



Where to manufacture?

**Global analysis of the cost of
doing business**

KPMG International

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Foreword



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Across the globe, manufacturers are taking a critical look at their networks. Confidence in supply chains has been shaken; policy disputes and tariffs have undermined global trade; customer demands and expectations have shifted. Many manufacturers are asking whether their current production footprint is still optimal in the context of the new reality.

As they rethink their network, cost is coming under the microscope. What manufacturers increasingly recognize is that labor costs are only part of the overall cost of doing business that can vary from market to market. In fact, 'secondary costs' (those typically related to the business environment or ease of doing business) are often a better predictor of a market's overall cost of doing business than 'primary

costs' like labor. Yet quantifying those costs and their impact on a manufacturer's overall operations can be challenging.

To help support manufacturing executives as they assess different markets, KPMG collaborated with the Manufacturing Institute (MI) to see if a quantitative index of the cost of doing business (CoDB) across 17 key manufacturing markets in the developed and emerging markets could be developed.

To discuss the factors that influence your cost of doing business or to drill down into a specific market or strategy, we encourage you to contact your local KPMG firm or one of the contacts listed at the end of this report.

Key findings:

Country and jurisdiction rankings:

Canada ranked first for overall cost of doing business.



Asia-Pacific markets performed well, led by Taiwan, South Korea and Malaysia.

Traditional 'low-cost' markets like Mexico, India, China and Brazil returned higher-than-average cost of doing business results.



Cost impacts:

Secondary Cost Index performance is a strong predictor of overall cost of doing business.



Countries that do well on primary factors tend to perform poorly on secondary factors and vice versa.

Tax reform can have a significant impact on a country's relative ranking.



Changing world:

Many manufacturers are currently reassessing their supply chain costs and stability.

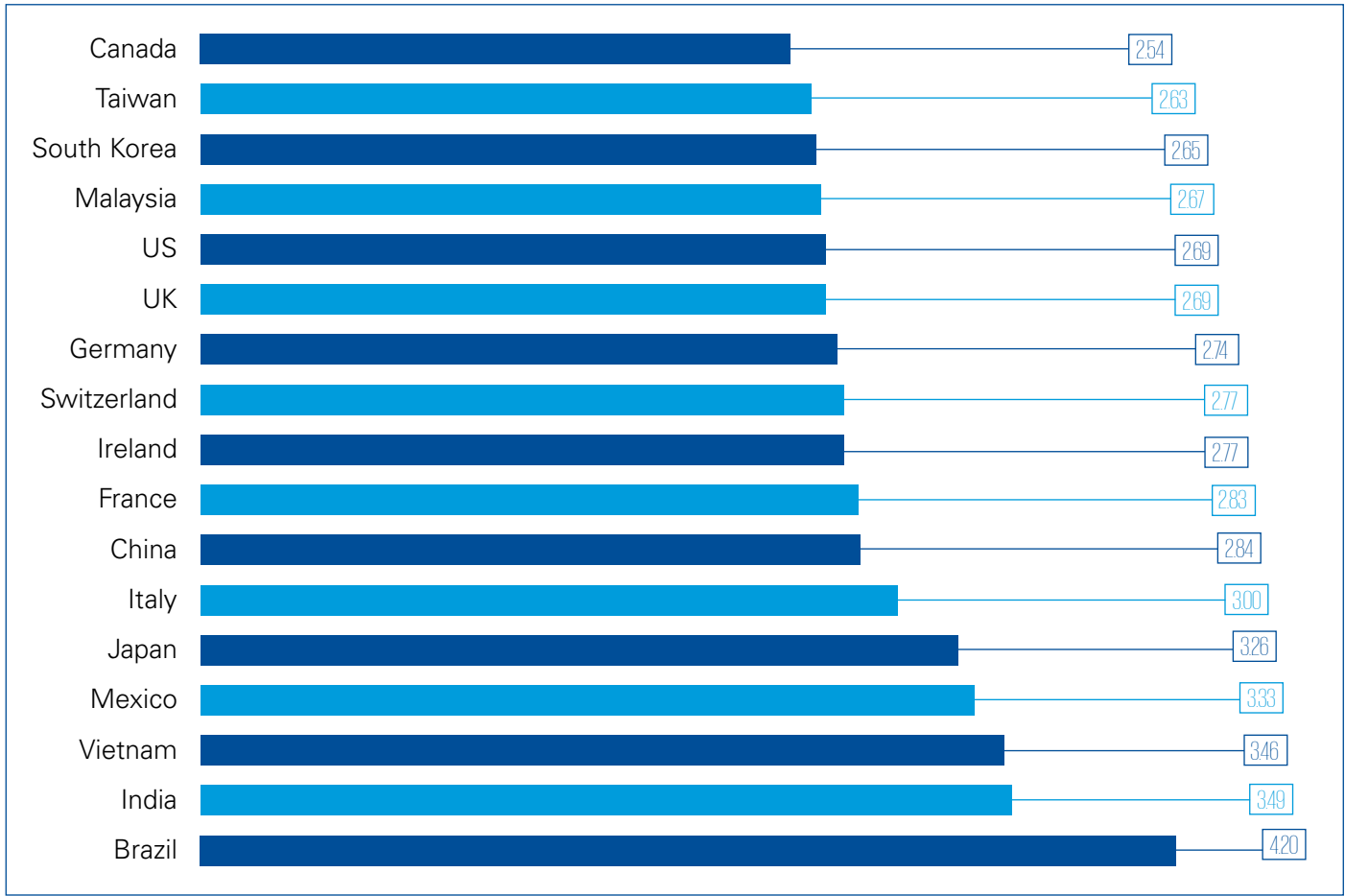


Exchange rates remain in flux, which can have a direct impact on costs.

Automation is changing the dynamics and value equation of certain markets and sectors.



CoDB Index score by country and jurisdiction



Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.



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This report is a result of a collaboration between KPMG and the Manufacturing Institute.

What are the costs of doing business?

Where to locate a production facility is an important strategic decision for a manufacturing company. The location decision can have a long-term impact on performance. The selection of a particular site (or country) requires more than just an assessment of labor costs. It requires the consideration of multiple factors, including the cost of setting up the facility, real estate costs, energy costs, the quality of the labor force and infrastructure, the regulatory environment, and intellectual property protections.

