Geographic assessment for aerospace manufacturing investment

August 2017

Aerospace manufacturing attractiveness rankings

pwc

Introduction

The aerospace and defense industry reported higher revenues and profits in 2016 compared with 2015. Demand for air travel increased by 6.3 percent in 2016, the second consecutive year above six percent and sixth consecutive year above five percent, which is consistent with the 20-year forecast,[1] far exceeding global economic growth expectations, and causing heightened demand for aircraft, engine, and parts manufacturing. Large commercial aircraft production has already increased more than 40 percent since 2011, with long term forecasts calling for further increases.[2] As aerospace companies pursue available opportunities to help satisfy demand, they are in the enviable position of being able to choose the most advantageous locations for business expansion.

This 2017 Aerospace Manufacturing Attractiveness Rankings is a qualitative framework that looks at all countries and states within the US to help provide aerospace companies with information to improve manufacturing supply chains, control costs, and plan for future growth. In this fourth edition of our analysis, we have improved and refined the ranking methodology to provide a more meaningful comparison of both countries globally and states within the US for aerospace manufacturing.

The 2017 index is based on a weighted score of category and subcategory rankings. Ranking categories include Labor, Infrastructure, Industry, Economy, Cost, Tax Policy, and Geopolitical Risk. As states share similar geopolitical risk, that category is excluded from the state rankings. Within each category, there are subcategories that provide additional data for our analyses. While both state and country rankings use comparable metrics, there are slight differences in each measure's relevance to the ranking and the availability of quantitative information. Country rankings rely on 32 unique measures obtained from seven different data sources; state rankings rely on 34 unique measures obtained from ten different data sources. The use of such a diverse dataset allows for optimal quality in the rankings. Individual users of this report may decide to weigh these factors differently than our methodology, depending on circumstances. Details on the methodology are described in the ranking methodology section.

We hope you find this year's aerospace attractiveness rankings informative and useful. We welcome your thoughts on our findings and their potential impact on your strategy.

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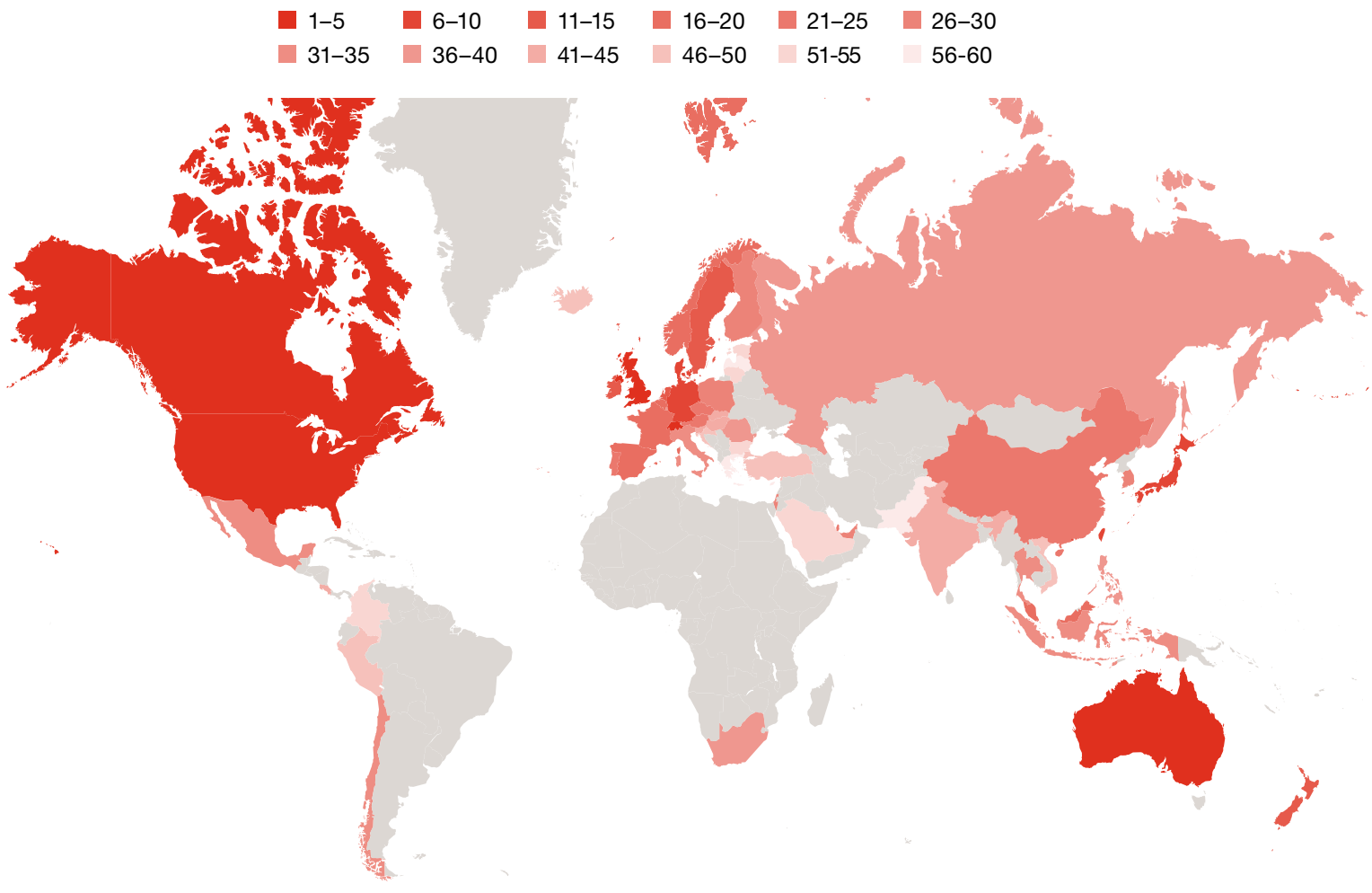
[1] PwC, "Aerospace & Defense 2016 Year in Review and 2017 Forecast", June 2017.

[2] Ibid

Country rankings and commentary



This year's rankings place the United States in first place, followed by Switzerland, the United Kingdom, Australia, and Canada. New entrants to the top ten include Australia, Taiwan, and Denmark. Singapore, the Netherlands, and France dropped out of the top ten.

Top 10 countries by rank for aerospace attractiveness

Country	Overall Rank	Cost	Labor	Infra-structure	Industry	Geo-political Risk	Economy	Tax Policy
United States	1	11	2	6	1	2	16	36
Switzerland	2	18	9	11	18	5	7	18
United Kingdom	3	23	16	5	4	7	28	10
Australia	4	13	11	20	16	1	17	25
Canada	5	24	8	13	8	13	26	17
Taiwan	6	7	6	17	22	18	14	30
Hong Kong	7	16	18	1	18	39	20	3
Japan	8	8	3	10	6	10	12	70
Denmark	9	5	13	8	51	25	15	7
Germany	10	19	7	6	5	4	38	48

United States

The United States consistently places first in the aerospace manufacturing rankings as a result of the aerospace industry's significant scale, supported by a relatively strong economy, robust air transportation infrastructure, and active defense posture. Within the Industry category, the United States was first in industry size and maturity, as the country continued to have the highest proportion of global aircraft and spacecraft sales[3] and defense spending. Accordingly, the United States' performance in Industry far exceeded that of other countries in the analysis. The United States also placed high in the Labor, Geopolitical Risk, and Infrastructure categories, but fell short on Tax Policy.

