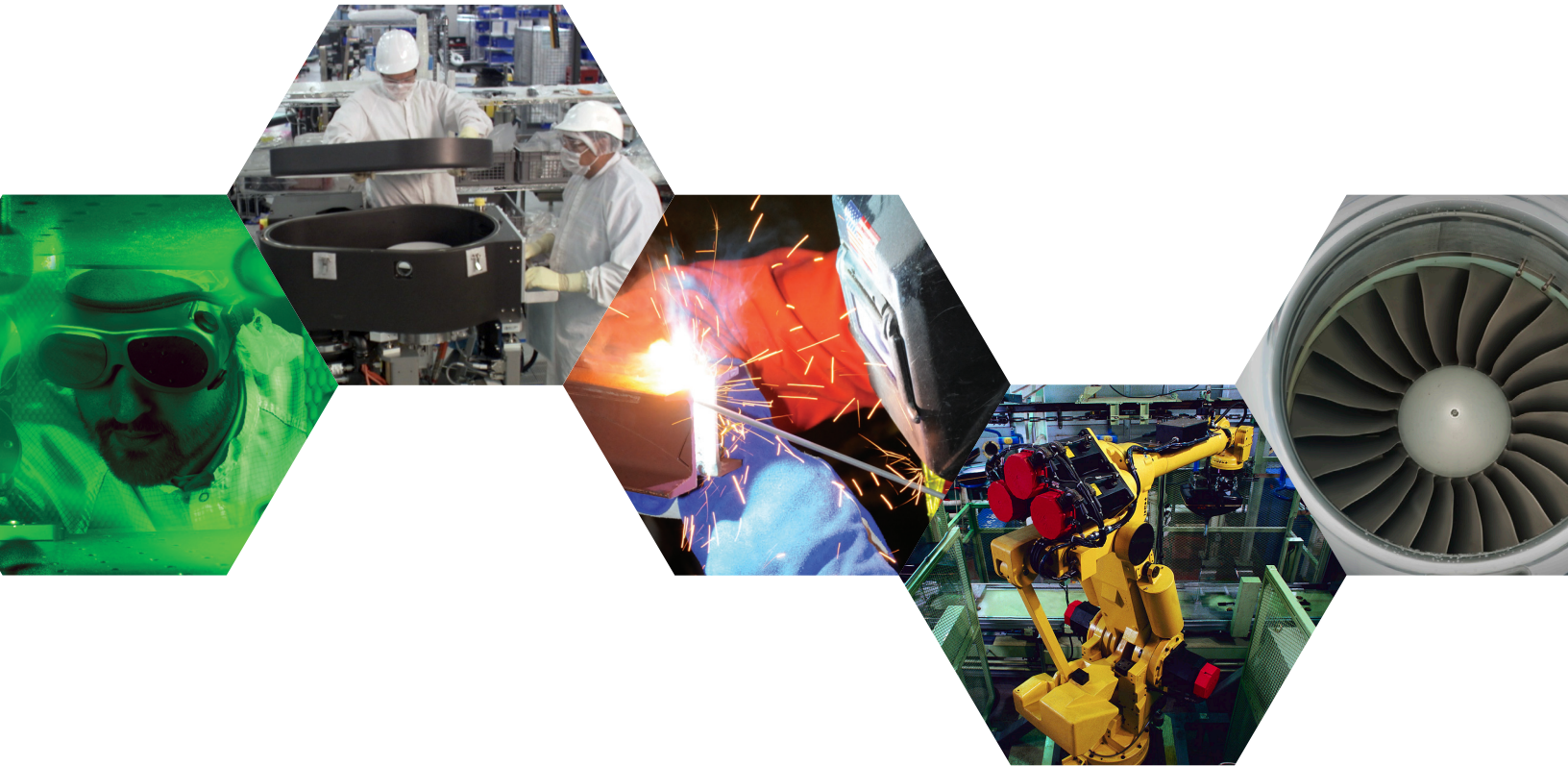


Deloitte.



2013

Global Manufacturing
Competitiveness Index



About this study

To learn how manufacturing CEOs and other senior leaders view their industry's competitiveness around the world, the Deloitte Touche Tohmatsu Limited (DTTL)'s Global Manufacturing Industry group and The U.S. Council on Competitiveness (Council) have undertaken a multi-year Global Competitiveness in Manufacturing initiative. The initiative is based, in part, on the responses of more than 550 senior manufacturing executives worldwide to a wide-ranging survey discussing the current business environment and global competitiveness in the manufacturing sector. The study also draws on select interviews with key manufacturing players as well as unique insights provided by the professionals at Deloitte member firms, the Council, Indian Institute of Management — Lucknow, and Clemson University. For more information concerning the specifics of this study and its participants, please consult the appendix.

Preface

We are pleased to present the 2013 Global Manufacturing Competitiveness Index, a collaboration between Deloitte Touche Tohmatsu Limited (Deloitte) and The U.S. Council on Competitiveness (Council). This study, gathering data from more than 550 CEOs and senior manufacturing leaders in 2012, is part of a multi-year initiative to better understand the trends creating a hyper-competitive global manufacturing environment.

This study examines the highly complex forces driving the future of manufacturing and many of the structural changes reshaping the global economy. Manufacturing today includes all facets of research, development, production, sales, distribution, logistics, customer service, marketing, and support. It extends from the making of physical products to the delivery of services. Properly understanding the breadth of manufacturing is essential to enacting policies to improve standards of living and be more competitive in the long term.

The digital revolution and pace of technological change also profoundly impact the way that business and production are organized. Digital technologies have made many facets of the global economy nearly borderless. In an earlier era, the location of natural resources often determined where manufacturing would take place. In today's economy, knowledge, know-how, technology, creativity and capital are the most important resources for production, and they are highly mobile. Not surprisingly, national economies and firms are growing more sophisticated in their ability to react to these changes and, where possible, leverage them to their advantage. The findings of the study confirm that the global competitive landscape for manufacturing will continue to undergo transformational shifts that will redefine the drivers of economic growth, wealth creation, national prosperity and national security.

We would also especially like to extend our sincere gratitude to all the executives around the world who took the time to share their valuable insights about the current and future states of global manufacturing competitiveness.

Yours sincerely,



Samuel R. Allen

Chairman

Council on Competitiveness

Chairman and Chief Executive Officer

Deere & Co



Joseph Echevarria

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Deloitte LLP (Deloitte U.S.)



Deborah L. Wince-Smith

President & CEO

Council on Competitiveness

Highlights from the 2013 Global Manufacturing Competitiveness Index

- The 2013 Global Manufacturing Competitiveness Index report prepared by the Deloitte Touche Tohmatsu Limited (DTTL) Global Manufacturing Industry group and the Council on Competitiveness includes more than 550 survey responses from senior manufacturing executives around the world with 39.7 percent from North America, 28.5 percent from Asia, 21.0 percent from Europe, 5.4 percent from South America and 5.4 percent from Australia. Forty-six percent of respondents identified themselves as chairman, CEO, or president, another 40 percent as managing director, senior vice-president, or general managers while the other 14 percent included directors, legal counsel, and others that completed the survey on behalf of the CEO. (Appendix B3 and B4, page 54)
- Consistent with the 2010 GMCI, China was again ranked the most competitive manufacturing nation in the world today and five years from now of the 38 countries ranked by executives. (Table 1, page 2)
- Five developed economy nations were ranked in the top 10 today: Germany (ranked second), the U.S. (third), South Korea (fifth), Canada (seventh) and Japan (tenth), while five emerging economy nations were also ranked in the top 10 today: China (first), India (fourth), Taiwan (sixth), Brazil (eighth), and Singapore (ninth). (Table 1, page 2)
- Five years from now, emerging economy nations surge to occupy the top three spots, with China retaining the top spot, and India and Brazil moving up to claim the second and third rankings, respectively. Brazil's jump from eighth to third is the largest jump expected over the next five years. And, Vietnam moves into the top 10 as the tenth most competitive nation. (Table 1, page 2)
- Developed economy nations slip lower in the executive rankings in five years with Germany moving from second to fourth, the U.S. from third to fifth, South Korea from fifth to sixth, Canada from seventh to eighth and Japan falls out of the top 10 moving from tenth to twelfth. (Table 1, page 2)
- Through a regional lens, five years from now the Americas continues to show significant manufacturing strength with the U.S., Brazil, Canada and Mexico all in the top 15 most competitive nations. But the continued shift to Asia is unquestionable with 10 of the top 15 most competitive nations in five years. And the message for European nations is sobering: Only Germany among the European nations remains in the top 15 most competitive nations five years from now. (Table 1, page 2)
- Again consistent with the 2010 GMCI, talent-driven innovation is deemed the most critical driver of a nation's competitiveness among the 10 major categories of drivers. Within talent-driven innovation, the quality and availability of scientists, researchers and engineers and the quality and availability of skilled production workers are ranked as the first and second most important of the 40 individual sub-components of competitiveness drivers. (Table 3b, page 7)
- Catapulting into the second most important driver position is the economic, trade, financial and tax system of a nation, moving up from fourth place in the 2010 GMCI. Trade, financial, and tax policies have now supplanted labor and materials costs, supplier networks, infrastructure, energy costs, and everything else as a more important driver of a nation's competitiveness, demonstrating executives' recognition of government leaders' increasing efforts to use public policy as an enabler of economic development. The tax rate burden and tax system complexity, and the clarity and stability of regulatory, tax and economic policies were ranked as the third and fifth most important of the 40 individual sub-components of competitiveness drivers. (Table 3b, page 7)
- According to the U.S. executives, from the 19 policy selection choices offered, only intellectual property protection policies and policies supporting technology adoption, integration and transfer help contribute a competitive advantage for their businesses. On the negative side of the ledger, environmental policies, energy policies, corporate tax policies, and healthcare policies were seen as contributing to a competitive disadvantage for manufacturers in the U.S. (Figure 20, page 28)
- In Europe, business leaders see only the continent's intellectual property protection policies contributing to a competitive advantage for them from the 19 policy selection choices. At the other end, only three policies were cited by European business leaders as contributing to a clear disadvantage; they include labor policies, immigration policies and policies resulting in government intervention and ownership in companies. (Figure 20, page 28)
- In China, policies either encouraging or directly funding investments in science and technology, employee education, infrastructure development along with safety and health regulations and sustainability policies are helping to provide a competitive advantage according to Chinese executives surveyed. Policies Chinese business leaders see inhibiting their competitiveness in China include antitrust laws and regulations, government financial intervention and ownership in companies, foreign direct investment policies, immigration policies and corporate tax policies. (Figure 20, page 28)

The Global Manufacturing Competitiveness Index

The new day brings new perspectives

With the release of the 2013 Global Manufacturing Competitiveness Index (hereafter, GMCI), Deloitte and the Council build upon the GMCI research, which was first introduced in 2010. This new and updated report includes over 550 survey responses from CEOs around the world collected throughout 2012, and provides their perspective of the key drivers of manufacturing competitiveness for a country; their ranking of the most competitive nations today and in five years from now; and, the public policies creating a competitive advantage or disadvantage for key countries and regions around the world. The 2013 GMCI now augments the detailed CEO perspectives with additional objective economic and related data and analysis that, as a result, provides a rich and detailed foundation to better understand the forces driving manufacturing competitiveness and overall economic prosperity for a nation. It is hoped that this fact-based, framework — free of policy recommendations — enables constructive dialogue on this important topic among all stakeholders: policymakers, business leaders, academic leaders, labor leaders and civil society.

Index methodology

In order to quantify country competitiveness more precisely, manufacturing executives were asked to rate the overall manufacturing competitiveness of 38 countries, currently and in five years. The selection of the countries was based on the conclusions of a sampling of executives as well as subject matter experts from the Council, Deloitte, and Clemson University. Also, executives who participated in the survey could add and rate any other country not included on the list. The Global Manufacturing Competitiveness Index (GMCI) was developed directly from their responses, assigning a single number for each country reflecting its relative attractiveness in terms of manufacturing.

For the computation, executive responses were standardized to adjust for potential country and cultural response bias, industry sector, as well as for company size, which is captured through annual revenues in U.S. dollars. Companies with more global experience, as demonstrated through physical presence with operations, sales and/or distribution in multiple geographic regions, were deemed to have more global experience and received a higher weight for their responses. Prior research also showed firm size to be an important factor for firms' overall global experience. Hence, the heuristic applied different weights to companies according to revenue size of the firm, which is taken as a proxy measure of their overall global experience. Those manufacturers with revenue size of less than 500 million \$ received the lowest weight whereas companies with revenues of 5 billion \$ or more received the highest weight. This approach of weighting responses also resulted in less regional variation among the ten drivers of manufacturing competitiveness and their components as well as within the GMCI of the most competitive countries. Not surprisingly, regardless of the location of company headquarters, large manufacturers had a more common perspective on competitiveness of nations as well as the underlying drivers of competitiveness with each other, than they do with their smaller counterparts mostly located within their home countries. See Appendix B for weights assigned to firms based on revenue size.

The new normal: uncertainty and unexpected change

When the first Global Manufacturing Competitiveness Index was released in 2010, the world seemed poised for a recovery from the worst economic downturn since the Great Depression, with the manufacturing sector leading the way. New production orders were rising and supply chains restocking. But much has transpired since that first release, and most of it unexpected: the devastating earthquake and tsunami in Japan in March of 2011, the Arab Spring, the European sovereign debt crisis threatening the European Union, Vladimir Putin's return as Russia's president, Standard & Poor's downgrading of the United States (U.S.) credit rating, and an unprecedented unemployment rate in the U.S. — now measured in years — during an economic recovery.

As we enter 2013, much is up for grabs. With the recent restrained growth in China coupled with imminent leadership changes, a delicate and precarious recovery teetering in the U.S., a dark cloud over much of the Eurozone, trade wars in South America, an ongoing malaise in Japan, and the percolating but elusive rise of India, the competitiveness of each nation's manufacturing innovation ecosystem will continue to be a focus area for policymakers, business leaders and much of society.

Emerging markets press for sustained competitive advantage

For the 2013 GMCI, CEO survey respondents were again asked to rank nations in terms of current and future manufacturing competitiveness with the results depicted in Table 1. And once again, China tops the list as the most competitive manufacturing nation today and five years from now. The three most significant manufacturing powers for much of the past 60 years — the U.S., Germany, and Japan — remain ranked in the top 10 most competitive nations today. Of these, Germany ranked as the second most competitive nation followed by the U.S. at number three and Japan at number 10. The global economic downturn and the Euro-crisis have helped shine a bright light on the considerable advantages and capabilities both Germany and the U.S. possess as locations for advanced manufacturing relative to other nations and their contributions to country-level economic resiliency. However, despite being recognized by executives for providing significant advantages in areas like research and development, access to highly skilled workers, and robust legal and regulatory policies that provide strong intellectual property protections, these developed nations are expected to decline in their overall competitiveness rankings over the next five years with Germany falling to fourth and the U.S. to fifth. And Japan drops out of the top 10 into position number 12 over the next five years, continuing its decades-long, cost challenges that reduce its global manufacturing competitiveness. Appendix A provides a detailed description on each of the top 10 most competitive countries today as ranked by CEOs for the 2013 GMCI.

Table 1: Global CEO Survey: 2013 Country manufacturing competitiveness index rankings*Executives believe China leads overall and emerging markets will become more competitive in the near future***Current competitiveness**

Rank	Country	Index score
10 = High 1 = Low		
1	China	10.00
2	Germany	7.98
3	United States of America	7.84
4	India	7.65
5	South Korea	7.59
6	Taiwan	7.57
7	Canada	7.24
8	Brazil	7.13
9	Singapore	6.64
10	Japan	6.60
11	Thailand	6.21
12	Mexico	6.17
13	Malaysia	5.94
14	Poland	5.87
15	United Kingdom	5.81
16	Australia	5.75
17	Indonesia	5.75
18	Vietnam	5.73
19	Czech Republic	5.71
20	Turkey	5.61
21	Sweden	5.50
22	Switzerland	5.28
23	Netherlands	5.27
24	South Africa	4.92
25	France	4.64
26	Argentina	4.52
27	Belgium	4.50
28	Russia	4.35
29	Romania	4.09
30	United Arab Emirates	3.93
31	Colombia	3.85
32	Italy	3.75
33	Spain	3.66
34	Saudi Arabia	3.57
35	Portugal	3.39
36	Egypt	3.24
37	Ireland	3.23
38	Greece	1.00

Competitiveness in five years

Rank	Country	Index score
10 = High 1 = Low		
1	China	10.00
2	India	8.49
3	Brazil	7.89
4	Germany	7.82
5	United States of America	7.69
6	South Korea	7.63
7	Taiwan	7.18
8	Canada	6.99
9	Singapore	6.64
10	Vietnam	6.50
11	Indonesia	6.49
12	Japan	6.46
13	Mexico	6.38
14	Malaysia	6.31
15	Thailand	6.24
16	Turkey	5.99
17	Australia	5.73
18	Poland	5.69
19	United Kingdom	5.59
20	Switzerland	5.42
21	Sweden	5.39
22	Czech Republic	5.23
23	Russia	5.04
24	Netherlands	4.83
25	South Africa	4.77
26	Argentina	4.58
27	France	4.02
28	Colombia	4.01
29	Romania	3.98
30	Belgium	3.63
31	Spain	3.58
32	United Arab Emirates	3.58
33	Saudi Arabia	3.46
34	Italy	3.45
35	Egypt	3.45
36	Ireland	3.03
37	Portugal	2.87
38	Greece	1.00

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Underscoring the extremely competitive nature of today's manufacturing environment, the top 10 most competitive nations five years from now is remarkably similar to today's ranking. Only India rising from fourth to second and Brazil rising from eighth to third alters the top 10. And as shown in Table 2, those nations expected to decline in their manufacturing competitiveness outnumber those on the rise, with developing nations such as India, Brazil, Indonesia and Vietnam moving into the top echelon.

Viewed through a regional lens, yet another significant story emerges. The Americas continues to show significant manufacturing prowess with the U.S., Brazil, Canada and Mexico all in the top 15 most competitive nations five years from now. But the real power has unquestionably shifted to Asia with 10 of the top 15 most competitive nations in five years. And the message for European nations is sobering. Indeed as the sovereign debt issues are being addressed, European nations are likely to be overtaken by emerging

economies that continue to move up the manufacturing-innovation ladder and establish domestic research and development centers, world-class infrastructures, and more advanced manufacturing capabilities. Only Germany among the European nations remains in the top 15 most competitive nations five years from now, according to CEOs surveyed.

Traditional views of inputs and outputs don't tell the whole story

Figure 1 highlights a number of macroeconomic inputs and outputs and compares the top 10 most competitive nations in the 2013 GMCI today against each other. It also shows the relative averages for each indicator based on all 38 countries, as ranked in Table 1. This objective, macroeconomic data serves as an important supplement to provide insights into the CEO rankings of the most competitive nations. Notably, it also illustrates there is no single formula of inputs and outputs that guarantees a nation's position as viewed by executives. Clearly, some countries are more apt to use inputs effectively to compensate for respective country weaknesses and bolster particular strengths. For example, the U.S. and Germany, with high labor costs and high corporate tax rates, offset these factors with strong labor productivity, with the U.S. leading the world by a healthy margin. The U.S. is further strengthened by very high innovation index scores, likely to be attributed in part to government policies for protection of intellectual property (See "The impact of public policy" section for additional detail). Moreover, there are many intangibles that are not captured in macroeconomic data. Many U.S. manufacturing companies create an entrepreneurial spirit and appreciate the soft people skills (e.g., artistic ability, appreciation of diversity, and creativity), which may be adding "hidden" value to traditional "hard" skills for improved labor productivity, as indicated by above average researchers per million U.S. population. China, on the other hand, still has relatively "lower" labor costs and is above average in the attractiveness of its corporate tax rates. Yet, China falls below average on labor productivity, researchers per million population and innovation index score. But executives know China has explicit goals and policies to improve in these areas. Japan's significant lead in researchers per million population yields only a modest innovation index score, while high labor costs, modest labor productivity and high corporate tax rates suppress overall competitiveness and lend credence to CEOs' current and future ranking of Japan.

Alternately, there are the CEO rankings that do not seem to be easily explained by the macroeconomic input and output indicators. India's leadership position on low labor costs does not seem to be enough to make up for its last place position in labor productivity, researchers

Table 2: Global CEO Survey: Executives see new players emerge: Brazil, India, Indonesia and Vietnam

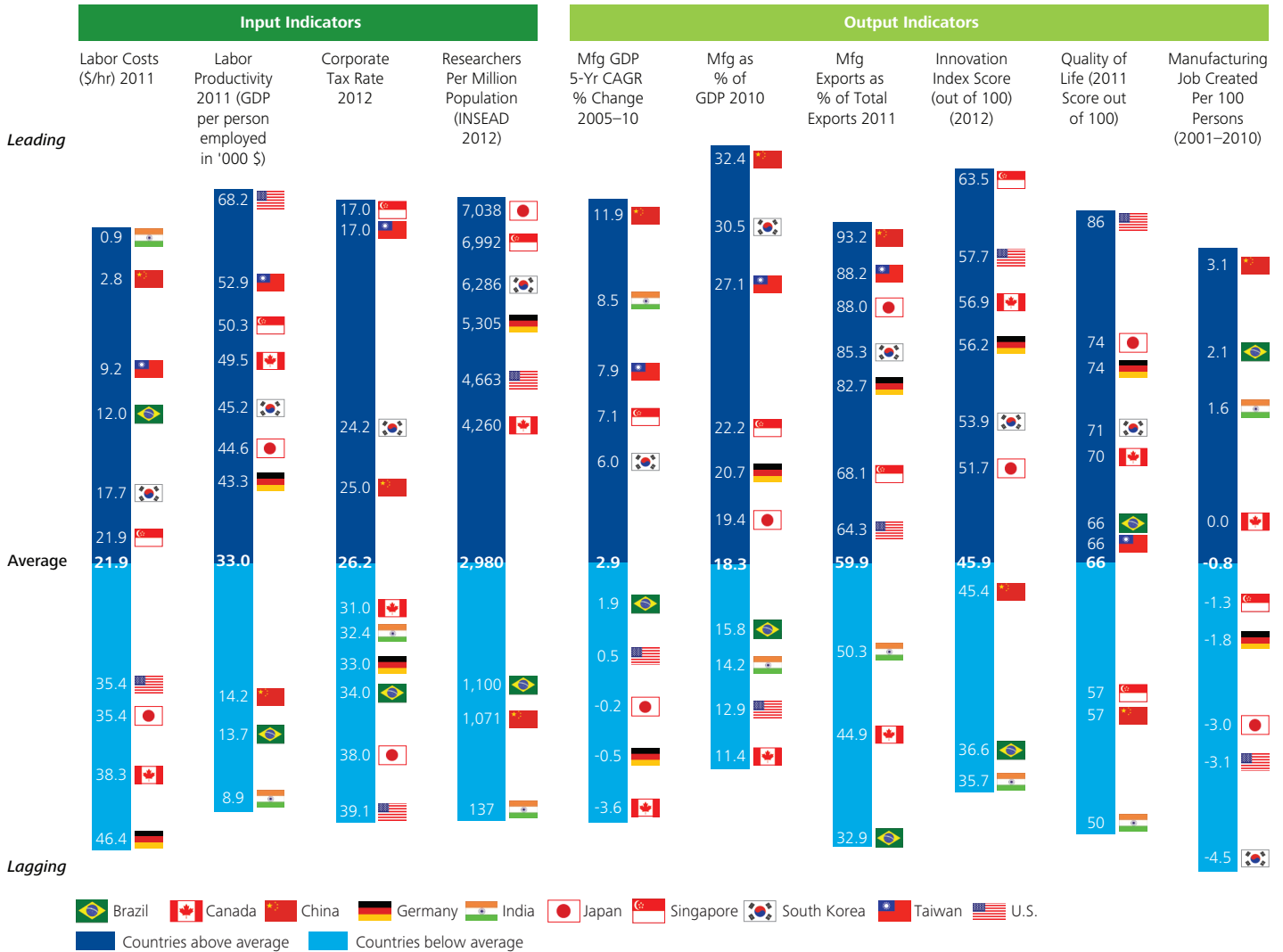
Expected change in manufacturing competitiveness in five years

Sliding DOWN	From		To	Moving UP	From		To
Americas				Americas			
United States	3	↓	5	Brazil	8	↑	3
Canada	7	↓	8	Colombia	31	↑	28
Mexico	12	↓	13	Europe			
Europe				Turkey	20	↑	16
Germany	2	↓	4	Switzerland	22	↑	20
Poland	14	↓	18	Russia	28	↑	23
United Kingdom	15	↓	19	Spain	33	↑	31
Czech Republic	19	↓	22	Ireland	37	↑	36
Netherlands	23	↓	24	Asia			
France	25	↓	27	India	4	↑	2
Belgium	27	↓	30	Indonesia	17	↑	11
Italy	32	↓	34	Vietnam	18	↑	10
Portugal	35	↓	37	Africa & Middle East			
Asia				Saudia Arabia	34	↑	33
South Korea	5	↓	6	Egypt	36	↑	35
Taiwan	6	↓	7				
Japan	10	↓	12				
Thailand	11	↓	15				
Malaysia	13	↓	14				
Africa & Middle East							
South Africa	24	↓	25				
United Arab Emirates	30	↓	32				
Australia							
	16	↓	17				

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 1: Supplemental data analysis: Competitiveness driven differently among most competitive nations

2013 GMCI top 10 country comparisons of key country manufacturing related macroeconomic indicators



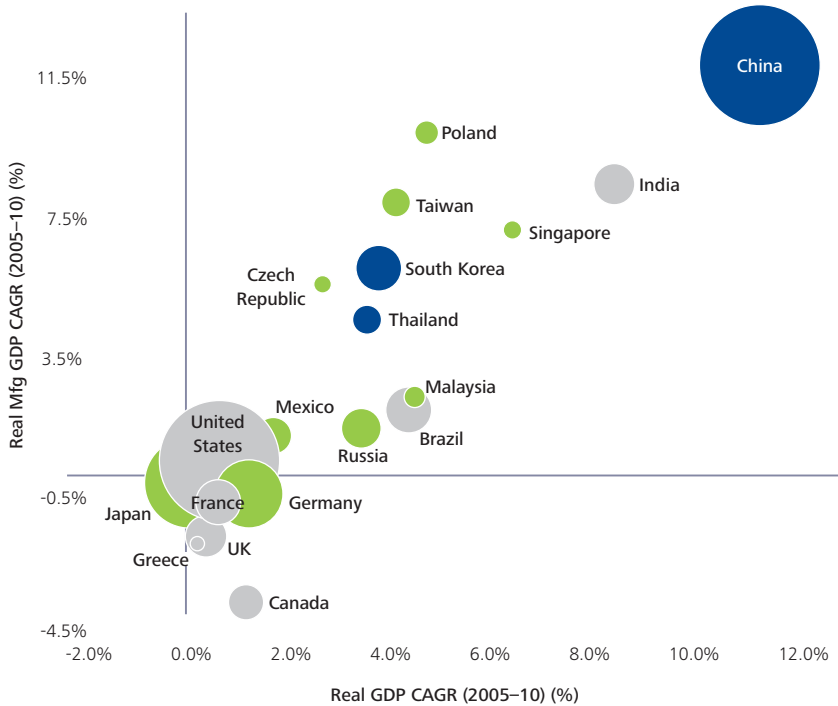
Source: Deloitte Touche Tohmatsu Limited analysis (i) (ii) (iii)

- Notes:
- Average figures mentioned are: average of 38 Index countries for Labor Productivity, Manufacturing GDP five year Compound Annual Growth Rate (CAGR) (2005-2010), Manufacturing as percentage of GDP (2010), Manufacturing exports as percentage of total exports (2011), and Quality of Life; average of 37 Index countries for Innovation Index Score, and Manufacturing Jobs Created per 100 Persons since data for Taiwan is not available; average for 37 countries for Corporate Tax Rates since data for UAE is not available; average of 36 countries for researchers per million population since data for Taiwan and UAE is not available; average for 34 countries for labor costs/hour since data for Saudi Arabia, South Africa, UAE, and Vietnam is not available.
 - Manufacturing as percentage of GDP and manufacturing as percentage of Exports at 2010 prices and exchange rates.
 - Corporate tax rate represents the *highest* corporate tax bracket for a given nation.
 - See additional details in Supplemental country analysis section (Appendix A).

per million population, innovation index or quality of life scores. But India's focused and comprehensive national manufacturing strategy, democratic governance and infrastructure development over the next five years may unlock the potential for CEOs around the world to see this rising star. Similar to India, Brazil's below average position on all input indicators, except for low labor costs, and all output indicators, except quality of life and manufacturing jobs created, does not explain its expected rise from eighth to third in five years as ranked by CEOs surveyed. Perhaps Brazil's resources are catapulting it in executives' viewpoint. And finally, South Korea's above average position on every input and output indicator does not explain either its last place position in manufacturing job creation or its expected decline from fifth to sixth in five years.