Companies consider a variety of CoDB factors when evaluating their international manufacturing location decisions. Our study considers the factors evaluated by companies at the country level and seeks to incorporate these into country-level rankings. A country's competitiveness is often judged by the cost of labor and an often cited motivation for moving manufacturing offshore (relative to higher-cost countries like the US) is the desire to gain access to low labor costs and to lower the cost of production. Studies, however, have indicated that a range of other factors go into the location selection decision.¹ The leading factors identified that contribute to the location decision are:

1. Availability of skilled labor
2. Cost and productivity of labor
3. Availability of and proximity to transportation infrastructure
4. Tax rates
5. Regulatory environment
6. Real estate costs
7. Availability and cost of power, communications, water, and other utilities
8. Access to and cost of capital
9. Transparency in government and business practices, and the ease of doing business

10. A politically and economically stable environment with ability to enforce legal and property rights

We compiled data on each of these factors, directly or through proxy measures, over the 2012 to 2019 time period for the 17 countries (see Appendix A for details). The selection of specific categories of costs to compare were guided by the surveys and studies we reviewed (see Appendix A for details). We note here that data for every cost element were not available for every country or not available for a recent time period. Thus, the cost types analyzed are those that could be obtained from public sources spanning 2012–2019, but we use only the most recent data in our analysis where available.

Given the large number of indicators being considered, we categorized these decision factors into two groups:

- **Primary costs** — Those that can be measured in cost terms (dollars or percentage, in the case of cost of capital and tax rates). These cost factors are more readily assessed and include expenses such as wages, utilities, real estate costs, and taxes.
- **Secondary costs** — Factors that impact overhead costs and the facility's ability to operate efficiently. The secondary factors are typically related to the business environment or the ease of doing business. For instance, they take into consideration the level of transparency in business and government processes, the legal protection of property rights, and the regulatory burden.

For primary cost factors, the specific measures we have included are:

- Labor costs — Hourly labor rates (including benefits)
- Utility costs — Energy costs
- Real estate costs — Lease costs for industrial/logistics locations
- Cost of capital — Borrowing interest rates
- Corporate tax rates.

¹ For a discussion of these factors see for example:

- a. B.L. MacCarthy and W. Atthirawong. "Factors Affecting Location Decisions in International Operations – a Delphi Study," *International Journal of Operations & Production Management*, 2003.
- b. C. Manning, M. Rodriguez and Chinmoy Ghosh. "Devising a Corporate Facility Location Strategy to Maximize Shareholder Wealth," *Journal of Real Estate Research*, 1999.
- c. F. Karakaya and C. Canel. *Underlying Dimensions of Business Location Decisions*, *Industrial Management & Data Systems*, 1998.
- d. S. Turhan, B.C. Ozbag and B. Cetin. "Factors Affecting Location Decisions of Food Processing Plants," *Journal of Applied Sciences*, 2007.
- e. M. Plaziak and A.I. Symanska. *Role of Modern Factors in the Process of Choosing a Location of the Enterprise*.

For secondary cost factors tied to the business environment and infrastructure, we considered a range of indicators reflecting the quality of labor, the ease of doing business, infrastructure, and risk and protections. The table below summarizes the measures and cost types considered.

Primary and secondary measures by subcategory

#	Measure	Cost type	Subcategory
1	Hourly compensation costs	Primary	-
2	Real estate costs	Primary	-
3	Utility costs	Primary	-
4	Corporate tax rates	Primary	-
5	Interest rates	Primary	-
6	Learning-adjusted years of schooling	Secondary	Quality of labor
7	Skill set of graduates	Secondary	Quality of labor
8	Real value added per employee	Secondary	Quality of labor
9	Days to start business	Secondary	Ease of doing business
10	Burden of government regulation	Secondary	Ease of doing business
11	Registering property	Secondary	Ease of doing business
12	Road Quality Index	Secondary	Infrastructure
13	Railroad quality	Secondary	Infrastructure
14	Airport connectivity	Secondary	Infrastructure
15	Liner Shipping Connectivity Index	Secondary	Infrastructure
16	Electric power losses (% of output)	Secondary	Infrastructure
17	Exposure to unsafe drinking water	Secondary	Infrastructure
18	Reliability of water supply	Secondary	Infrastructure
19	Access to internet/Wi-Fi	Secondary	Infrastructure
20	Political risk	Secondary	Risk and protections
21	Enforcing contracts	Secondary	Risk and protections
22	Protecting minority investors	Secondary	Risk and protections
23	Corruption Perception Index	Secondary	Risk and protections

Based on these indicators, we first developed separate indices, one for the primary costs and another for the secondary costs, and then combined the two to produce the CoDB Index, an overall competitiveness index. We adopted this approach to produce one common index by which to rank the countries with respect to CoDB while retaining the ability to explore how the primary and secondary costs influenced the overall rank.

Appendix A provides details on the sources from which the data on these measures were gathered.

Developing the Index

Since we are evaluating 23 factors — some that impact a manufacturing company's operations in a country directly and others more indirectly — it is challenging to draw cross-country inferences by evaluating each separate CoDB factor. Instead, we created a composite index that would jointly reflect the information provided by the various individual measures. We recognize that such an index will subsume a significant range of information across all the identified measures. To provide transparency and to allow further exploration to identify the set of factors driving a country's index level (and rank), we developed two indices — one for the primary cost factors and another for the secondary cost factors. Subsequently, we combined them to generate an overall index (the CoDB Index) to benchmark country performance. This allowed us to analyze the relative importance of each set of factors to each country's overall index score.