The United States is known to have 1,710 aircraft, engine, and parts manufacturing companies and $212 billion in annual revenue.[4] While we cannot directly compare this year's methodology with the prior year, the United States improved its rankings in the Infrastructure and Cost categories.

Switzerland

Switzerland moved up five spots to take second place in the rankings this year. It ranked well in the Geopolitical, Economy, and Labor categories. Within the Economy category, Switzerland ranked first in the subcategories of Interest Rates and fourth in Outside Investment. Centrally located to provision the European aerospace markets, Switzerland was a key supplier to the Middle East and continued to be a prime location for business aviation as well as maintenance, repair and overhaul (MRO) operations.

Despite its relatively small size, the country hosts two notable global aerospace manufacturers, RUAG and Pilatus. Headquartered in Bern, RUAG is a leading supplier of aircraft components and services in both aerospace and defense, with 8,734 employees and annual turnover nearly $2 billion USD. Pilatus, a smaller company in total employment, specializes in production related to business jets and single-engine turboprops.

United Kingdom

The United Kingdom fell from second to third place this year as a result of a decline in the Cost and Economy categories. These results may be related to uncertainties surrounding BREXIT, including the possibility that the United Kingdom will face more restricted supply chains as the country separates from the European Union. Even so, as of 2016, the United Kingdom still received the benefits of a powerful wave of prior investments. The industry had £31 billion turnover, £27 billion in exports, and a growth rate of 39 percent during the last 5 years.[5]

This past year, Boeing opened a £20 million production facility in Sheffield to manufacture components for the company's next-generation aircraft, and Rolls-Royce announced plans to invest more than £30 million to manufacture a range of aerospace discs for in-service engines. In addition, Boeing announced its plans to invest £3 billion in the United Kingdom, creating 2,000 jobs and doubling its workforce there.[6]

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[3] IHS Markit Ltd, "Aircraft & Spacecraft Industry Outlook", February 2017.

[4] IBSWorld, "Aircraft, Engine & Parts Manufacturing in the US: Market Research Report", January 2017.

[5] ADS, "UK Aerospace Outlook Report 2016," July 28, 2016.

[6] Russell Hotten, "Boeing signs £3bn deal for nine marine patrol planes," BBC News, July 11, 2016.

Australia

Australia ranked fourth overall, an improvement of 14 places from last year, ranking first in Geopolitical Risk, and eleventh in Labor. The country benefited from low strategic, political, and sovereign risk as well as a predictable climate. Also helpful was the country's top ranking in Basic Education, a subcategory of Labor.[7]

IBISWorld reports[8] that aircraft manufacturing and services revenue in Australia has increased over the past 5 years as a result of a surge in exports, primarily due to the United States and France; Australian parts are key components of the Boeing 787 Dreamliner and the Airbus A380. Currently, major aircraft manufacturing companies, such as Boeing, Airbus, and BAE Systems have facilities in Australia, making it an attractive location for new manufacturing investment.

Canada

While Canada dropped two places in this year's rankings, it still came in fifth overall. According to IBISWorld, Canada's aircraft, engine, and parts manufacturing industry includes 440 companies, with annual revenues of $21 billion.[9] Bombardier, headquartered in Quebec, is continuing to expand its relationship with the Commercial Aircraft Corporation of China (Comac). In recent news, Bombardier reportedly held talks with Comac about a potential investment in Bombardier's commercial aerospace division.[10] Bell Helicopter and United Technologies Corporation also have a large presence in Canada and provide a sound foundation for the future of Canadian aerospace manufacturing.

Considerations for your business

Demand for aircraft continued to be strong in most regions of the world, but especially in rapidly growing markets in Asia Pacific. This region, with a burgeoning middle class and a large and growing population, offers significant opportunities for US aircraft manufacturers and can drive both international and domestic expansion. However, since some global markets pose significant risk, US companies can mitigate this risk by considering each country's specific regulations, tax policies, and intellectual property protection laws. Also, companies need to address human resource issues, such as talent recruitment, training, and retention, which require knowledge of cultural norms and sensitivities. These risks have to be measured against the soundness of offshoring to extend supply chains overseas. In recent years, some companies have moved to re-shore all or part of their supply chain as domestic business conditions have become more competitive. To support this new resurgence in American aerospace manufacturing, companies, educators, and policy makers need to promote the skills and policies that will foster investment growth in the US.

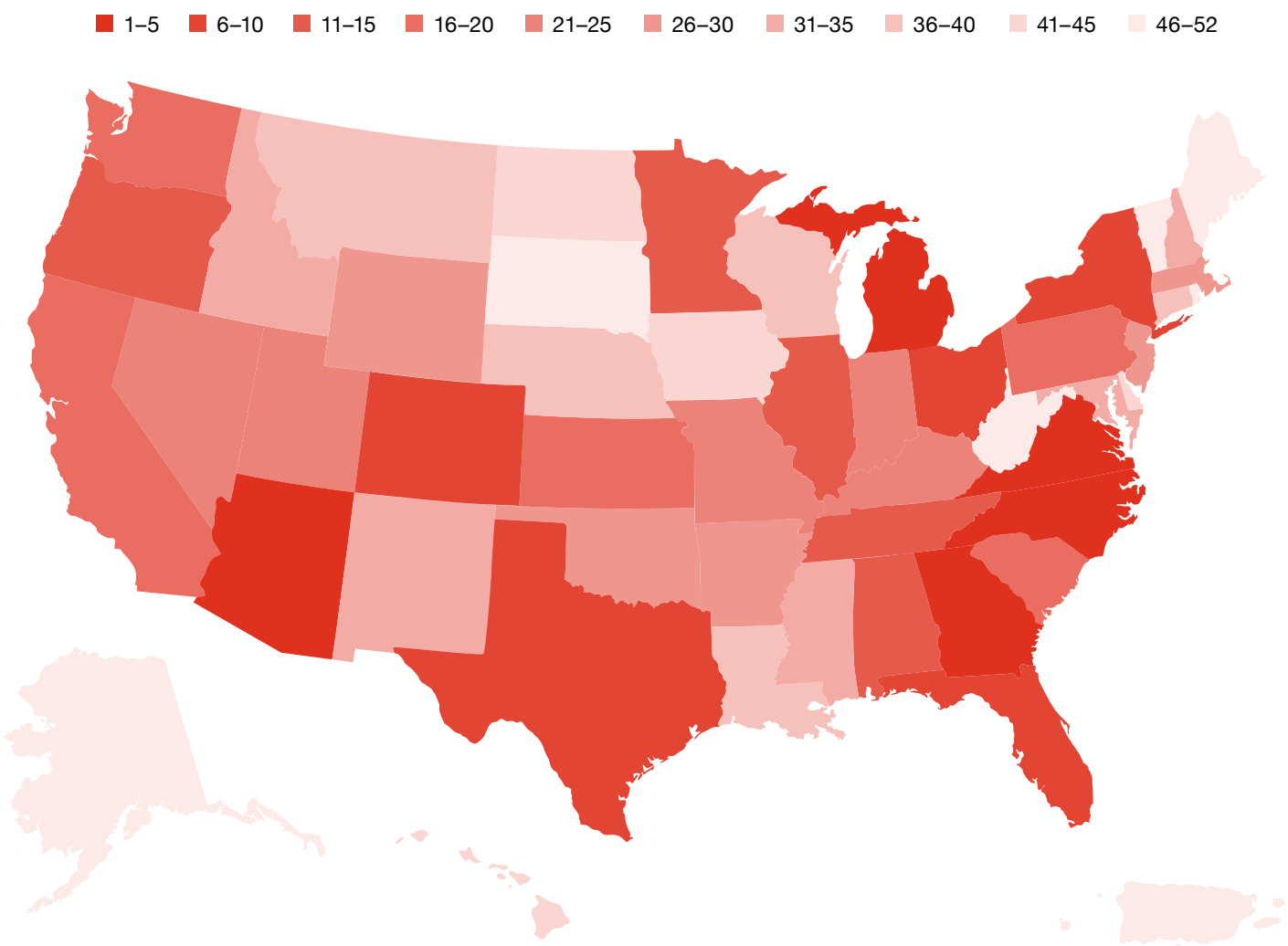
7 World Economic Forum, "The Global Competiveness Report 2016-2017," September 28, 2016.

