Off-, On- or Reshoring: Benchmarking of Current Manufacturing Location Decisions

Insights from the Global Supply Chain Benchmark Study 2015

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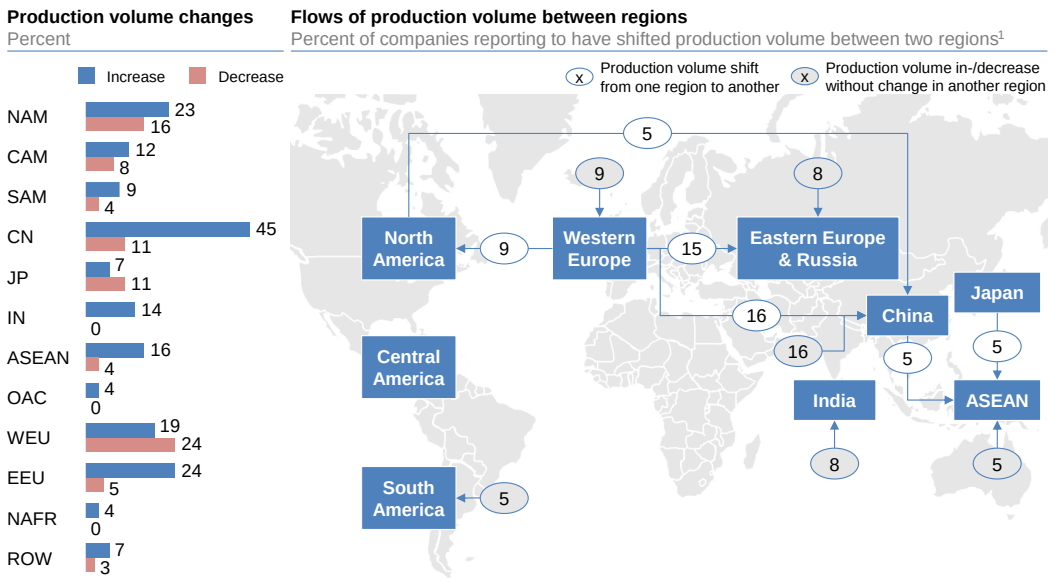
Executive Summary

Three Questions to Be Answered

Despite the growing attention in the business press to reports of companies relocating manufacturing to western countries, there is very little empirical research on the scale of such decisions, their drivers and their impact. Hence, in this study we investigate current trends in production sourcing. Based on a survey of 74 leading manufacturing companies predominantly from North America, Europe and Japan we shed some light on (1) what production sourcing decisions are currently being made, (2) what drives these decisions and (3) what results do they lead to.

Exhibit 1: Changes made to global production sourcing



A Multitude of Decisions in Industrial Practice

Our research suggests that there is a significant wave of restructuring of global supply chains in progress. Companies de- and increase production volume all over the globe as shown in the overview presented in Exhibit 1. However, we did not observe a dominant strategy for sourcing production volume. Companies make different decisions for a variety of reasons. While China continues to be the most attractive country for manufacturing, many companies reported following (also) other strategies. Moreover, we see that decision making has evolved from simple cost comparisons to more complex trade-offs between a magnitude of factors that are deemed important, i.e., across quality, market access and risk. Based on these and other reported drivers we see a shift of production not only to China but also to

Eastern Europe and the ASEAN countries which are being used as nearshore sources of production for Western European and Chinese markets respectively.

The Return of Manufacturing to North America Is Driven by Non-American Firms

For North America we see evidence for a return of manufacturing. It is not a strong trend but in our sample more companies report shifting production volume to North America rather than offshoring to other countries. This pattern is not consistent with the much cited reshoring trend predicted by many business and political commentators. The movement we observed is not driven by the reshoring of American firms but rather by European and Asian firms offshoring who account for 60% of the production volume increase in North America. While this is good news for manufacturing in North America, the indicators for the future of manufacturing in Western Europe appear to be less bright. Indeed, Western Europe is one of only two regions for which our sample reports a net decrease of production volume. Companies reported offshoring for a variety of reasons including shifting to either less costly locations or to places closer to market demand.

Despite the decline in production volume in certain regions, there is no evidence for a further decline in manufacturing jobs. In fact our sample reports that for China, Western and Eastern Europe their sourcing decisions hardly impacted employment. Moreover, it was only for North America and Japan that growth of manufacturing employment is observed.

A Call for Action for Executives and Policy Makers

We believe the analyses and insights presented in this report not only inform but also call for action. Executives should look at their supply chains critically by challenging their current footprint and production sourcing choices. We explicitly encourage benchmarking against the companies in our sample within their industry and across industries. Insights into market expectations and the forces driving the reported production sourcing and technology decisions should stimulate a discussion about future strategic actions.

For policy makers – especially in Western (European) countries – this report provides information concerning the perceived attractiveness of regions worldwide. Reading the report will provide policy makers with data about the trends in industry and the factors that have led companies to shift production into or away from particular regions and can thus inform the debate on how manufacturing policy can boost competitiveness, attract and retain manufacturing jobs.

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List of Exhibits

List of Abbreviations

*****	Difference is statistically significantly at 0.10 (*), 0.05 (**), 0.01 (***) based on two-sided T-test
ASEAN	Association of Southeast Asian Nations
ASS	After Sales Services
AUT	Automotive
CAM	Central America
CAP	Capital Goods
CDA	Consumer Durables & Apparel
CN	China
CS	Consumer Staples
EEU	Eastern Europe & Russia
EUR	Europe
IN	India
IT	Information Technology
JP	Japan
MAC	Machinery
NAFR	Northern Africa
NAM	North America
OAC	Other Asian Countries
OTH	Other Industries
R&D	Research & Development
ROA	Rest of Asia
ROW	Rest of world
SAM	South America
(E/S)VP	(Executive/Senior) Vice President
WEU	Western Europe

I. Introduction

Recently Many Companies Report to Reshore Production

For the past 25 years manufacturing offshoring to low-cost locations like China has been the dominant strategy for many western manufacturing companies. This has led to a significant reduction of manufacturing jobs in developed economies. Recently, many manufacturers have reported they plan to bring back at least a part of their global production volume to developed countries. General Electric, for example, announced in 2012 they would relocate manufacturing and R&D of their household appliances business, which had previously been offshored to China and Mexico, to Louisville, KY in the USA.[1] Similarly, Plantronics, a U.S. based manufacturer of headphones, shifted production volume back from China to Mexico.[2] At the same time companies from perceived low-cost countries have reported investments in manufacturing capacity in developed economies. For instance, the Chinese company Lenovo recently brought back the production of personal computers to North America.[3]

While there seems to be an emerging trend to reshore production, traditional offshoring to developing economies continues to be a viable phenomenon. For example, General Motors recently announced a USD 12bn investment in new plants in China.[4] These examples offer just a glimpse of the magnitude of manufacturing location decisions companies are currently making in a wave of restructuring of their global supply chains.