Figure 2: Manufacturing drives path to economic prosperity for developing nations: China leads the way

Real Gross Domestic Product (GDP) Compound Annual Growth Rate (CAGR) versus Manufacturing (Mfg) GDP CAGR



Color of bubble indicates Real Mfg. GDP as a % of Real GDP (2010)

- Mfg. GDP % of GDP (2010): < 16%
- Mfg. GDP % of GDP (2010): 16-30%
- Mfg. GDP % of GDP (2010): > 30%

Size of bubble indicates manufacturing GDP (2010)

- \$100 Billion
- \$1 Trillion

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

As goes manufacturing, so goes the nation

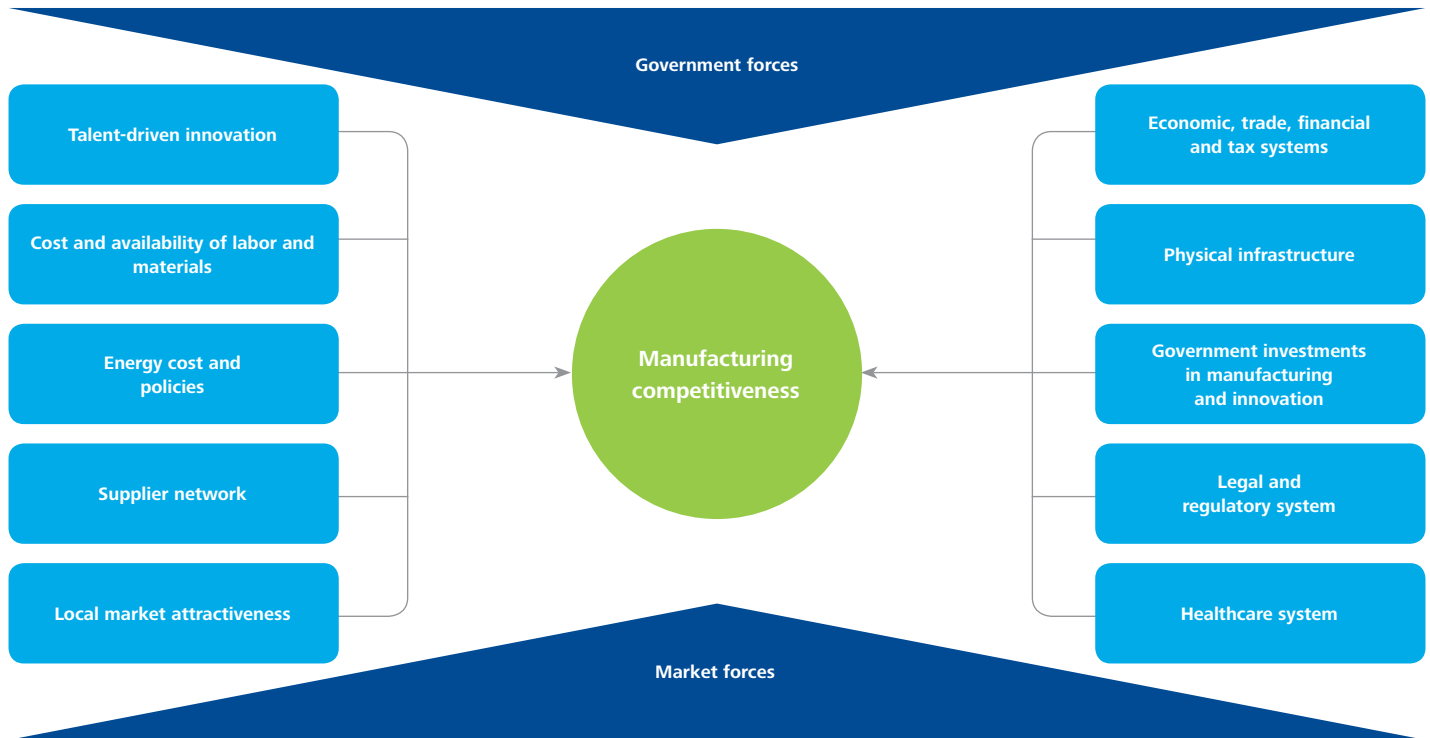
So *how much* does a strong manufacturing sector contribute to economic prosperity? The analysis shown in Figure 2 illustrates that there is a strong association between manufacturing Gross Domestic Product (GDP) and the real (overall) GDP of a nation. The strength of the relationship appears to be especially true for emerging economy nations. Developed nations are grouped together over this time period, with slow *manufacturing* GDP compound annual growth rate (CAGR) and equally slow overall *real* GDP CAGR. While emerging economies, driving higher *manufacturing* GDP growth (CAGR), were experiencing much stronger growth in overall *real* GDP (CAGR). This association appears to hold whether manufacturing GDP as a percent of total GDP is high (i.e., over 30 percent) or much lower (i.e., less than 16 percent). In other words, higher manufacturing growth, whether representing a large or small portion of the economy, drives higher total *real* GDP growth overall, with the emerging nations clustering in Figure 2 with relatively high rankings in both manufacturing and real manufacturing growth (CAGR).

The observed association in this study was corroborated in the recently released research of Ricardo Hausmann and Cesar Hidalgo (Harvard and MIT¹). Their extensive examination of the economic fabric of nearly every nation in the world over the past 60 years indicates the temporal effects, which show that once a nation begins to build the knowledge and capabilities necessary to manufacture goods, their path to prosperity begins. Further, they show that producing more complex products and developing and deploying more advanced manufacturing processes leads to greater economic prosperity for a nation and its citizens. Finally, their research argues that the linkage 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 nations than any other leading indices.

The next section presents the rankings of the key drivers of a nation's manufacturing competitiveness as seen by CEOs surveyed, as well as select country-specific comparisons related to those drivers. The clear differentiation perceived by CEOs of the competitive capabilities of nations is a fascinating look into the competitive dynamics challenging both developed and emerging market economies around the world in their quest to achieve sustained economic growth and prosperity.

Global drivers of manufacturing competitiveness

Table 3a: Drivers of global manufacturing competitiveness



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2010 Global Manufacturing Competitiveness Index

Talent-driven innovation drives manufacturing competitiveness

Like those participating in the 2010 GMCI, executives responding to the 2013 CEO survey were again asked to rank the key government and market forces that drive manufacturing competitiveness. The competitiveness framework developed for the 2010 GMCI, shown in Table 3a, was again applied for the development of the 2013 GMCI to both position the discussion of the key drivers of competitiveness and their important sub-components and to allow for a direct comparison between CEO responses in 2010 and 2013. We expect this framework will stand the test of time and continue to allow for longitudinal data analysis over the coming years.

As shown in Table 3b, and consistent with the 2010 GMCI rankings, executives again cited talent-driven innovation as the most important driver of a country's ability to compete. Punctuating the point, and key to the make-up of talent-driven innovation, executives cited the quality and availability of scientists, researchers, and engineers and the quality and availability of skilled labor as the top two most critical individual drivers of the 40 total sub-components (See Appendix B1) making up the 10 main drivers of

manufacturing competitiveness (See Table 3b) they were asked to rate. Nothing was more important to CEOs than the quality, availability and productivity of a nation's workforce helping them drive their innovation and growth agendas.

Catapulting into the second most important driver position is the economic, trade, financial and tax system of a nation, moving up from fourth place in the 2010 GMCI. CEOs' recent experiences with economic volatility, trade barriers, structural cost tax burdens, and crushing national indebtedness, combined with high degrees of policy and regulatory uncertainty, has likely caused them to now place government-related forces and actions as more important to determining a nation's competitiveness than anything other than the quality of its workforce. Government-driven trade, financial, and tax policies have now supplanted labor and materials costs, supplier networks, infrastructure, energy costs, local market attractiveness and everything else as a more important driver of a nation's competitiveness. This seems driven by executives concerns that economic, trade and tax policies are often detracting from competitiveness for manufacturers versus helping create an advantage. (See the Impact of public policy section for more detail).

Table 3b: Global CEO Survey: Global drivers of manufacturing competitiveness index ranking

Executives rank key drivers that impact a country's ability to compete in manufacturing

Overall rank (1–10)	Overall index score	Main driver	Most important sub-components	Sub-component rank (1-40)
1	10.00	Talent-driven innovation	Quality and availability of researchers, scientists, and engineers	1
			Quality and availability of skilled labor	2
2	8.42	Economic, trade, financial and tax system	Tax rate burden and system complexity	3
			Clarity and stability of regulatory, tax and economic policies	5
3	8.07	Cost and availability of labor and materials	Cost competitiveness of materials	11
			Availability of raw materials	21
4	7.76	Supplier network	Cost competitiveness of local suppliers	8
			Ability of supply base to innovate in products and processes	9
5	7.60	Legal and regulatory system	Stability and clarity in legal and regulatory policies	7
			Labor laws and regulations	13
6	6.47	Physical infrastructure	Quality and efficiency of electricity grid, IT and telecommunications network	4
			Quality and efficiency of roads, airports, ports, and railroad networks	16
7	6.25	Energy cost & policies	Cost competitiveness of energy	14
			Ongoing investments to improve and modernize energy infrastructure	20
8	3.99	Local market attractiveness	Size and access of the local market	27
			Intensity of local competition	36
9	2.48	Healthcare system	Cost of quality healthcare for employee and society	26
			Regulatory policies (e.g., pollution, food safety, etc.) that are enforced to protect public health	33
10	1.00	Government investments in manufacturing and innovation	Government investments in R&D: science, technology, engineering and manufacturing	29
			Private and public sector collaboration for long-term investments in R&D: science, technology, engineering and manufacturing	30

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Note: See Appendix B1 for full list of 40 sub-components and associated ranking

The cost of labor and materials now ranks third on the list, followed by supplier networks as the fourth most important driver, moving up four spots in 2013 compared with 2010. But other subtle shifts in the overall rankings suggest that the normal factors of production including the costs of labor, materials, energy and other related items, which can be directly managed and controlled by a company, are far less concerning to CEOs than the many other government and public policy driven factors outside of their control and often outside of their influence.

In the following pages, we focus on the top 10 drivers of competitiveness and discuss each in terms of sub-components, relative importance, and implications of their rankings.

A mosaic of strengths and weaknesses

The significant addition to this 2013 GMCI report compared with the 2010 version is the input received from CEOs on the individual rankings of strengths and weaknesses of an important subset of the most competitive nations relative to the 10 key drivers of competitiveness. While the CEOs' rankings of the most competitive nations today and in the future for 38 countries (Table 1), and the ratings for the 10 categories of competitiveness drivers and the 40 individual sub-components of those drivers, in the 2010 report provided many important insights, asking CEOs to rank 38 countries for 10 drivers and 40 sub-components was certainly too much to ask regarding the time of the more than 550 CEOs who participated in the 2013 GMCI study. Instead, an abbreviated approach was taken by asking the CEOs to rank only six countries on the key drivers of competitiveness and their respective sub-components

(Tables 3a and 3b, and Appendix B). For this purpose, three developed economy nations were chosen for more in-depth comparative analysis — the U.S., Germany and Japan, and three emerging economy nations — China, India and Brazil. As each of these nations finished in the 2010 and 2013 top 10 most competitiveness group, they are often identified as the surrogates for developed and emerging economy competitiveness dynamics.

Table 4 shows the results of mean ratings by CEOs surveyed of all drivers relative to each other — meaning the lowest rated country and competitiveness driver (i.e., India and Healthcare system) is given an index value of 1.0, and the highest rated country and competitiveness driver is rated 10.0 (i.e., China and Cost of labor and materials). All other country and competitiveness drivers in Table 4 are then indexed relatively against the highest and lowest rated ones, and thereby, creating individual and unique scores for each driver in the matrix. The mosaic that emerges clearly demonstrates the competitive advantage Germany, the U.S. and Japan hold relative to talent-driven innovation as well as against most of the other drivers, with the exception of the cost of labor and materials. Not

surprisingly, the survey revealed emerging nations hold an advantage with regard to the low cost of labor and materials; however, compared to their developed nation counterparts, they lag far behind regarding their healthcare systems and their legal and regulatory environments.


Importantly, what also emerges from the CEO rankings in Table 4 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 and capabilities over the coming years and improve their overall competitiveness position over the next five years as forecasted by the CEOs surveyed, it will be fascinating to see the new patterns that emerge in this mosaic.

The following pages focus on each of the top 10 drivers of competitiveness and discuss each in terms of sub-drivers, relative importance, and implications of their rankings.

Table 4: China’s transformation reveals itself through key competitiveness drivers

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 labor 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



Most competitive **Least competitive**

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 U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

1. Talent-driven innovation

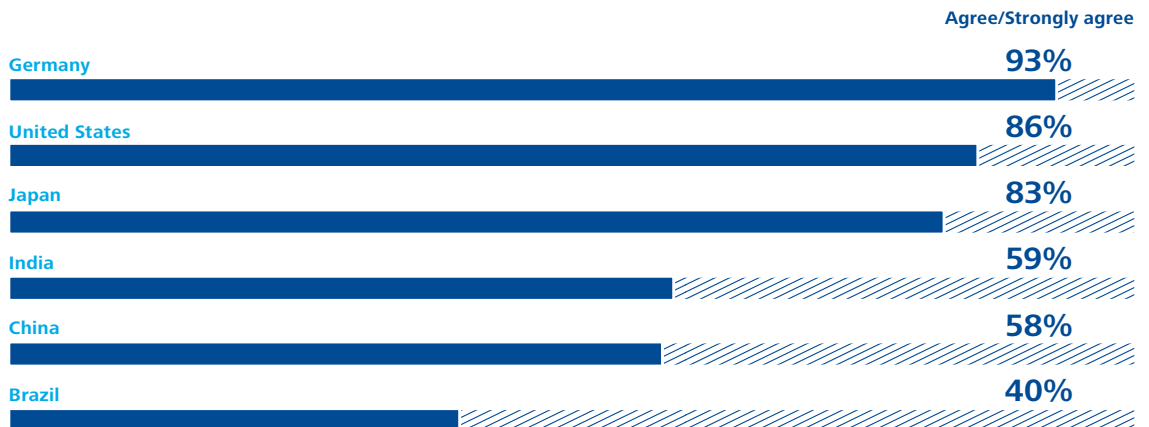
The quality and availability of a country’s skilled workforce, including researchers, scientists, and engineers, and the resulting ability to drive innovation was noted by executives participating in the 2013 GMCI survey as the most important driver of manufacturing competitiveness. Talent-driven innovation, which came out as a clear winner in both 2010 and 2013 GMCI rankings, remains the linchpin of manufacturing competitiveness.

At the country level, Figure 3 illustrates that executives participating in the 2013 GMCI survey see developed nations, such as Germany and the U.S., as the most competitive nations with respect to their ability to promote talent and innovation. This is especially interesting when looking at specific talent and innovation metrics, such as those listed in Figure 4, which might signify that although Germany and the U.S. have strong Innovation Index scores, countries — such as South Korea and Singapore — are very competitive on multiple measures like researchers per million population and basic math and science test scores. What the survey reveals beyond the metrics in Figure 4, is this: the efficiency of developed nations’ innovation ecosystems enables countries and companies to get much more innovation while requiring less input. So although the overall test scores of the general public are lower in the U.S. and Germany, the robust innovation ecosystems that have been developed over time are so entrenched that they can remain highly productive relative to innovation (i.e., using less new contributions to the innovation infrastructure). For instance, as discussed later in the supplemental country analysis section in Appendix A, executives surveyed thought that Germany’s

historical strength in key sectors as well as its focus on “mechatronics,” its “dual system” of vocational training and close links between industry and universities were key factors that resulted in its top ranking of talent-driven innovation capabilities. It is important to understand that a blend of a few quantitative metrics in Figure 4 may not give a complete picture of talent capability of a nation. Executives are able to introduce more intangible country factors into the competitiveness equation. Countries like Germany and the U.S. that thrive on developing strong innovation cultures more than likely have a perceived advantage in the eyes of executives. This is not to say developed nations will always benefit from this advantage. On the contrary, one could argue that South Korea and Singapore are laying a very solid foundation and infrastructure required for their own innovation ecosystems. This is reflected in Figure 4 from the higher ranking of Singapore, South Korea and Japan on the Innovation Index and researchers per million population. Hence, unless more significant strides are made in improving their education systems and raising the human capital bar further, developed nations like the U.S., Germany, and Japan would continue to be surpassed by other emerging nations like Singapore — which is ranked fourth in the World Economic Forum’s (The Forum) Global Competitiveness Report² among 142 countries with respect to secondary education and training, ranked number one in terms of quality of math and science education, and as illustrated in Figure 4, has a high per capita of researchers. Interestingly, the emerging countries — India, China and Brazil — currently lag their developed nation counterparts on talent and have the opportunity to develop this area further as shown by Figures 3 and 4.

Figure 3: Global CEO Survey: Talent-driven innovation country level competitiveness perception

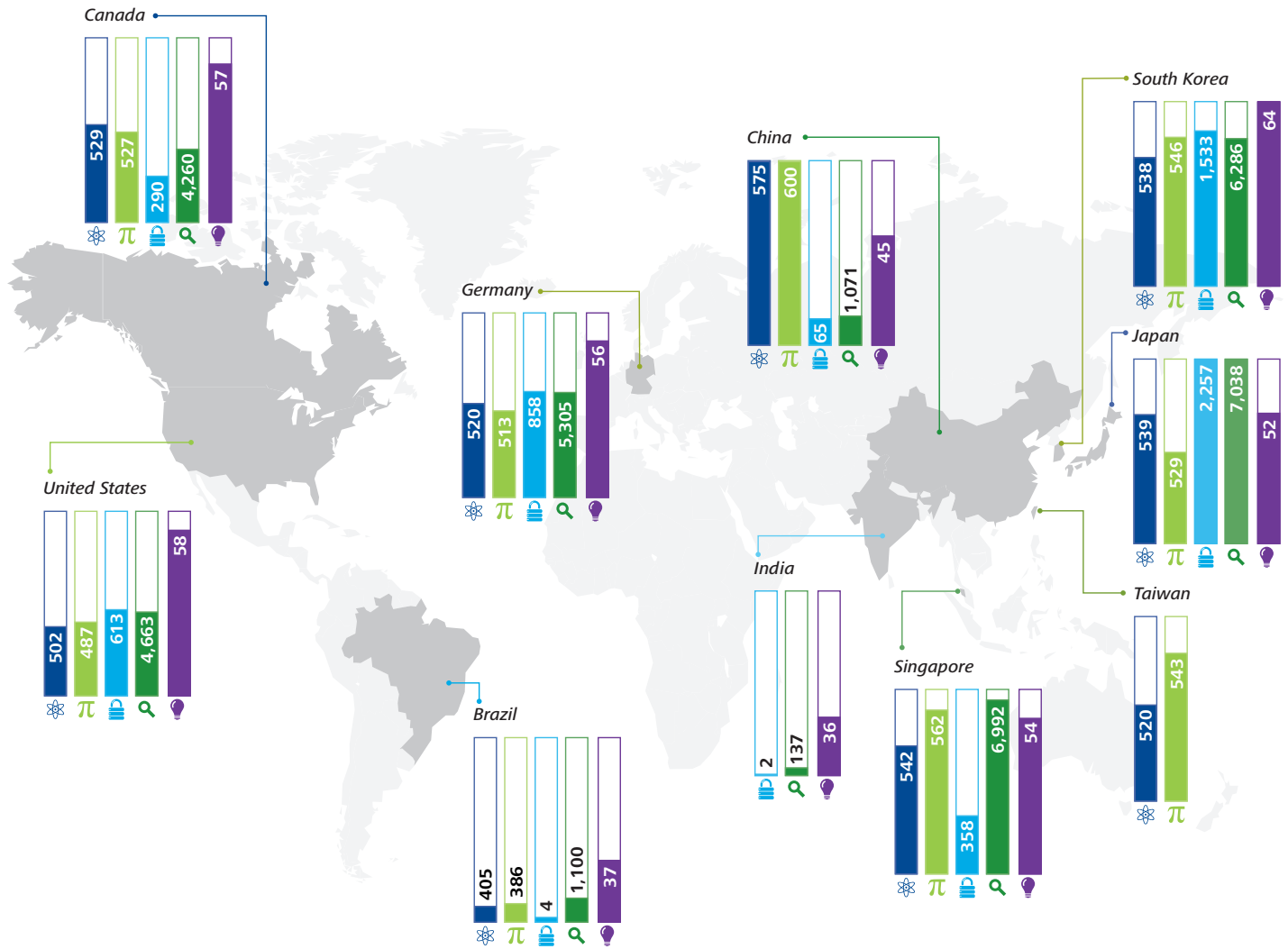
Percentage of executives that reported a country was extremely competitive with respect to talent-driven innovation



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 4: Supplemental data analysis: A snapshot of key factors for talent-driven innovation for 2013 Top 10 GMCI nations

Singapore and South Korea receive top marks across a number of key factors



Legend:

- Program for International Student Assessment (PISA) Science Scores out of 1,000 (2009)
- Program for International Student Assessment (PISA) Math Scores out of 1,000 (2009)
- Patents Granted per Million Population (2010) (WIPO, EIU)
- Researchers per million population (INSEAD 2012)
- Innovation Index Score (INSEAD 2012)

Source: Deloitte Touche Tohmatsu Limited analysis ⁽ⁱⁱⁱ⁾ (a) (d) (e)

Notes:

- PISA math and science scores not available for India
- Data for patents per million population, researchers per million population, and innovation index score not available for Taiwan

2. Economic, trade, financial and tax systems

Executives attributed a number of factors to country competitiveness due to economic, trade, financial and tax systems — the second most important competitiveness driver overall. Specifically, tax rate burdens and system complexity, along with the clarity and stability of policies, are huge hurdles for less competitive countries to overcome in order to create an attractive manufacturing destination. Closely following these sub-components were the relative health of economic and financial systems overall and the comprehensiveness and competitiveness of trade policies. Our study of six focused countries in Figure 5 reveals that Germany and the U.S. have a significant competitive edge on this driver with almost three-quarters of the executives surveyed pointing to their importance world-wide. Also, the figure reveals that while India and Brazil fell short in their economic, trade, financial and tax systems as providing competitive advantage, China appears to be moving up the maturity path in this area with its ranking on this competitive driver on par with Japan.

Regarding the movement of goods among key trading partners depicted in Figures 6 and 8, Germany appears to retain its intellectual property (in terms of relatively high share of medium and high technology products) within Europe, whereas the U.S. and Japan were geographically more diverse in exporting its medium and high technology products. Looking at China and Taiwan, the greatest percentages of their medium and high technology exports stay within Asia.

The distribution of exports by country and technology levels as a percentage of manufacturing goods is shown

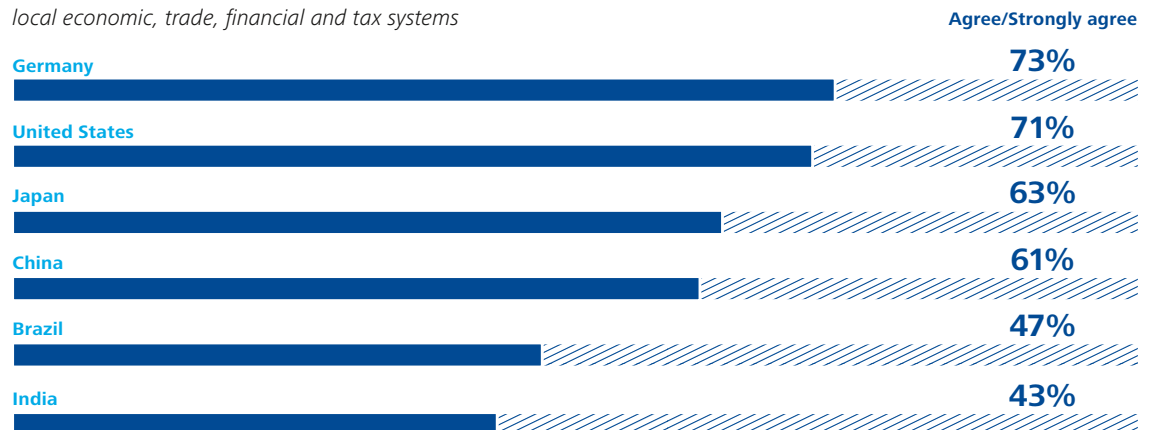
in Figure 7, which also identifies the relative dynamics of manufacturing exports as a percentage of total merchandise exports and cumulative annual growth rates in manufacturing exports over two distinct time frames: (1) 1995 to 2000 and (2) 2006 to 2011. The dynamics in Figure 7 reveal that Germany has been able to increase its pace of manufacturing exports and hence increase total manufacturing exports from a modest one percent CAGR in 1995-2000 to 5.2 percent in 2006-2011. In contrast, for the U.S., the share of manufacturing exports has been steadily declining over the same time intervals, which can be explained in part due to firms' shifting manufacturing to low-wage countries like China. It is however, interesting to note that smaller Asian nations — Singapore, Taiwan and South Korea are making their presence felt not only in terms of manufacturing competitiveness but also in their relative share of high and medium technology products.