8 IBSWorld, "Aircraft Manufacturing and Repair Services in Australia", January 2017.

9 IBSWorld, "Aircraft, Engine & Parts Manufacturing in Canada: Market Research Report," May 2017.

10 Alicja Siekierska, "Bombardier in talks with Chinese aircraft manufacturer for potential investment: report," Financial Post, May 18, 2017.

State rankings and commentary



There were several significant movements in the state rankings this year. In particular, Georgia took first place, Michigan second, and Arizona third. North Carolina reentered the top ten, placing fourth. Meanwhile, Florida fell four ranks to sixth place, while Virginia and New York jumped into the top ten for the first time in the past four years. Washington and Indiana fell out of the top ten, while Utah and Missouri dropped out of the top ten rankings, partly as a result of changes in the methodology. While rank improvements and reductions can be attributed to a variety of industry dynamics and manufacturing investments, many movements are the result of refinements to the ranking methodology. Below is a closer look at a few notable industry initiatives among the top 10 states.

Top 10 states by rank for aerospace manufacturing attractiveness

State	Overall Rank	Cost	Labor	Infra-structure	Industry	Economy	Tax Policy
Georgia	1	10	19	12	4	7	20
Michigan	2	7	28	4	11	3	25
Arizona	3	21	23	6	5	24	4
North Carolina	4	15	24	25	6	5	14
Virginia	5	23	6	13	23	20	12
Ohio	6	21	35	2	3	8	30
Florida	6	20	30	9	12	10	18
Colorado	8	35	3	7	28	30	2
Texas	8	28	33	11	1	5	27
New York	10	24	8	21	9	11	37

Georgia

Georgia moved up by two ranks to first place this year, mainly because of an improved ranking in the Industry category and a strong placement in the newly-added Economy category. Among the Economy subcategories, Georgia scored highly in Gross State Product (GSP), GSP Growth, and Level of Government Subsidies and observed the third largest GSP growth in 2016. Within Industry, Georgia ranked fourth as the home of over 500 aerospace companies, producing more than $8.44 billion in global aerospace exports annually.[11] Additionally, Georgia is close to space launch facilities. With these strengths, Georgia is continuing to attract investments in commercial aviation and space technology, with a focus on autonomous commercial aircraft, commercial space, and existing defense platforms.

Lockheed Martin Aeronautics in Marietta is home to the only US military cargo aircraft currently in production and the assembly site for the center wing box of the United States' newest fighter.[12] With recent revisions to defense budgets, these proven programs are poised for additional growth. On the commercial side, Gulfstream Aerospace Corp., a subsidiary of General Dynamics, continues to add a significant number of innovative options to modernize its iconic GIV and GV aircraft families, which have large manufacturing facilities in Savannah and Brunswick.[13] Pratt & Whitney, a division of United Technologies Corp, announced earlier this year that it will invest approximately $386 million in its Columbus facility to increase the production of parts and maintenance services and reduce costs for new and existing engine programs.[14]

Michigan

Michigan moved into second place in the rankings after falling to eighth place last year. This improvement is supported by the state's strong performance in the Economy, Infrastructure, and Cost categories. Looking at the subcategories in Economy, Michigan ranked third in the Consumer Price Index (CPI), sixth in Exports, and seventh in Manufacturing Output. In the Costs subcategories, Michigan ranked second in Labor Productivity and sixth in the Cost of Materials. In Tax Policy, Michigan showed a slight improvement in the rankings, most likely a reflection of its policy to phase out personal property tax for most businesses. In Infrastructure, the state's ranking was bolstered by the Quality of Electricity Supply.

The Michigan Aerospace Manufacturing Association continues to support the industry through research and development in the aerospace supply chain. While identifying opportunities for cost savings, the association has taken a proactive stance in the development of additive manufacturing technology and battery logistics. These efforts have helped attract investment in Michigan's aerospace industry. In particular, AE Industrial Partners acquired Michigan-based Moeller Aerospace in 2016.

[11] Georgia Department of Economic Development, Aerospace, http://www.georgia.org/industries/aerospace.

[12] Georgia Department of Economic Development, "New frontiers for Georgia Aerospace in 2016," February 18, 2016.

[13] General Dynamics press release, "Gulfstream Continues to Invest in GIV and GV Aircraft Families," October 31, 2016.

[14] Pratt & Whitney press release, "Pratt & Whitney Expanding Business in Columbus, Georgia, to Meet Increased Demand," February 14, 2017.

Arizona

Arizona came in third this year, a decline of two places, but maintained a strong attraction for aerospace manufacturing. It continues to have an ideal climate for aircraft testing and space observation, one of the best transportation infrastructures, and a tax policy congenial to business.

According to the Arizona Commerce Authority, the state currently houses 1,200 aerospace and defense companies, showing a large network of suppliers that can serve aerospace manufacturing. Last year, there were two M&A transactions that supported Arizona's ranking; Mesa-based Able Aerospace was acquired by Textron for an undisclosed amount, and TriMas acquired Parker Hannifin's Tolleson facility which manufactures complex machined parts for the aerospace industry. Additionally, large investments from non-aerospace companies, such as from the Intel Corporation, indicate the state has a general appeal to manufacturers.[15]

North Carolina

The birthplace of aviation climbed 14 spots to rank as the fourth most attractive state in this year's study. North Carolina had the fifth best Economy metrics, the sixth best Industry metrics, and above average Tax Policy (it has the lowest corporate income tax rate in the US). With respect to Infrastructure, the state benefits from deep-water seaports, an extensive rail network, and low electricity rates. In Industry, the state has strong aerospace sales, margins, and maturity and is considered to have the largest manufacturing workforce in the Southeast.