Recent Decisions Seem to Be Driven by Changing Cost Competitiveness and More Advanced Decision Making

Based on such reports two predominant drivers emerge for the afore mentioned decisions: a change in global cost competitiveness and changing paradigms in the way companies make manufacturing location decisions. For many years factor costs have been the dominant driver in making decisions to offshore manufacturing, especially from North America to China and to other countries in Asia. Cost

1 Crooks, Ed (2012). GE takes $1bn risk in bringing jobs home. Financial Times

2 Cattan, Nacha; Martin, Eric (2012): Mexico replaces China as U.S. supplier with no wage gains. Businessweek

3 The Economist (2013): Here, there and everywhere. Special report on outsourcing and offshoring.

4 Cook, Rebecca (2014): GM to battle VW in China with $12 billion investment and new plants. Reuters

differentials between developed and developing economies were so high that offshoring had become the default choice for many companies. That is no longer necessarily the case.

A recent study conducted by The Boston Consulting Group suggests that the U.S. has become cost competitive compared to many low-cost locations.[5] According to this study, manufacturing in the U.S. is hardly more expensive than in China and might be even cheaper when compared to Eastern Europe. Within Western Europe the UK has emerged as the most cost advantageous country and Brazil, one of the BRIC countries, is nowadays one of the most expensive places for manufacturing worldwide. The authors cite four reasons for the change in cost competiveness. Firstly, labor cost in many developing nations have risen along with the industrialization of these nations. Chinese labor wages, for example, have tripled over the past ten years. In the same time the Chinese Yuan has appreciated by 36% making it less favorable to export out of China. Thirdly, while the cost of industrial energy has gone up in many developing economies it has stayed flat or has even decreased in some developed economies due to technological advances such as fracking. Lastly, the rising oil price has increased the cost of transportation making long supply chains with production in far offshore locations less favorable.

In addition to the changes in factor costs, many companies report that other considerations have gained in importance for making today's manufacturing location decisions. On the one hand there are corrective decisions made by companies that went offshore but then struggled with IP protection or the maintenance of quality levels. On the other hand, there are companies that nowadays consider factors such as risk, agility and market access to be more important than in the past. Previous offshoring has made supply chains longer and thus more exposed to different types of risk, e.g. the flood in Thailand that disrupted entire industries.[6] Consequently, mitigating such risks has become much more important for today's supply chain design considerations. The current business environment has become ever more volatile with rapidly changing demand, exchange rates, or commodity prices. To cope with this volatility many companies invest heavily in making their supply chains more agile. Since industrialization increases wealth, a local consumer class is rapidly growing in emerging economies. For example, the management consulting firm McKinsey & Company estimates that the Chinese consuming middle class might grow to 400 million people by 2020,

5 Sirkin, Harold L.; Zinser, Michael L.; Rose, Justin R. (2014): The Shifting Economics of Global Manufacturing. How Cost Competitiveness is Shifting Worldwide. The Boston Consulting Group.

6 The New York Times (2011): Pervasive Thailand Flooding Cripples Hard-Drive Suppliers

which is more than the entire population of the U.S..[7] Hence, many companies that once moved production to emerging economies for the cheap labor are now staying for access to growing local demand.

Three Questions Emerge around Current Trends in Global Manufacturing Location Decisions

While there is quite a lot of anecdotal evidence and speculation about the noted recent manufacturing locations decisions, there is very little empirical research to document what is actually happening. This is especially true when it comes to understanding why individual decisions are made. Hence, we embarked on a benchmarking effort to shed light on three questions that we believe arise when reviewing the existing evidence:

1. What global production sourcing decisions are being made in industry?
2. What are the drivers of these decisions?
3. What has been their observed or expected impact?

This report summarizes the results of that benchmark study. In order to address these questions we surveyed supply chain executives from manufacturing firms in North America, Europe and Japan about specific decisions made by their companies in recent years and the drivers of those decisions. In this report we highlight the key findings. The report is structured in six sections. After this introduction we first outline the overall trends we see by looking at the entire sample including global flows of production volume in Chapter II. In Chapter III, we investigate regional perspectives by highlighting the driving forces associated with these flows of production volume in and out of specific regions of the world. An industry perspective is then discussed in Chapter IV. In that chapter we summarize the findings of a per industry comparison. The corresponding data concerning the decisions made and their drivers is presented in the appendix. We conclude the review of our findings in Chapter VI after outlining the impact that the reported decisions have had on manufacturing employment in Chapter V.

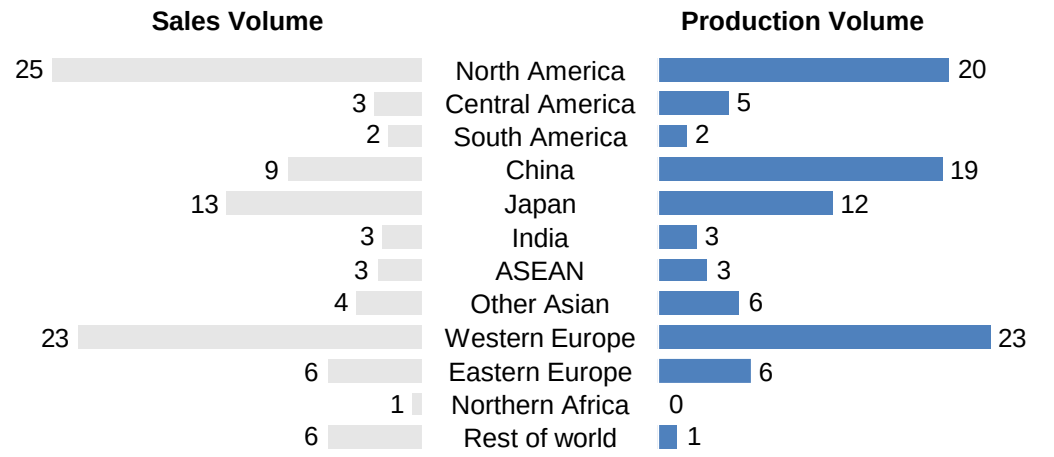
[7] Atsmon, Yuva; Magni, Max (2012): Meet the Chinese consumer of 2020. McKinsey Quarterly (March)

II. Changes in Global Manufacturing Footprints

CURRENT SALES AND PRODUCTION FOOTPRINTS: CHINA AS THE WORLD'S FACTORY

Before asking about changes to their supply chains we asked the participants in our study to describe their current sales and production footprint. Exhibit 2 illustrates the average sales and production volumes per region in 2014. For most regions, e.g., Western Europe or Japan, the share of production and sales volume is balanced. However, for China local production volume is more than twice that of local sales volume. Much of what our sample produces in China is thus exported. This finding is in line with the offshoring activities of the past decades. Similarly, it is not surprising to see that in North America more is sold than produced given the fact that many North American companies engaged early on and at a large scale in manufacturing offshoring to China.