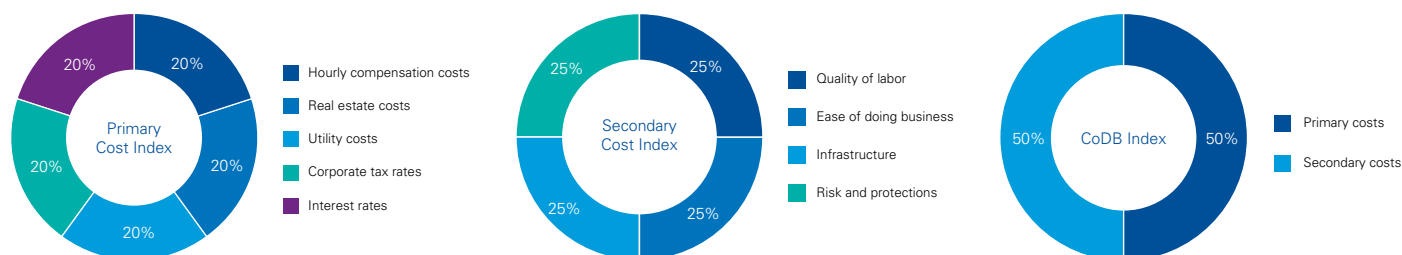
As with any index, the weighting placed on each component is a key consideration. Most studies that examine CoDB factors tend to weight the key factors

equally.² It did not appear that one or some of the four secondary cost categories we considered — quality of labor, ease of doing business, infrastructure, and risk and protections — stood out in importance relative to the others. Accordingly, the assumption of equal weighting appeared to be reasonable for all factors (see Appendix D for a specific breakdown of the weights).

With respect to the primary cost factors, namely, labor, utility, real estate costs, interest rates, and tax rates, we evaluated the need to place higher weight on labor given its perceived importance as a factor in location decisions. Specifically, we reviewed data on the contribution of labor costs to manufacturing. The 16 percent weight indicated by this analysis is similar in magnitude to the 20 percent weight that we use for labor under an equal weighting approach. In the absence of any clear indication that pointed to an alternate weighting choice, we assigned equal weighting to the five primary factors.³

In summary, we utilized the following weights when calculating index values for each country:

Index weights



²For example, the Brookings Institution's report, *Global manufacturing scorecard: How the US compares to 18 other nations*, accessible at <http://www.brookings.edu/research/global-manufacturing-scorecard-how-the-us-compares-to-18-other-nations/>

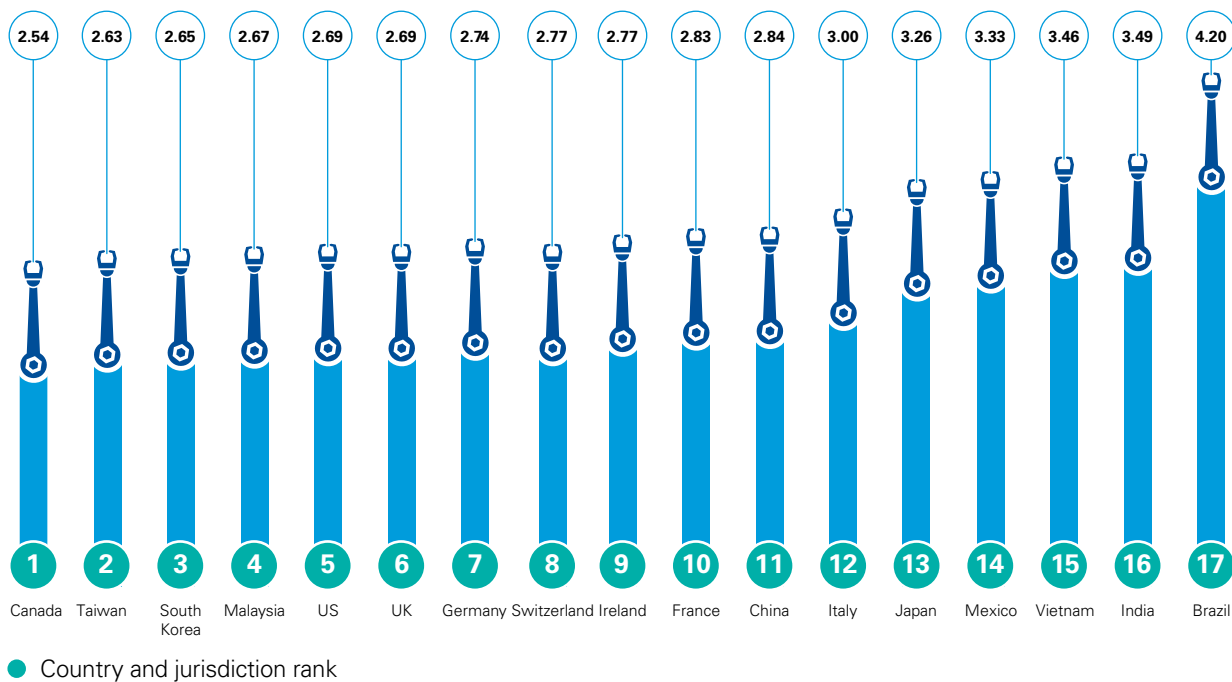
³We recognize that there are alternate index weighting choices that could be adopted and that an alternate set of weights would likely yield a different ranking on the overall index. To allow the interested reader to alter the weights to reflect their facts and circumstances, and to explore the sensitivity of results to these changes, we have developed a Tableau visualization tool in conjunction with this study. This tool provides the ability to emphasize or deemphasize various cost factors and to visualize the impact of the changes on the CoDB Index rank.

Results

The application of the indexing methodology resulted in a ranking of countries as summarized on a score from 1–5, with 1 being the best and 5 being the worst.