The bottom half of Figure 7 also reemphasizes the dominance of advanced manufacturing in developed countries (e.g. the U.S., Germany and Japan), each of which had more than 80 percent of 2011 manufacturing exports classified as high and medium technology-based products as compared to relatively lower shares of other emerging nations (e.g., China, Brazil and India). These results are consistent with lower-wage labor countries.

China has taken the foremost position in global trade of manufactured goods and the scale of China's exports — the highest of the most competitive nations — can be gleaned from Figure 7. And it is manufacturing that has likely catapulted China to this position creating an internal market that now services its local market. This

Figure 5: Global CEO Survey: Economic, trade, financial and tax system competitiveness perception for six focus countries

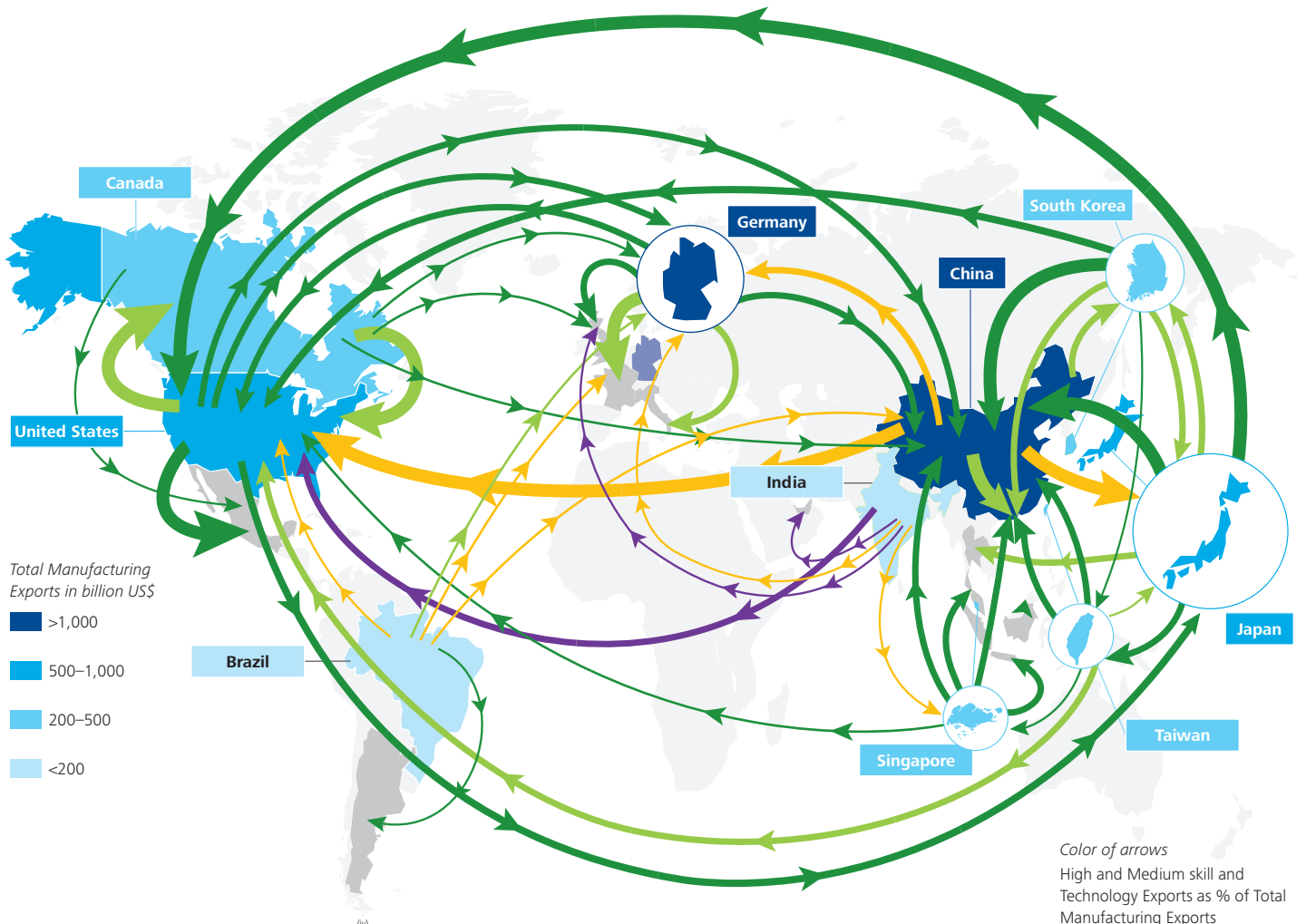
Percentage of executives that reported a country was extremely competitive with respect to the local economic, trade, financial and tax systems



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 6: Supplemental data analysis: A global view — Movement and levels of manufacturing products to and from the top 10 GMCI nations, to their top five trade partners, by product type

2011 manufacturing export competitiveness by size and level of technology



Source: Deloitte Touche Tohmatsu Limited analysis

Notes:

- The classification of goods into different degrees is based on Standard International Trade Classification (SITC) codes, UNCTAD ^(iv)
- Shaded grey countries represent export trade partners of top 10 GMCI competitive nations

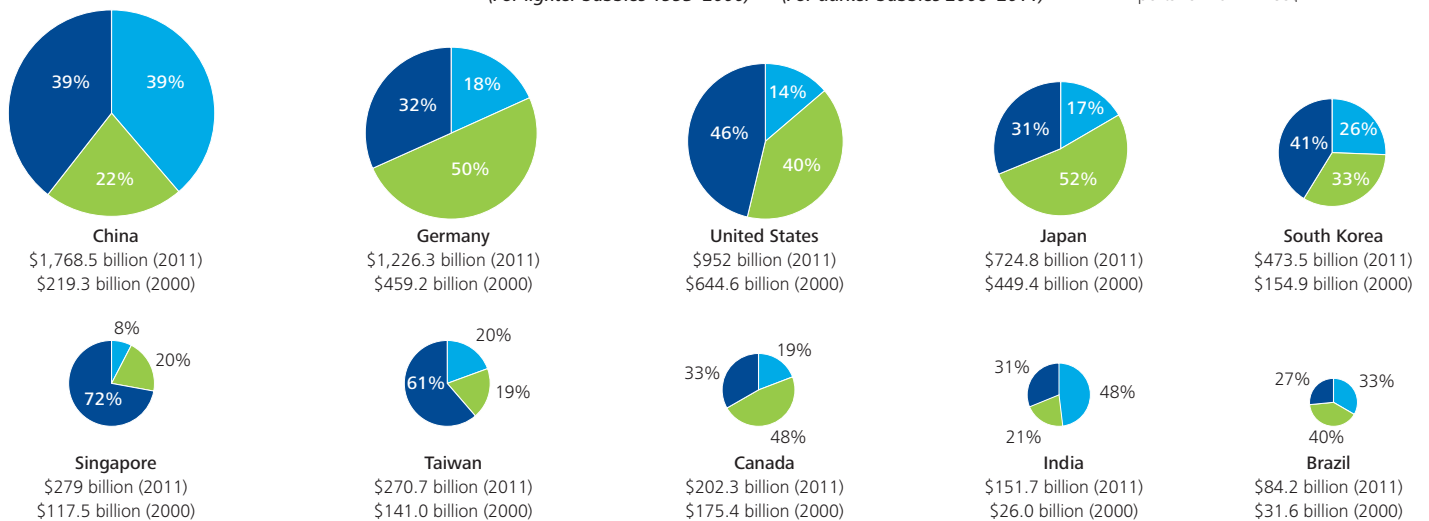
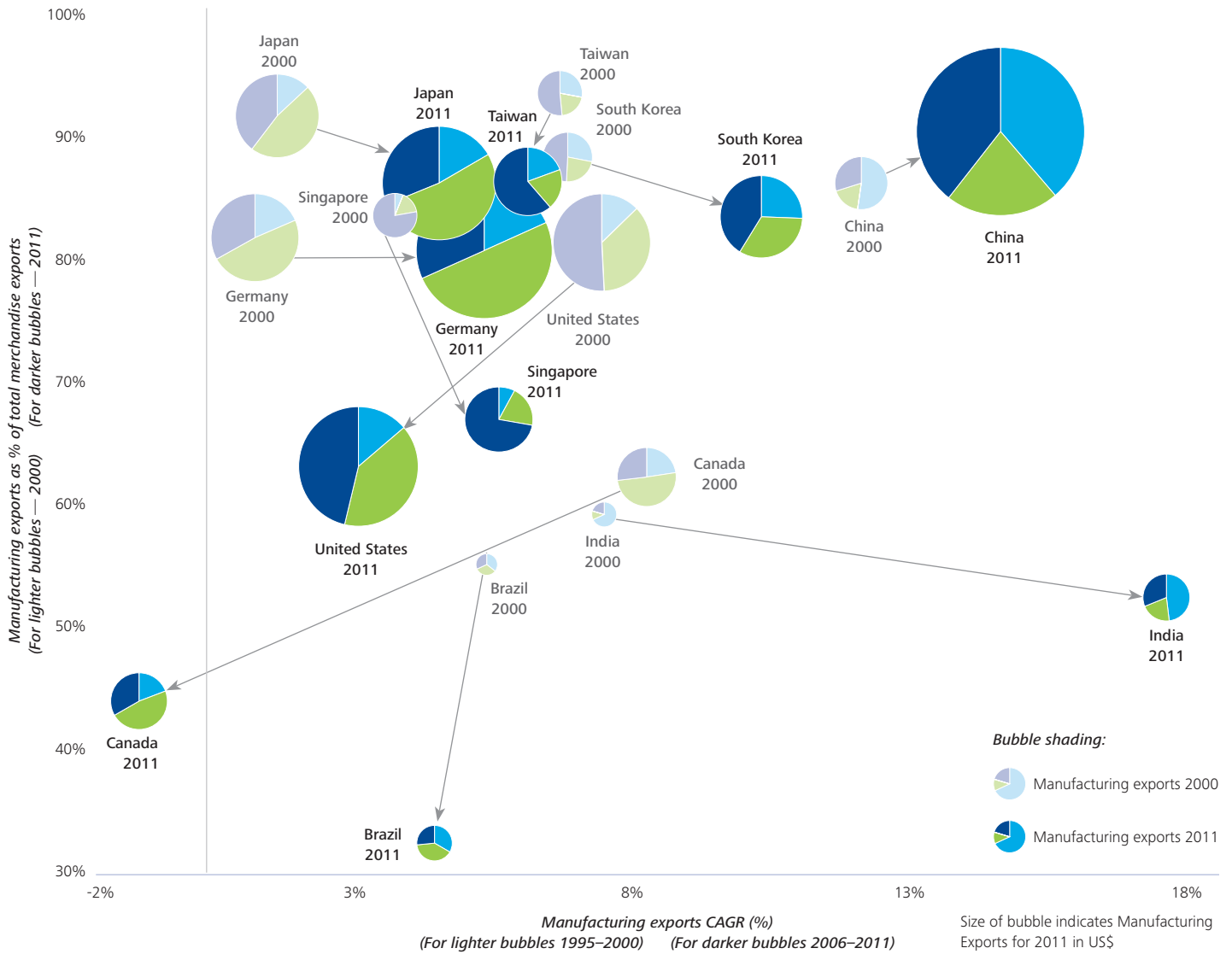
Figure not only shows a significant increase in the total manufacturing exports with high growth rates for China, India, South Korea and Taiwan from 2000 to 2011, but also the relative increase in their share of high and medium technology products over this period. This is quite evident from the gradual shift of low technology jobs from China to other nations like Vietnam, Bangladesh and Indonesia.³ However, increases in the contribution of high and medium technology products for emerging countries such as China and Taiwan, could also be because of the processing activity in which these countries are involved. For example, they assemble and export the finished product.⁴ Despite the impressive growth in manufactured exports, analysis

of the profile of traded goods from India, as depicted in Figures 6 and 7, shows that a large share of India's exports continues to be in the form of low value-added, labor-intensive goods. Figure 8 provides a deeper dive into these trade flows.

From a broader perspective, the volatility of the global economy over the last several years and the lack of certainty with respect to some countries' economic, trade, financial and tax systems remain areas of concern. This uncertainty has serious implications for policy making in respective countries.

Figure 7: Supplemental data analysis: 2011 manufacturing export competitiveness by size, skill and technology

China leads the pack in size and growth of manufacturing exports, with a significant portion from high and medium tech products



Source: Deloitte Touche Tohmatsu Limited analysis ^(iv)

Percentages in these bubbles are for 2011

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 labor-intensive and resource-based manufactured goods

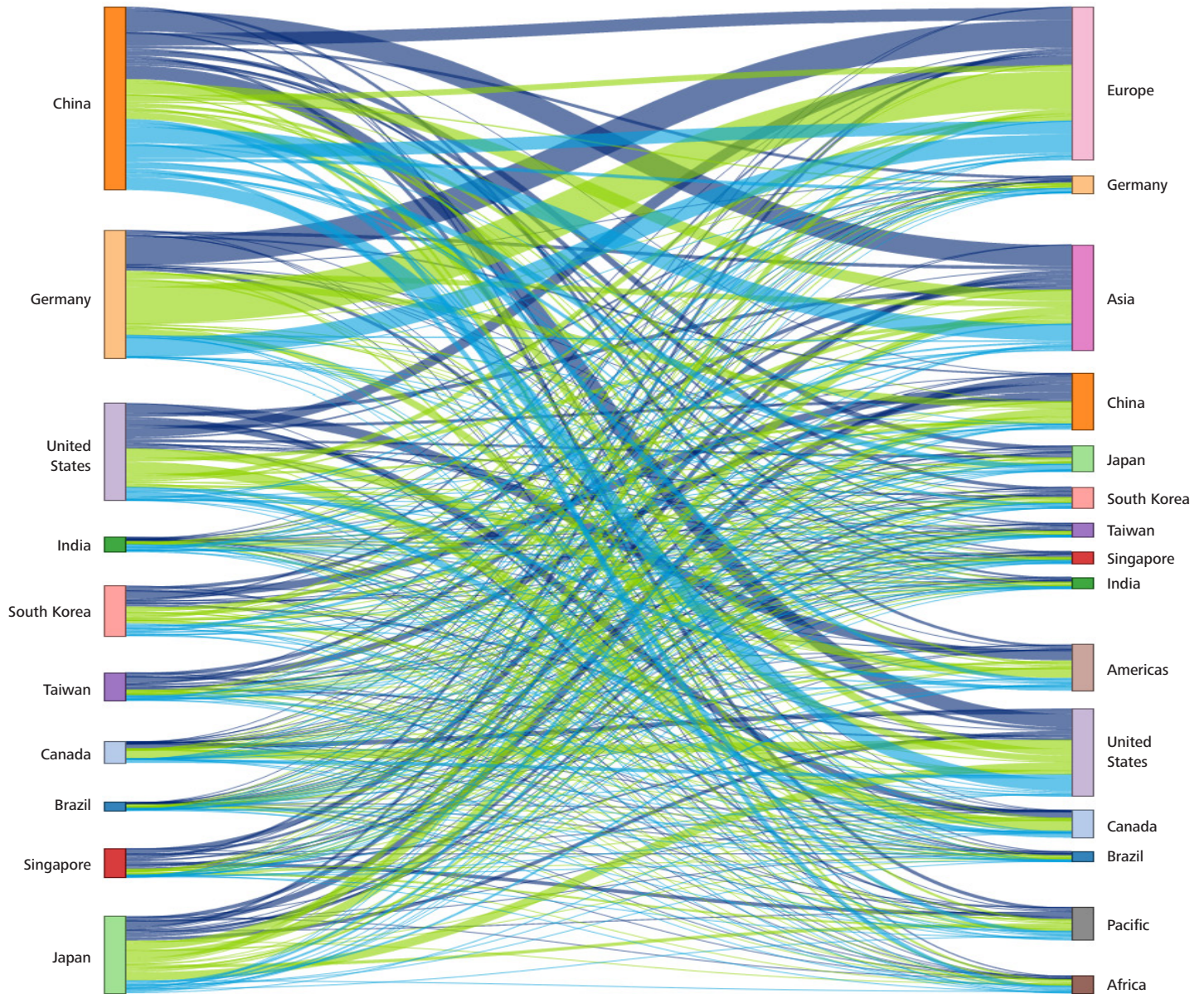
Note: The classification of goods into different degrees is based on Standard International Trade Classification (SITC) codes, UNCTAD ^(iv)

Figure 8: Supplemental Data Analysis: A look at where and what type of manufacturing goods the most competitive nations are exporting

2011 manufacturing trade export levels for 2013 top 10 GMCI countries

Exports for Index's top 10 nations

Their major export partners



Source: Deloitte Analytics HIVE (Highly Immersive Visual Environment) and 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 labor-intensive and resource-based manufactured goods

Notes:

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

Regional definitions — Europe (excludes Germany), Asia (excludes China, Japan, South Korea, Taiwan, Singapore, and India), Americas (excludes United States, Canada, and Brazil)

3. Cost and availability of labor and materials

Cost and availability of labor and materials continues to transform the global landscape significantly with respect to creating manufacturing competitive advantage. Historically, as reflected in the prior section regarding exports, numerous companies moved their production to emerging economies where labor and materials were cheaper. As a result, the economic prosperity of the citizens in these once low cost destinations has improved, giving rise to a growing middle class — and demands for higher wages.

As these countries continue to evolve and move up the product complexity ladder — and in turn, grow their economies and become involved in the production of more complex products — they are becoming less competitive on their labor advantage. They look more like developed countries and are beginning to shift production to lower cost countries for more commoditized products. China, for example, is now shifting production to countries like Thailand and Vietnam, and is one example of this dynamic.

Nonetheless, Figure 9 shows that executives responding to the 2013 GMCI survey felt that China and India continue to provide the most significant labor and material cost advantage of the six focus countries highlighted in the 2013 GMCI. Not surprisingly, Brazil rounds out this group of three countries that executives felt provide a substantial advantage over the U.S., Germany, and Japan.

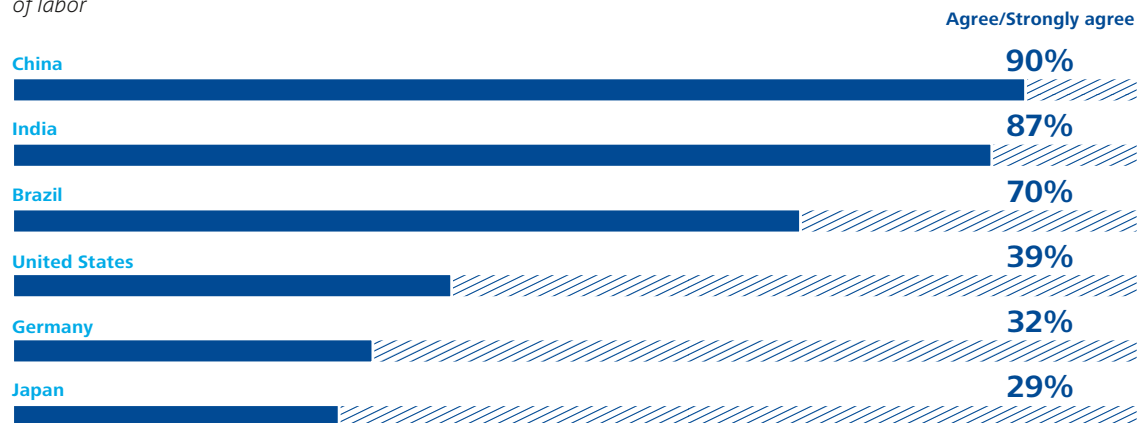
In ranking the components, executives viewed cost competitiveness of raw materials as the most important driver, followed closely by competitive wage rates, availability of raw materials, and lastly cost competitiveness of labor outside of wages (e.g., benefits).

It is important to note that increasingly countries appear to be taking a broader and longer-term approach to labor and material costs. Figure 10 demonstrates, for example, that though the U.S. has higher labor costs, it also has the highest labor productivity. On the other end of the spectrum, although China and India have made significant improvements in labor productivity over the last decade, their starting points are low, and therefore, they remain far behind the U.S.

At the same time, individual companies recognize that making sourcing decisions in order to simply gain access to low cost labor and materials is neither a strategic benefit nor a sustainable strategy over the long term. Moreover, as previously mentioned, lower cost destinations like China and India now have large middle class populations and significant domestic consumer demand. Hoping to seize these growth opportunities, many multinational companies are expected to continue to expand and grow operations in these markets.

Figure 9: Global CEO Survey: Cost and availability of labor competitiveness perception for six focus countries

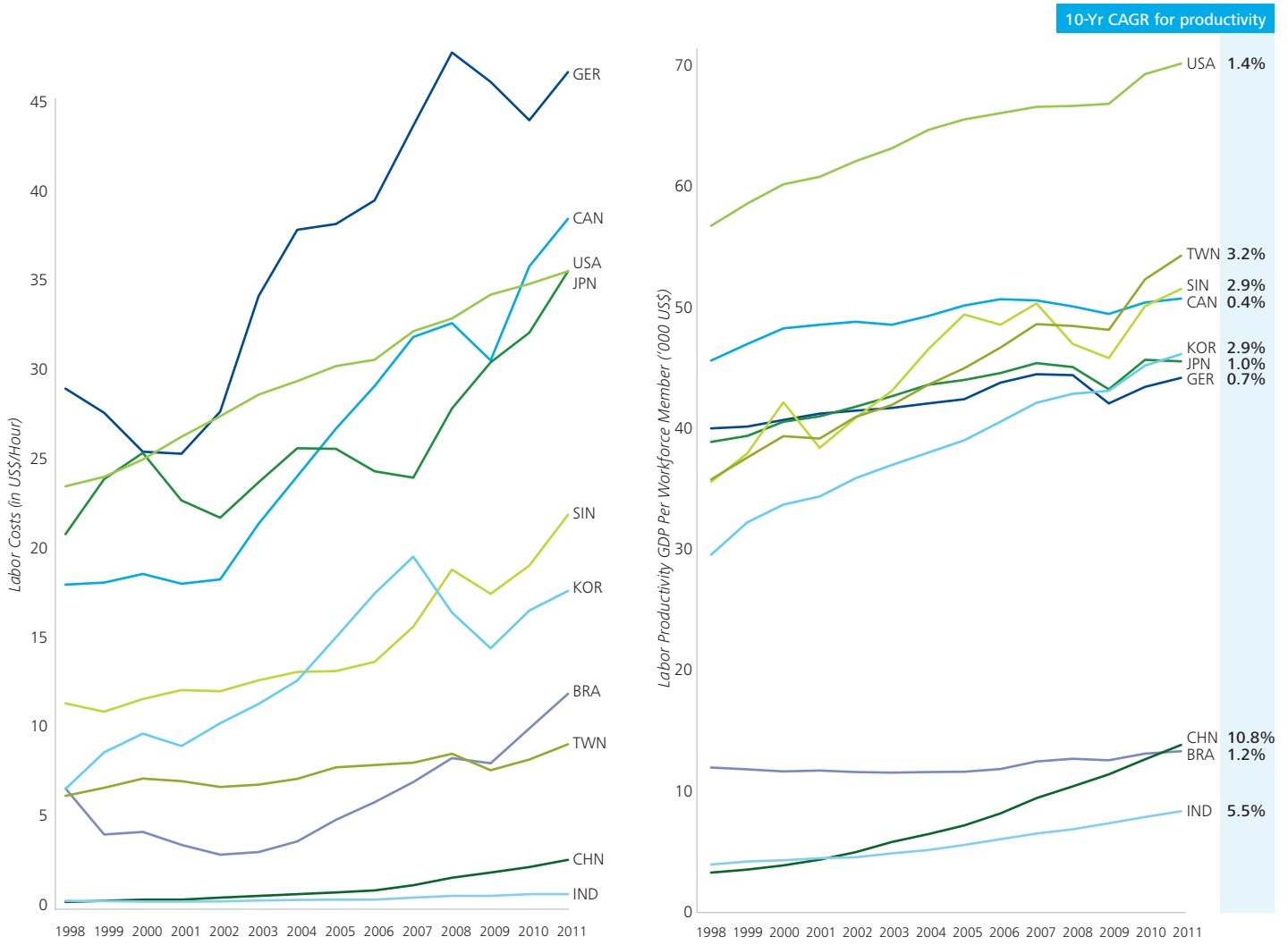
Percentage of executives that reported a country was extremely competitive with respect to the local cost and availability of labor



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 10: Supplemental data analysis: The correlation between the cost of labor and productivity levels

Labor cost and productivity for 2013 GMCI top 10 most competitive nations



Correlation coefficient for labor cost and labor productivity: .75

Source: Deloitte Touche Tohmatsu Limited analysis ^(vi)

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

4. Supplier network

As previously mentioned, executives responding to the 2013 GMCI survey ranked supplier network as the fourth most important driver of manufacturing competitiveness. CEOs gave much more importance to supplier networks than in 2010, when, supplier network ranked eighth.

This improvement may be attributed to a number of factors, including the increasing globalization of manufacturing organizations and supply chains and intensifying efforts to localize production near emerging consumer markets. The sheer scale of today's global supply networks is staggering. In addition, CEOs and senior executives have elevated the standing of supply chains as they are taking strategic actions to mitigate supply chain risks in response to natural disasters and to gain more control and transparency of sources. In evaluating a country's competitive advantage in this area, executives

cited financial stability and resources within a supplier network as the most important factor contributing to competitiveness, followed closely by its ability to innovate, cost competitiveness, and suppliers' availability and responsiveness. The old adage, "getting the right products to the right markets at the right time in the right amounts at the right cost" translates into efficient and effective supply chain management.