Exhibit 2: Share of global sales and production volume per region in 2014
Percent

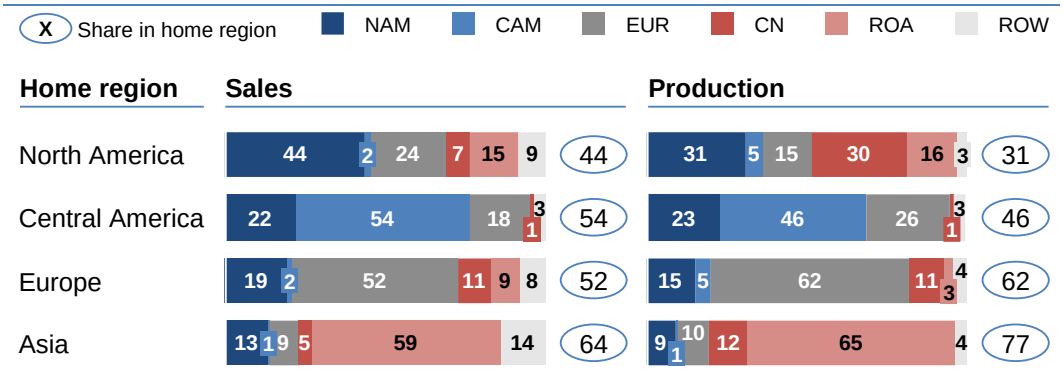


Many Manufacturers Depend on Home Markets and Manufacturing Base

At a more granular level one can observe that despite the fact that all companies in our sample, whether small or large, engage in international business, many companies rely heavily on their home regions – defined as the region where the business unit's headquarter is located – for sales and production. Across the sample we observe that a company's home region is in most cases not only the largest

Exhibit 3: Regional distribution of sales and production volume by origin

Percent



market but also the largest manufacturing source as shown in Exhibit 3. The regions where the business units' headquarters are located account on average for 44-64% of sales and 31-77% of production volume. We note that, North American firms seem to depend the least on their local market. While 44% of their sales occur in North America only 31% of the global production volume are manufactured at home. In contrast, Europe accounts for 52% of the sales volume of European firms and for 62% of the global production volume. This is a high number for production given the relatively high factor costs in Europe but it is in line with the recent history of global manufacturing. American firms had quickly shifted production to China, which accounts for 30% of North American production, while European firms were more hesitant to do so.

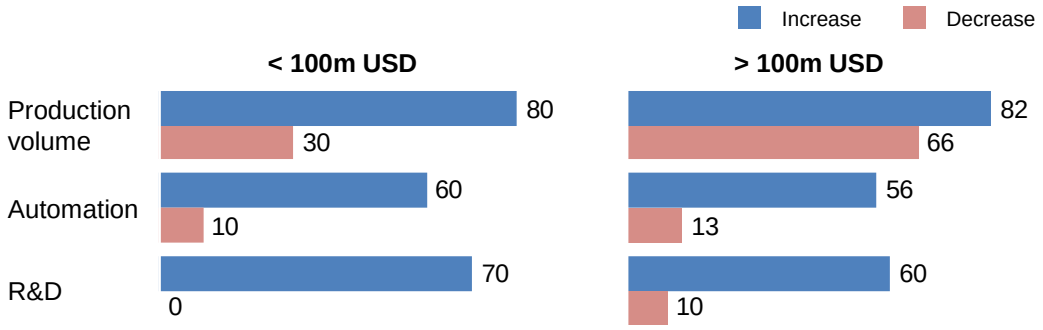
GLOBAL FLOWS OF PRODUCTION VOLUME: COMPANIES ARE RESTRUCTURING THEIR SUPPLY CHAINS

Our sample confirms anecdotal evidence that across all industries and firm sizes, companies indeed are restructuring their supply chains by investing and divesting in production capacity, automation and R&D as shown in Exhibit 4.

In the following we focus our analysis on the changes made to production sourcing reported by the entire sample. In subsequent sections individual perspectives by region and industry will be presented, highlighting not only the decisions but also their drivers and impact. References to automation as well as R&D decisions can be found in the appendix.

Exhibit 4: Changes to global supply chain strategy by turnover

Percent

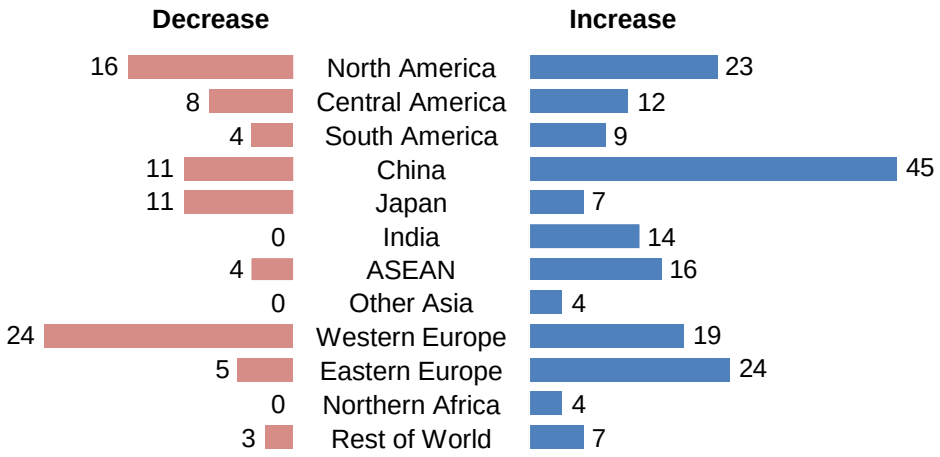


China Is Still the Most Attractive Region for Production Sourcing

Despite slowing economic growth the companies in our sample agree on China's continued attractiveness as a production sourcing location. As outlined in Exhibit 5, China is the region in which the most companies from all industries and locations reported investing in. More than four times as many decisions are reported to increase production volume in China than to decrease production.