Country and jurisdiction ranking — CoDB Index

CoDB Index score by country and jurisdiction (1=best, 5=worst)



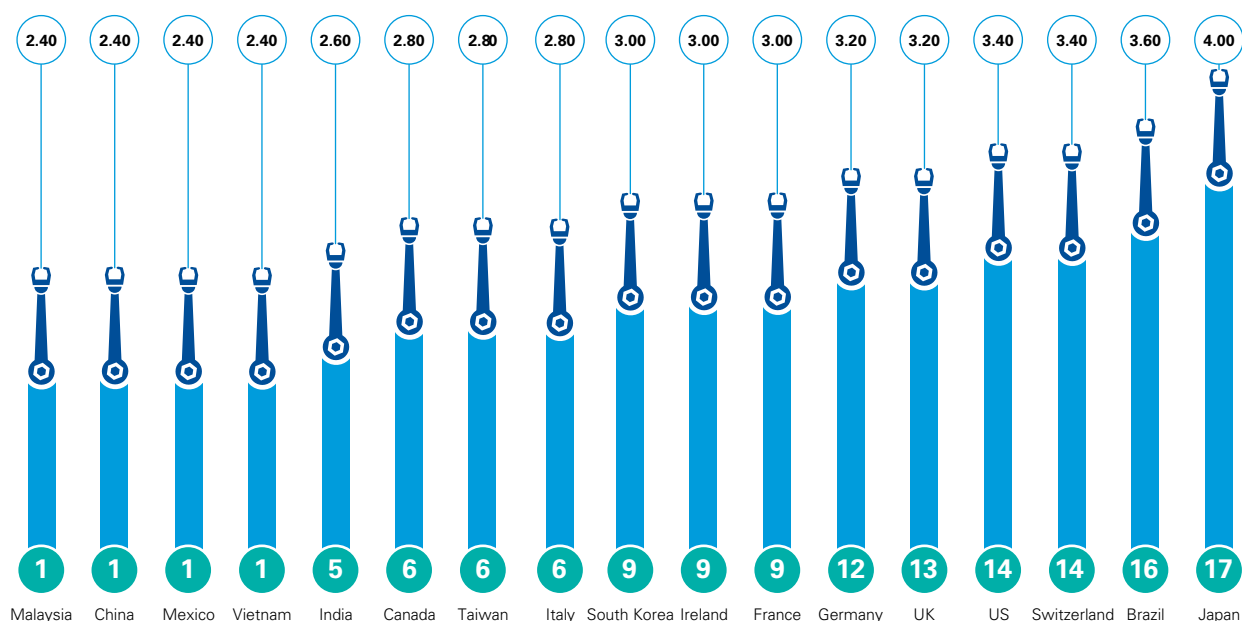
Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

Canada, Taiwan, and South Korea ranked as the top three countries and jurisdictions on the CoDB Index, which equally weights primary cost factors and secondary cost factors. The US ranked fifth among the 17 countries. The country with the lowest rank was Brazil, with Japan, Mexico, Vietnam, and India ranking just above it.

To understand the overall CoDB rankings based on the Primary Cost Index and the Secondary Cost Index, the next two tables summarize the rankings across the two subcategories of factors. For primary costs, unsurprisingly for the most part, Malaysia, China, Mexico, and Vietnam are all tied for the top position (i.e. most competitive).

Country and jurisdiction ranking — Primary Cost Index

CoDB Primary score index by country and jurisdiction (1=best, 5=worst)



● Country and jurisdiction rank

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

From a review of the Primary and Secondary Cost Indices, it becomes apparent there are different reasons why countries rank where they do on the CoDB Index. Consider the case of Canada, which scored highest on the CoDB Index. The primary driver of this rank is the fact that Canada scored very highly on the Secondary Cost Index while maintaining a middle rank on the Primary Cost Index. The US's overall fifth place ranking is primarily driven by its score on the Secondary Cost Index, since it ranks 14th on the Primary Cost Index.

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Dedicated focus on cost management has enabled some manufacturers in Japan to achieve an extraordinary level of cost control. Yet, for most manufacturers in Japan, operating profits can suggest there is little room left for traditional cost cutting. More innovative approaches should be found.”

Tomohiro Kabe

Director, Supply Chain & Operations
KPMG in Japan

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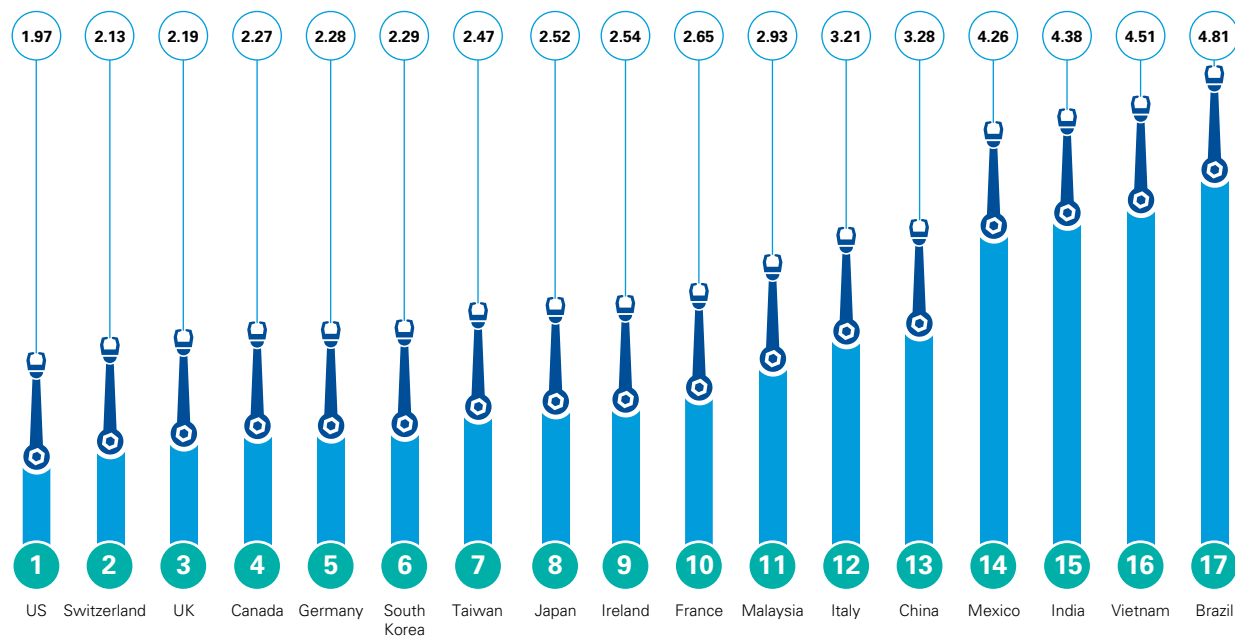
Cost and resilience factors together are informing choices in procurement and supply chain, along with tax considerations such as rules of origin, working practices and skills. At the same time, we are seeing manufacturers dispose of non-core activities in order to free up funds for investment, which are then targeted closely around opportunities for profitable growth.”