With respect to the six focus countries highlighted in Figure 11, it's not surprising that the developed nations — and China — rank as the leaders. Certainly, key contributors to this ranking are the long manufacturing tradition that the developed countries enjoy and the traditional role each has played in driving innovation and creating a high quality supplier ecosystem. Furthermore, it should be of no surprise that China is also recognized by executives surveyed as a leader in providing a competitive advantage through its supplier network.

Among the emerging economies, China has an overwhelming lead over India and Brazil. China's emergence as a leader in supplier networks is likely attributed to focused efforts within the country to localize supply chains; and thereby, creating innovation hubs that bring together universities, research institutions and suppliers⁵. Access to a well-oiled supplier network makes large multinationals successful in the production and continued advancement of complex goods to meet the needs of global customers.

China, with its focused efforts to localize supply chains and create innovation hubs, is seen by CEOs as the only emerging nation offering the same supplier network advantages as developed nations (Figure 11).

Figure 11: Global CEO Survey: Supplier networks competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local network of suppliers



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

5. Legal and regulatory system

Much like with the supplier network driver, executives ranked developed nations as leaders when it comes to the competitive advantage they deliver through their legal and regulatory systems. Stability and clarity within the legal and regulatory environment stood out as the primary factor influencing the individual country rankings. This is supported by executive input outlined in *Ignite 1.0: Voices of American CEOs on Manufacturing Competitiveness*, developed by Deloitte and the Council, and those executives' concerns with respect to the consequences of uncertainty⁶. Other contributing factors include labor laws and regulations, compliance costs, intellectual property protection, enforcement of laws and regulations, and antitrust regulations.

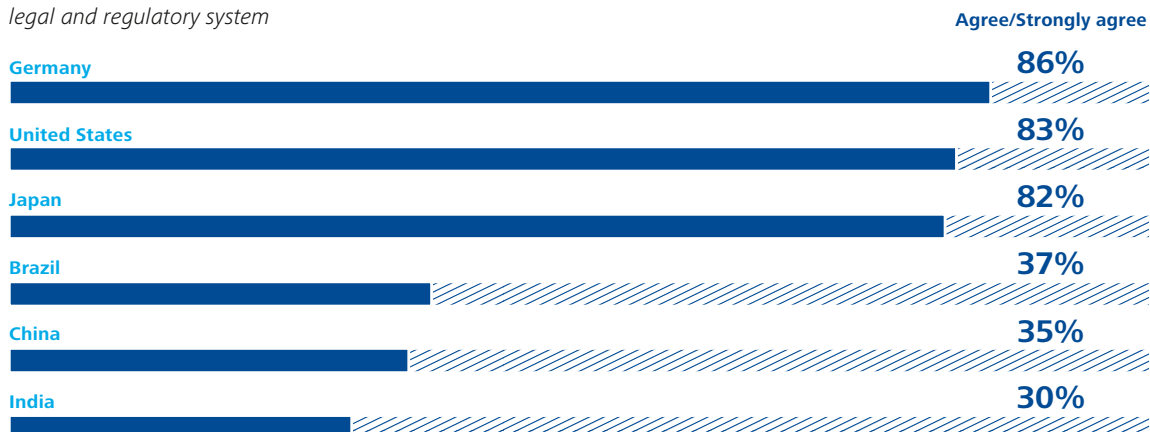
It may not be surprising that emerging economies trail in the rankings of the six focus countries highlighted in the 2013 GMCI. However, as illustrated in Figure 12, it is interesting that these nations appear to be substantially further behind developed nations when compared to how executives evaluated each country's supplier network advantages. Survey results also reveal that China and Brazil, with respect to the strength and competitiveness of their legal and regulatory system, are also ahead of India.

At the opposite end of the spectrum are the developed nations, which despite their competitive strengths, are struggling with burdensome, uncertain and often complex legal and regulatory systems. The intellectual property protections afforded under the U.S. laws and regulations, for example, are highly regarded. However the competitiveness of the developed nations could be better served by reducing the cost and complexity of regulatory compliance. This can be achieved through the streamlining of processes, reduction in fraud and waste, and removal of outdated aspects of the laws. While emerging economies could focus more on developing better legal and regulatory systems, developed economies could focus more on better management of their existing systems to promote efficiency and competitiveness.

CEOs viewed the legal and regulatory systems in developed nations more than twice as strong as those in emerging nations, (Figure 12), primarily as a result of stability and clarity within their legal and regulatory environments.

Figure 12: Global CEO Survey: Legal and regulatory systems competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local legal and regulatory system



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

6. Physical infrastructure

Executives responding to the 2013 GMCI survey ranked physical infrastructure as the sixth most important driver of manufacturing competitiveness, noting specifically the cost and process efficiencies, as well as productivity improvements that directly result from access to quality infrastructure. This driver includes support for the basic logistics involved in the movement of physical goods, as well as the efficient movement of information and energy through technology-based infrastructure investments in smart-grid, broadband and other networks.

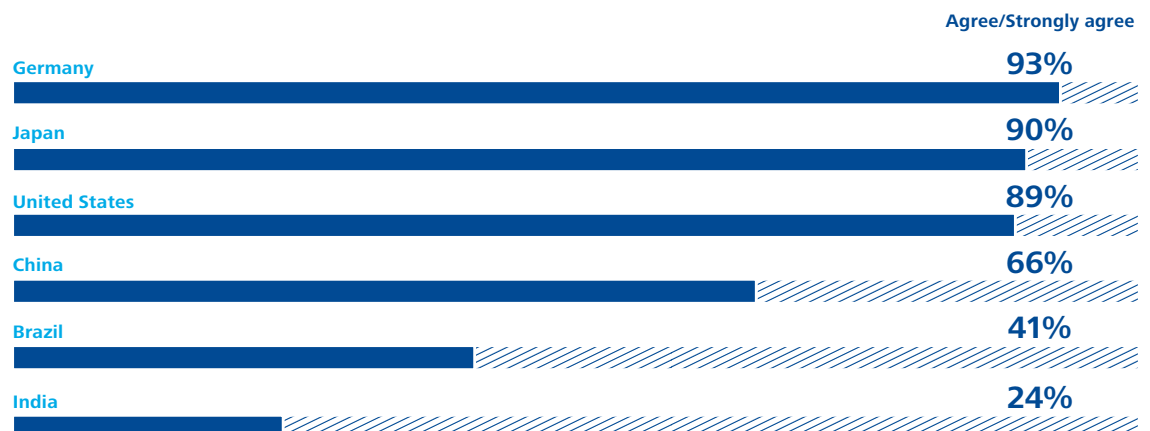
In addition to reducing costs and improving efficiencies to conduct business, supplemental research reveals that ongoing investments in infrastructure drive innovation, and in turn, boost job creation, fostering a growth cycle within a nation.⁷ Specifically, a recent estimate by the U.S. Congressional Budget Office suggests that every dollar of infrastructure spending generates an additional 60 cents in economic activity (for a total increase to GDP of \$1.60).

Figure 13 clearly shows that executives participating in the survey felt developed nations — Germany, Japan and the U.S. — offer a competitive advantage over the three emerging economies — China, Brazil, and India. However, as the infrastructure in developed nations ages, and as emerging nations ramp up investments in not just traditional infrastructure, (e.g., roads, ports, and bridges), but also in advanced-technology based infrastructure (e.g., smart electricity grids, national security technologies, high speed rail, etc.), there is potential for significant disruption in current country rankings in the near future.

When evaluating the factors that create a competitive advantage with respect to infrastructure, executives participating in the 2013 GMCI survey consistently noted the strength of a nation's electricity, Information Technology (IT) and telecom systems as the most important infrastructure driver in measuring a country's manufacturing competitiveness. Strength in technology-based infrastructure bodes well for emerging economies like China, India and Brazil, which are making significant infrastructure investments in areas that can not only support current technologies but also provide much needed capacity for future innovations and mass adoption of new technologies. One specific example is China's government focus on electric vehicles and the investments to provide citizens with the requisite support infrastructure to ensure their success (e.g., smart grids, convenient access to charging stations for customers, etc.)⁸. Over the long-term, these and similar infrastructure investments will not only improve physical infrastructure, but will likely also serve as catalysts for additional investments in Research and Development (R&D) and other areas that positively impact a nation's overall competitiveness.

Figure 13: Global CEO Survey: Physical infrastructure competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local physical infrastructure



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Research reveals that ongoing investments in infrastructure results in long-term economic benefit. Specifically, a recent estimate by the United States Congressional Budget Office suggests that every dollar of infrastructure spending generates an additional 60 cents in economic activity (for a total increase to GDP of \$1.60). This multiplier effect bodes well for India, which recently announced plans to invest USD \$1 trillion on infrastructure through 2017⁹.

7. Energy costs and policies

As energy becomes scarcer and costs continue to rise, executives participating in the 2013 GMCI reported that those nations with the ability to provide access to clean and renewable energy at competitive costs would have an advantage over their competitors. And while respondents also indicated that the level of investment in energy infrastructure, as well as the comprehensiveness and efficiency of energy policy also contributed to a nation's competitiveness, increasing demand and limited supply coupled with market forces that drive prices up resulted in energy costs being the most important driver in this category.

It is interesting that, given the importance of energy costs, executives ranked China as the most competitive nation among the six focus nations, while the U.S. and Brazil were similar in taking the second and third spots, as shown in Figure 14. Supplemental research provided in Figure 15 reveals that China's electricity costs (7.4 cents per KWH) were on par with Canada (7.4 cents per KWH) and higher than the U.S. (6.9 cents per KWH); however, they were significantly lower than other emerging economies, including Brazil (15.4 cents per KWH) and India (10.1 cents per KWH) and also developed nations, such as Japan (17.9 cents per KWH) and Germany (15.7 cents per KWH). Figure 15 also reveals that China and India's environmental performance, measured by Environmental Performance Index (EPI), lagged the three developed nations — Germany, Japan, and the U.S. The desire to rapidly grow in order to improve their lower per capita disposable income (as reflected in Figure 17), and thus, quality of life (as reflected in Figure 1), could be the cause for higher emissions and lower EPI in China and India. In contrast,

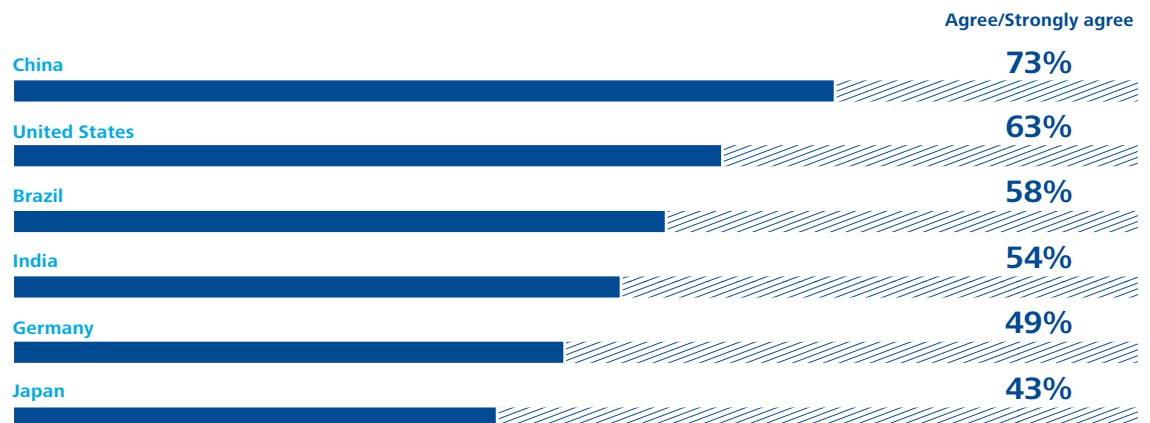
Brazil's higher EPI may be attributed to the massive coverage of the Amazon rainforest that it currently enjoys. Additionally, it may not be surprising that Germany, which traditionally has a high focus on clean energy, had the highest EPI score among the top 10 competitive nations.

Though the U.S. ranked better than China in electricity costs (6.9 cents per KWH) and in environmental performance (See Figure 15), China's rise to the top, overtaking the U.S. in new clean energy investments in 2009¹⁰, and the government's commitment to increase further the share of renewable energy could have tipped executives to rank China as the most competitive nation.

Over the long term, a number of factors — including government policy and the emergence of new and more efficient energy technologies — will influence the level of impact energy costs have on a nation's overall competitiveness, and may also result in some countries leapfrogging their competitors. For example, open markets and falling levels of energy import dependence in the U.S., as well as new discoveries in areas such as shale gas, have the potential to make the country energy secure.^{11 12} Or in Brazil, where large oil reserves and abundant access to oil shale, natural gas, and uranium will soon result in the country not only being self-sufficient, but also a major exporter of energy¹³. As stated earlier, Brazil's prospects for energy independence are likely to partially explain its anticipated rise from the eighth to the third spot in the GMCI in the next five years. On the other hand, Germany appears to be already rapidly progressing in adoption of renewable sources, with clean energy now accounting for roughly a quarter of electricity production compared to about 12 percent for the U.S.¹⁴

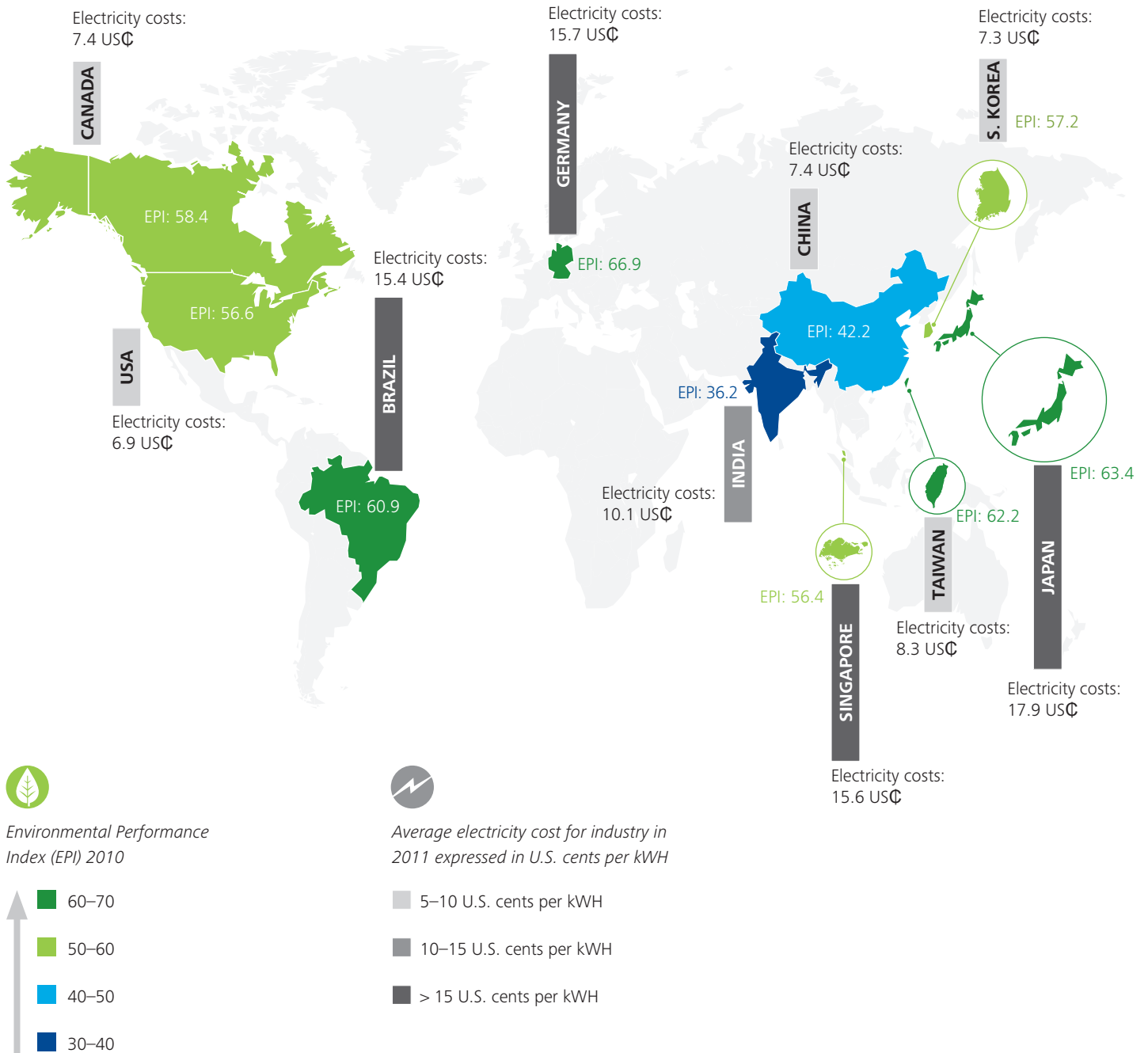
Figure 14: Global CEO Survey: Energy costs competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local cost of energy



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 15: Supplemental data analysis: Energy cost and environmental performance likely to drive future competitiveness
 Electricity costs and Environmental Performance Index (EPI) for 2013 GMCI top 10 most competitive nations



Source: Deloitte Touche Tohmatsu Limited analysis ⁽ⁱⁱⁱ⁾ (iv)
 Note: The higher the value of EPI, the better the environmental performance

8. Local market attractiveness

Size and access to local markets is the most important driver in this category, according to 2013 GMCI Survey results. It is perhaps no surprise that China — with its large population and explosive economic growth — is considered among the most competitive of the six focus nations highlighted in this report, along with the U.S. and Germany, as shown in Figure 16. In contrast, it is interesting that similar percentage of executives rate Japan, India and Brazil as competitive in terms of local market attractiveness. Surprisingly, Figure 17 shows China, India and Brazil experienced substantial 10-year CAGR growth on per capita personal disposable income between 2001 and 2011. Yet, executives surveyed ranked Brazil and India much behind China.

At the same time, relative market attractiveness parity among China, the U.S. and Germany demonstrates that country size is not the only factor. Rather such parity between emerging and developed economies on competitive advantage is driven by a vibrant domestic consumer base with significant spending power. These

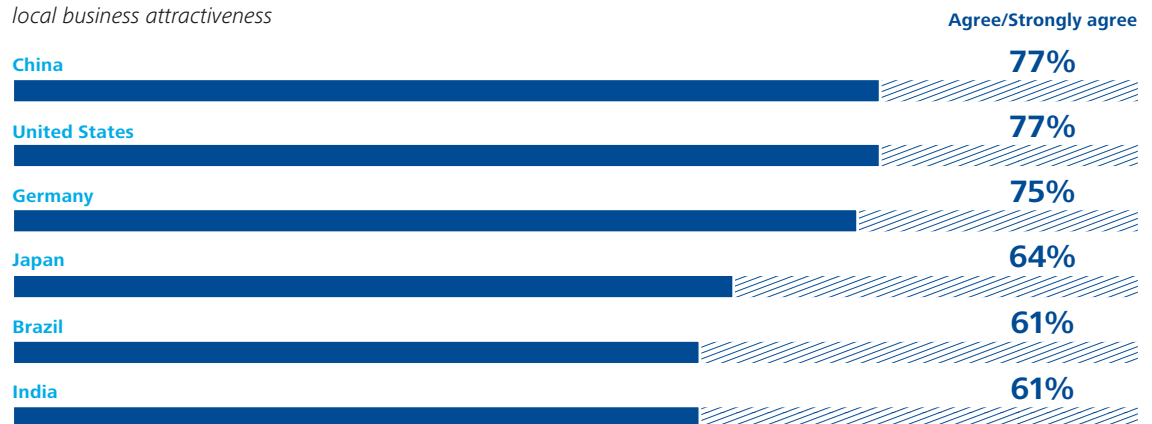
nations, as well as others like Singapore and South Korea, all have established middle class consumers that demand more complex and higher quality goods — and as a result, are likely to make these markets more attractive for large multinationals.

In the long term, trends for emerging economies to have higher disposable incomes bodes well for those lower-cost manufacturing destinations, as the good manufacturing jobs will inherently create economic prosperity for their citizens. These trends then act to create a virtuous manufacturing cycle: increased incomes, higher spending ability and increased market attractiveness.

Demographics, more specifically aging populations, will have a significant impact on market attractiveness over the coming decades, with some nations like Japan, and even China, despite its large population, significantly inhibited by their aging populations and others, including the U.S. with favorable population age demographics gaining the upper hand as time passes.

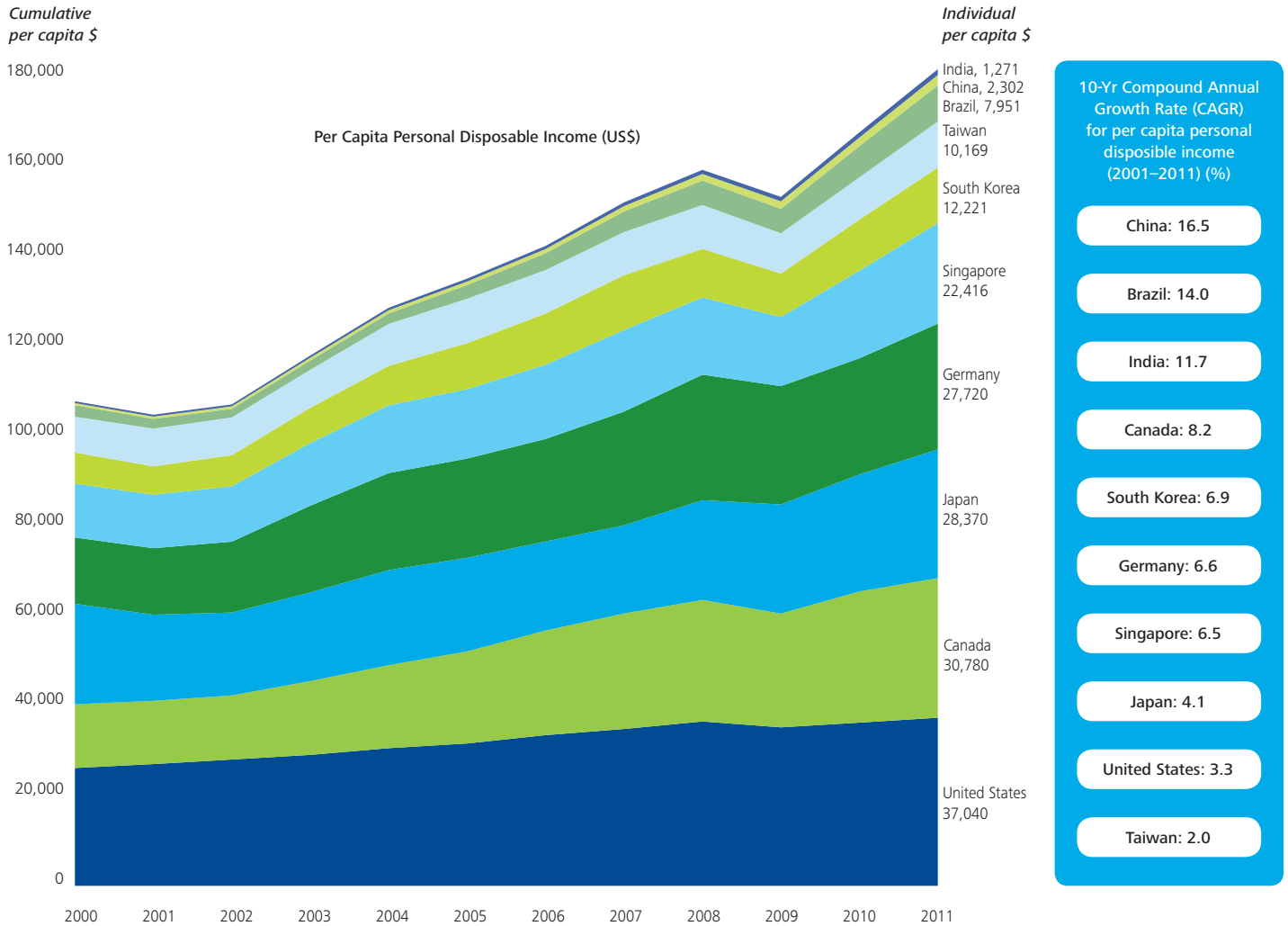
Figure 16: Global CEO Survey: Local market attractiveness competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local business attractiveness



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Figure 17: Supplemental data analysis: Local market attractiveness for 2013 GMCI top 10 most competitive nations
 Historical trends of personal disposable income per capita (US\$)



Source: Deloitte Touche Tohmatsu Limited analysis ^(viii)

Note: Per capita personal disposable income is calculated based on personal disposable income (in \$ million) and population data from the Economist Intelligence Unit (EIU)

Of the emerging nations, executives felt the local markets in India and Brazil were less attractive than first-ranked China (Figure 16), despite all three nations experiencing substantial 10-year CAGR growth for per capita personal disposable income between 2001 and 2011 (Figure 17).

9. Healthcare systems

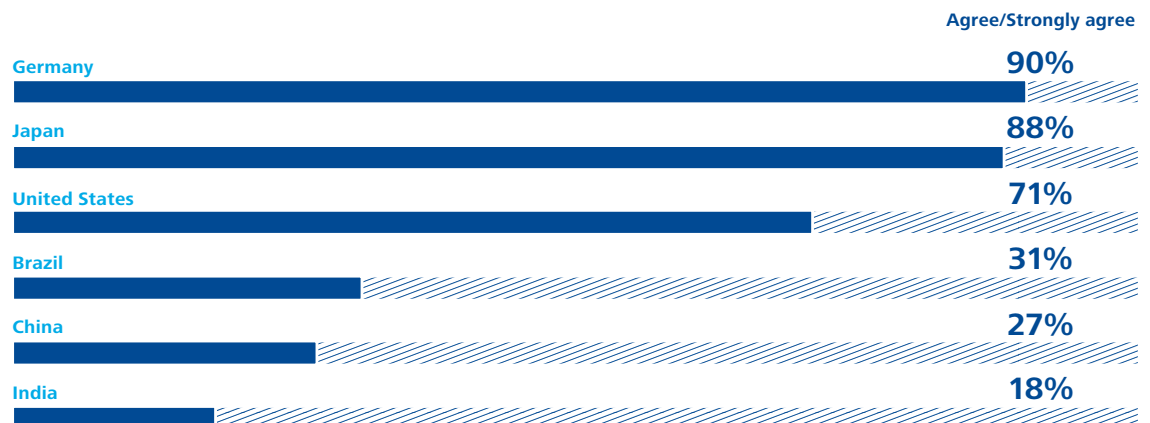
Executives responding to the 2013 GMCI survey stated, on average, that the overall cost of healthcare was the most important driver within this category, followed closely by access to quality healthcare and regulatory policies for public health. It's no surprise then that Germany, which is regarded as having the world's oldest employment-based social health insurance and has recently started to inject money from government revenues into the social health insurance system to reduce wage-based health insurance contributions¹⁵. As shown in Figure 18, Germany is rated as the most competitive nation in this category. Japan is close behind Germany in healthcare system competitiveness. While the U.S. ranks third, there is a wide gap between it and second-ranked Japan (71 percent vs. 88 percent of CEOs, respectively). This gap indicates the importance of healthcare costs in making a country competitive.