Exhibit 5: Changes in production volume per region

Percent



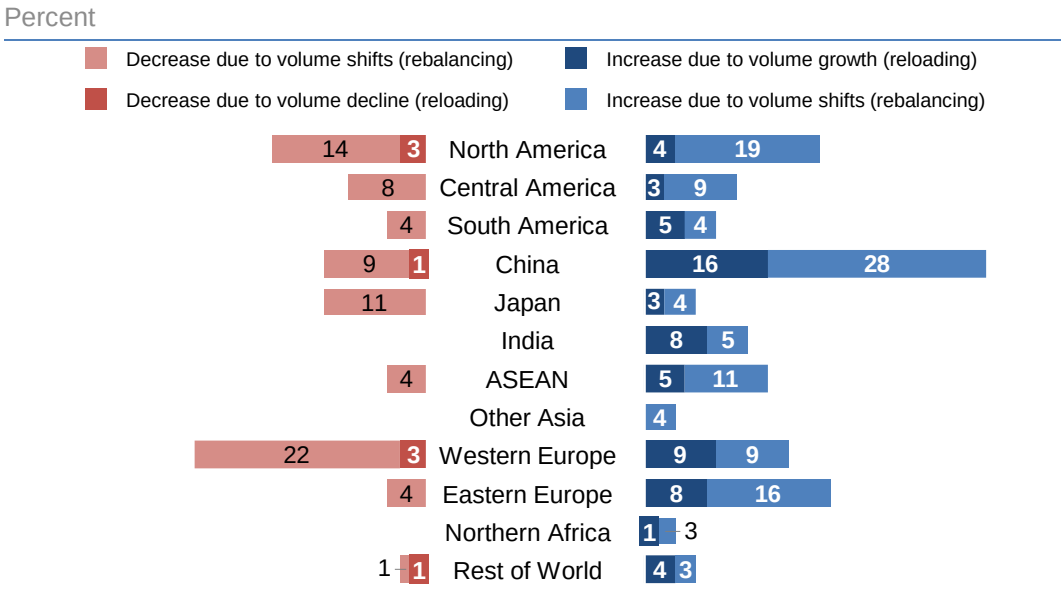
Emerging and Developed Economies Follow China in Attracting Manufacturing Capacity

After China, two groups of regions can be distinguished: Emerging and developed economies. On the one hand it can be observed that developed economies (North America, Western Europe, Japan) still attract manufacturing of a substantial number

of companies in our sample. However, we also note that about as many companies that increase in any of these regions also decrease production volume there. While for North America we observe a surplus of production volume increase, the net effect on production volume is negative for Western Europe and Japan. Western Europe in fact is the region for which most companies in our sample report decreasing production volume

For emerging economies (Eastern Europe & Russia, ASEAN, India) we see a different picture. For these regions a substantial share of the reported decisions are to increase production volume, and very few report decisions to decrease. For example for Eastern Europe & Russia: 24% of the decisions are associated with an increase in production volume while only 5% with a decrease.

Exhibit 6: Changes in production volume per region

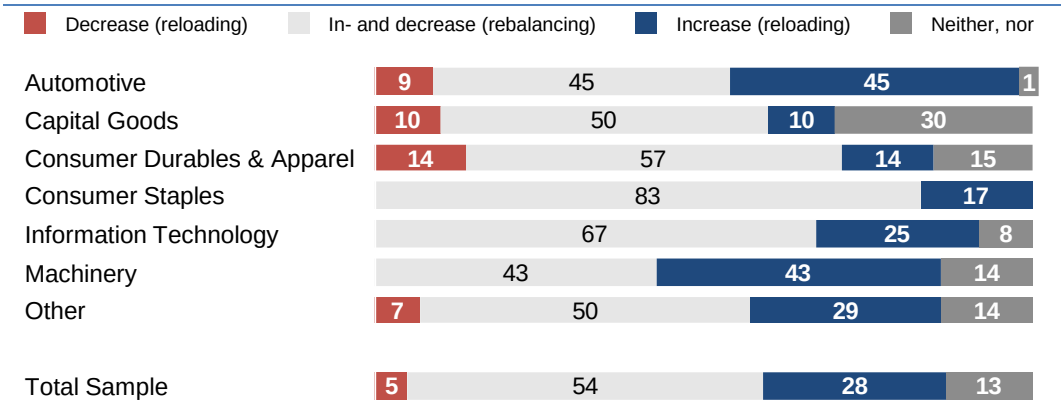


Rebalancing of Production Volume Prevails

We observe firms that shift production volume between different regions – a process that we refer to as *rebalancing*. Alternatively, we refer to the decision for firms that either in- or divest in a region as a consequence of an overall growth or decline of global production as *reloading*. Rebalancing describes the shifts of production volume between regions whereas reloading refers to investments without any reallocation. In the case of rebalancing one country's gain is another country's loss while with reloading the gain in one region is not associated with the loss of production in another.

Exhibit 7: Changes in production volume by industry

Percent



Across the sample we observe that rebalancing dominates as shown in Exhibit 6 and Exhibit 7. This is especially true in China, North America and Europe where a large share of investments can be classified as rebalancing. China, Europe and India also show a relatively high share of reloading investments associated with volume growth. For divestments across all regions the vast majority is due to rebalancing. Only a few firms in our sample decreased their global production volume.

From an industry perspective we see a distinct difference in the pattern of changes to the global allocation of production volume. While as many of the automotive and machinery firms in our sample reloaded (production volume increase) as rebalanced, rebalancing prevails for firms in other industries in the total sample. In three industry groups – consumer staples, IT, machinery – no reloading due to a volume decline is observed. Overall, capital goods firms appear to be the least active in changing the allocation of production volume. 30% did not engage in changing their production footprint at all but rather invested in automation or R&D.