Rebecca Shalom

Partner, Head of Defense and Manufacturing
KPMG in the UK

Country and jurisdiction ranking — Secondary Cost Index

CoDB Secondary index score by country and jurisdiction (1=best, 5=worst)



● Country and jurisdiction rank

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

In contrast, the ranks of Malaysia and Taiwan on the CoDB Index result from high scores on the Primary Cost Index. For instance, Taiwan ranks second on the CoDB Index despite a ranking of seventh on the Secondary Cost Index.

Interestingly, China's middling score of 11 on the CoDB Index, despite being part of a four-way tie for first on the primary factors, is caused by its poor performance (rank of 13th) on the Secondary Cost Index. China's low score on Secondary Cost Index arises primarily from higher operating risks. Overall, it appears that countries that do well on primary factors do less well on the secondary factors and vice versa. The clear exception appears to be Brazil, which ranks poorly on both indices.

Primary costs are clearly important to location decisions. To examine how the overall CoDB ranking may change under an alternate set of weights, we recomputed the results placing greater consideration on primary costs. That is, we re-ran our analysis, changing the weight of the primary costs and secondary costs from equal or 50 percent–50 percent weighting to 70 percent–30 percent in favor of primary costs. As presented in Table 6, not surprisingly, this caused China's ranking on the CoDB Index to move up significantly, from 11th to third, and the US ranking to decline from fifth to 12th. However, Canada, Malaysia, and South Korea retained their top-five CoDB rankings despite this change.

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There are multiple factors that can influence the cost of doing business, including local market demand, local supply chain and parts availability, tax incentive policies and others. ”

Frank Li

Partner, Advisory
KPMG China

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With a high priority on primary costs, German manufacturers have traditionally focused on near-shore countries in Eastern Europe and off-shore countries in ASPAC or in Central and South America. But the disruption and supply chain volatility created by the COVID-19 pandemic has made them think very seriously about diversifying their supply base. ”

Kaveh Taghizadeh

Partner, Consulting, Value Chain Transformation
KPMG in Germany

Country and jurisdiction ranking with higher weight on primary costs

Countries and jurisdictions	CoDB Index ranking	Primary Cost Index ranking	Secondary Cost Index ranking
Malaysia	1	1	11
Canada	2	6	4
China	3	1	13
Taiwan	4	6	7
South Korea	5	9	6
Ireland	6	9	9

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

From a labor market perspective, the quality of labor available in the US is a strong asset. However, increasing the weight of the quality of labor measure reveals that there is also significant competition from European countries and Canada in this regard. For example, as presented in the table below, increasing the weight on the quality of labor to 70 percent from 25 percent within the Secondary Cost Index (but maintaining equal weight between primary and secondary costs) causes Ireland, Germany, and Switzerland to rise to the top five most competitive countries, with the US and Canada rising and falling by one rank, respectively.⁴

US ranking with higher weight on labor quality

Countries	Overall ranking	Primary cost ranking	Secondary cost ranking
Ireland	1	9	2
Canada	2	6	5
Germany	3	12	4
US	4	14	1
Switzerland	5	14	3
South Korea	6	9	6

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.



Social expectations have changed quickly. And legislation is rapidly catching up with a focus on supply chain transparency. More and more, sustainability is playing an increasingly important role in the investment decisions of European manufacturers. ”

Kaveh Taghizadeh

Partner, Consulting, Value Chain Transformation
KPMG in Germany

Understanding the results

To understand these results better, we further examined the constituents of the Primary and Secondary Cost Indices.

Primary Cost Index

To further understand the drivers of our findings, we examined which factors cause East Asian countries and jurisdictions such as Vietnam, Taiwan, and Malaysia to rank highly on the Primary Cost Index and the US to rank 14th. The table below presents constituent ranks for countries and jurisdictions that rank highly on the Primary Cost Index — Vietnam, Taiwan, Malaysia, India, China, and Mexico — and for the US. Note that the table shows percentile ranks, that is to say a percentile rank of 5 represents the top 15 percentile of costs. The percentile ranking of 1 indicates the best-performing countries in the category and the percentile ranking of 5 indicates the worst-performing countries in the category (see Appendix D for additional details). As Table 8 indicates, the differences are most stark with respect to hourly compensation costs between the US and other countries.

Selected country and jurisdiction primary cost percentile rankings (sorted by Primary Cost Index)

Countries and jurisdictions	Hourly compensation costs	Real estate costs	Utility costs	Corporate tax rates	Interest rates
Malaysia	2	1	3	2	4
China	2	2	1	3	4
Mexico	1	1	1	4	5
Vietnam	1	4	1	2	4
India	1	1	2	4	5
Taiwan	3	4	2	2	3
US	5	3	3	3	3

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

In terms of real estate costs and the cost of capital, the US is relatively competitive compared to the Southeast Asian nations. Among these countries and jurisdictions, only India, Malaysia, and China had lower average costs for industrial property than the US, while only Taiwan had a lower interest rate. The US compares less favorably to the Southeast Asian nations on the measures of utility costs and corporate tax rates.⁵ The US is tied with Malaysia for the highest electricity costs among these countries, significantly higher than the average rate paid by Chinese electricity users. In terms of corporate tax rates among this group, only India and Mexico have higher statutory tax rates, at 30 percent compared to 27 percent for the US.

⁴ We increased the weight on quality of labor to 70 percent in the Secondary Cost Index and equally weighted the other three measures at 10 percent each.

⁵ The US tax rates used here are after tax reform.

Ranking of the industrialized countries

The table on the right provides a comparison to some of the industrialized countries relative to the US. The table shows percentile ranks, that is to say a percentile rank of 5 represents the top 15th percentile of costs (worst performing from a competitiveness standpoint) while a percentile rank of 1 slots into the best performing in the category (see Appendix D for additional details). We note that, even compared to the industrialized countries, US labor costs are high. Hourly rates in Canada, the UK, and Japan range between US\$23 per hour and US\$30 per hour, compared to US\$39 per hour in the US. With respect to corporate tax rates, where tax reform lowered rates significantly, the US rates are lower than Japan and comparable to Canada, but still higher than those imposed by the UK.