The Economic Development Partnership of North Carolina notes the state has lower labor costs than traditional aerospace hubs, such as California and Washington, and the second lowest unionization rate in the US. A recent indication of the state's appeal is that Los Angeles-based DAE Systems will be relocating to North Carolina, investing more than $6.8 million over the next three years.[16]

Virginia

Virginia jumped into the top ten this year, placing fifth in the overall state rankings. The state ranked sixth in the Labor category because of the presence of skilled workers and higher education institutions. Langley holds one of the country's largest populations of military personnel and its NASA research center provides highly skilled expertise in aeronautics.

According to the Virginia Economic Development Partnership, the state is home to 287 aerospace firms and ranks first in the nation for US Department of Defense Prime Contracts. Recent news that Boeing's venture capital arm will invest in an augmented reality software firm based in Virginia support the state's upward movement in the rankings.[17]

New York

New York jumped to tenth place this year, driven by a strong performance in the Labor, Industry, and Economy categories. The state

[15] McKinnon, J., Greenwald, T., Ballhaus, R., "Intel Corp. Announces $7 Billion Investment in Arizona Plant," The Wall Street Journal, February 28, 2017.

[16] Business Facilities, "Aerospace Manufacturer Moving To North Carolina", July 19, 2016.

[17] Michael Hoffman, "New Boeing Venture Arm Invests in Virginia Augmented Reality Firm", Tandem NSI, April 19, 2017.

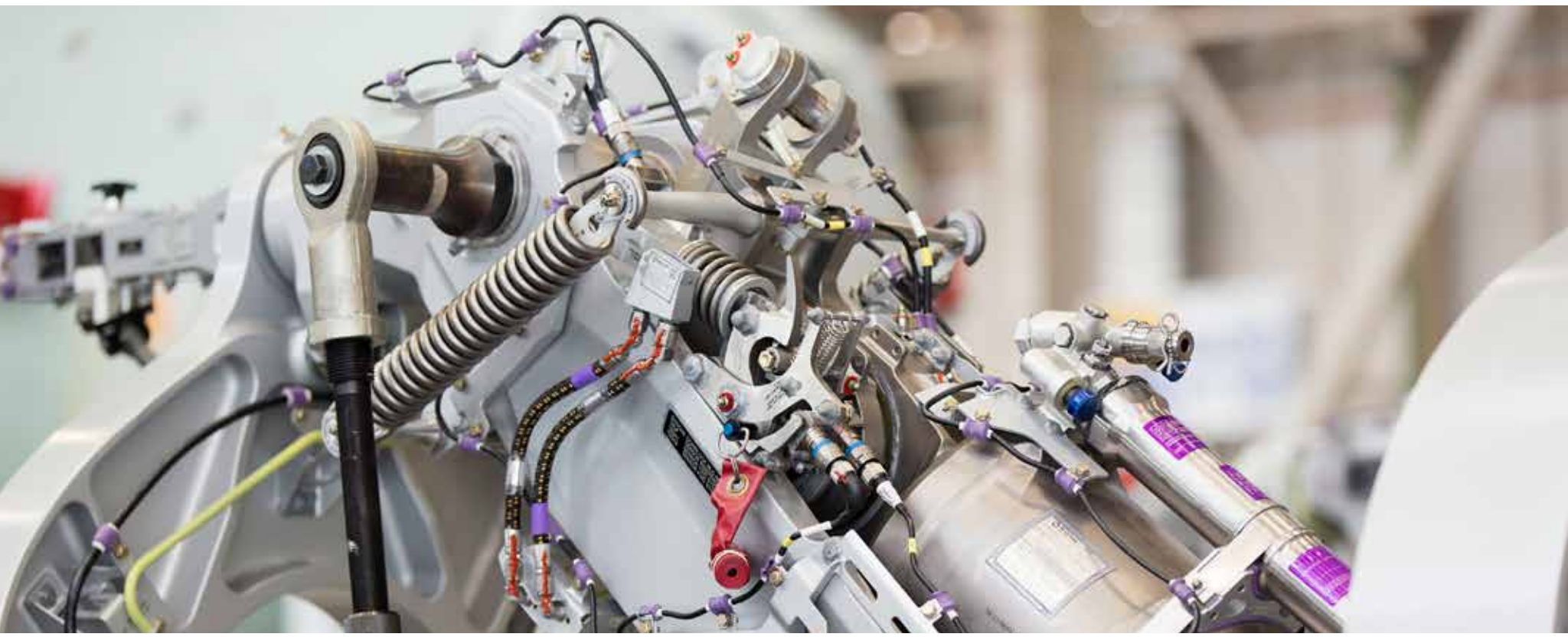
performed well in Labor and Economy as a result of its position as a global economic center. Also, New York has become more attractive to industry as a whole due to its role as a technology center. Recently, Magellan Aerospace acquired Ripak, an aerospace processing facility located on Long Island.

Selected ranking declines

Several states dropped out of the top ten including Washington, Indiana, Utah, and Missouri. Most interestingly, Washington fell back to sixteenth place. Although Boeing's commercial aircraft business is headquartered there, the state does not perform well in the Cost, Infrastructure, and Tax Policy categories. Other states fell short on a variety of different measures in key categories. For example, Florida fell from second to seventh place this year because of lower rankings in the Cost and Labor categories. It is possible that after receiving substantial aerospace investment in recent years, the state is experiencing talent constraints, which is exerting upward pressure on wages. Additional detail on state rankings is provided in the appendix.

Considerations for your business

The category of education is critical not only for companies trying to meet today's demands, but in ensuring tomorrow's workforce can help build the next generation of more efficient, sustainable aircraft. An educated, technology-savvy, and diversified workforce is essential for maintaining US competitiveness in commercial aviation manufacturing. Some companies are actively participating in the process of preparing the future workforce. A good example is Utah, which announced the expansion of the Utah Aerospace Pathways program to a second school district. The program provides students in their last year of high school with the opportunity to begin training for an aerospace manufacturing certification. After students earn their certification, they can begin work with one of the program's aerospace partners in Utah. Seven aerospace companies have been involved in developing the program.



Appendix
Ranking Methodology

Ranking calculations

The 2017 country and state rankings were carefully determined through the simple addition of seven category ranks. The category ranks were all weighted evenly, although the measures used to determine category ranks were weighted to account for relevance and the availability of quantitative information. Measure weights were determined through a collaboration between client service professionals and the industry analyst at PwC and can be found in the "Measure Weights for Country and State Rankings" section. Measures with null values were given the lowest possible rank. The formulas below were used to compute the ranking calculations:

Provided:

Measure Value

Measure Weight

Calculations:

$$\text{Rank}_{\text{Measure i}} = \text{Rank}\,[\,\text{Measure Value}\,]$$

$$\text{Score}_{\text{Measure i}} = \text{Weight}_{\text{Measure i}} \times \text{Rank}_{\text{Measure i}}$$

$$\text{Rank}_{\text{Category n}} = \text{Rank}\,[\,\text{Score}_{\text{Measure 1}} + \text{Score}_{\text{Measure 2}} + \ldots + \text{Score}_{\text{Measure i}}\,]$$

$$\text{Final Country Rank} = \text{Rank}\,[\,\text{Rank}_{\text{Category 1}} + \text{Rank}_{\text{Category 2}} + \ldots + \text{Rank}_{\text{Category n}}\,]$$

Data resources

Seven public and private independent data sources were used in calculating the 2017 country rankings. Paid-for subscriptions included IHS and S&P and public domain information was obtained from global associations such as Germanwatch and the World Economic Forum. PwC's "Paying Taxes 2017" report provided thorough data for the Tax Policy category.