Flows of Global Production Volume Investments Show a Diverse Pattern without Dominant Strategy

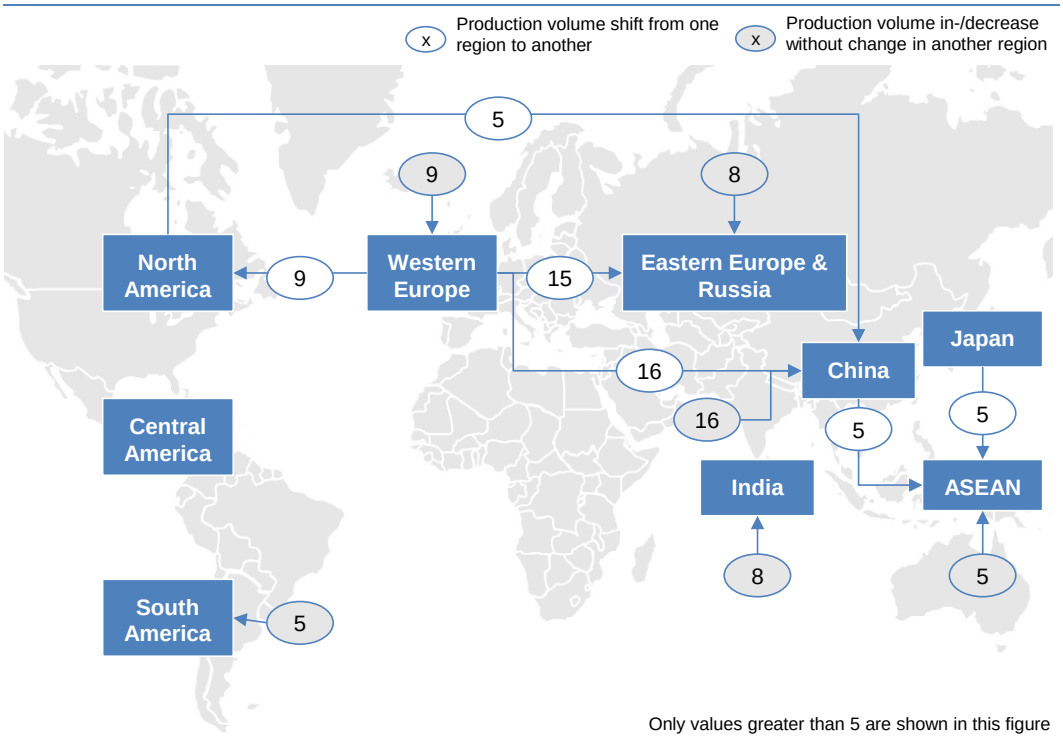
To understand the decisions reported by our sample better we analyzed the flows of production volume between regions. Exhibit 8 illustrates these flows and demonstrates that there is no dominant strategy for production sourcing decisions. While there are stronger and weaker flows of production volume between regions, our interpretation is that currently there is a complex and diverse pattern of production volume flows that is occurring on a global scale.

Consistent with the in- and divestment decisions outlined earlier in this chapter, we note that the largest flows into any region are those into China and the largest flows out of any region are those out of Western Europe. Notably, the flow from Western

Europe to China is the largest flow observed between any two regions. 16% of the decisions reported in our sample include a shift of production volume from Western

Exhibit 8: Flows of production volume between regions

Percent of total sample



Europe to China. An equally-sized reloading flow can be observed into China with no simultaneous volume decrease in another region. These firms grew their global manufacturing capacity by investing in China.

Eastern Europe & Russia is the region after China for which the most respondents reported an increase production volume. Of the 24% of the sample that reported investments in this region the majority, 15% of the entire sample, are associated with a shift of production volume from Western Europe. Another 8% of the sample reload and invest without reallocation.

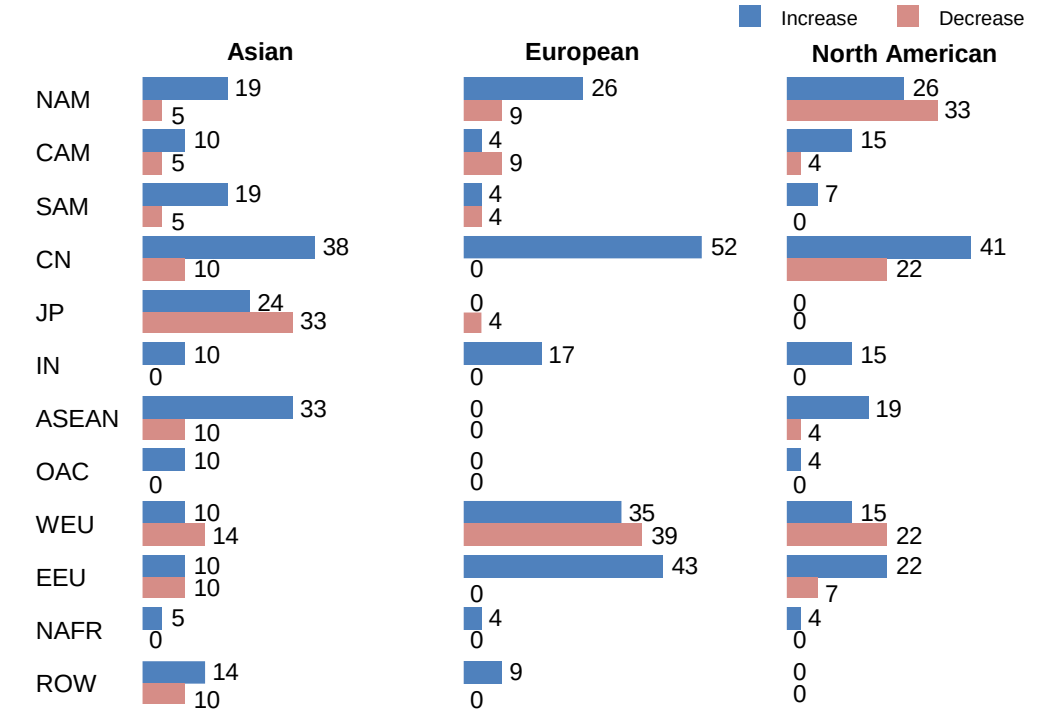
Are Companies in Our Sample Reshoring to North America?

While decisions to in- or divest in a specific region will be discussed in greater detail in the remainder of this report, at this point we would like to address the particular question of whether there is a trend to reshore to North America.

While Exhibit 5 indicates that there is a surplus of investments in production volume in North America from various sources, the question is whether this increase is based on American firms bringing capacity back to North America, i.e.

Exhibit 9: Changes in production volume by origin

Percent



reshoring. The answer in our responses is no. Exhibit 9 contrasts the decisions made by companies from Asia, Europe and North America. It can be seen, that for North American firms more decisions to decrease production volume are reported than decisions to increase. Among Asian and European firms on the other hand far more companies report investing than divesting in North America. So, while we may continue to speak of a return of manufacturing to North America due to a net increase in production volume, we should not say that it is driven by reshoring of North American firms, in particular, as 60% of the increase in North America is due to offshoring of Asian and European firms.