The impact of tax reform

As part of this analysis, we also examined if tax reform had a material impact on the relative standing of the US. In particular, we examined how the US would have ranked had we used the pre-tax-reform corporate tax rate of 40 percent (combined federal and state average) instead of the post-tax-reform combined rate of 27 percent.

It is worth noting here that our analysis of the tax input is limited to the statutory corporate rate only. We recognize that many other factors contribute to the overall tax burden in any given jurisdiction — including but not limited to the methodology of cost recovery, the deductibility of debt service, and the taxation of cross-border flows of income. Those other factors, which vary from jurisdiction to jurisdiction, were outside the scope

Industrialized country primary cost percentile rankings (sorted by Primary Cost Index)

Countries	Hourly compensation costs	Real estate costs	Utility costs	Corporate tax rates	Interest rates
Canada	3	3	2	3	3
South Korea	3	3	3	3	3
UK	3	5	4	1	3
US	5	3	3	3	3
Japan	3	5	5	5	2

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

of this report. Still, we believe that the use of the statutory rate alone provides valid directional information even if not necessarily the entire picture.

As presented in the next table, tax reform improved the US's ranking not only on the corporate tax measure, but also on the Primary Cost Index and the CoDB Index. With tax reform, the US was considered a median tax country. Had the US corporate tax rate continued to be 40 percent, it would have one of the highest corporate tax rates in the comparison group of countries. Tax reform resulted in the US ranking on the Primary Cost Index to improve two notches, from being 16th to 14th out of the 17 countries. The impact on the CoDB Index score is even more significant, with the US's ranking increasing from 11th place (considering pre-reform tax rates) to 5th (after tax reform).



Secondary Cost Index

With respect to secondary cost factors, the US is clearly in a strong position. As the table below indicates (the countries sorted by their respective rank on the Secondary Cost Index), the US scores are among the top three on almost all of the metrics, including quality of labor, transport infrastructure, and ease of doing business. The scores below represent weighted averages of percentile ranks for each measure considered under the category. A score of one (1) is best while five (5) is worst (see Appendix D for additional details).

Secondary cost factor scores (sorted by Secondary Cost Index)

Countries and jurisdictions	Quality of labor score	Ease of doing business score	Infrastructure score ⁶	Infrastructure — Transport score	Infrastructure — Utility score	Risk and protections score
US	1.67	2.00	2.22	2.00	2.67	2.00
Switzerland	1.67	1.67	2.44	3.00	2.33	2.75
UK	2.67	2.33	2.25	2.75	3.00	1.50
Canada	2.33	2.33	2.42	3.25	3.00	2.00
Germany	1.67	2.67	2.28	2.50	2.33	2.50
South Korea	2.33	3.33	1.50	1.50	2.00	2.00
Taiwan	3.00	2.33	2.78	3.00	2.33	1.75
Japan	2.33	3.00	2.25	1.75	2.00	2.50
Ireland	1.33	3.00	3.58	4.75	3.00	2.25
France	2.67	3.00	2.69	2.75	2.33	2.25
Malaysia	3.33	2.33	3.06	2.50	3.67	3.00
Italy	3.33	3.00	3.50	3.50	3.00	3.00
China	3.67	2.33	3.64	2.25	3.67	3.50
Mexico	4.33	4.00	4.44	4.00	4.33	4.25
India	5.00	4.33	4.42	3.25	5.00	3.75
Vietnam	4.67	4.33	4.31	4.25	4.67	4.75
Brazil	5.00	5.00	4.47	4.75	4.67	4.75

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

⁶ The infrastructure score is a combined score across transportation, utility, and internet. Details are shown for transportation and utility subcomponents while internet access is not shown in the table but is included in the combined score. Each of these three factors (transport, utility, and internet) get an equal weight.

On all of the secondary factors considered, including quality of labor, the US ranks significantly better than countries that offer lower labor costs, such as Vietnam, China, Mexico, and India. To put it differently, the low ranking of these countries on the Secondary Cost Index reflects the weaker investment climate — for example, the poorer connectivity from limited road, rail, and airline networks; more challenging business operating environments; and lower levels of transparency in government operation and reduced legal protections available to businesses.

The industrialized countries generally rank favorably and similarly across secondary metrics, falling for the most part in the top half of the countries. Among them, however, the US clearly ranks better with respect to at least two factors: quality of labor and ease of doing business. Thus, relative to the other 16 countries considered, the US ranks best on the secondary cost components.

Labor – Cost and quality

As noted earlier, compensation cost is often the most cited factor for locating manufacturing facilities in Asian countries and jurisdictions such as China, Taiwan, or Vietnam. As the data confirms, these countries do offer among the lowest hourly compensation costs for labor. Further, the hourly compensation costs in the US are among the highest in the world.

As the table on the right shows, a different picture emerges when productivity attributes are considered in addition to the quality of labor. For example, countries with the most favorable cost attributes are not always the ones with the highest real value added per employee. In fact, the table suggests a high degree of positive correlation between costs and productivity.

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The cost of doing business should be viewed in the context of future operating profits. Sectors like automotive and consumer electronics can face high costs, but they can also enjoy high sales value. As such, actual operating profit values are quite high. Making investment decisions requires manufacturers to understand more than just the labor and material costs.”

Tomohiro Kabe

Director, Supply Chain & Operations
KPMG in Japan

Thus, it would appear that for manufacturing activities that are more routine in nature and require less advanced skills, where the loss of productivity may be outweighed by lower costs, companies may consider locating their manufacturing facilities in lower costs countries and jurisdictions such as China, Vietnam, or Taiwan; however, in higher value-added manufacturing where the process is more complex or automated and requires highly skilled labor to manage, the US may be considered more favorably as a location.

Percentile ranks for cost and quality of labor

Countries and jurisdictions	Hourly compensation costs	Real value added per employee
Vietnam	1	5
India	1	5
Mexico	1	4
China	2	4
Malaysia	2	4
Brazil	2	5
Taiwan	3	3
South Korea	3	3
Japan	3	3
UK	3	2
Canada	3	3
Italy	4	3
Ireland	4	1
France	4	2
US	5	1
Germany	5	2
Switzerland	5	1

Source: *Cost of Manufacturing Operations Around the Globe*, KPMG LLP, 2020.