With respect to regulatory policies for public health, survey participants consistently cited costs associated with compliance — including government mandates that result in reduced corporate profitability and increased healthcare cost burdens — as a key factor negatively impacting a country's overall competitiveness. That said, all of the emerging economies in the set of six focus nations in this report significantly trailed their developed nation competitors despite having relatively low healthcare costs and favorable regulatory systems that do not place a heavy financial burden on corporations. These findings suggest that executives are only willing to go so far with respect to sacrificing quality healthcare for cost, and that emerging nations have a long road ahead in their efforts to improve the quality of healthcare provided in their countries. As a result, their overall attractiveness as a manufacturing destination will be ultimately influenced by the effectiveness and efficiency of their country's healthcare system.

Germany, which is regarded as having the world's oldest employment-based social health insurance and has recently started to inject money from government revenues into the social health insurance system to reduce wage-based health insurance contributions, is rated as the most competitive nation in this category in the 2013 GMCI (Figure 18).

Figure 18: Global CEO Survey: Healthcare system competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local healthcare system



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

10. Government investment in manufacturing and innovation

A number of factors were noted by 2013 GMCI participants as critical in evaluating a country's overall competitive advantage with respect to government investment in manufacturing and innovation. Primary among them was the number of public-private collaborations, followed by investments in technology, research and development, and engineering.

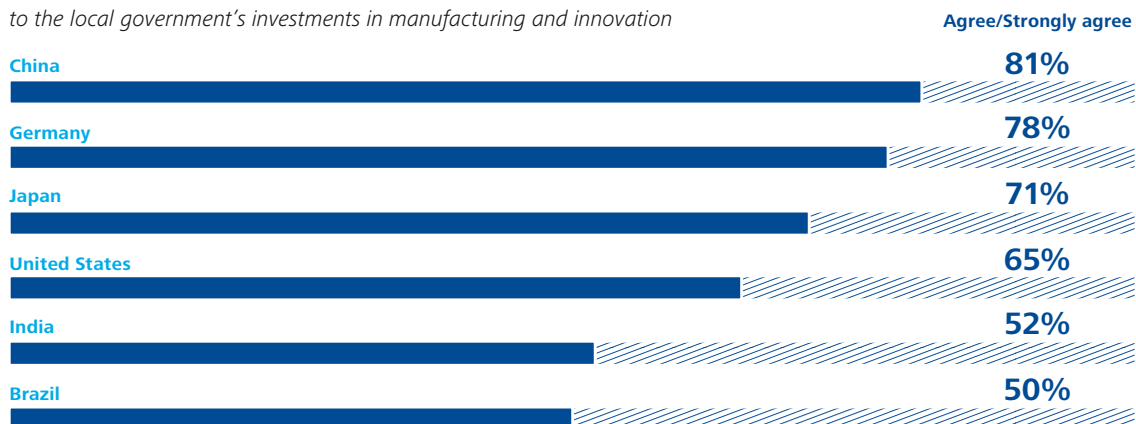
Countries that lead in developing public-private collaborations not only bring together the skills required to spur innovation, but also create an ecosystem that thrives on innovation through collaboration. Figure 19 shows that China and Germany, which place heavy emphasis on creating public-private partnerships, were ranked by 2013 GMCI survey respondents as being most competitive among the six focus nations of the study. Take for example, the Fraunhofer Society¹⁶ in Germany, which is a leading example of public-private collaboration. Fraunhofer is Europe's largest applied-research oriented organization and aims to transform scientific findings and basic research into useful innovations to further economic growth and job creation. Founded in 1949, Fraunhofer receives approximately 40 percent of its funding from the public sector and about 60 percent from contract research earnings; and it operates between application-oriented fundamental research and innovative applied research and early stage commercialization development projects.¹⁷

The Industrial Technology Research Institute in Taiwan (ITRI)¹⁸, which received 50 percent of the funding from government, was developed with a similar mission and model as the Fraunhofer Society. ITRI describes itself as a national research organization, with a mission of conducting technological research, promoting industrial development, creating economic value, and improving social welfare for Taiwan.¹⁹ Today, ITRI is Taiwan's largest applied technology R&D institution.²⁰ ITRI has continued to evolve since its inception in 1973 and is now spearheading original and innovative industrial research, transfer of technology and product developments, thereby proliferating domestic and international industries.²¹

These two examples highlight key reasons why Germany and Taiwan both are recognized among the top 10 most competitive nations as ranked by executives responding to the 2013 GMCI survey. In stark contrast, India and Brazil trail on government investments in manufacturing and innovation. Being ranked among the top 10 competitive nations overall, India and Brazil may ultimately need to become more involved in public-private partnerships in the future.

Figure 19: Global CEO Survey: Government investments in manufacturing and innovation competitiveness perception for six focus countries

Percentage of executives that reported a country was extremely competitive with respect to the local government's investments in manufacturing and innovation



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

The impact of public policy

Chinese executives find their voice while the U.S. and European executives sing a familiar tune

With economic, trade, financial and tax systems ranked as the second most important driver of a nation's competitiveness, and with the public policy threads that wind their way through most of the other drivers of a country's competitiveness, CEOs were asked again to identify the national public policies they perceived as contributing to the competitive advantage — or disadvantage — of their businesses. Figure 20 identifies the policies yielding advantages, disadvantages or rated as neutral by CEOs for three major countries/regions included in the study: China, Europe and the U.S. These ratings are unique in the study design as CEOs were asked to rate the policy portfolio only for the one country they defined as their "home market." Thus, Figure 20 represents U.S. headquartered CEOs rating U.S. policies, European CEOs rating European policies, and Chinese executives rating Chinese policies. The results across these three countries/regions again show some striking differences in the way public policy is being received by business leaders.

In China, policies either encouraging or directly funding investments in science and technology, employee education, infrastructure development along with safety and health regulations and sustainability policies, are helping to provide a competitive advantage according to Chinese executives surveyed. Sustainability policies in China — often met with a raised eyebrow in the west — are seen by Chinese executives as helping them drive innovations in manufacturing and movement toward the next generation of energy efficient products and processes supporting the Green Growth Agenda.²² Improving energy and environmental sustainability, which is a significant challenge for China, is also being used by policymakers as a catalyst for the development of a domestic innovation culture, understood to be essential for China to make the next significant step forward. Perhaps more notable this time around in China are the policies business leaders see inhibiting their success including antitrust laws and regulations, government financial intervention and ownership in companies, which has been at the very core of Chinese capitalism, foreign direct investment (FDI) policies, immigration policies and corporate tax policies. These policies being cited as disadvantages by Chinese executives surveyed may have been unthinkable a decade ago, and yet as we enter 2013, Chinese executives, through their responses, sound more like their western colleagues than ever before in their critique of the shortcomings of the current public policy agenda at home.

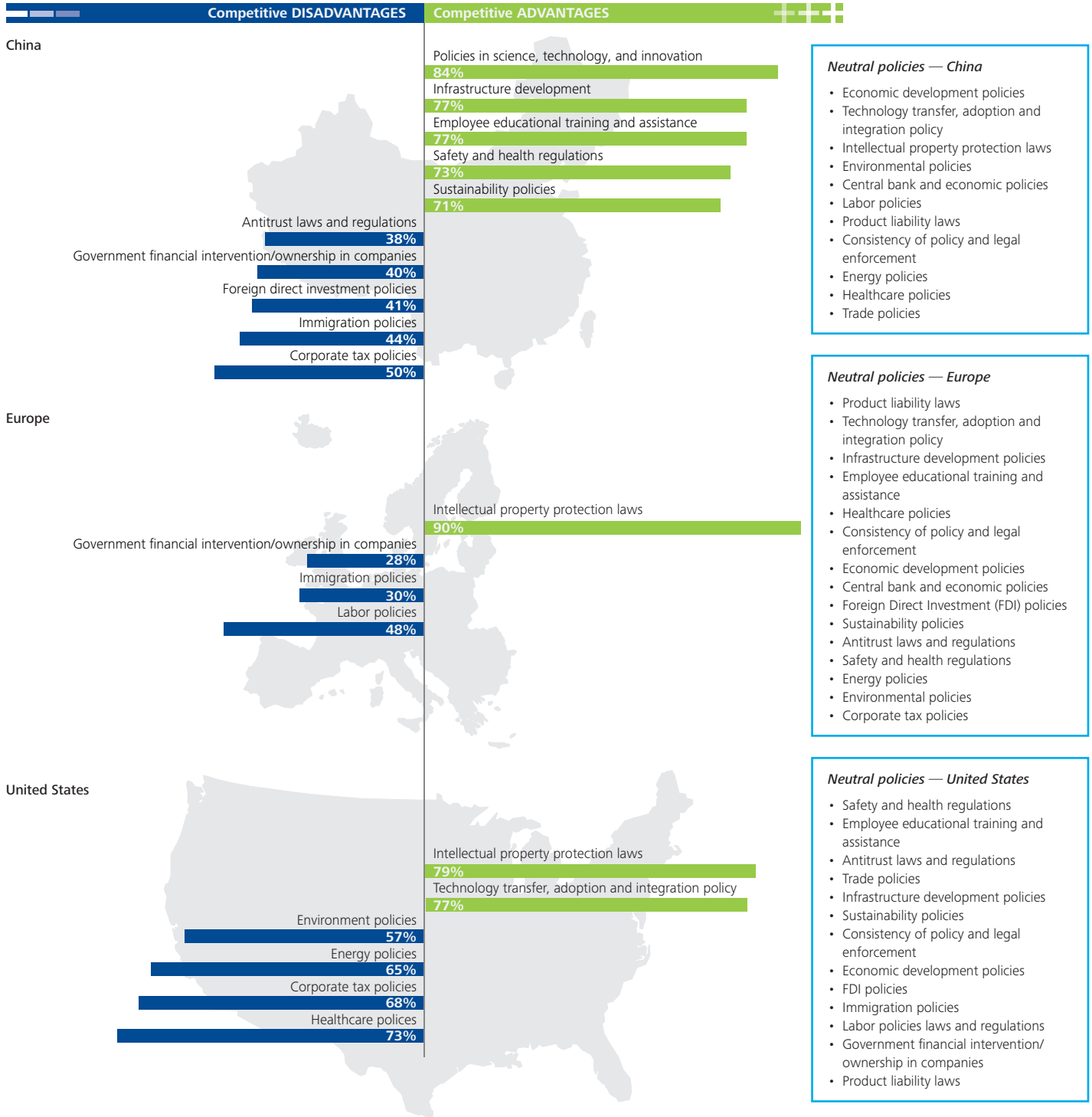
In Europe, business leaders see only the continent's intellectual property protection policies contributing to a competitive advantage for them, with over 90 percent of executives indicating that current European intellectual property policies give them an advantage. At the other end, only three policies have been cited by European business leaders as contributing to a clear disadvantage for them; they include labor policies, immigration policies and policies resulting in government intervention and ownership in companies. Most other policies appear to be having a neutral impact on European manufacturing competitiveness according to the CEO responses received. Considering the challenges facing the Eurozone and the extended time during which policymakers have been working and re-working potential solutions, business leader responses to these questions demonstrate noticeable patience and restraint with the policy environment.

According to the U.S. CEOs surveyed, both intellectual property protection policies and policies supporting technology adoption, integration and transfer help contribute to a competitive advantage for their businesses. On the negative side of the ledger, CEOs surveyed see U.S. environmental policies, energy policies, corporate tax policies, and healthcare policies as contributing to a competitive disadvantage for manufacturers in the U.S. These four policy areas have been consistently cited by the U.S. executives as areas of concern.²³

A striking observation common across all three countries/regions were the large number of policies cited by executives as neither creating a competitive advantage nor disadvantage for their businesses, but rather seen as being neutral or benign in the impact on competitiveness. In this study, the neutral group is viewed as the ante for the game in their country/region. In the U.S., 13 of the 19 policy areas identified were deemed as being *neutral*; in Europe, 15 of the 19 were seen as neutral, while in China 11 of the 19 were deemed neutral. If the goal of policymakers is to have a limited impact on the competitiveness of their manufacturing industry sectors, these responses from CEOs suggest they are succeeding. However, as policymakers continue to become more active and more sophisticated with the policy portfolios that they are pursuing in their quest to drive both economic growth and job creation while protecting the citizens of their nation, an increased number of policies being cited by executives on both the advantage and disadvantage side of the ledger in the future is expected.

Figure 20: Global CEO Survey: The impact of public policy

Executives thoughts on policy advantages and disadvantages (percent indicating competitive advantage or disadvantage due to current government policies and regulations in their home country)



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Conclusion

Why manufacturing matters

The 2013 Global Manufacturing Competitiveness Index report reaffirms that the world is in the midst of a paradigm shift in manufacturing in the 21st century — one that integrates diverse sets of ideas, products and services globally through the lens of highly complex, integrated and self-morphing resource webs. With the direct input provided by CEOs into this report on the ranking of relative country-level manufacturing competitiveness, along with supplemental macro-level secondary data, a more comprehensive picture of the manufacturing landscape is possible. This report highlights what business leaders view as the critical drivers of nations' relative manufacturing competitiveness and the policies that underpin relative country-level advantages and disadvantages. These combined perspectives indicate that the rapidly evolving, global manufacturing ecosystems coincide with not well understood and even seemingly excessive levels of uncertainty and risks that affect nations' economic well-being. Taken together, however, the pace and sheer magnitude of change presents business leaders and policymakers alike with unprecedented challenges, while offering extraordinary opportunities to vastly increase the vitality of a nation's manufacturing engine for economic growth and sustainability.

Interestingly, conventional wisdom in high performance manufacturing has long held that highly talented and skilled people are necessary to effectively and consistently apply cutting edge science and technology, systems thinking, smart services and processes, and supply chain excellence. In turn, manufacturing leaders have been able to tackle the complexity and ride the economic storms. They have created virtuous cycles connecting human capital synergistically with new product and process innovation capital, green capital (e.g., energy-efficient, sustainable and low-carbon manufacturing and supply chains), structural capital and financial capital.

So too, as nations vie to compete in this new era of manufacturing, they are also developing new *strategic bills of country-level manufacturing resources* — ones that are driven by highly productive human capital and know-how — and increasingly, not just low-cost, physical labor. Overall, the 2013 Global Manufacturing Competitiveness Index indicates that leading nations are making the paradigm shift towards prioritizing the development of talented and skilled citizens, who are the source of their competitive advantage, and benefits from their manufacturing infrastructures and ecosystems. But before concluding on country-level manufacturing competitiveness as ranked by executives in this study, it is important to understand why manufacturing matters to the economy of a nation and the prosperity of its citizens. On the surface, the answer is simple: manufacturing is a driving force of job creation for the middle class, no matter the turmoil in the world. And nations with significant advanced manufacturing capabilities enjoy an enticing multiplier on overall economic activity.

But there is a more complex answer that has become ever more apparent over the past decade. High performing manufacturing also creates a virtuous cycle for a nation. For any nation, advancing their manufacturing capabilities matters because it typically brings together a cadre of human talent with its investments in research and development, resulting in innovation — the advancements of product and process technologies, and productivity that not only allows for the transition of those innovations into commercialized goods and services, but also creates demand for similar high level skills in other sectors that support manufacturing, such as banks, third party logistics, education, call centers, healthcare, etc. Oftentimes, manufacturing plants are the hub — and lifeblood — of small, rural communities. Moreover, nations that excel in manufacturing prowess are in a more favorable position to export high-demand goods and attract foreign direct investment. Over time, as a nation's manufacturing capabilities become more mature and the overall skill levels of workers become more advanced all stakeholders — countries, companies and citizens — begin to enjoy the economic and quality of life benefits that result from a vibrant manufacturing sector. In contrast, nations — and companies — are finding that 21st century manufacturing, as described here, is indeed a 'core competence;' and therefore, by fully outsourcing production, leverage and advantage are eroded, which in turn, can jeopardize their long-run, economic well-being. These factors, in part, explain what is often not obvious: namely, how new era manufacturing supports country-level resiliency in turbulent times.

In summary, this report offers a critical and timely jumping-off point for both developed and emerging economies as they make strategic investments and enact public policies designed to spur post-industrial era manufacturing growth and the economic benefits that result. The final chapter is far from written. The landscape of competitiveness will continue to change and there will be an ebb and flow among the drivers that business leaders see as most important to gaining a competitive advantage. However, history would suggest that the availability of high quality human talent will always remain in the top set of competitiveness drivers. Importantly, this report also provides a roadmap to guide policy in a proactive manner. A productive and sustainable manufacturing ecosystem requires national policies provide the enabling country conditions and resources that are aligned with resource drivers and the policy hurdles that exist in that nation.

Over time, new nations will likely emerge as leaders in the Global Manufacturing Competitiveness Index while others will continue to fall — either as a result of being overtaken by other countries or failing to make the appropriate investments or lacking the political will to ensure continued leadership. The stakes are high. One thing is certain for the new normal — the competition for manufacturing supremacy will continue to intensify — and country strength in manufacturing most assuredly matters!

Appendices

Appendix A: Supplemental country analysis for top 10 GMCI nations

1. China

Despite a recent slowdown in its economic growth, China has become the world's largest manufacturing nation — helping maintain its ranking from 2010 as the most competitive manufacturing nation in the world. Executives participating in the study consistently noted China's labor and materials cost advantage, strong government investment in manufacturing and innovation, and established supplier network as key strengths.

Favorable policy actions under the country's 12th Five-Year Plan (FYP)²⁴ likely also helped maintain China's top ranking for future competitiveness. Chinese executives responding to the survey felt their government was establishing policies in infrastructure, science and technology innovation,

workforce development, safety, health and sustainability that would further enable future competitiveness advantages versus other nations. These favorable policy actions, coupled with investments in key strategic industries such as biotechnology, new energy, high-end equipment manufacturing, clean-energy vehicles and others highlighted in the table below position China well for continued strength in the manufacturing industry — provided the country can maintain low labor costs, which have been on the rise with the emergence of a strong middle class. As a result, China is losing ground to nearby lower cost countries like Vietnam, Indonesia and India.²⁵

Supplemental data analysis: Key statistics	China	Peer average
Manufacturing GDP CAGR (2005–10)	11.9%	2.9%
Manufacturing GDP percentage of total GDP (2010)	32.4%	18.3%
Labor costs (US\$/hour) (2011)	2.8	21.9
Manufacturing exports percentage of total exports (2011)	93.2%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	3.1	-0.8
Highest corporate tax rate (2012)	25.0%	26.2%
Researchers per million population (INSEAD 2012)	1,071	2,980.0
Per capita personal disposable income (US\$) (2011)	2,302	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	16.5%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ⁽⁶⁾

Supplemental data analysis: China — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • China is the largest exporter and the second largest importer in the world. • China became the largest manufacturing country in the world, overtaking the U.S. in 2010. • China's exports are primarily in the toys, apparel and electrical and electronics industries. China is the world's largest manufacturer of toy products, with a 70 percent share.
Advantages to manufacturers	<ul style="list-style-type: none"> • Favorable policy actions <ul style="list-style-type: none"> – Under the 12th Five-Year Plan (FYP), the government is likely to invest U.S. \$450 billion each in environmental protection and renewable energy, and U.S.\$600 billion in smart grids. – Over 2011–2015, the government will likely continue to develop talent recruitment through education reforms, open up the country's service sector, and strengthen the intellectual property regime. • Growing middle class: China's middle class is rapidly growing, and is expected to double in size in the next decade. The influence of this large consumer segment will only increase with its growing disposable income levels, creating a strong domestic demand for products. • Increasing R&D: <ul style="list-style-type: none"> – China has been increasing its R&D spend, growing from 1.3 percent of GDP in 2001-2005 to 1.75 percent in 2006-2010. The target for 2011-2015 stands at 2.2 percent. – Patent applications from China have also been increasing at 30 percent CAGR since 2000. • Advanced electronics manufacturing: Low costs and government support have made China the hub for advanced electronics and resulted in the development of a strong electronics supplier base, attracting manufacturers from across the world. • Robust raw material supply base: Ease of raw material availability and coal-based production have lowered input costs. • Physical infrastructure: According to a Deloitte survey, physical infrastructure in China is more competitive than other Asian countries such as India and Vietnam.
Challenges	<ul style="list-style-type: none"> • Innovation: Despite the presence of intellectual property protection laws, enforcement of the laws remains a concern. According to a Deloitte survey, China ranks behind other Asian economies such as Japan, South Korea and India, but ahead of Thailand, Vietnam and Indonesia in intellectual property protection. • Tax burden: Overall tax burden* has been identified as the most critical cost issue for manufacturers in China. Among major industrial countries, China's overall tax burden is more than all other countries with the exception of France. • Lower productivity: China is focused on improving wages in the country. However, according to a Deloitte survey, China needs to balance wage increases with productivity gains. • Regulatory inefficiency: According to World Bank study, China is considerably behind other large economies in terms of policy formulation and implementation, with a 2011 percentile ranking of 45 percentile compared to Japan's 78 percentile and U.S.'s 92 percentile.
Areas to watch out	<ul style="list-style-type: none"> • Investment in strategic industries <ul style="list-style-type: none"> – Under the 12th FYP, the government is focusing on improving the innovation capacity of the country. – Government plans to implement preferential tax, fiscal, and procurement policies for seven identified Strategic Emerging Industries (SEI) — biotechnology, new energy, high-end equipment manufacturing, energy conservation and environmental protection, clean-energy vehicles, new materials and next-generation information technology. • Slowing domestic growth: China's GDP growth has slowed over the past three years. In 2012, China's GDP grew 7.6 percent year over year, its slowest pace in the last three years. Slow growth in the Eurozone and sluggish recovery in the U.S. are limiting the contribution of net exports to the country's GDP growth. • Greater emphasis on energy and environment: <ul style="list-style-type: none"> – Government is promoting sustainable growth by promoting SEIs such as new energy, energy conservation and environmental protection. – 12th FYP emphasizes efforts to improve and encourage sustainable growth. This is through tax and other fiscal incentives for environment-friendly industries/practices and stringent pollution reduction targets. • Improving education: The 2012 budget entails a 2.2 trillion Yuan (i.e. 4 percent of GDP, about \$346.5 billion) allocation for education. This investment will be an important step for improving the quality and availability of labor. • Rising labor costs: <ul style="list-style-type: none"> – Labor costs in China have been growing over the last 10 years. Factory wages had increased 20 percent year over year in 2010. – The central government is encouraging the increase of minimum wages as a matter of policy, by about 13 percent annually through 2015.

Source: Deloitte Touche Tohmatsu Limited analysis^(a)

*Note: Overall tax burden includes corporate tax, individual tax, social security contribution, and VAT

2. Germany

Global executives participating in the 2013 GMCI survey felt Germany had made significant manufacturing competitiveness gains since the 2010 GMCI was published, which is perhaps not surprising since the country ranked highest in talent-driven innovation — the driver executives ranked as most important for competitiveness. The country jumped six positions from eighth to second in the current competitiveness rankings. Primarily driven by a renewed focus on the manufacturing sector over the last decade, manufacturing exports grew nearly three times between 2000 and 2011. Today, Germany is the world’s second-largest manufacturing exporter behind China.²⁶

Germany has taken a different path than China in improving manufacturing competitiveness. The country has focused its efforts on the development of new technologies and innovative capabilities, which requires a highly skilled workforce that commands high labor rates. Diversity within the manufacturing sector is also helping elevate Germany’s GMCI ranking. Building on its historical strength in automotive manufacturing and “made in Germany” premium brand, the country continues to grow and dominate the field of “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.²⁷ The technological advancements and innovations stemming from investments in mechatronics will likely result in significant demand for Germany’s specialized manufacturing machines and systems from developing countries seeking more advanced manufacturing capabilities.

Germany also received high marks for other competitiveness drivers, including physical infrastructure, healthcare, legal and regulatory systems, and its established supplier network.

Executives surveyed, however, expressed concern about Germany’s ability to maintain its competitive advantage. Survey results reveal that participants fear Germany will drop from the world’s second most competitive nation in 2013 to fourth by 2018. Executives felt Germany’s labor and material costs, as well as energy costs and policies, were significant disadvantages negatively impacting the country’s long-term competitiveness. Other factors noted as concerning include lack of venture capital for start-ups and ongoing instability across the Eurozone. These factors, exacerbated by rapid advancements in the manufacturing capabilities of countries like China, India and Brazil, may slowly erode Germany’s competitiveness.