III. A Regional Perspective

Five Regional Trends Instead of One Dominant Global Strategy

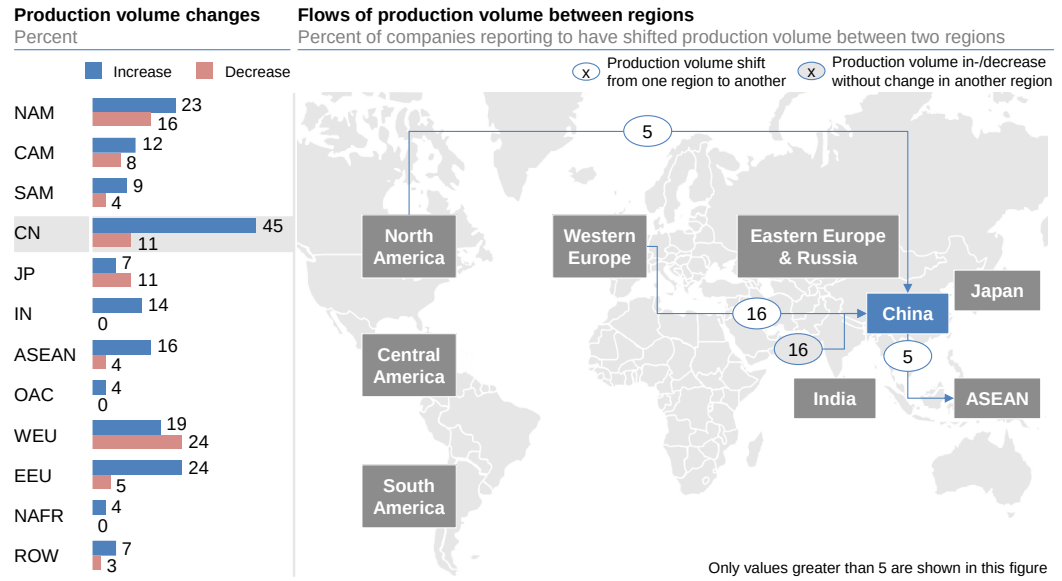
As outlined in the previous chapter participants in our study report on a variety of changes to their global supply chains. Consideration of these changes in terms of one or two dominant strategies is misleading. In this chapter we outline what we believe to be the key trends from a regional perspective. These key trends are based on bundles of decisions that follow similar global flows for the shifting production volume. It is at this level that we believe an attempt should be made to understand the driving forces for the reported decisions. Yet, even at this, disaggregated regional level we see that there is very seldom only one dominant decision driver. Moreover, we see a collection of important factors such as cost, quality, delivery and market access whose weight varies across the observed bundles of flows. One observation that is common across the flows is that cost has lost its dominant position as a driver and has been replaced by more complex decision making that is trading off various factors. What makes the understanding of today's decisions even more complex is that we observe opposite decisions like investing and divesting in a country driven by the same factors. Despite such complexities we have found five over-arching trends that provide a better understanding of current global production sourcing decisions.

1. China's role in global manufacturing is changing: market seeking firms invest while cost chasing companies divest
2. Eastern Europe & Russia are becoming a low-cost nearshore production source for Western Europe
3. Western European manufacturing is on a decline
4. Japanese manufacturing seems to be suffering from the repercussions of Fukushima
5. No reshoring to North America is observed, this region may still be at the cusp of a manufacturing renaissance based on shifts from other regions in the world.

In the remainder of this chapter we will analyze these trends in more detail and outline how the conclusions were derived and what data they are supported by.

CHINA'S ROLE IN GLOBAL MANUFACTURING IS CHANGING: MARKET SEEKING FIRMS INVEST WHILE COST CHASING COMPANIES DIVEST

Exhibit 10: Flows of production volume to and from China



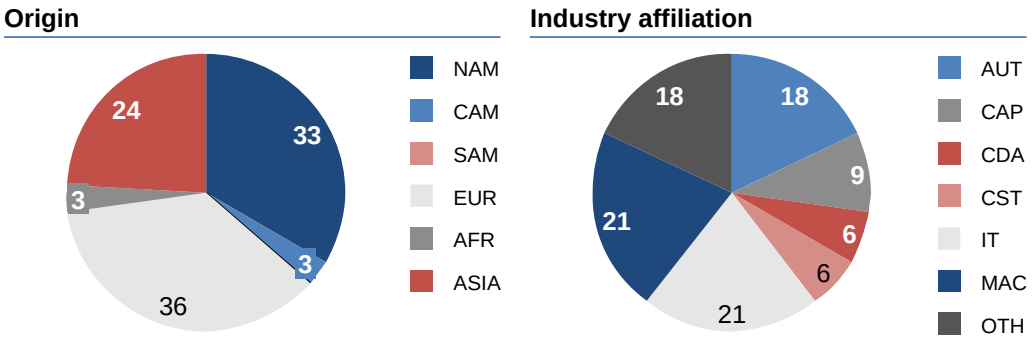
China continues to be the most attractive region for production sourcing. Inflows of production volume come to a large degree from Western Europe or are the result of an overall capacity increase within the global manufacturing network. Our sample reports that cost is no longer the driving force. Instead, market access, quality and supply chain related factors have emerged as dominant drivers for increasing production volume in China. However, in the opposite direction, decreasing production volume in China, it is primarily labor cost that drives companies out of the country and in most cases to ASEAN countries.

Mostly European Firms from All Industries Shift Also Non-Labor-Intensive Production of Intermediaries to China

As Exhibit 11 shows it is predominantly North American and European firms from all industries that invest in production volume in China. These companies invest in the production of not only labor- but also to a large degree in capital-intensive products in China as outlined in Exhibit 12. This finding is consistent with ongoing news coverage about manufacturers in China investing in automated high-tech manufacturing.