Methodology changes

The number of measures used to determine the 2017 country rankings increased by 200% compared to the previous year. The country rankings combined a total of 33 metrics into seven categories: Cost, Labor, Infrastructure, Industry, Geopolitical Risk, Economy, and Tax Policy.

Measure selection

The measures used in the 2017 Aerospace Manufacturing Attractiveness Rankings came from "Facility Location Selection for Global Manufacturing."[18] In cases in which we were unable to obtain detailed data for measures in the report, we used proxy measures. The following illustrations show the detailed breakouts of country and state rankings used in the 2017 rankings:

Measures used in country rankings

Labor	Infrastructure	Industry	Economy	Cost	Tax Policy	Geo-Political Risk
Labor Force Total country labor force	**Quality of Roads** Quality of roads	**Industry Size** Total aircraft and space-craft sales	**GDP** Real gross domestic product (GDP)	**Operating Expense** Aerospace operating expenditures as a percent of sales	**Overall Tax Ranking** Based on PwC's overall tax ranking in their annual "Paying Taxes" publication	**Population** Average annual population
Basic Education Quantity of education	**Quality of Railroads** Quality of railroad infrastructure	**Industry Maturity** Total aircraft and spacecraft consumption	**GDP Growth** Real GDP growth	**Capital Expense** Aerospace capital expenditures as a percent of sales		**Population Growth** Annual population growth
Skilled Education Quality of math and science education	**Quality of Air Infrastructure** Available airline seat kilometers per week		**FDI** Net Foreign Direct Investment (FDI), net capital inflow	**Trend in Opex** Annual change in aerospace operating expenditures		**Strategic Risk** Overall strategic risk rating
Advanced Education Availability of scientists and engineers	**Internet Usage** International internet bandwidth, kb/s per user		**Internet Rates** Interest rate policy	**Trend in Capex** Annual change in aerospace capital expenditures		**Political Risk** Overall political risk rating
Union Flexibility Cooperation on labor employer relations	**Quality of Electric Supply** Quality of electricity supply		**Debt** Current account balance as a % of GDP	**Labor Cost** Unit labor costs index		**Sovereign Risk** Credit risk rating
	Quality of Port Infrastructure Quality of Port Infrastructure		**Inflation** Aircraft and spacecraft depreciation	**Labor Productivity** GDP-to-employed labor force		**Climate Risk** Climate risk index

[18] Kalantari, A.H. "Facility Location Selection for Global Manufacturing," UWM Digital Commons at the University of Wisconsin Milwaukee, August 2013. Website: http://dc.uwm.edu/cgi/viewcontent.cgi?article=1238&context=etd

Measures used in state rankings

Labor	Infrastructure	Industry	Economy	Cost	Tax Policy	Geo-Political Risk
Labor Force Production workers annual hours for aerospace mfg.	**Quality of Roads** Road condition by average roughness	**Market Size** Total value of aerospace shipments & rcpts.	**GDP** Real gross state product (GSP)	**Energy Cost** Average Price of electricity to ultimate customers	**Individual Income Tax** State individual income tax rate @ $75K	**Not Relevant at the State level**
Basic Education % of people over 25 who have completed high school	**Quality of Railroads** Number of freight railroads by class	**Market Profit Margin** Total value added in aerospace products and parts mfg.	**GDP Growth** Real GSP growth	**Transportation Cost** Transportation expenditures by State & Local Gov'ts	**Corporate Income Tax** Maximum corporate income tax rate	
Skilled Education % of people over 25 who have completed a bachelor's degree	**Quality of Air Infrastructure** Public and private airports, heliports and seaplane bases	**Market Maturity** Manufacturing share of total gross state product	**CPI** Consumer Price Index	**Labor Cost** Annual payroll for Aerospace product and parts mfg.	**State Sales Tax** State sales tax	
Advanced Education % of people over 25 who have completed an advanced degree	**Internet Usage** % of house-holds with a broadband internet subscription	**Market Growth** Growth in manufactured goods exports	**Government Subsidies** Subsidies for durable goods manufacturing	**Labor Productivity** Industrial production index for total manufacturing	**Local Sales Tax** Average local sales tax	
Union Flexibility Union membership rates by state	**Quality of Electric Supply** Number of major disturbances and unusual occurrences	**Number of Companies** Number of aerospace and defense firms	**Manufacturing Output** Total manufacturing output	**Construction Cost** Total cost over created value of construction	**Gasoline Tax** Total state gasoline tax rates	
		Number of Suppliers Number of manufacturing firms	**Value of Exports** Total value of manufactured goods exports	**Cost of Materials** Total cost of materials for aerospace mfg.	**Property Tax** Property taxes/ owner-occupied housing value	

Appendix

Category weights and reference metrics

Country metrics

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Cost	Opex/Sales	(Aircraft & Spacecraft—Operating Expenditures)/(Aircraft & Spacecraft—Sales)	IHS Aircraft & Spacecraft Industry Outlook February 2017	17%	100%
	Capex/Sales	(Aircraft & Spacecraft—Capital Expenditures)/(Aircraft & Spacecraft—Sales)	IHS Aircraft & Spacecraft Industry Outlook February 2017	17%	
	Trend in Opex	Aircraft & Spacecraft—Operating Expenditures Percent Change	IHS Aircraft & Spacecraft Industry Outlook February 2017	17%	
	Trend in Capex	Aircraft & Spacecraft—Capital Expenditures Percent Change	IHS Aircraft & Spacecraft Industry Outlook February 2017	17%	
	Labor Cost	Index: Unit Labor Costs, US$ basis	IHS Global Economics February 15, 2017	9%	
	Labor Productivity	Labor Productivity: GDP-to-Employed Labor Force, US$	IHS Global Economics February 15, 2017	22%	
Labor	Labor Force	Labor Force	IHS Global Economics February 15, 2017	16%	100%
	Basic Education	Sum of Quantity of education	WEF Global Competitiveness Index 2017	21%	
	Skilled Education	Sum of Quality of math and science education, 1-7 (best)	WEF Global Competitiveness Index 2017	21%	
	Advanced Education	Sum of Availability of scientists and engineers, 1-7 (best)	WEF Global Competitiveness Index 2017	21%	
	Union Flexibility	Sum of Cooperation in labor-employer relations, 1-7 (best)	WEF Global Competitiveness Index 2017	21%	
Infra-structure	Quality of Roads	Sum of Quality of roads, 1-7 (best)	WEF Global Competitiveness Index 2017	17%	100%
	Quality of Railroads	Sum of Quality of railroad infrastructure, 1-7 (best)	WEF Global Competitiveness Index 2017	17%	
	Quality of Port Infrastructure	Sum of Quality of port infrastructure, 1-7 (best)	WEF Global Competitiveness Index 2017	17%	
	Quality of Air Infrastructure	Sum of Available airline seat km/week, millions*	WEF Global Competitiveness Index 2017	17%	
	Internet Usage	Sum of Int'l Internet bandwidth, kb/s per user*	WEF Global Competitiveness Index 2017	17%	
	Quality of Electricity Supply	Sum of Quality of electricity supply, 1-7 (best)	WEF Global Competitiveness Index 2017	17%	
Industry	Industry Size	Aircraft & Spacecraft—Sales	IHS Aircraft & Spacecraft Industry Outlook February 2017	50%	100%
	Industry Maturity	Aircraft & Spacecraft—Consumption	IHS Aircraft & Spacecraft Industry Outlook February 2017	50%	