Supplemental data analysis: Key statistics	Germany	Peer average
Manufacturing GDP CAGR (2005–10)	-0.5%	2.9%
Manufacturing GDP percentage of total GDP (2010)	20.7%	18.3%
Labor costs (US\$/hour) (2011)	46.4	21.9
Manufacturing exports percentage of total exports (2011)	82.7%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	-1.8	-0.8
Highest corporate tax rate (2012)	33.0%	26.2%
Researchers per million population (INSEAD 2012)	5,305	2,980.0
Per capita personal disposable income (US\$) (2011)	27,720	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	6.6%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(a)

Supplemental data analysis: Germany — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • With only about 1.2 percent of the world population, Germany is the world's fourth largest producer and the largest exporter of automobiles (cars and commercial vehicles). • Germany is the second largest manufacturing exporter after China, with manufacturing exports growing 2.7 times between 2000 and 2011. • Germany's small and medium sized enterprises (SMEs), called the Mittlestand, include three million companies and employ around 70 percent of the country's workforce.
Advantages to manufacturers	<ul style="list-style-type: none"> • Dominance in manufacturing "mechatronics": <ul style="list-style-type: none"> – Machine and plant manufacturing is one of the five biggest industries in Germany followed by electronics manufacturing. – German Mittlestand produces sophisticated machine tools that the emerging markets need as they develop their manufacturing capabilities. • Automotive capabilities: <ul style="list-style-type: none"> – Germany's marquee auto brands have created a name and strong customer loyalty for themselves across the globe. – High-end German cars are in demand from affluent consumers all across the new emerging markets. • Innovation capability: <ul style="list-style-type: none"> – Germany is a leader in key new technologies, including renewable energy such as solar and wind power. – Abundance of R&D institutes, continued government support to science and technology, and close links between industry and universities are some of the key factors for growth in innovation capacity. • Growth of SMEs (Mittlestand) boosted manufacturing: <ul style="list-style-type: none"> – Growth of Mittlestand with stable family ownership and the ability to produce sophisticated goods that cannot be easily replicated boosted manufacturing growth in Germany. – Government support in terms of tax breaks and depreciation allowances boosted SME growth. • Skilled labor: <ul style="list-style-type: none"> – The "dual system" of vocational training, which combines classroom instruction with work experience is a model several countries are trying to emulate. – Nearly half of German high-school students take up dual training in one of the 344 trades (from tanner to dental technician) in the country. • High quality infrastructure: <ul style="list-style-type: none"> – Infrastructure is one of Germany's strengths. Swiss institute, IMD, ranks Germany seventh on the quality of infrastructure among 59 countries, compared to other nations such as Japan (seventeenth), China (twenty-ninth), and Brazil (fourty-fifth).
Challenges	<ul style="list-style-type: none"> • Lack of venture capital: <ul style="list-style-type: none"> – Most of the SMEs are dependent on bank financing while the venture capital market in Germany remains weak. In 2011, venture capital investment in Germany was 0.03 percent of GDP, compared to 0.2 percent in the U.S. – In times of crisis, such as the Euro-zone crisis, it is essential for companies to not just rely on banks but look for other partners as well. • High labor costs: At \$43.8/hour in 2010, manufacturing wages in Germany are among the highest globally. • Vulnerability of German banks to the Euro-zone crisis: <ul style="list-style-type: none"> – Some of the German banks are highly leveraged, have low capital quality and profitability, and are significantly exposed to the euro area economies. – This vulnerability could impact the availability of finance within the economy.
Areas to watch out	<ul style="list-style-type: none"> • Domestic demand-led recovery: According to IMF, Germany is likely to post robust economic growth in the second-half of 2012 as household incomes are rising, corporate balance sheets are healthy, the unemployment rate is low at 5.3 percent (in 2Q12), and inflation is expected to be low. • Encouragement for alternative energy sector: <ul style="list-style-type: none"> – Germany's laws encouraged investment in green-energy and in 2010, the country's green-energy sector received \$41 billion in new investment, compared to \$34 billion in the U.S. – Germany's green-energy companies make niche products such as components for solar panels and machine tools for building parts for solar devices. Such products are always in demand, as countries across the world strive to increase the production of alternative energy. • Intensification of the Euro-zone crisis <ul style="list-style-type: none"> – An escalation of financial stress and further deterioration of confidence in Europe could lead to a sharp downturn in Germany. Decline in financing by banks as well as decline in consumer and business confidence could slowdown domestic growth. On the other hand, exports will also suffer due to weak global demand. – Germany's efforts to stabilize the Euro-zone are unpopular within the country and the effect of these policy decisions might be of significance for the political scenario in Germany.

3. United States

Like Germany, executives participating in the 2013 GMCI survey felt that the U.S. had also improved its competitiveness capabilities since 2010, moving up one spot from fourth to third in current manufacturing competitiveness, behind China and Germany.

Executives surveyed noted several advantages that improved U.S. appeal as a manufacturing destination, including a core competency for talent-driven innovation. The country also received high scores with respect to its physical infrastructure, established supplier network, and strong legal and regulatory systems. Other noted policy advantages that further strengthened U.S. competitiveness included intellectual property protection laws and technology transfer, adoption, and integration.

Despite an increased focus in the U.S. over the last five years by both public and private sector leaders with respect to America's manufacturing competitiveness, executives participating in the 2013 GMCI survey almost consistently cited an overall sense of uncertainty that plagues much of the U.S. regulatory system as a significant disadvantage.

These sentiments are consistent with those outlined in *Ignite 1.0*.

Released in 2011, *Ignite 1.0* is based on interviews that the Council and Deloitte conducted with over three dozen U.S. CEOs and senior executives. Like those participating in the 2013 GMCI survey, executives participating in the *Ignite 1.0* interviews also consistently and nearly unanimously expressed concern over the consequences of uncertainty. Clarity and permanency of R&D tax credits, competitive tax rates, ratification of free trade agreements, tort reform, healthcare policy, financial reforms, labor policy, innovation policy, energy policy and carbon regulation policy were all examples cited by executives of policy areas where competitive policies developed and enacted with clarity and maintained with stability would likely provide tremendous opportunities for American manufacturers.²⁸

As a result of policy and regulatory disadvantages, as well as high labor, corporate tax, and unemployment rates, along with sluggish GDP growth, executives surveyed expect the U.S. to fall behind due to the rise of India and Brazil, and drop to the world's fifth most competitive manufacturing nation in five years.

Supplemental data analysis: Key statistics	United States	Peer average
Manufacturing GDP CAGR (2005–10)	0.5%	2.9%
Manufacturing GDP percentage of total GDP (2010)	12.9%	18.3%
Labor costs (US\$/hour) (2011)	35.4	21.9
Manufacturing exports percentage of total exports (2011)	64.3%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	-3.1	-0.8
Highest corporate tax rate (2012)	39.1%	26.2%
Researchers per million population (INSEAD 2012)	4,663	2,980.0
Per capita personal disposable income (US\$) (2011)	37,041	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	3.3%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(a)

Supplemental data analysis: United States — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • U.S. remains the most heavily invested-into country in the world with FDI stock inflow being \$3.5 trillion in 2011. • Second largest manufacturer of automobiles (cars and commercial vehicles) in 2011. • U.S. has the sixth largest proven natural gas reserves. Low cost shale gas availability gives U.S. manufacturers a competitive edge in the global markets. • U.S. share of the world's total GDP (PPP) is likely to fall to 18.4 percent by 2015 due to China's rapid economic growth. • Manufacturing employment in the U.S. declined from 17.6 million jobs in 1998 to just 11.6 million jobs at the end of 2010. • Largest producer of ethanol biofuel. Along with Brazil, it accounted for 87 percent of ethanol production in 2011.
Advantages to manufacturers	<ul style="list-style-type: none"> • Technological prowess and size: <ul style="list-style-type: none"> – U.S. leads many nations, both developed and developing, in innovation. For instance, in 2010, the U.S. stood among the top countries in terms of patents granted. – U.S. is the second largest manufacturing economy (at current prices) and produced 18.2 percent of globally manufactured products in 2010. • Research support for national laboratories and universities: <ul style="list-style-type: none"> – U.S. has a robust system of research funding for national laboratories and universities. – About 20 percent of research in universities is funded through the National Science Foundation, which comes to about \$7 billion in funding for 2012. – The total funding for national laboratories is expected to be over \$10 billion in 2013. • High productivity: U.S. has the highest labor productivity in the world, at \$68,156 per employee for 2011. • Policy actions: <ul style="list-style-type: none"> – In June 2011, President Obama launched Advanced Manufacturing Partnership with an investment of more than \$500 million that invests in emerging technologies such as nanotechnology to create jobs and enhance competitiveness. – In 2012, the President announced a new \$1 billion proposal for creating a network of “manufacturing innovation institutes” and proposed \$2.2 billion in advanced manufacturing R&D for FY13.
Challenges	<ul style="list-style-type: none"> • High-cost labor: Labor costs in the U.S. in 2011 were significantly higher than in emerging countries such as China and India; in addition, availability of talent and rising consumption in these markets has been a threat to the U.S. manufacturing. • High corporate tax rates: One of the highest corporate tax rates in the world (at 39.1 percent in 2012) poses a serious burden on manufacturers. • Slowing growth: Low GDP growth rates and high unemployment rate of over 8 percent for the last three years would dampen consumer confidence. This would encourage manufacturers to move to high-growth regions such as China and India in search of better opportunities. In addition, manufacturers are also increasing their R&D efforts in Asia, to bring out products to suit their localized needs.
Areas to watch out	<ul style="list-style-type: none"> • Policy uncertainty <ul style="list-style-type: none"> – Uncertainty about continuation of tax cuts and a fall in budget spending starting in January 2013 is making some manufacturers defer or cancel their investment plans. – Manufacturers support the R&D tax credit being made permanent, rather than being extended it each year, to boost competitiveness. – Policy uncertainty in the U.S. is attributed to frequent lack of bipartisanship and the absence of long term national plans. • Shale gas availability <ul style="list-style-type: none"> – Abundant availability of shale gas could make the U.S. an attractive destination for energy-intensive manufacturing such as chemicals. – Some of the manufacturers producing petrochemicals, steel, fertilizers and other products are already returning to the U.S. after relocating overseas. – High rates of shale gas recovery could result in a million new manufacturing jobs by 2025. • Reshoring: Due to rising labor costs in China, increasing transportation costs due to higher oil prices, and availability of low-cost shale gas in the U.S., U.S. manufacturing companies are building high-tech factories in the U.S.

Source: Deloitte Touche Tohmatsu Limited analysis ⁽⁶⁰⁾

4. India

It appears India's appeal as a global manufacturing destination is not yet solidified. The country dropped two spots in current 2013 GMCI rankings, falling from second to fourth since 2010. However, the decline may be short-lived as executives felt the country would regain its former position and once again become the world's second most competitive manufacturing nation in the next five years, behind China.

The country's strong talent pool in the areas of science, technology and research, in conjunction with some of the lowest labor rates in the world, were cited by survey participants as significant competitive advantages that would positively impact India's ability to conduct cost-efficient research and development.

While the political climate in India is viewed as stable, executives cite concerns with the country's policy, regulatory, and healthcare systems, and under-developed physical infrastructure as some of India's least competitive areas.

Until recently, India's economy witnessed extraordinary expansion, achieving a five-year CAGR rate of 7.8 percent in 2011. In addition, in the last five years its manufacturing exports grew at a CAGR of 17.1 percent. In September 2012, however, The Prime Minister's Economic Advisory Council (PMEAC) lowered its growth estimate to 6.7 percent for India's current fiscal year. And despite the revision, some economists believe the PMEAC's projection seems optimistic, and GDP growth could end up even lower.²⁹

High interest rates appear to have also hurt Indian companies, which have higher interest payments. In addition, higher crude prices, rupee depreciation and rising power costs have impacted corporate performance.³⁰ Yet the outlook for the coming quarters is much better, and the Centre for Monitoring Indian Economy (CMIE) expects the profitability of companies to improve.³¹ Recognizing the importance of kick-starting the manufacturing sector and boosting domestic investment, India's finance minister has also recently urged public sector banks to cut lending rates.³²

India's government is also enacting policy changes designed to improve the country's competitiveness in areas executives noted as disadvantages. In 2011, the country approved a National Manufacturing Policy, which will help lower taxes, provide faster permits and ease labor laws. Through this policy, India hopes to boost the share of manufacturing from 16 percent of GDP in 2009 to 25 percent by 2022, while also adding 100 million jobs in the manufacturing sector by 2022.

India also recently announced a U.S\$1 trillion (Rs. 50 trillion) investment in infrastructure over the next five years, which will result in increased efficiency and low operating costs for manufacturers operating in the country.

Over the long term, India's workforce skills and cost advantages, improved policies and regulations, and significant investment will likely boost its competitive advantage and help maintain the country's position as a strong contender on the global manufacturing front.

Supplemental data analysis: Key statistics	India	Peer average
Manufacturing GDP CAGR (2005–10)	8.5%	2.9%
Manufacturing GDP percentage of total GDP (2010)	14.2%	18.3%
Labor costs (US\$/hour) (2011)	0.9	21.9
Manufacturing exports percentage of total exports (2011)	50.3%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	1.6	-0.8
Highest corporate tax rate (2012)	32.4%	26.2%
Researchers per million population (INSEAD 2012)	136	2,980.0
Per capita personal disposable income (US\$) (2011)	1,271	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	11.7%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(a)

Supplemental data analysis: India — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> India posted a real GDP growth of 6.9 percent in 2011. The economy grew at a 5-year CAGR of 7.8 percent till 2011, which is among the highest among major emerging nations. India's manufacturing exports grew at a CAGR of 17.1 percent between 2006 and 2011. India's largest manufacturing exports are textile goods, engineering goods and chemicals. India is the sixth largest manufacturer of automobiles (cars and commercial vehicles) in the world in 2011.
Advantages to manufacturers	<ul style="list-style-type: none"> Skilled, low-cost labor force: <ul style="list-style-type: none"> Rich talent pool of scientists and researchers offering cost-efficient research and development. Abundant availability of engineers and English-speaking workforce aid in the growth of services as well as manufacturing industry. Labor costs (\$0.9/hour in 2011) are among the lowest in the world. Plans huge investments in infrastructure: India has set itself a target of \$1 trillion investment in infrastructure over the next five years (2012-17). Huge investments in infrastructure provides a big market for manufacturers such as steel and cement industries, improves the logistics, and lowers the manufacturing costs and makes manufacturers more competitive. High economic growth provides a vast domestic market for manufacturers. To tap this opportunity, global manufacturers are setting up plants in India, bringing the latest technology, and competing with the local manufacturers. Competition between the foreign multinationals and local companies pushes companies to improve productivity and also encourages them to invest more in innovation. Ambitious national manufacturing policy: <ul style="list-style-type: none"> Approved in 2011, the policy will aid in creating industrial enclaves that will offer lower taxes, faster permits and easier labor laws and is expected to boost the share of manufacturing from 16 percent of GDP in 2009 to 25 percent by 2022, adding 100 million jobs in manufacturing by 2022. However, third party estimate that manufacturing as a percent of GDP may grow only up to 17 percent and add 69 million jobs.
Challenges	<ul style="list-style-type: none"> Poor infrastructure and government regulations: <ul style="list-style-type: none"> Huge investments are needed to improve the transport network and power supply. This is because logistics cost in India is high at 13-14 percent of GDP compared to 7-8 percent in developed countries. Outdated land acquisition and labor laws along with cumbersome procedures for shipping manufactured goods overseas, pose a challenge to manufacturers. Increased inflation, higher interest rates and lower growth: <ul style="list-style-type: none"> India's Central Bank has maintained a tough stance against rising prices by increasing its key policy rate, the repo rate, by 375 basis points between March 2010 and October 2011, and the rate currently stands at 8 percent. High interest rates raise, the cost of funds for manufacturers, hurting investment prospects. GDP grew at 5.3 percent in the first quarter of 2012, the slowest quarterly rate since early 2003.
Areas to watch out	<ul style="list-style-type: none"> Labor reforms: <ul style="list-style-type: none"> Successive governments in India have been trying to reform archaic labor laws that make firing permanent labor a daunting task. To avoid this problem, manufacturers, particularly auto firms, have been increasingly hiring contract labor who are paid at half the rate of permanent labor. Wage disparity and absence of other benefits related to health and pensions is causing discontent among contract labor, leading to demand for pay parity with permanent labor. Government policies: The prevalence of coalition politics in India means that the consensus needed for policy reforms is difficult to reach and has led to a slow pace of policy reforms, which can hurt investments in the country. However, things appear to be moving in a positive direction with the government announcing a slew of policy measures including allowing FDI in multi-brand retail and aviation sectors.

Source: Deloitte Touche Tohmatsu Limited analysis ^(viii)

5. South Korea

Executives participating in the 2013 GMCI survey cite South Korea as the fifth most competitive nation in the world in terms of current manufacturing competitiveness. This represents a decline of two positions since the 2010 GMCI. Perhaps more troubling, however, are 2013 GMCI survey results which show that South Korea will continue to become less competitive over the next five years - falling to sixth by 2018.

Despite long-term concerns, South Korea has a strong manufacturing foundation on which to build. Executives in particular noted South Korea's competitive cost structure and product quality as key competitive advantages. Favorable industrial policy and a highly educated and skilled

workforce were also cited. Driven by the country's leadership in the manufacturing of advanced technologies, companies operating in South Korea have easy access to local talent with experience in high-technology industries.

However, executives surveyed viewed South Korea's complex policy and regulatory environment as one of the country's most significant competitive disadvantages. The resulting difficulties of conducting business in South Korea, coupled with recent economic declines, contributed to the forecasted five-year dip in the country's GMCI ranking.

Supplemental data analysis: Key statistics	South Korea	Peer average
Manufacturing GDP CAGR (2005–10)	6.0%	2.9%
Manufacturing GDP percentage of total GDP (2010)	30.5%	18.3%
Labor costs (US\$/hour) (2011)	17.7	21.9
Manufacturing exports percentage of total exports (2011)	85.3%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	-4.5	-0.8
Highest corporate tax rate (2012)	24.2%	26.2%
Researchers per million population (INSEAD 2012)	6,286	2,980.0
Per capita personal disposable income (US\$) (2011)	12,221	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	6.9%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ⁽⁶⁾

Supplemental data analysis: South Korea — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • South Korea leads globally in the manufacturing of LCD (Liquid Crystal Displays), memory chips and smart phones. • It is the world's largest shipbuilder and 5th largest globally in automobile manufacturing. • Its most important exports are finished products such as electronics, semiconductors, LCD panels, mobile phones, computers accessories, television sets and motor vehicles.
Advantages to manufacturers	<ul style="list-style-type: none"> • Competitive costs and better quality: <ul style="list-style-type: none"> – South Korea's average manufacturing wages/hour is less than half of U.S. wages at \$16.6/hour, compared to \$34.7 in the U.S. – In addition, labor output/hour in South Korea improved at a CAGR of 5.8 percent between 2005 and 2010 compared U.S.'s 3.7 percent and Germany's 0.6 percent. Hence, higher productivity leading to reduction in labor costs. – Japanese auto makers are increasing their South Korean imports since they are cheaper and are better in quality compared to China. • Growth in free trade agreements: After the establishment of free trade agreements Roadmap in 2003, South Korea has actively pursued free trade agreements with more than 50 countries. South Korea currently has eight free trade agreements in force, two concluded free trade agreements, eight under negotiation and six under consideration with economies across the world. • Strong Innovation: South Korea is counted among the innovation leaders of the world and is the top ranked country for innovation in the Information and Communication Technology (ICT) sector. • Favorable industrial policy: <ul style="list-style-type: none"> – Identified manufacturing and export as key growth areas and within these, identified 17 sectors as possible high-growth markets. – These 17 sectors fall under three broad categories: green-tech, high-tech convergence technologies such as intelligent robotics, and value-added services in sectors such as telecommunications. – The government then identified seven 'flagship' areas for investment that could facilitate growth across the 17 sectors. These areas are — automobiles, shipbuilding, semiconductors, steel, machinery, textiles, parts and materials. – The seven areas were then encouraged through public investment, policy directives, and incentives for private investments and FDI. • Well-educated workforce: Among the peer set of 38 countries, South Korea ranks fourth in terms of the percent of graduates in technical fields. Almost 80 percent of the students passing high school enroll for tertiary education and the country's education spending is among the highest in Organization for Economic Cooperation and Development (OECD) countries. According to EIU, local talent is easily available in high-technology industries in the country.
Challenges	<ul style="list-style-type: none"> • Bureaucratic complexities: Despite favorable government attitude towards FDI, South Korea's business environment remains difficult due to the continuing complexities of registration, notification, licensing and approval requirements. • Slowing global economy impacting South Korea's growth: <ul style="list-style-type: none"> – South Korea relies on exports for growth, with exports of goods and services as a percent of GDP at 52.4 percent in 2010 compared to 39.3 percent in 2005. Hence, slowing global economic growth will impact South Korea's exports in the short term. – In addition, growth outlook for the country has declined due to slowing manufacturing output, exports growth, and global economic growth. IMF reduced GDP growth estimate for the country for the second-half of 2012 to 3.25 percent from 3.5 percent.
Areas to watch out	<ul style="list-style-type: none"> • Reducing interest rates to boost growth: <ul style="list-style-type: none"> – First time since February 2009, South Korea's central bank reduced its base interest rate in July 2012 by 25 basis points to cushion the impact of the Eurozone crisis and boost domestic growth. – The rate cut spurred worries of further cuts in the future and also resulted in the KRW weakening against USD. – The KRW lost 5.5 percent against the U.S. Dollar in the one-year to August 30, 2012 as South Korea's exports and domestic growth slowed. • Investment opportunities from development of green technologies and renewable energy (RE): South Korea is focused on increasing renewable energy consumption from 2 percent in 2010 to 11 percent by 2030. The government plans to invest \$30.7 billion by 2020 in renewable energy and green technologies. The government is also providing tax credits and other incentives for RE/green technologies and all components/equipment used in RE plants to spur investment in these sectors.

6. Taiwan

Taiwan's top 10 ranking in the 2013 GMCI is perhaps no surprise given the country's competitive advantages in the areas of corporate tax rates, trade, infrastructure and workforce development. Furthermore, executives responding to the 2013 GMCI survey cite Taiwan's high economic freedom and established manufacturing capabilities as key contributors to the country's competitiveness, which have evolved to become recognized as a global destination for research, development and production. Crucial to the country's success in this area has been the approach taken in establishing a leadership position in the semiconductor industry. Today, Taiwan has a culture of industrial development that has led to the rise of research and manufacturing clusters, something identified in *Ignite 2.0* as critical to the "manufacturing ecosystem."³³

With respect to competitive disadvantages, executives surveyed noted concerns about intellectual property protection and high energy and material costs as a result of Taiwan's lack of natural resources.

Although the country has strong trade relations with Western economies, is pursuing new free trade agreements and working to improve relations with China in efforts to boost cross-strait trading, Taiwan, like other countries, is expected fall behind the rise of India and Brazil and become the seventh most competitive manufacturing nation by 2018.

Executives responding to the 2013 GMCI survey cite Taiwan's high economic freedom and established manufacturing capabilities, which have evolved to become recognized as a global destination for research, development and production, as key contributors to the country's competitiveness.

Supplemental data analysis: Key statistics	Taiwan	Peer average
Manufacturing GDP CAGR (2005–10)	7.9%	2.9%
Manufacturing GDP percentage of total GDP (2010)	27.1%	18.3%
Labor costs (US\$/hour) (2011)	9.2	21.9
Manufacturing exports percentage of total exports (2011)	88.2%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	NA	-0.8
Highest corporate tax rate (2012)	17.0%	26.2%
Researchers per million population (INSEAD 2012)	NA	2,980.0
Per capita personal disposable income (US\$) (2011)	10,169	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	2.0%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ⁽⁶⁾

Supplemental data analysis: Taiwan — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> Taiwan has a large electronics industry that has been the primary exporter and driver of the country's economy. Taiwan began as a manufacturing base for foreign semiconductor companies but has now evolved into a global development and manufacturing center.
Advantages to manufacturers	<ul style="list-style-type: none"> Low tax burden: Taiwan has a top corporate tax of 17 percent, significantly lower than many developed nations, making Taiwan's taxes very competitive. Educated workforce: Taiwan has near universal literacy with the government spending an average of 18 percent of its expenditure on education every year. Infrastructure: Being one of the first countries in Asia to develop infrastructure, Taiwan's facilities are extensive, with 100 percent of the state-owned railway network electrified, three large ports and two international airports. Strong ties with western economies: Being one of the first developed countries in Asia, Taiwan has had strong relations with Western economies which were, and continue to be its major trade partners. Taiwan free trade zone: The presence of a free trade zone coupled with Taiwan's geographic advantage of being located close to several major ports in Asia is a significant advantage for manufacturers. High economic freedom: Taiwan is one of the 20 freest economies in the world, with strong commitment to structural reform and openness to global commerce. It has recently eliminated minimum capital requirements for establishing a company in Taiwan. Manufacturing cluster: Taiwan has a culture of industrial development in the semiconductor industry which has led to the rise of research and manufacturing clusters in the industry.
Challenges	<ul style="list-style-type: none"> Intellectual property Protection: Despite being removed from USTR's (United States Trade Representative) watch list, Protection of intellectual property in Taiwan remains a challenge. No natural resources: Taiwan lacks any significant natural resources and its reserves of coal, natural gas and oil are of limited commercial viability. Hence the large manufacturing base it possesses is supported by energy and raw material imports.
Areas to watch out	<ul style="list-style-type: none"> Cross-strait relations: Taiwan is attempting to improve relations with China, its largest trade partner by negotiating new accords within the framework of the bilateral Economic Co-operation Framework Agreement (ECFA). However this is being balanced with a wary approach, to ensure its sovereignty is not put at risk. A strong relationship with China is also important for Taiwan to pursue trade agreements with other countries with less resistance from China. Signing of new free trade agreements: Taiwan has been discussing deals with partners including the EU, U.S., Singapore, Indonesia and Malaysia and New Zealand. but obstacles persist. Taiwan's deal with New Zealand may be an exception where a far-reaching agreement may be possible.

Source: Deloitte Touche Tohmatsu Limited analysis^(iv)

7. Canada

Like Germany, Canada also climbed six spots in 2013 GMCI current manufacturing competitiveness rankings — moving the country into the top 10 most competitive nations in the world. Executives surveyed noted specifically Canada’s established manufacturing industry and strong automotive, industrial machinery, aircraft and telecommunications exports as strong contributors to manufacturing competitiveness. Other advantages included Canada’s favorable regulatory environment, government support and investment in manufacturing, and proximity to the U.S.

In efforts to build on these advantages, Canada is now pursuing additional free trade agreements, and has recently announced that it will fund all

capital costs associated with the construction of a new bridge between Windsor, Ontario and Detroit, Michigan.³⁴ The measure is intended to improve the efficiency of goods that flow through this trade corridor, which total approximately 25 percent of all trade between the U.S. and Canada, as well as allow for increased commercial traffic that is forecasted to triple over the next 30 years.³⁵

Despite these efforts, Canada is expected to drop to eighth in GMCI competitiveness rankings over the next five years. A key factor contributing to this decline, according to executives responding to the 2013 GMCI survey is increased difficulty in finding highly educated workers who possess the skills required in today’s advanced manufacturing operations.