Exhibit 11: Origin and industry affiliation of companies that increase production volume in China

Percent



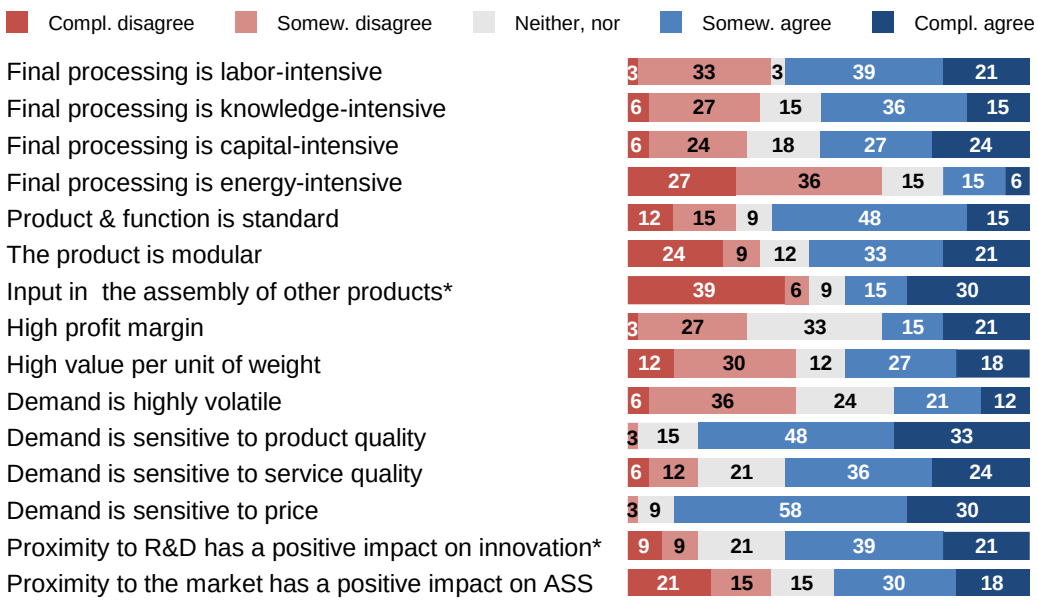
In terms of value chain position, a significantly larger share of the respondents, when compared to other flow decisions, indicated that the products shifted to China are intermediaries which are used as inputs for other products.

Market Changes, Quality and Supply Chain Performance Are the Driving Forces for Investment Decisions, Labor Cost Is Only for Some

We consider the primary drivers companies cite in connection with two groups of decisions to increase production volume in China, i.e. a shift from Western Europe

Exhibit 12: Attributes of products for which production volume is increased in China

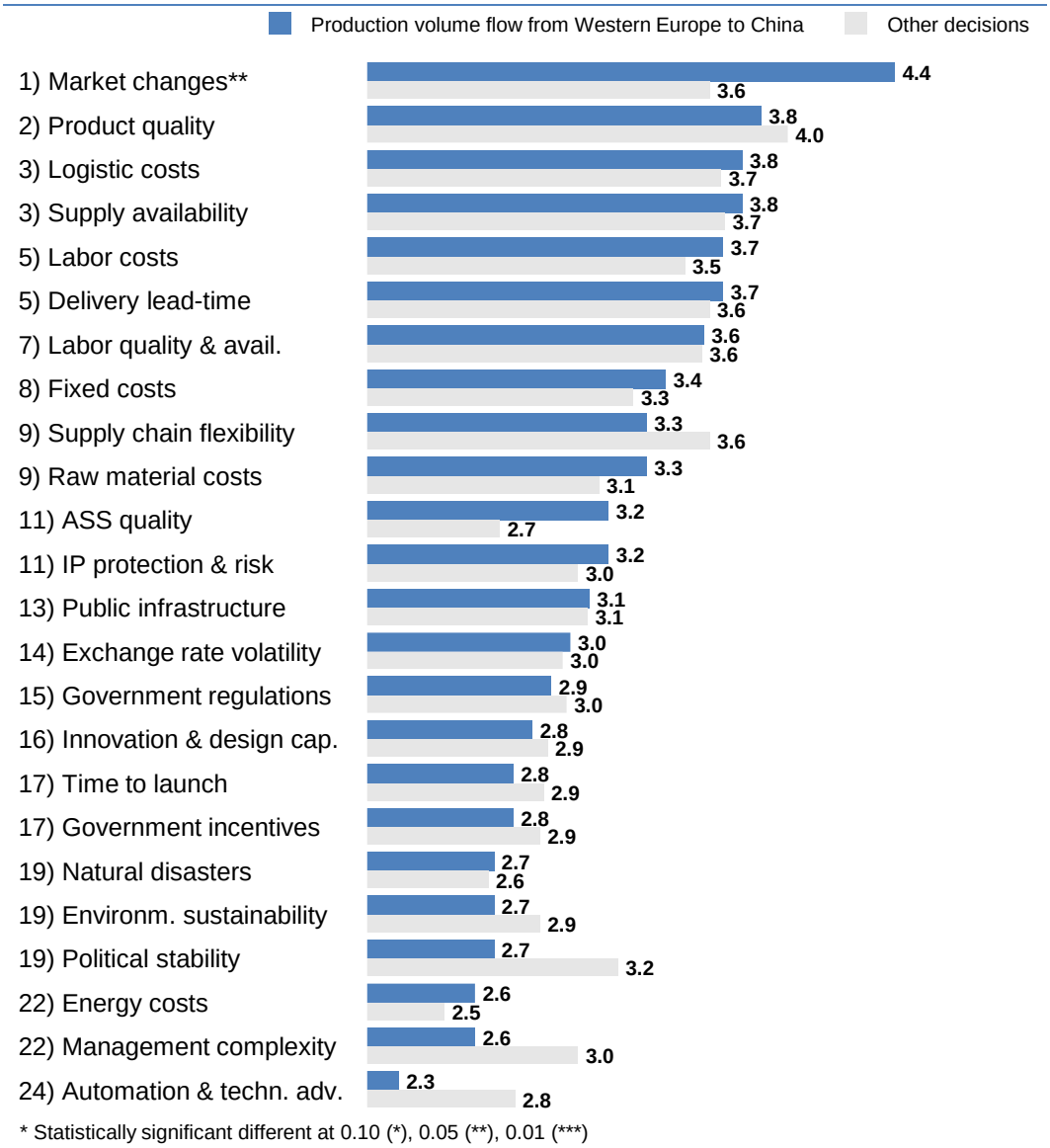
Percent



* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Exhibit 13: Importance of decisions drivers for production volume flow from Western Europe to China