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Geo Political Risk	Population	Population: Total	IHS Global Economics February 15, 2017	17%	100%
	Population Growth	Population: Growth Rate	IHS Global Economics February 15, 2017	19%	
	Strategic Risk	Overall Strategic Risk	IHS Country Risk Ratings February 15, 2017	20%	
	Political Risk	Overall Political Risk	IHS Country Risk Ratings February 15, 2017	20%	
	Sovereign Risk	Credit Risk Rating	S&P Capital IQ February 15, 2017	7%	
	Climate Risk	Climate Risk Index	Germanwatch Climate Risk Index 2017	17%	
Economy	Outside Investment	BOP Direct Investment Balance or Net FDI (Net Capital Inflow), % of GDP	IHS Global Economics February 15, 2017	15%	100%
	Interest Rates	Interest Rate: Policy	IHS Global Economics February 15, 2017	15%	
	Debt/GDP	Current Account Balance as a % of GDP	IHS Global Economics February 15, 2017	17%	
	Inflation	Aircraft & Spacecraft—Depreciation	IHS Aircraft & Spacecraft Industry Outlook February 2017	8%	
	GDP	Real GDP (Gross Domestic Product), US$	IHS Global Economics February 15, 2017	23%	
	GDP Growth	Real GDP, Growth Rate, Year-on-Year	IHS Global Economics February 15, 2017	22%	
Tax Policy	Overall Tax Ranking	Overall Tax Ranking	PwC Paying Taxes 2017	100%	100%

State

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Cost	Energy Cost	Average Price of Electricity to Ultimate Customers by End-Use Sector, Industrial	EIA Electric Power Monthly (January 2017 and 2016 Data)	25%	100%
	Transportation Cost	Transportation Expenditures by State and Local Governments, Total	DOT BTS State Transportation Statistics	5%	
	Labor Cost	Aerospace product and parts manufacturing—Annual Payroll	US Census Bureau—American Fact Finder	25%	
	Labor Productivity	Industrial Production Index, Total Manufacturing	IHS US Regional Economics 2017	25%	
	Construction Cost	NAICS 023 Construction—Total Costs/Total Value Created	US Census Bureau—American Fact Finder	5%	
	Cost of Materials	Aerospace product and parts manufacturing—Total Cost of Materials	US Census Bureau—American Fact Finder	15%	
Labor	Labor Force	Aerospace product and parts manufacturing—Production Workers Annual Hours	US Census Bureau—American Fact Finder	10%	100%
	Basic Education	Percent of people 25 years and over who have completed high school (includes equivalency)	US Census Bureau—American Fact Finder	5%	
	Skilled Education	Percent of people 25 years and over who have completed a bachelor's degree	US Census Bureau—American Fact Finder	40%	
	Advanced Education	Percent of people 25 years and over who have completed an advanced degree	US Census Bureau—American Fact Finder	40%	
	Union Flexibility	Union Membership Rates by State	Bureau of Labor Statistics—Data Finder 9.0	5%	
Infra-structure	Quality of Roads	Table 1-4: Road Condition	DOT BTS State Transportation Statistics	25%	100%
	Quality of Railroads	Table 1-13: Number of Freight Railroads by Class	DOT BTS State Transportation Statistics	15%	
	Quality of Air Infrastructure	Table 1-10: Public and Private Airports, Heliports and Seaplane Bases	DOT BTS State Transportation Statistics	20%	
	Internet Usage	Percent of Households with a Broadband Internet Subscription	US Census Bureau—American Fact Finder	15%	
	Quality of Electricity Supply	Major Disturbances and Unusual Occurrences	DOE Office of Electricity Delivery & Energy Reliability	25%	

Category	Sub-Category	Reference Metric	Source	Weight	Category Sum
Industry	Industry Size	Aerospace product and parts manufacturing—Total value of shipments and receipts for services	US Census Bureau—American Fact Finder	25%	100%
	Industry Profit Margin	Aerospace product and parts manufacturing—Value added	US Census Bureau—American Fact Finder	5%	
	Industry Maturity	Mfg share of total GSP (2014)	NAM Manufacturing Data Table (2016)	5%	
	Industry Growth	Growth in Manufactured Goods Exports (2010-2015)	NAM Manufacturing Data Table (2016)	25%	
	Number of Companies	Aerospace and Defense Firms	Capital IQ Company Screening Report	20%	
	Number of Suppliers	Manufacturing Firms (2013)	NAM Manufacturing Data Table (2016)	20%	
Economy	GDP	Real Gross State Product (GSP)	IHS US Regional Economics 2017	10%	100%
	GDP Growth	Real GSP Growth	IHS US Regional Economics 2017	20%	
	Consumer Price Index	Consumer Price Index (CPI)	IHS US Regional Economics 2017	5%	
	Manufacturing Output	Total Manufacturing Output	IHS US Regional Economics 2017	30%	
	Exports	Manufactured Goods Exports	NAM Manufacturing Data Table (2016)	30%	
	Subsidies	Subsidies, Durable Goods Manufacturing	BEA—Regional Data 2017	5%	
Tax Policy	Individual Income Tax	State Individual Income Tax Rate @ $75K	Tax Foundation "Facts & Figures 2017"	10%	100%
	Corporate Income Tax	State Corporate income Tax Rate @ Max	Tax Foundation "Facts & Figures 2017"	40%	
	State Sales Tax	State & Local Sales Tax Rate—State Sales Tax	Tax Foundation "Facts & Figures 2017"	5%	
	Average Local Sales Tax	State & Local Sales Tax Rate—Average Local Sales Tax	Tax Foundation "Facts & Figures 2017"	5%	
	Gasoline Tax	State Gasoline Tax Rates—Total	Tax Foundation "Facts & Figures 2017"	20%	
	Property Tax	Property Taxes Paid as a percentage of Owner-Occupied Housing Value	Tax Foundation "Facts & Figures 2017"	20%	