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The need for rapid change in response to issues like Brexit and COVID-19 showed manufacturers the connection between a strong data strategy and their ability to manage costs. Those with a robust data management system and a connected enterprise data strategy were able to pivot much faster than their peers. Not surprisingly, we are seeing a significant uptick in activity from manufacturers seeking to enhance their data strategy and create a more connected enterprise.”

Simon Jonsson

Partner, UK Head of Industrial Products
KPMG in the UK

Conclusion

Our results indicate that countries that placed better on the Secondary Cost Index generally performed better on the overall rankings. Of the top five most competitive economies on the overall rankings, only two — Malaysia and Taiwan — have a better primary than secondary cost score.

In keeping with this trend of lower secondary cost countries scoring better on the CoDB Index, the US placed fifth on the CoDB Index despite being tied with Switzerland for 14th on the Primary Cost Index. This high Primary Cost Index ranking was primarily due to high labor costs. The US was able to compensate somewhat for these unfavorable scores on the Primary Cost Index by placing first in the Secondary Cost Index.

As part of this analysis, we also examined if tax reform had a material impact on the relative standing of the US. In particular, we compared how the US ranks now (post-tax-reform combined federal and local tax rate of 27 percent) relative to the pre-reform with a corporate tax rate of 40 percent (combined federal and state average). The impact on the US's CoDB Index ranking is quite significant. After tax reform, the US's competitiveness increased — as evidenced by its current rank of 5 — compared with its previous rank of 11 under pre-reform tax rates.

A closer look at the countries that outperformed the US on the CoDB Index ranking indicates some interesting factors. For example, the US outperformed all of the countries on the Secondary Cost Index due to better labor productivity and business conditions. This implies that the outperformance on the CoDB Index by Canada, Taiwan, South Korea, and Malaysia are all driven by primary cost factors. Specifically, Canada's rank is driven primarily by its ability to offer lower compensation costs and slightly lower electricity rates while still maintaining Secondary Cost Index rankings that were not far behind the US. South Korea ranked third by offsetting a weaker ranking on the Secondary Cost Index with even lower compensation costs. A sharper version of the trade-off between primary and secondary cost explains the rankings of Taiwan and Malaysia, with Taiwan offering higher primary costs but lower secondary costs.

This study has focused on certain CoDB factors that are commonly considered in manufacturing facility location decisions — at the country level — and the results provide a high-level perspective on the attributes of various countries with respect to these factors. However, the location decision is specific to each company and its consideration of the supply chain and access to markets. The decision may be impacted by the type of industry the company is active in, the type of product,

where customers are, and the company's overall business strategy. Thus, individual location decisions are significantly more complex than we can address in an analysis such as this.

For instance, for heavy equipment manufacturing, from a transportation point of view, it may be better to locate the facility closer to suppliers and the market, whereas from a production standpoint, it may be more desirable to locate the facility closer to where the desired type of workforce or raw materials might be available. Alternatively, for a specialized precision products manufacturing operation, the firm's decision may be heavily impacted by the availability of labor with advanced manufacturing skills. In other instances, tax and operating incentives offered by a country may be significant enough to outweigh weakness on other dimensions. As such, the location decision is often guided by unique factors that may go well beyond those we have considered.

Additionally, even within the factors we have considered, the relative importance of these factors to a specific firm may be different than the weights we have considered. Furthermore, it may well be the case that the factors we classify for the purpose of convenience as secondary are in fact primary factors for consideration in a location decision for an individual firm or manufacturing sector. Finally, a number of local factors that go into firm location decisions may or may not be captured in the country-level analysis. For example, labor and rent costs are higher in urban areas relative to more distant suburban or rural areas. Recognizing this, we have developed a Tableau analytic and visualization tool in conjunction with this study that allows the interested reader to alter the weights and reassess the score based on the relative importance of these factors to them. Click [here](#) for the Cost of Manufacturing Operations Tool.



We also note for the reader that the primary cost factors are measured in US dollars. Since we have compared costs on a US dollar-denominated basis, the results are impacted by the relative strength of the various currencies relative to the dollar. As the foreign exchange rates fluctuate, as they inevitably will, the cost measurements we have relied on would vary and possibly impact the ranking of individual cost components, even if local currency costs do not change.

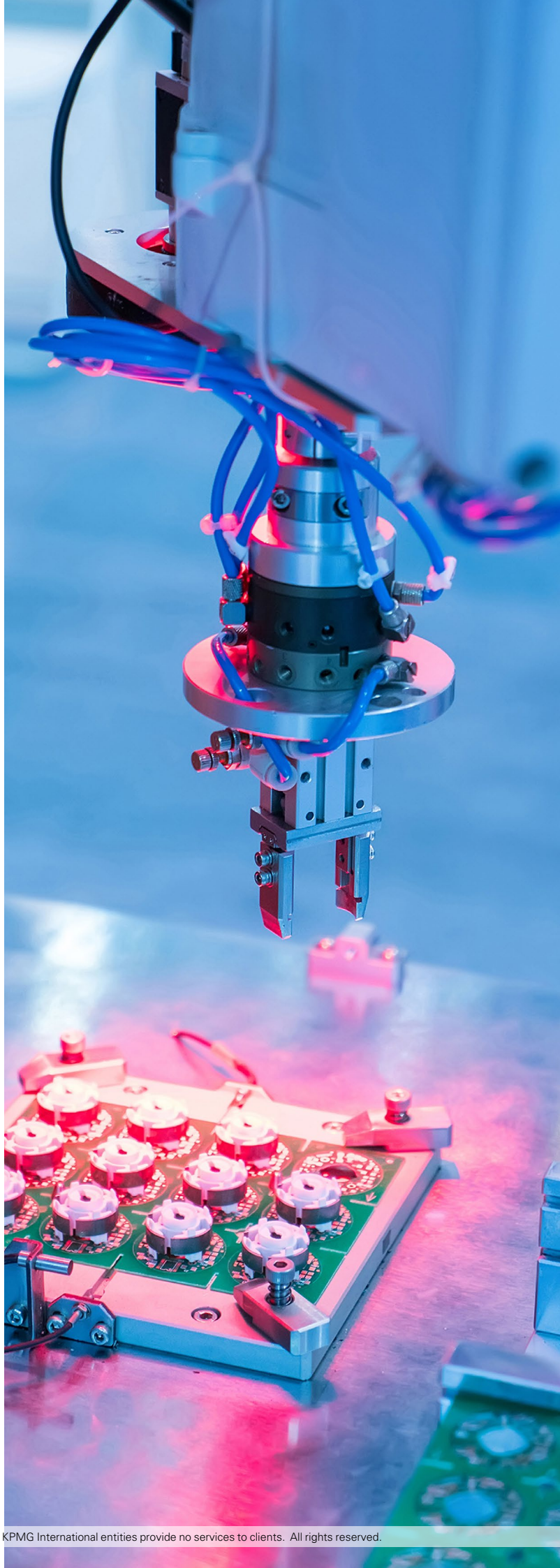
Finally, we note that the rankings are based on the best historical information available. Such data is mostly available only with a lag, and therefore the impact of recent trade disputes or the market disruptions from COVID-19 are not reflected in the results.