Supplemental data analysis: Key statistics	Canada	Peer average
Manufacturing GDP CAGR (2005–10)	-3.6%	2.9%
Manufacturing GDP percentage of total GDP (2010)	11.4%	18.3%
Labor costs (US\$/hour) (2011)	38.3	21.9
Manufacturing exports percentage of total exports (2011)	44.9%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	0.0	-0.8
Highest corporate tax rate (2012)	31.0%	26.2%
Researchers per million population (INSEAD 2012)	4,260	2,980.0
Per capita personal disposable income (US\$) (2011)	30,780	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	8.2%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(a)

Supplemental data analysis: Canada — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • Canada has an established manufacturing industry and exports motor vehicles and parts, industrial machinery, aircraft, telecommunications equipment and electronics. • Canadian industry relies heavily on resource-based manufacturing. • Canada is one of the few developed countries that is a net energy exporter.
Advantages to manufacturers	<ul style="list-style-type: none"> • Efficient regulatory environment: The regulatory environment in Canada is very supportive of businesses, with: <ul style="list-style-type: none"> – No minimum capital required for starting a company. – Recent reduction in cost of obtaining necessary licenses. – Flexible labor regulations. • High economic freedom: Canada has the freest economy in the North American Region. Canada also has low trade and non-trade tariff barriers, allowing for open markets. • Strong support for exports: Canadian economy has a significant dependence on exports. NAFTA (North American Free-Trade Agreement) dominates Canadian trade and provides it special access to the largest economy in the world, the U.S. • Canada's most important trading partner is the United States, which accounted for 73.7 percent of its total exports in 2011. • Support for industry: Government incentives are provided to companies to invest in underdeveloped areas in Canada via four region-specific programs for improving productivity and global competitiveness; building new plants, or expanding or modernizing existing ones; and identifying and developing new domestic or global markets. • Abundant natural resources: Canada has significant energy, forest and mineral resources. Canada is also a leading exporter of natural resources, and resource-based technology and knowledge.
Challenges	<ul style="list-style-type: none"> • Availability of skilled labor: With rapid evolution of technology used in manufacturing, Canadian manufacturers are increasingly finding it difficult to find technically skilled labor. • Appreciation of Canadian dollar: Recent increase in the export of oil and natural gas has led to a corresponding appreciation of the Canadian dollar, which affects the export competitiveness of Canadian products.
Areas to watch out	<ul style="list-style-type: none"> • Free trade agreements: Canada in in ongoing negotiations to create trade agreements with: <ul style="list-style-type: none"> – Individual countries — Canada is in India, Japan, Korea, Morocco, Singapore, Ukraine. – Group of countries — EU (Comprehensive Economic and Trade Agreement), CARICOM, Andean Community Countries. • Elimination of import duties and tariffs: The federal government has in place a program to eliminate all import duties and tariffs on more than 1,700 products such as manufacturing equipment and a variety of sector inputs by 2015. This will come through a national economic action plan that was brought in as part of the 2009/10 and 2010/11 budgets. • Clean energy: <ul style="list-style-type: none"> – The government is focused on developing clean energy and has implemented several programs to encourage clean-energy practices. – The 2011/12 budget extended accelerated-capital-depreciation treatment to specific equipment for clean-energy generation and conservation and renewed \$97 million in funding for clean-energy-research opportunities. – \$1 billion in funding will be provided through Pulp and Paper Green Transformation Program for renewable-energy production in the forest-products industry.

Source: Deloitte Touche Tohmatsu Limited analysis ^(xxx)

8. Brazil

Surprisingly, Brazil's GMCI ranking has dropped since 2010, falling from fifth to eighth in current manufacturing competitiveness. Unlike South Korea and Taiwan, however, executives surveyed expect the manufacturing environment in Brazil to improve quickly and felt the country would become the world's third most competitive nation over the next five years.

Key to Brazil's manufacturing advantages are ongoing investments in the sector and favorable policy actions that seek to spur long-term competitiveness. Specifically, the country's recently announced Brasil Major (Bigger Brazil) Industrial Plan is expected to create favorable tax advantages for Brazilian manufacturers, as well as reduce lending and energy costs. Under the plan, the Brazilian government also hopes to address a set of fiscal, legal, financial and infrastructure obstacles, commonly referred to as the "Brazil Cost," that have helped undermine the competitiveness of Brazilian companies, as well as the competitiveness of the entire domestic market in relation to the ability of importers and exporters to deal with international competition.³⁶

Fortunately, preparations for the World Cup in 2014 and the Olympics in 2016 are expected to drive a number of improvements. For example, Brazil is expected to improve infrastructure and bring in foreign investment, which will likely have a positive influence on improving the country's manufacturing industry and competitive position.³⁷ Brazil is also 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.³⁸

Executives participating in the 2013 GMCI survey did express concern with Brazil's workforce, which some felt represented a competitive disadvantage. This could be due to scarce availability of skilled workers, which was further exacerbated by the high cost of labor in Brazil.

Despite some questioning of the long-term effectiveness of the Brasil Major Industrial Plan, most executives agree that the manufacturing environment in the country will continue to improve as Brazil proactively addresses policy, regulatory and workforce challenges.³⁹ Additional investments by companies representing China, South Korea and North America looking to take advantage of opportunities resulting from the World Cup and Olympics will also likely boost competitiveness.

Supplemental data analysis: Key statistics	Brazil	Peer average
Manufacturing GDP CAGR (2005–10)	1.9%	2.9%
Manufacturing GDP percentage of total GDP (2010)	15.8%	18.3%
Labor costs (US\$/hour) (2011)	12	21.9
Manufacturing exports percentage of total exports (2011)	32.9%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	2.1	-0.8
Highest corporate tax rate (2012)	34.0%	26.2%
Researchers per million population (INSEAD 2012)	1,100	2,980.0
Per capita personal disposable income (US\$) (2011)	7,951	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	14.0%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(x)

Supplemental data analysis: Brazil — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • Brazil is a growing economy with footwear, autos, automotive parts and machinery as its major manufacturing exports. • Brazil is the world’s second largest producer of ethanol fuel and until 2010, it was the largest exporter.
Advantages to manufacturers	<ul style="list-style-type: none"> • Favorable policy actions — Brazil Major <ul style="list-style-type: none"> – The government launched Brazil Major (Bigger Brazil) Industrial Plan in 2011 and expanded it in 2012. The plan removes 20 percent payroll tax for some Brazilian manufacturers including clothing, shoe making, textiles, auto parts, capital goods, etc. Instead of a payroll tax, these industries will be paying tax at the rate of 1 percent on gross revenues. • The Plan also expands low-cost lending by Brazil’s National Development Bank, BNDES, thus aiding in cheaper funds for industries. • Vast natural resource base: Sufficiently large natural base along with relatively advanced research infrastructure places the country in a unique position to capture more profitable stages of the value chain through alternative energies that are ecologically sustainable.
Challenges	<ul style="list-style-type: none"> • Low-skilled but high-cost labor <ul style="list-style-type: none"> – With only 11.3 percent of total tertiary graduates in science and engineering fields in 2010, there is scarcity of skilled labor in Brazil. – Hourly compensation for manufacturing wages rose at a 5-yr CAGR of 15 percent to \$10.1 in 2010. These wages were higher when compared to China or India. • High taxation: High corporate taxes of 34 percent add to already high cost of doing business in Brazil. • Poor infrastructure: Poor infrastructure poses a threat to the competitiveness of the manufacturing industry and adds an additional \$10 billion annually to the costs. • Brazilian real appreciation: Appreciation of the Brazilian Real is making imports cheaper and exports costlier; merchandise imports grew at a CAGR of 19.7 percent during 2006-11 compared to 13.2 percent for exports.
Areas to watch out	<ul style="list-style-type: none"> • Reforms to reduce “Brazil Cost” <ul style="list-style-type: none"> – The government is implementing policies to lower interest rates, provide tax breaks on certain consumer goods, and check the appreciation of the currency. Brazil has recently cut electricity taxes up to 28 percent for industries, which will lower energy costs for industries and improve their competitiveness. – Government also aims to lower the excessive red tape and widespread bribery, another major factor in the “Brazil Cost.” • Effectiveness of Bigger Brazil Industrial Plan: OECD criticized the plan in 2011 saying that it may provide short-term relief for manufacturing companies but will not be sufficient to reduce the cost disadvantage of producing in Brazil. • Investment in infrastructure <ul style="list-style-type: none"> – Infrastructure is likely to improve aided by the planned energy generation projects and by hosting of soccer World Cup and Olympic Games in 2014 and 2016, respectively. – Chinese, Korean, and North American companies are investing, particularly in auto and construction machinery sectors, to benefit from the growth opportunities that would result from the hosting of the 2014 World Cup and 2016 Olympic Games.

Source: Deloitte Touche Tohmatsu Limited analysis ^(viii)

9. Singapore

2013 GMCI rankings position Singapore as the ninth most competitive nation in the world in terms of current manufacturing capabilities. Executives participating in the survey noted several factors that contributed to Singapore's manufacturing competitiveness, including favorable tax policy, significant R&D incentives, high-quality infrastructure, strong intellectual property protection laws, an investment-friendly environment driven by efficient and transparent government, and access to a highly-educated workforce.

Over the next five years, however, executives surveyed felt Singapore would become less competitive as a result of increasing business costs and the country's significant dependencies on China, the Eurozone, and the U.S. as export markets — which are all forecasted to experience sluggish economic growth over the next several years.⁴⁰

To offset these economic declines, the Singapore government is actively promoting long-term productivity-driven growth through the Productivity and Innovation (PIC) scheme. Under the 2012 budget, PIC improvements will include increases in cash payouts and enhancements to incentives for R&D and training.⁴¹ Given the importance of talent-driven innovation to manufacturing competitiveness, these improvements coupled with Singapore's already strong workforce will continue to favorably position the country as a competitive manufacturing destination.

Supplemental data analysis: Key statistics	Singapore	Peer average
Manufacturing GDP CAGR (2005–10)	7.1%	2.9%
Manufacturing GDP percentage of total GDP (2010)	22.2%	18.3%
Labor costs (US\$/hour) (2011)	21.9	21.9
Manufacturing exports percentage of total exports (2011)	68.1%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	-1.3	-0.8
Highest corporate tax rate (2012)	17.0%	26.2%
Researchers per million population (INSEAD 2012)	6,991	2,980.0
Per capita personal disposable income (US\$) (2011)	22,416	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	6.5%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ⁶⁰

Supplemental data analysis: Singapore — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> Major manufacturer of electronics and chemicals, including pharmaceuticals. Manufacturing exports as a percent of merchandise exports stood at 68.1 percent in 2011. Electronics manufacturing nominal value-add to manufacturing is declining — 35.8 percent in 2005 to 29.2 percent in 2011. However, electronics was still the largest industry in manufacturing in 2011, followed by biomedical manufacturing at 22.4 percent.
Advantages to manufacturers	<ul style="list-style-type: none"> Highly-educated workforce: <ul style="list-style-type: none"> The Forum's Competitiveness Report, rank's Singapore's secondary education and training fourth among 142 countries with the quality of math and science education ranked number one. In addition to four locally grown universities, the country has attracted 10 world-class institutions including France's INSEAD and U.S — based MIT. The government also offers professional and skills-based training even after joining the workforce. It also provides tax relief to employees on training course fees. Investment friendly climate: <ul style="list-style-type: none"> FDI inflow in Singapore increased at a CAGR of 23.4 percent between 2005 and 2011. Government provides tax incentives, depreciation schemes, favorable loan conditions, and high-quality industrial estate to attract investment. Manufacturing of electronics, pharmaceuticals, and petroleum remain primary magnets for investment. Government is also trying to attract MNC investment in high-technology sectors while trying to expand the country's role as a global financial center. R&D Incentives: Considering base deduction, additional and enhanced deduction, Singapore allows 400 percent tax deduction on the S\$400,000 (US\$319,440) for qualifying R&D expenses. High-quality infrastructure and intellectual property protection: <ul style="list-style-type: none"> WEF's Competitiveness Report, rank's Singapore's infrastructure third among 142 countries with the quality of both port and air transport infrastructure ranked first. Singapore's stringent intellectual property protection mechanism (ranked second globally by WEF) makes it easier for companies to invest in R&D. Transparency and government efficiency: <ul style="list-style-type: none"> Heritage foundation ranks Singapore second (of 184 countries) in terms of economic freedom in the 2012 World Economic Index report. Singapore ranks first in terms of freedom from corruption as per the World Economic Index report as the country's regulatory environment is flexible and transparent. Favorable tax system: <ul style="list-style-type: none"> Singapore's corporate taxes are at 17 percent compared to the U.S. at 39 percent and Japan at 38 percent. According to EIU, 80 percent of the companies pay tax at a rate of less than 10 percent in Singapore.
Challenges	<ul style="list-style-type: none"> Increasing business costs and inflation: <ul style="list-style-type: none"> Unit business costs (UBC) in the manufacturing sector increased by 3.7 percent year over year in second quarter of 2012, following the 5.4 year over year percent increase in the first quarter and 2.6 percent in 2011. According to a study by Singapore's Ministry of Trade and Industry, for every 1 percent increase in UBC, export prices increase by only one-fifth, hence negatively impacting profit margins. In 2011, inflation was 5.2 percent due to higher transport, housing, and food costs. Average inflation rate between 2002 and 2006 was 0.6 percent compared to 3.5 percent between 2007 and 2011. High living costs: <ul style="list-style-type: none"> Living costs spurred by inflation and an inflow of expatriates. In Singapore, property prices, rents, costs of owning a car, and private schooling expenses are very high. According to an HSBC survey, 50 percent of expats in Singapore earned more than \$200,000 in 2011, making it the country with the highest expat salaries in Asia.
Areas to watch out	<ul style="list-style-type: none"> Focus on improving productivity and efficiency: <ul style="list-style-type: none"> Continued decline in labour productivity in 2012 with 2.3 percent year over year decline in the first quarter and a further 1.9 percent year over year decline in the second quarter. The Government is actively promoting productivity-driven growth in the longer term through the productivity and innovation (PIC) scheme under the 2012 budget. PIC improvements include increase in cash payouts and enhancements to incentives for R&D and training. Declining growth: <ul style="list-style-type: none"> In 2011, EU, China, and the U.S. were the top three export destinations and constituted 36 percent of the country's non-oil domestic exports. Slowing growth in these economies is reflected in Singapore's slow growth rates. For instance, for 2011, external demand accounted for 63 percent of the increase in total demand while for 2010 it accounted for 89 percent of the increase. If the Greece political issue remains unsolved and the debt crisis escalates, Singapore may experience a severe credit crunch, according to Deloitte's Asia-Pacific Economic Outlook.

Source: Deloitte Touche Tohmatsu Limited analysis ^(viii)

10. Japan

Rounding out the top 10 in the 2013 GMCI rankings of the world's most competitive manufacturing nations is Japan. Unfortunately, this represents a drop of four positions since the publication of the 2010 Global Manufacturing Competitiveness Index.

Although Japan is one of the largest economies in the world and is recognized for its advanced R&D and manufacturing capabilities, executives participating in the 2013 GMCI survey noted a number of disadvantages that negatively contributed to Japan's overall competitive ranking. Most notable was the high cost of labor and materials in Japan, on which

executives rated Japan last as 2.59 on the 2013 GMCI 10-point scale when compared to Germany (3.29), the U.S. (3.97), Brazil (6.70), India (9.41) and China (10.00). Other challenges noted by executives include high corporate tax rates, scarcity of natural resources, currency volatility and the country's rapidly aging population.

Despite recent policy actions designed to incentivize foreign investment, as well as the country's energy and infrastructure investments following the natural disasters in 2011, Japan is expected to fall out of the top 10 and become the world's twelfth most competitive nation by 2018.

Supplemental data analysis: Key statistics	Japan	Peer average
Manufacturing GDP CAGR (2005–10)	-0.2%	2.9%
Manufacturing GDP percentage of total GDP (2010)	19.4%	18.3%
Labor costs (US\$/hour) (2011)	35.4	21.9
Manufacturing exports percentage of total exports (2011)	88.0%	59.9%
Manufacturing jobs created per hundred persons (2001–2010)	-3.0	-0.8
Highest corporate tax rate (2012)	38.0%	26.2%
Researchers per million population (INSEAD 2012)	7,039	2,980.0
Per capita personal disposable income (US\$) (2011)	28,370	15,886
Per capita personal disposable income (2011) CAGR (2001–2011)	4.1%	8.5%

Source: Deloitte Touche Tohmatsu Limited analysis ^(a)

Supplemental data analysis: Japan — Competitiveness at a glance

Manufacturing highlights	<ul style="list-style-type: none"> • Japan is one of the largest economies in the world despite lacking any significant natural resources. Its manufacturing industry has been the primary driver during its period of rapid growth post the second world war. • Japan’s primary exports are consumer electronics, automobiles and semiconductors. • Japan has traditionally been ahead of the rest of the world in automation and implementation of best practices in manufacturing operations.
Advantages to manufacturers	<ul style="list-style-type: none"> • Favorable policy actions <ul style="list-style-type: none"> – The Japanese government has passed a “Law on Special Measures for Industrial Revitalization and Innovation” to support business reconstruction and business in various industries. – Japan has also identified infrastructure, environment and energy (next generation vehicles), creative industries (fashion, content, etc.), healthcare, robotics and space as focus industries. – Its “New Growth Strategy” aims to create demand and jobs through regulatory reform and fiscal measures. • Incentives to locate facilities in Japan: To retain the manufacturing industry in Japan, the government has announced incentives for companies producing critical components or which play an important role in the supply chains to setup R&D facilities and headquarters in Japan. • Dominance in auto and electronics industries: Japan is home to companies which are global auto and electronics leaders. Automobiles, auto parts and electronics are among the largest exports of the country.
Challenges	<ul style="list-style-type: none"> • High taxation: The top bracket for corporate taxes stands at 38 percent and 50 percent for individuals, making Japan one of the toughest tax regimes in the world. • Rapidly ageing population: The rapidly ageing population in Japan means that the working population, which is critical for the manufacturing industry, is fast shrinking. This is also important as insurance and healthcare costs increase the debt burden on the state. • JPY appreciation: Currency appreciation is hurting Japanese exports. The yen has appreciated by more than 50 percent since the beginning of 2007, and shows no signs of slowing down. This is a significant challenge for manufacturers who export from their Japanese production units. • Few natural resources: Scarcity of natural resources of its own has required Japan to rely on imports for its industries. This has been the case even through its rapid industrialization in the 20th century.
Areas to watch out	<ul style="list-style-type: none"> • Support for renewable energies: This support is in the form of: <ul style="list-style-type: none"> – Feed-in tariffs (FiT) for renewable energy. – Mandates to electric utility companies mandated to purchase solar, wind, biomass and hydro power through the Renewable Energy Law, 2011. – More than 130 billion yen (\$1.7 billion) in funding for clean energy demonstration projects. • Restarting of nuclear energy facilities: Despite the outcry against nuclear power following the Fukushima incident, nuclear energy generation was begun in a modest fashion in July 2012. Nuclear reactors, which contributed to about 27 percent of Japan’s power generation in 2010 are critical to the Japanese economy until feasible alternatives are developed. • Investment in infrastructure: There has been a growth in infrastructure investment with a major focus on the reconstruction post the tsunami and earthquake in the Fukushima region of Japan. This is expected to continue in the near future. 3.3 trillion yen (\$42.2 billion) will be spent in 2012-13 on rebuilding in addition to 15 trillion yen (\$192 billion) already spent in 2012.

Source: Deloitte Touche Tohmatsu Limited analysis ^(xxx)

Appendix B: Index methodology

Appendix B1: Global CEO Survey: List of sub-components comprising of each main manufacturing competitiveness drivers — rank and scaled score

Sub-component rank	Sub-component	Main driver/component	Scaled sub-component score
1	Quality and availability of engineers, scientists and researchers	Talent-driven innovation	10.00
2	Quality and availability of labor	Talent-driven innovation	8.82
3	Tax rate burden and system complexity	Economic, trade financial and tax system	8.77
4	Quality and efficiency of electricity grid, information technology (IT) and telecom network	Physical infrastructure	8.76
5	Clarity and stability of regulatory, tax and economic policies	Economic, trade financial and tax system	8.76
6	Health of economic and financial system	Economic, trade financial and tax system	8.52
7	Stability and clarity in legal and regulatory policies	Legal and regulatory system	8.14
8	Cost competitiveness of local suppliers	Supplier network	8.08
9	Ability of supply base to innovate in products and processes	Supplier network	8.08
10	Financial stability and resources of the supply base	Supplier network	7.90
11	Cost competitiveness of material	Cost and availability of labor and materials	7.89
12	Availability and responsiveness of qualified local supplier base	Supplier network	7.55
13	Labor laws and regulations	Legal and regulatory system	7.53
14	Cost competitiveness of energy	Energy cost and policies	7.53
15	Quality of primary and secondary schools to produce student population targeted in Science, Technology, Engineering, and Math (STEM)	Talent-driven innovation	7.48
16	Quality and efficiency of roads, ports, railways and airports	Physical infrastructure	7.45
17	Regulatory compliance costs (health, safety, environment, tax, other)	Legal and regulatory system	7.26
18	Intellectual property protection laws and enforcement	Legal and regulatory system	7.20
19	Comprehensive and competitive trade policies	Economic, trade financial and tax system	7.10
20	Ongoing investments to improve and modernize energy infrastructure	Energy cost and policies	7.08
21	Availability of raw material	Cost and availability of labor and materials	6.93
22	Central bank and economic policies	Economic, trade financial and tax system	6.54
23	Comprehensive and effective energy policy	Energy cost and policies	6.50
24	Legal and regulatory environment and enforcement	Legal and regulatory system	6.43
25	Cost competitiveness of wages	Cost and availability of labor and materials	6.28
26	Cost of quality healthcare for employees and society	Healthcare system	6.04
27	Size and access to local market	Local market attractiveness	5.94
28	Quality of college/university partnerships in research and innovation	Talent-driven innovation	5.87
29	Government emphasis on investments in science, technology, R&D and engineering	Government investments in manufacturing and innovation	5.85
30	Collaboration between public and private sectors for long term investments and national goals in manufacturing	Government investments in manufacturing and innovation	5.77
31	Cost competitiveness of labor other than wages	Cost and availability of labor and materials	5.52
32	Antitrust laws and regulations	Legal and regulatory system	5.01
33	Regulatory policies (e.g. Pollution, food safety) that are enforced to protect public health	Healthcare system	4.79
34	Quality, availability and access to healthcare professionals and facilities	Healthcare system	4.68
35	National innovation strategy that ensures robust pipeline from basic and applied research to full commercialization	Government investments in manufacturing and innovation	4.64
36	Intensity of local competition	Local market attractiveness	4.54
37	Long term predictable and steady support in government sponsored science labs and national programs	Government investments in manufacturing and innovation	4.38
38	Government support to build capacity for manufacturing innovation (product and process)	Government investments in manufacturing and innovation	4.34
39	Government investments in economic development through attraction of manufacturing businesses	Government investments in manufacturing and innovation	3.56
40	Effective and efficient immigration policies and processes to attract and retain talent	Talent-driven innovation	1

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

The 2013 Global Competitiveness in Manufacturing CEO survey is part of a broader initiative to learn firsthand how manufacturing CEOs view competitiveness around the world. One aim was to garner the perspectives of key decision makers into a single index — one that captures their collective knowledge and insights regarding the relative manufacturing competitiveness of nations now and in the future. A second objective was to better understand the important drivers that contribute to country competitiveness and the role government policies play in supporting or advancing a manufacturing agenda. The survey was divided into three sections:

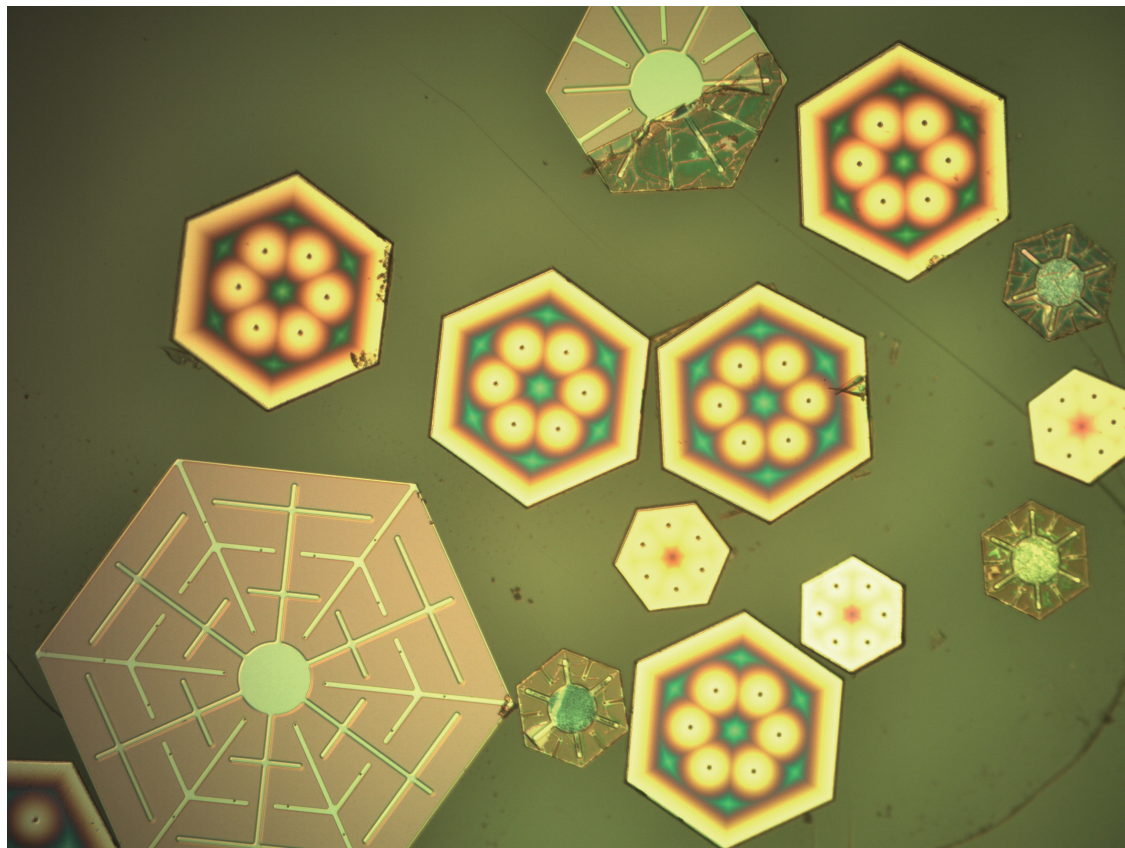
1. Business confidence and current environment
2. Manufacturing competitiveness
3. Demographics

Section 1 asked executives about the likely economic environment globally and at country and industry level. It

also examined how the sales and costs would change for their business in their most significant geographic markets. Respondents were also questioned about which government policies and regulations they view as either an advantage or disadvantage to their companies' competitiveness in their home country.