Appendix

Complete country rankings

Country	Overall Rank	Cost	Labor	Infra-structure	Industry	Geo-political Risk	Economy	Tax Policy
United States	1	11	2	6	1	2	16	36
Switzerland	2	18	9	11	18	5	7	18
United Kingdom	3	23	16	5	4	7	28	10
Australia	4	13	11	20	16	1	17	25
Canada	5	24	8	13	8	13	26	17
Taiwan	6	7	6	17	22	18	14	30
Hong Kong	7	16	18	1	18	39	20	3
Japan	8	8	3	10	6	10	12	70
Denmark	9	5	13	8	51	25	15	7
Germany	10	19	7	6	5	4	38	48
Singapore	11	43	1	2	11	31	33	8
Sweden	12	25	21	14	24	20	2	28
Netherlands	13	4	5	3	25	9	71	20
Ireland	14	27	17	19	17	43	27	5
New Zealand	15	41	12	24	39	12	18	11
Spain	16	10	30	12	15	24	32	37
Norway	17	6	10	21	30	15	58	26
France	18	12	27	4	2	6	53	63
Malaysia	19	50	22	22	13	8	8	61
Belgium	20	3	14	15	27	23	67	66
Austria	21	14	15	23	56	11	61	42
Qatar	22	32	25	50	34	70	25	1
China	23	22	26	33	2	30	1	131
Portugal	24	1	29	16	51	33	81	38
Czech Republic	25	38	46	37	32	27	21	53
Finland	26	28	4	9	46	42	114	13
Poland	26	40	43	41	35	37	13	47
South Korea	28	9	35	18	9	174	4	23
United Arab Emirates	29	46	19	34	29	123	24	1
Israel	30	15	20	29	23	96	10	96
Indonesia	31	47	34	56	26	22	9	104
Italy	32	2	41	28	14	28	65	126
Thailand	33	51	40	44	37	29	6	109
Chile	34	29	31	30	37	26	47	120
Mexico	34	34	61	48	12	17	34	114
Russia	36	30	39	51	7	119	40	45
Philippines	37	49	49	84	20	14	3	115
Luxembourg	38	80	54	25	76	16	88	16
South Africa	39	26	112	32	32	56	50	51
Romania	40	42	51	69	54	53	41	50
India	41	37	45	45	28	36	5	172
Slovakia	42	39	76	64	47	46	49	56
Slovenia	43	70	36	39	76	38	96	24
Hungary	44	48	67	61	44	34	56	77
Costa Rica	45	54	33	83	59	54	43	62
Vietnam	46	44	65	59	41	3	19	167
Peru	47	20	95	71	59	32	31	105
Turkey	48	21	58	36	21	122	30	128
Iceland	48	108	37	47	76	57	62	29

Country	Overall Rank	Cost	Labor	Infra-structure	Industry	Geo-political Risk	Economy	Tax Policy
Croatia	50	84	68	38	76	55	48	49
Bulgaria	51	31	63	55	66	104	23	83
Saudi Arabia	52	63	28	26	43	156	46	69
Colombia	53	45	59	67	31	41	51	139
Lithuania	54	79	44	31	76	92	93	27
Estonia	55	78	24	42	76	87	115	21
Greece	56	17	32	35	49	133	128	64
Latvia	57	85	55	42	76	88	110	15
Cyprus	58	69	64	72	76	83	79	34
Bahrain	59	60	66	66	58	139	85	4
Pakistan	59	53	97	76	40	45	11	156
Panama	61	36	79	27	49	44	74	170
Morocco	62	66	81	40	64	131	59	41
Kenya	63	56	109	58	44	67	37	125
Mauritius	64	89	60	90	76	65	76	45
Ukraine	65	55	23	73	36	181	55	84
Iran	66	52	50	57	42	194	22	100
Oman	67	108	72	62	76	49	144	12
Brazil	68	35	91	79	10	64	64	181
Kazakhstan	69	87	53	63	76	85	102	60
Kuwait	70	71	113	86	57	172	29	6
Jordan	71	71	42	52	62	175	57	79
Argentina	72	33	74	78	48	48	89	178
Uruguay	73	64	106	60	72	35	103	113
Guatemala	74	108	75	109	76	52	45	93
Namibia	75	108	119	45	76	40	99	74
Sri Lanka	76	67	38	53	53	78	119	158
Azerbaijan	77	96	56	49	76	129	122	40
Bangladesh	78	71	80	96	69	63	39	151
Botswana	79	108	115	99	76	50	68	55
Mongolia	80	108	48	91	76	81	155	35
Macedonia	81	94	82	74	76	167	95	9
Georgia	82	100	98	54	76	153	105	22
Dominican Republic	82	108	96	101	76	21	77	129
Senegal	84	71	89	89	75	71	44	174
Ecuador	85	65	77	80	70	93	101	137
Zambia	85	108	116	111	76	72	82	58
Barbados	87	108	52	65	76	114	140	85
Ethiopia	88	108	124	88	76	94	66	90
Uganda	89	108	118	110	76	80	83	75
Honduras	90	68	84	114	73	99	63	152
Serbia	90	93	71	100	76	155	80	78
Cambodia	92	108	125	94	76	19	108	124
Ghana	93	108	70	105	76	95	84	122
Egypt	94	59	73	77	54	202	35	162
Albania	95	97	57	87	76	158	92	97
Jamaica	96	61	100	104	64	143	78	116
Montenegro	97	90	83	75	76	140	147	57
Bhutan	97	108	110	126	76	59	170	19
Cote d'Ivoire	99	108	107	68	76	103	36	175
Madagascar	100	108	92	118	76	51	112	117
Rwanda	101	108	99	121	76	62	154	59
Malta	102	108	69	85	76	142	175	33
Tunisia	103	58	108	69	61	188	104	106
Cameroon	104	71	90	122	74	116	42	180