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The disruption of the past year has forced many companies to rethink the strength and resilience of their supply chains, which, in turn, is shifting the focus towards micro-supply chain networks and local suppliers. It is expected that the cost equations will change significantly over the coming year as companies adjust their supply chains and markets start to focus on attracting foreign investment. ”

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Data sources

Primary cost measures — References

Data sources:

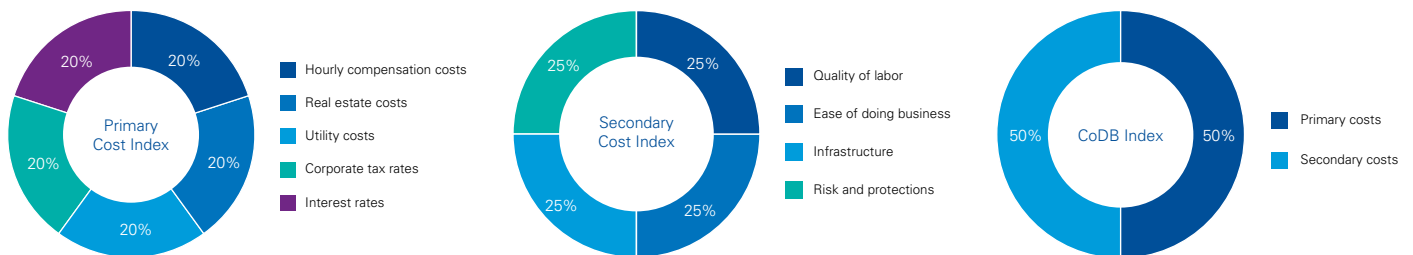
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Appendix A: Index methodology

Secondary cost measures

We use 23 metrics to develop an overall weight of the country. The metrics are further segregated into primary and secondary costs. The primary costs consist of five subcategories of costs and the secondary costs consist of an additional four subcategories (with a varying number of metrics for each category for a total of 18 categories).

Weights by measure category



The primary and secondary cost indices are equally weighted at 50 percent each, and each subcategory within these two broad categories is also equally weighted. The weighting for each individual factor, however, varies as the number of factors considered for each metric varies — thus, the five primary costs have 20 percent weight each, for an overall ranking weight of 10 percent (50 percent*20 percent), while the secondary factors have 25 percent weight each. Quality of labor, for example, has three metrics associated with it, with each metric weighted at 4.2 percent (approximately 50 percent*25 percent*1/3). The table below shows the final weights for each metric.



Final weights in overall ranking by metric

#	Measure	Cost type	Subcategory	Overall ranking weight
1	Hourly compensation costs	Primary		10.0%
2	Real estate costs	Primary		10.0%
3	Utility costs	Primary		10.0%
4	Corporate tax rates	Primary		10.0%
5	Interest rates	Primary		10.0%
6	Learning-adjusted years of schooling	Secondary	Quality of Labor	4.2%
7	Skill set of graduates	Secondary	Quality of Labor	4.2%
8	Real value added per employee	Secondary	Quality of Labor	4.2%
9	Days to start business	Secondary	Ease of Doing Business	4.2%
10	Burden of government regulation	Secondary	Ease of Doing Business	4.2%
11	Registering property	Secondary	Ease of Doing Business	4.2%
12	Road Quality Index	Secondary	Infrastructure	1.0%
13	Railroad quality	Secondary	Infrastructure	1.0%
14	Airport connectivity	Secondary	Infrastructure	1.0%
15	Liner Shipping Connectivity Index	Secondary	Infrastructure	1.0%
16	Electric power losses (% of output)	Secondary	Infrastructure	1.4%
17	Exposure to unsafe drinking water	Secondary	Infrastructure	1.4%
18	Reliability of water supply	Secondary	Infrastructure	1.4%
19	Access to internet/Wi-Fi	Secondary	Infrastructure	4.2%
20	Political risk	Secondary	Risk and Protections	3.1%
21	Enforcing contracts	Secondary	Risk and Protections	3.1%
22	Protecting minority investors	Secondary	Risk and Protections	3.1%
23	Corruption Perception Index	Secondary	Risk and Protections	3.1%

In addition to the weights assigned for each metric, the methodology for developing the index consisted of the following steps:

- Performance on each metric is ranked using a percentile-based methodology. The top (or bottom from an operating cost perspective based on the metric) 15 percent receives the highest rank, and the lowest (or highest) 15 percent receives a rank of 5. Ranks for real estate costs are shown below as an example. Thus, the cheapest or lowest 15 percentile of real estate costs is rank 1, percentiles between the 15 and 35 percentiles receive a rank of 2 and so on. This is further illustrated in the table below.
- The final scores are calculated by applying the appropriate weights for each metric first at the subcategory level and combined (using weight multiplied by the rank) with the primary and secondary cost scores and ultimately to the overall score. The scores are then ranked for ease of display and comparison.

Percentile rankings by metric

Real estate costs		
Ranking	From	To
1	0.00%	14.99%
2	15.00%	34.99%
3	35.00%	64.99%
4	65.00%	84.99%
5	85.00%	100.00%

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