In *section 2*, the survey asked executives to rate the relative importance of components and sub-components that drive the competitiveness of a country's manufacturing sector. They were also asked to rank 38 countries on their overall manufacturing competitiveness today and five years from now.

Section 3 profiled the respondents' companies, including location of their headquarters and business units, total annual global revenues (in US\$), overall performance, global profitability over the past three years, the primary industry their companies belong to, the industry that provides the greatest source of revenues for their company.



Photograph courtesy of Sandia National Laboratories: **Representative thin crystalline-silicon photovoltaic cells** — these are from 14 to 20 micrometers thick and 0.25 to 1 millimeter across. Photo taken by Murat Okandan.

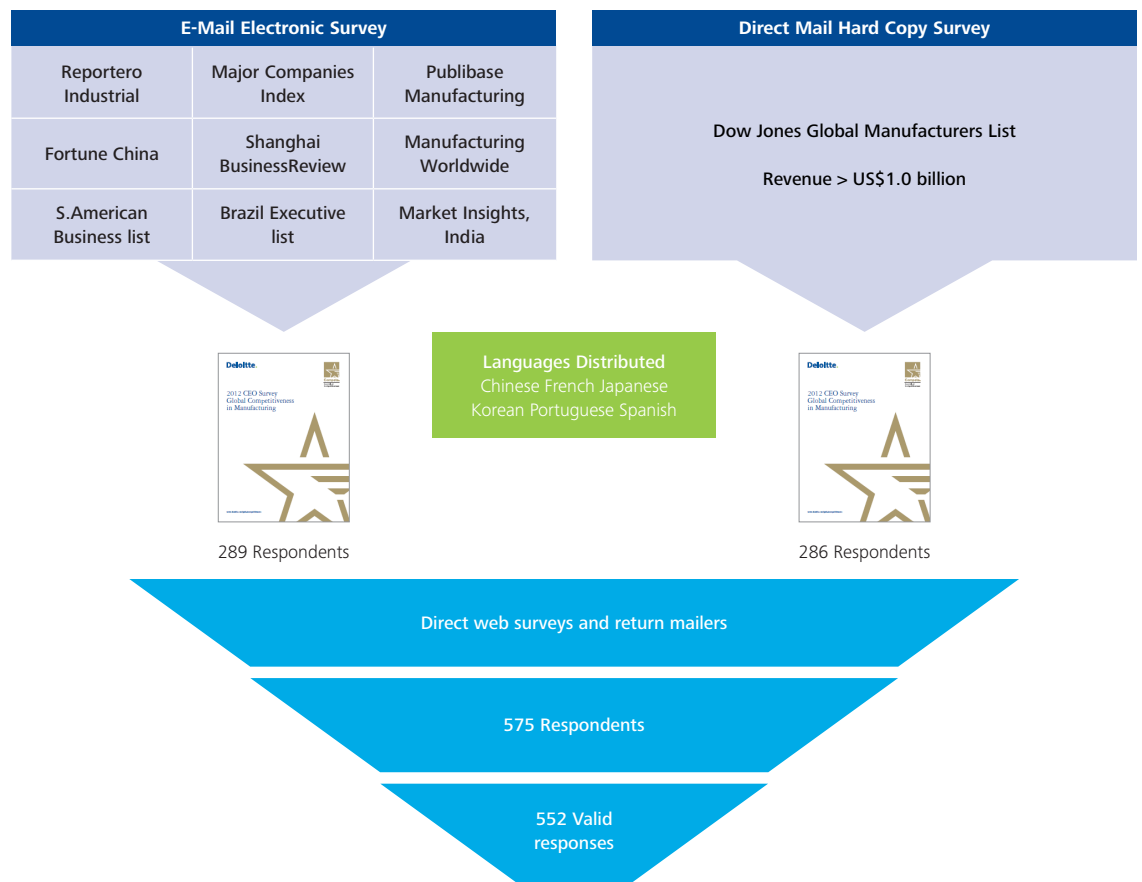
Survey administration and respondents

The 2013 Global Manufacturing Competitiveness Index survey instrument was developed in conjunction with subject-area experts at leading companies, including Deloitte U.S., The U.S. Council on Competitiveness, and Clemson University. Executives surveyed were obtained from three sources: Dow Jones Global Manufacturers, Reportero Industrial, Major Companies Index, Publibase Manufacturing, Research Now (US), Fortune China, Shanghai Business Review, Manufacturing Worldwide, South American Business list, Brazil Executive list, Market Insight (India) (See Appendix Figure B2).

The final survey instrument was translated (and cross-translated) into six languages and administered through two channels — direct mail and online. This process yielded 575 useable surveys, of which 552 were deemed valid for analysis. Twenty three surveys were dropped as they were received from predominantly service organizations.

About 50 percent of the businesses had company revenues less than US\$100 million. On the other end of the spectrum, about 23 percent reported revenues greater than US\$1 billion. The respondents represented 23 different industry sectors, which were broadly classified as aerospace and defense, automotive original equipment manufacturers and automotive suppliers, consumer goods, industrial products, pharmaceutical, process, textile and technology (see Figure B4). Forty-six percent of respondents identified themselves as chairman, CEO, or president, another 40 percent as managing director, senior vice-president, or general managers while the other 14 percent included directors, legal counsel, and others that completed the survey on behalf of the CEO.

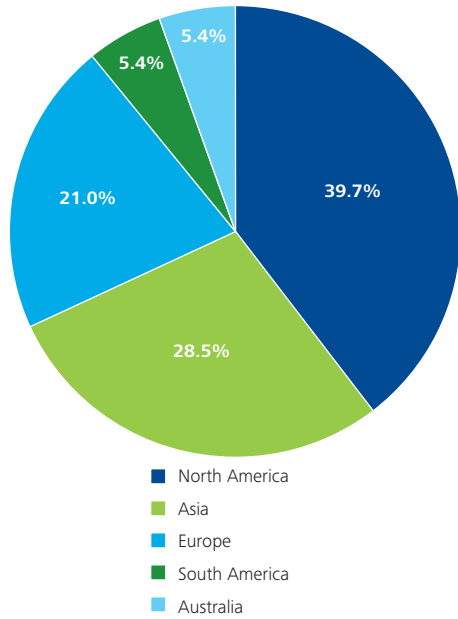
Appendix Figure B2: Methodology — Survey distribution



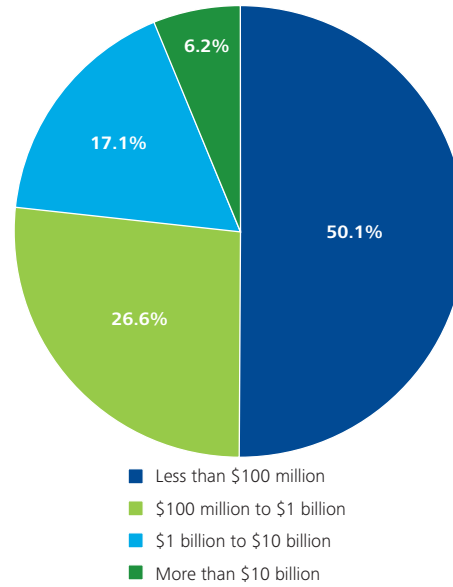
Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Appendix B3: Profile of respondents by region and revenue size

Respondents by region



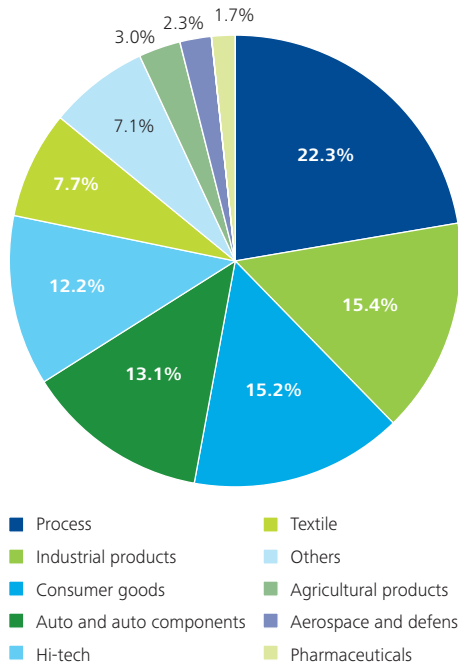
Respondents by revenue size



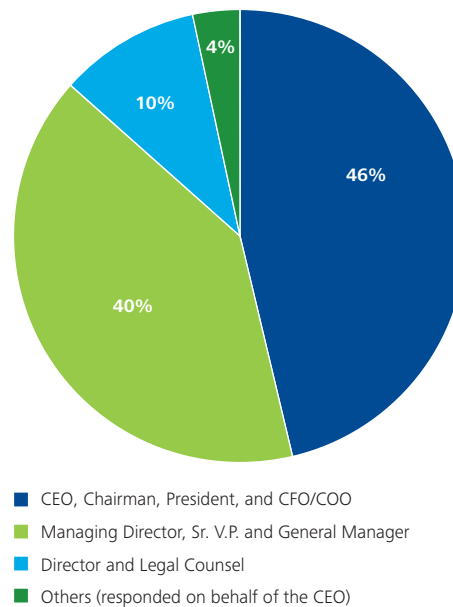
Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Appendix B4: Profile of respondents by manufacturing sector and title

Respondents by industry



Respondent by title



Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Weighting heuristics

The executives surveyed are from companies with different firm sizes and with varied presence in different countries and geographic regions. In determining the weights for respondents to calculate the 2013 Global Manufacturing Competitiveness Index, competitive driver scores, and policy scores, respondents were given different weights based on their global experience. Companies with more global experience, as demonstrated through physical presence with operations, sales and/or distribution in multiple geographic regions, were deemed to have more global experience and received a higher weight for their responses (see Appendix B5). Prior research also showed firm size to be an important factor for firms' overall global experience. Hence, the heuristic applied different weights to companies according to revenue size of the firm as a proxy measure of their overall global experience. Thus, a manufacturer's revenue size was considered a reasonable demonstration of global experience and resulted in a higher global experience weight. Those manufacturers with revenue size of less than US \$500 million received lowest weight whereas companies with revenues of US \$5 billion dollars or more received the highest weight. See Appendix B6 for weights assigned to firms based on revenue size. The resulting global experience weights were used to calculate the 2013 Global Manufacturing Competitiveness Index overall for each country — now and in five years — and for the components and drivers of manufacturing.

Appendix B5: Weighting of responses based on degree of global experience

- A weighting system was applied to the responses to adjust for the differences in the perspectives of companies and executives with different degrees of global experience.
- Companies with manufacturing operations and sales and service and distribution offices in multiple geographic regions were deemed to have more global experience and received a higher weight for their responses.
- Prior research also indicated that company size correlated strongly with manufacturing operations in multiple regions. Larger manufacturers, as measured by total annual revenue, tended to have a physical presence in multiple geographic regions.
- As a result, larger manufacturing organizations were given higher weight, resulting in their having a higher impact in defining the index for country rankings, policy scores as well as key drivers and components of manufacturing competitiveness.

Appendix B6: Weight assigned based on firm size

Size of the Firm	Weight Assigned (W_p)
Less than US \$500 million dollars	0.25
US \$500 million to US \$1 billion dollars	0.5
US \$1 to US \$5 billion dollars	0.75
Greater than US \$5 billion dollars	1

Index development methodology

For competitive driver ranking and country ranking

Survey responses on the importance of drivers for manufacturing competitiveness and the current and future ratings of countries in terms of manufacturing competitiveness were collected using 10-point, self-anchoring scales, with "1" equaling relatively not important/not competitive and "10" equaling relatively more important/extremely competitive.

For respondents who chose to answer from a parent company perspective, the location of the parent company headquarters was used for the purpose of the analysis and for those who responded from the business unit perspective, the business unit's location was considered.

Variation in ratings by geographic region were also tested for, and it was concluded that raw ratings had a cultural bias, as respondents from Mexico, India, and China tended to rate higher than respondents from Europe, the U.S., and Canada. Similar such biases existed by size of the firm and the industry to which the respondent belonged.

Thus, the raw data was normalized by country, size, and industry following steps 1 and 2 of the methodology shown below. The steps followed for calculating the importance score of various components of manufacturing competitiveness after the normalization procedure are explained in steps 3 to 5. See Appendix B7 for an example on the computation of the 2013 GMCI country index, which is derived from a similar computational heuristic.

Below are the details of the procedure used to develop the component and sub-component indices:

Step 1

For each industry of a particular revenue size range and from a particular country, the overall mean rating was calculated across all observations over the 50 components and sub-components of manufacturing competitiveness. See Appendix B1 for the list of main and sub-components of manufacturing competitiveness.

The computation is as follows: Let "i" represent the responding country where the executive is located ($i = 1 \dots 44$), "j" represent firm-size category ($j = 1 \dots 4$), and "k" represent the industry category ($k = 1 \dots 10$). Let \bar{x}_{ijk} and s_{ijk} represent the overall mean and standard deviation of all the components of manufacturing competitiveness for the responding country "i", firm-size category "j", and industry category "k".

Step 2

The data was normalized by computing a standard score $Z_{l,m}$ for each respondent, "l", and for each component and sub-component of manufacturing competitiveness, "m". ($m = 1$ to 50).

$$Z_{l,m} = \frac{(x_{l,m} - \bar{x}_{ijk})}{s_{ijk}}$$

Step 3

Multiply the score $Z_{l,m}$ of each respondent by the global experience weight. The size of the company is taken as a proxy for global experience weight. See Appendix B6 for the table of weights assigned. Smaller companies are given lower weight and bigger companies are given higher weight. This is used to obtain experience-weighted Z score:

$$Z_{l,wl} = w_l \times Z_{l,m}$$

where "w_l" is the global experience weight assigned to each respondent.

Step 4

For each component, "m", of manufacturing competitiveness, the average normalized weighted score is obtained:

$$CM_m = \frac{(\sum_{l=1}^n Z_{l,wl})}{n}$$

where "n" is the total number of valid respondents in the survey.

Step 5

Next, select the normalized weighted scores of the ten main components of competitiveness and convert CM_m obtained in step (4) into a 1 to 10 scale to get a scaled component score, (SCS_m), as follows:

$$SCS_m = 1 + 9 \times \frac{CM_m - \min(CM_m)}{\max(CM_m) - \min(CM_m)}$$

where $\min(CM_m)$ is the minimum of all the CM_m scores over "m" main components of manufacturing competitiveness, (where "m" = 1...10); and $\max(CM_m)$ is the maximum of all the (CM_m) scores over 'm' main components of manufacturing competitiveness (where "m" = 1...10).

Follow a similar approach in step 5, for the 40 sub-components' competitive scores (where $m = 1$ to 40). The main and sub-component scores along with rankings are listed in Appendix B1.

A similar approach was used for calculating the current and future manufacturing Global Manufacturing Competitiveness Indices (GMCI) of countries that were rated by the executives, where instead of the scores of the components of manufacturing competitiveness, a GMCI for each country was obtained. Thus, " m " will represent each rated country ($m = 1 \dots 38$), (CM_m) will be the normalized and weighted score for each country, and SCS_m will represent the scaled country score. (See Appendix B7 for an illustration.)

Calculation of policy scores

Policy advantages and disadvantages were determined for the U.S., China, and Europe. These questions were collected using 5-point, self-anchoring scales, where "1" equaled significant disadvantage and "5" equaled significant advantage.

For calculating the policy scores for the U.S., China, and Europe the steps mentioned below were followed:

Step 1

Calculate an overall mean rating (\bar{x}_{ijk}) and standard deviation (s_{ijk}) across $m = 22$ policy variables in the survey for a specific country (e.g., the U.S.), specific revenue size " j ", ($j = 1 \dots 4$), and specific industry category " k ", ($k = 1 \dots 44$)

Step 2

The data is normalized by computing a standard Z score for each respondent " l " for every policy variable, " m ". ($m = 1$ to 22).

$$Z_{l,m} = \frac{(x_{l,m} - \bar{x}_{jk})}{s_{jk}}$$

Step 3

Multiply the score $Z_{l,m}$ of each respondent by the global experience weight. Size of the company is taken as a proxy for global experience weight. See Appendix B6 for the table of weights assigned. Smaller companies are given lower weight and bigger firms are given higher weight. This is used to obtain experience-weighted Z score:

$$Z_{l,wl} = w_l \times Z_{lm}$$

where " w_l " is the global experience weight assigned to each respondent.

Step 4

Then for each policy variable, " m ", average normalized weighted policy score (PS_m) is obtained

$$PS_m = \frac{(\sum_{l=1}^n Z_{l,wl})}{n}$$

where " n " is the total number of valid respondents from that specific country (here U.S) in the survey.

Step 5

Convert the average normalized weighted policy scores to a 1 to 5 scale using the formula below to get the scaled policy score:

$$SPS_m = 1 + 4 \times \frac{PS_m - \min(PS_m)}{\max(PS_m) - \min(PS_m)}$$

Where $\min(PS_m)$ is the minimum of all the PS_m scores over a set of all policy drivers, (where " m " = 1...22) and $\max(PS_m)$ is the maximum of all the PS_m scores over a set of all policy drivers, (where " m " = 1...22).

The policy variables with SPS_m scores of four and above were considered as giving manufacturers a relative advantage and those below two were considered as giving relative disadvantage.

Appendix B7: Index creation methodology — A GMCI computation example (Note that the list of countries is not exhaustive and is used only to explain the methodology)

Raw ratings of countries

Respondent	Argentina	Brazil	Canada	Colombia	Mexico	U.S.	Belgium	Czech Republic	France	Germany	Greece
Resp. 1	4	8	8	8	8	7	6	6	6	6	6
Resp. 2	1	7	8	5	6	9					
Resp. 3	2	5	8	5	5	8	5	7	7	8	2
Resp. 4	4	9	8	5	6	9					
Resp. 5	7	10	8	6		9	3	3	9	10	3
Resp. 6	4	7	10	8	8	10	7	6	8	10	3
Resp. 7	6	5	5	6	5	5	5	7	5	6	4
Resp. 8	3	5	5	5	8	8	4	5	4	8	4
Resp. 9	5	6	4	2	2	4	3	3	3	6	1
Resp. 10	6	7	9	7	8	8	4	5	4	3	4
Resp. 11	5	7	8	6	6	7	8	6	7	8	5
Resp. 12	5	8	7	2	3	8	3	7	4	8	1
Resp. 13	5	1	7	1	1	7			7	7	
Resp. 14	5	7	8	6	7	8	5	6	4	8	3



Input for normalization by responding country, size and industry

Respondent	Responding country	Company size category	Company industry category	Mean rating of all the countries by each responding country, size and industry	Standard deviation of all the countries by each responding country, size and industry
Resp. 1	Argentina	1	2	6.636	1.286
Resp. 2	Argentina	1	6	6.043	2.306
Resp. 3	Argentina	1	6	6.043	2.306
Resp. 4	Argentina	1	6	6.043	2.306
Resp. 5	Argentina	1	9	6.800	2.898
Resp. 6	Argentina	3	2	7.364	2.335
Resp. 7	Argentina	3	6	5.364	1.364
Resp. 8	Argentina	3	6	5.364	1.364
Resp. 9	Argentina	3	8	3.545	1.635
Resp. 10	Brazil	1	2	5.909	2.023
Resp. 11	Brazil	1	5	6.636	1.120
Resp. 12	Brazil	1	8	5.091	2.625
Resp. 13	Brazil	2	6	4.500	2.976
Resp. 14	Brazil	4	6	6.091	1.700

$$Z_{l,m} = \frac{(x_{l,m} - \bar{x}_{ijk})}{s_{ijk}}$$



Normalized Z score for each country

Respondent	Argentina	Brazil	Canada	Colombia	Mexico	U.S.	Belgium	Czech Republic	France	Germany	Greece
Resp. 1	-2.05	1.06	1.06	1.06	1.06	0.28	-0.49	-0.49	-0.49	-0.49	-0.49
Resp. 2	-2.19	0.41	0.85	-0.45	-0.02	1.28					
Resp. 3	-1.75	-0.45	0.85	-0.45	-0.45	0.85	-0.45	0.41	0.41	0.85	-1.75
Resp. 4	-0.89	1.28	0.85	-0.45	-0.02	1.28					
Resp. 5	0.07	1.10	0.41	-0.28		0.76	-1.31	-1.31	0.76	1.10	-1.31
Resp. 6	-1.44	-0.16	1.13	0.27	0.27	1.13	-0.16	-0.58	0.27	1.13	-1.87
Resp. 7	0.47	-0.27	-0.27	0.47	-0.27	-0.27	-0.27	1.20	-0.27	0.47	-1.00
Resp. 8	-1.73	-0.27	-0.27	-0.27	1.93	1.93	-1.00	-0.27	-1.00	1.93	-1.00
Resp. 9	0.89	1.50	0.28	-0.95	-0.95	0.28	-0.33	-0.33	-0.33	1.50	-1.56
Resp. 10	0.04	0.54	1.53	0.54	1.03	1.03	-0.94	-0.45	-0.94	-1.44	-0.94
Resp. 11	-1.46	0.32	1.22	-0.57	-0.57	0.32	1.22	-0.57	0.32	1.22	-1.46
Resp. 12	-0.03	1.11	0.73	-1.18	-0.80	1.11	-0.80	0.73	-0.42	1.11	-1.56
Resp. 13	0.17	-1.18	0.84	-1.18	-1.18	0.84			0.84	0.84	
Resp. 14	-0.64	0.53	1.12	-0.05	0.53	1.12	-0.64	-0.05	-1.23	1.12	-1.82

$$Z_{l,wl} = w_l \times Z_{lm}$$



Normalized, experience weighted Z score for each country $Z_{l,wl}$

Respondent	Argentina	Brazil	Canada	Colombia	Mexico	U.S.	Belgium	Czech Republic	France	Germany	Greece
Resp. 1	-0.51	0.27	0.27	0.27	0.27	0.07	-0.12	-0.12	-0.12	-0.12	-0.12
Resp. 2	-0.55	0.10	0.21	-0.11	0.00	0.32					
Resp. 3	-0.44	-0.11	0.21	-0.11	-0.11	0.21	-0.11	0.10	0.10	0.21	-0.44
Resp. 4	-0.22	0.32	0.21	-0.11	0.00	0.32					
Resp. 5	0.02	0.28	0.10	-0.07		0.19	-0.33	-0.33	0.19	0.28	-0.33
Resp. 6	-0.72	-0.08	0.56	0.14	0.14	0.56	-0.08	-0.29	0.14	0.56	-0.93
Resp. 7	0.35	-0.20	-0.20	0.35	-0.20	-0.20	-0.20	0.90	-0.20	0.35	-0.75
Resp. 8	-0.87	-0.13	-0.13	-0.13	0.97	0.97	-0.50	-0.13	-0.50	0.97	-0.50
Resp. 9	0.67	1.13	0.21	-0.71	-0.71	0.21	-0.25	-0.25	-0.25	1.13	-1.17
Resp. 10	0.01	0.13	0.38	0.13	0.26	0.26	-0.24	-0.11	-0.24	-0.36	-0.24
Resp. 11	-0.37	0.08	0.30	-0.14	-0.14	0.08	0.30	-0.14	0.08	0.30	-0.37
Resp. 12	-0.01	0.28	0.18	-0.29	-0.20	0.28	-0.20	0.18	-0.10	0.28	-0.39
Resp. 13	0.04	-0.29	0.21	-0.29	-0.29	0.21			0.21	0.21	
Resp. 14	-0.64	0.53	1.12	-0.05	0.53	1.12	-0.64	-0.05	-1.23	1.12	-1.82

$$CM_m = \frac{(\sum_{l=1}^n Z_{l,wl})}{n}$$



Average normalized, weighted scores

Country	Argentina	Brazil	Canada	Colombia	Mexico	U.S.	Belgium	Czech Republic	France	Germany	Greece
Average Normalized weighted Score	-0.23	0.16	0.26	-0.08	0.04	0.33	-0.21	-0.02	-0.16	0.41	-0.64

$$SCS_m = 1 + 9 \times \frac{CM_m - \min(CM_m)}{\max(CM_m) - \min(CM_m)}$$



Scores converted to 1-10 scale to give GMCI index

Country	Argentina	Brazil	Canada	Colombia	Mexico	U.S.	Belgium	Czech Republic	France	Germany	Greece
Scaled country score	4.52	7.13	7.24	4.98	6.17	7.84	4.50	5.71	4.64	7.98	1.00

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2013 Global Manufacturing Competitiveness Index study

The 2013 Global Manufacturing Competitiveness Index study is an initiative led by The U.S. Council on Competitiveness and Deloitte Touche Tohmatsu Limited's (DTTL) Global Manufacturing Industry group to learn how CEOs view the competitiveness of the manufacturing industry in different countries around the world. A global CEO survey, which generated responses from 552 CEOs and senior executives, offers perspectives on the most important factors that drive manufacturing industry competitiveness. The global survey results also helped to create a unique Global Manufacturing Competitiveness Index ranking the relative manufacturing industry competitiveness of countries and reflect how executives perceive this may change over the next five years. The in-depth study seeks to define excellence in manufacturing and draw out the implications for manufacturers in terms of the competencies required to develop and sustain an edge in a new competitive landscape. CEOs and executives were also asked to provide their views of the global economic conditions and government actions that can bolster competitiveness in the manufacturing industry.

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Definitions

- A. **Innovation Index score** is calculated using five innovation input measures — institutions, human capital and research, infrastructure, market sophistication, and business sophistication and two innovation output measures — knowledge & technology outputs and creative outputs.
- B. **Quality of Life index** scores a country across nine categories — cost of living, culture, economy, environment, freedom, health, infrastructure, safety and risk, and climate
- C. **Manufacturing Jobs Created per 100 People:** Calculations based on data from World Bank and EIU. Total manufacturing jobs were derived using Manufacturing Employment as % of Total Employment data from World Bank and total labor force data from EIU. Mfg. jobs created per 100 people were then calculated using the total mfg. jobs data and the population data from EIU.
- D. **PISA math and science scores** are the average scores out of 1000 for all students at the age of 15 years.
- E. **Patents granted per million population** is calculated based on data from World Intellectual Property Organization (WIPO) and the Economist Intelligence Unit (EIU)
- F. **The Environmental Performance Index (EPI)** evaluates countries on 22 performance indicators spanning ten policy categories that reflect facets of both environmental public health and ecosystem vitality. These policy categories include Environmental Health, Water (effects on human health), Air Pollution (effects on human health), Air Pollution (ecosystem effects), Water Resources (ecosystem effects), Biodiversity and Habitat, Forest, Fisheries, Agriculture, and Climate Change & Energy

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