Country	Overall Rank	Cost	Labor	Infra-structure	Industry	Geo-political Risk	Economy	Tax Policy
Nigeria	105	71	94	117	63	105	69	182
Tajikistan	106	104	62	97	76	136	87	140
Moldova	107	102	101	93	76	184	116	31
Brunei Darussalam	108	108	86	95	76	60	198	89
Armenia	108	99	47	82	76	203	117	88
Mozambique	110	108	137	112	76	66	118	112
Tanzania	111	108	132	102	76	86	72	154
Cape Verde	112	101	102	120	76	127	126	86
Paraguay	113	108	128	132	76	90	52	153
Venezuela	114	62	88	113	68	135	94	185
Algeria	115	91	85	81	76	201	60	155
El Salvador	116	98	114	103	76	89	106	166
Kosovo	117	88	146	139	76	128	134	43
Lebanon	118	108	78	125	76	193	113	67
Malawi	119	108	129	128	76	76	146	102
Mali	120	108	121	119	76	126	73	144
Trinidad and Tobago	121	108	87	92	76	166	97	145
Puerto Rico	122	81	144	139	76	97	100	135
Lao PDR	123	108	93	130	76	79	142	146
Belize	124	108	147	139	76	125	138	44
Bahamas	125	108	152	139	76	47	165	95
Bolivia	126	71	130	98	71	141	86	186
St. Lucia	127	108	152	139	76	84	161	65
Seychelles	128	108	152	139	76	134	148	32
Vanuatu	129	108	152	139	76	73	188	54
Bosnia & Herz.	130	86	105	106	76	163	127	133
Nicaragua	131	105	111	127	76	112	90	176
Myanmar (Burma)	132	108	152	139	76	68	136	119
Macau	133	108	152	139	76	61	75	190
Congo DR	134	108	120	131	76	146	54	177
Iraq	135	108	152	139	76	196	91	52
Solomon Islands	136	108	152	139	76	118	190	39
Angola	137	108	152	139	76	77	120	157
Uzbekistan	138	103	139	139	76	165	70	138
Kiribati	139	108	152	139	76	82	202	73
Nepal	140	108	126	133	76	124	124	142
Dominica	141	108	152	139	76	74	177	111
Grenada	142	108	152	139	76	100	133	132
Djibouti	143	108	152	139	76	115	145	106
Kyrgyz Republic	144	106	103	116	76	185	109	148
Micronesia	145	108	152	139	76	58	203	108
Benin	146	108	104	123	76	106	157	173
Papua New Guinea	147	108	152	139	76	109	173	94
Niger	148	108	140	139	76	69	158	165
Gabon	149	108	127	107	76	170	111	161
St. Vincent & Gren.	150	108	152	139	76	110	179	98
Zimbabwe	151	57	122	114	67	154	185	164
Tonga	151	108	152	139	76	113	195	80
Burkina Faso	153	108	152	139	76	108	132	150
Sierra Leone	153	108	134	135	76	151	174	87
Belarus	155	95	141	139	76	198	121	99
Antigua and Barbuda	156	108	152	139	76	98	137	160
Togo	156	108	152	139	76	91	135	169
South Sudan	158	108	152	139	76	157	172	68
Liberia	160	108	133	108	76	182	199	72

Country	Overall Rank	Cost	Labor	Infra-structure	Industry	Geo-political Risk	Economy	Tax Policy
Fiji	161	108	152	139	76	102	192	110
St. Kitts and Nevis	162	108	152	139	76	101	162	143
Lesotho	163	108	135	138	76	164	187	91
Yemen	164	108	136	137	76	199	156	92
Samoa	165	108	152	139	76	176	184	71
Sao Tome & Principe	166	108	149	139	76	183	125	127
Reunion	167	108	152	139	76	117	130	190
Swaziland	168	108	145	139	76	169	201	76
Eritrea	168	107	142	139	76	180	123	147
Burundi	170	108	131	134	76	138	205	123
Turkmenistan	171	92	143	139	76	178	98	190
Haiti	172	108	152	139	76	145	141	159
French Guiana	173	108	152	139	76	75	182	190
East Timor	174	108	152	139	76	144	176	130
Suriname	175	108	147	139	76	200	153	103
Afghanistan	175	108	152	139	76	107	181	163
Sudan	177	108	152	139	76	204	107	141
Marshall Islands	178	108	152	139	76	171	208	82
Palestinian Authority	179	108	152	139	76	205	163	101
Liechtenstein	180	108	152	139	76	120	160	190
Chad	180	108	138	136	76	130	168	189
Gambia	182	108	123	124	76	149	197	171
Maldives	183	108	152	139	76	162	180	134
Cayman Islands	184	108	152	139	76	121	166	190
Andorra	185	83	151	139	76	150	164	190
Congo	186	108	152	139	76	168	129	183
Anguilla	187	108	152	139	76	152	139	190
Bermuda	188	108	152	139	76	161	131	190
Guyana	188	108	152	139	76	187	159	136
Guinea-Bissau	190	108	152	139	76	186	149	149
Aruba	191	108	152	139	76	147	150	190
Syria	191	108	152	139	76	210	196	81
Mauritania	193	108	117	128	76	179	169	188
Comoros	194	108	152	139	76	173	151	168
Libya	195	108	152	139	76	209	167	121
Cuba	196	108	152	139	76	132	183	190
American Samoa	197	108	152	139	76	111	207	190
US Virgin Islands	198	82	150	139	76	148	200	190
Guinea	199	108	152	139	76	159	171	184
Guam	201	108	152	139	76	137	191	190
Central African Rep.	202	108	152	139	76	197	143	187
Sint Maarten (SXM)	203	108	152	139	76	207	152	190
Equatorial Guinea	203	108	152	139	76	192	178	179
Martinique	205	108	152	139	76	160	204	190
Tuvalu	206	108	152	139	76	189	189	190
Somalia	207	108	152	139	76	195	194	190
North Korea	208	108	152	139	76	206	186	190
Curacao	209	108	152	139	76	190	206	190
Curacao (CUW)	210	108	152	139	76	208	193	190

Appendix

Complete state rankings

State	Overall Rank	Cost	Labor	Infra-structure	Industry	Economy	Tax Policy
Georgia	1	10	19	12	4	7	20
Michigan	2	7	28	4	11	3	25
Arizona	3	21	23	6	5	24	4
North Carolina	4	15	24	25	6	5	14
Virginia	5	23	6	13	23	20	12
Ohio	6	21	35	2	3	8	30
Florida	6	20	30	9	12	10	18
Colorado	8	35	3	7	28	30	2
Texas	8	28	33	11	1	5	27
New York	10	24	8	21	9	11	37
Tennessee	11	4	39	16	24	12	16
Oregon	12	6	18	18	22	13	35
Alabama	13	19	44	10	8	23	11
Minnesota	14	11	13	1	26	21	47
Illinois	15	26	12	28	7	4	43
South Carolina	16	8	36	36	15	26	5
Washington	16	27	10	27	16	2	44
Pennsylvania	18	29	21	3	10	14	50
California	19	39	14	26	2	1	46
Kansas	20	32	15	5	19	32	31
Indiana	21	16	43	32	14	9	22
Utah	22	18	17	37	33	25	9
Missouri	23	42	27	22	18	17	15
Kentucky	24	3	45	42	21	22	13
Nevada	25	5	47	14	20	36	26
Massachusetts	26	33	1	39	25	19	34
Oklahoma	27	17	46	33	13	38	7
Arkansas	28	13	49	23	27	28	17
Wyoming	28	12	37	20	36	51	1
New Jersey	30	33	9	24	29	15	52
Mississippi	31	14	51	30	38	27	3
New Mexico	32	9	32	42	31	44	8
Maryland	33	43	4	19	30	33	39
Idaho	34	2	41	15	42	37	33
New Hampshire	35	31	7	34	37	35	36
Montana	36	1	26	44	44	48	21
Connecticut	37	41	2	48	17	29	49
Wisconsin	38	45	34	17	34	16	42
Louisiana	39	37	48	29	35	18	23
Nebraska	40	25	29	31	32	34	40
Delaware	41	40	20	41	40	39	28
Iowa	42	36	42	8	41	31	51
District of Columbia	43	38	5	51	51	45	32
Hawaii	44	45	22	50	39	43	24
North Dakota	44	50	37	35	46	49	6
South Dakota	46	47	40	38	45	47	10
Rhode Island	47	44	16	49	43	46	38
West Virginia	48	30	52	47	47	42	19
Vermont	49	51	11	45	50	41	45
Alaska	50	49	31	40	48	50	29
Maine	51	48	25	46	48	40	41
Puerto Rico	52	52	50	52	52	52	48

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