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



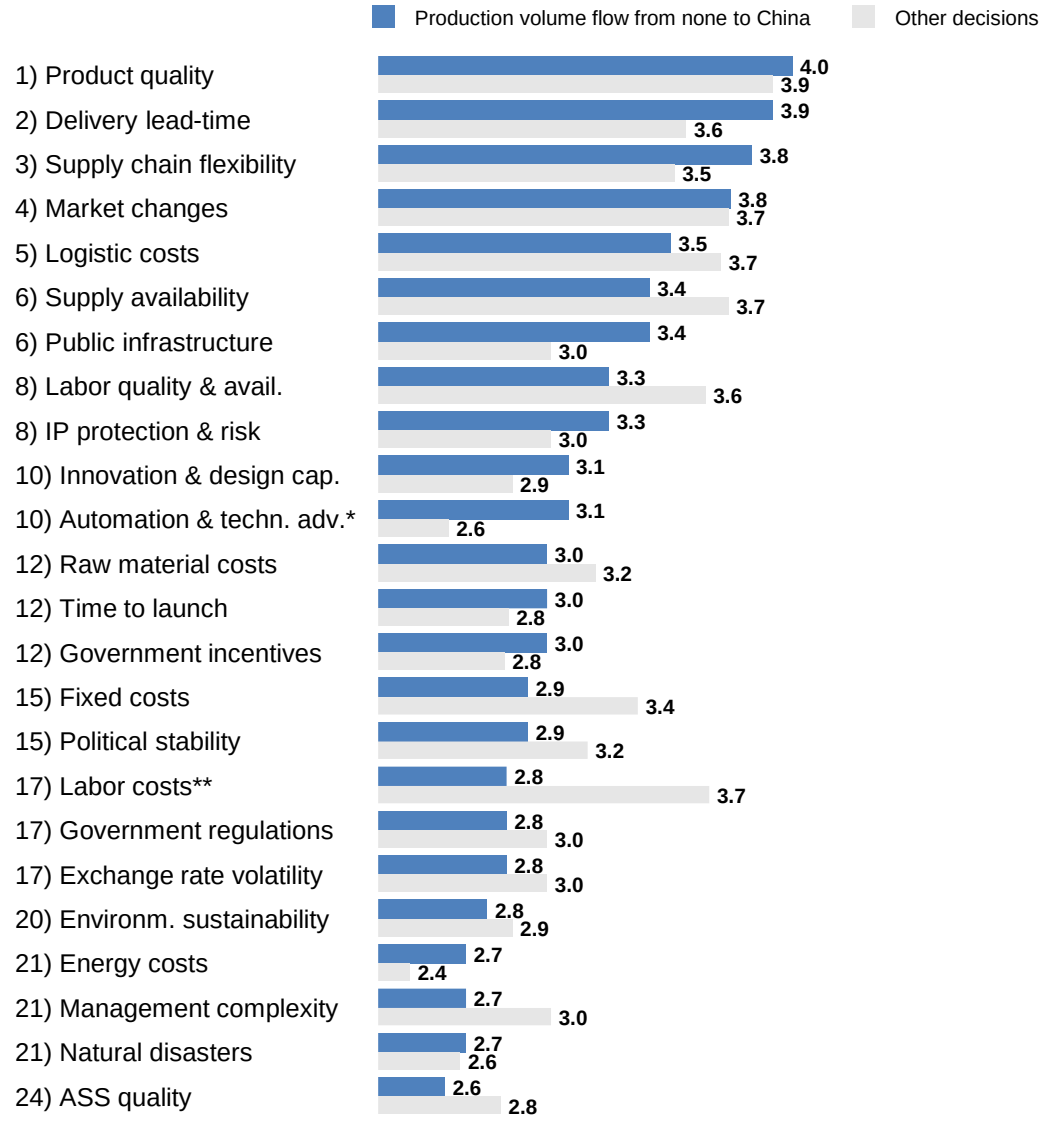
* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

to China and growth within China. Both have in common that market changes, product quality and supply chain performance (supply availability, delivery lead-time, flexibility, logistic cost) are of paramount importance. All these drivers rank among the most important for decisions to shift production from Western Europe to China (Exhibit 13) and for decisions to increase production volume in China without any reallocation (Exhibit 14).

The importance of labor (cost) however distinguishes decisions to shift production from Western Europe to China. Companies following this production volume flow rank labor cost highly and to a lesser degree labor quality and availability. In

Exhibit 14: Importance of decisions drivers for production volume increase in China without simultaneous reallocation

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

contrast, companies increasing production volume in China without any reallocation put labor cost among the least important drivers (#17) while it is in the top 5 for decisions to shift from Western Europe to China. A plausible explanation might be that for latter decisions the cost differential between China and their current location is still too substantial to be neglected.

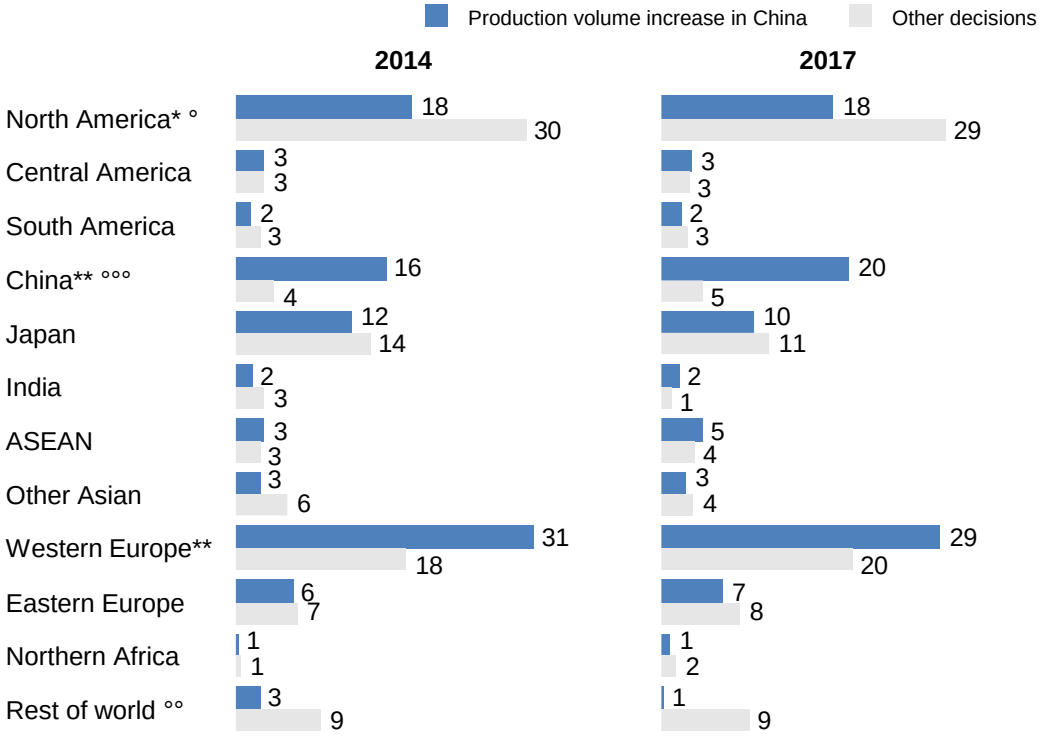
Investments in China Are Market Driven

Both groups, however, agree on the importance of market changes. Companies that shift production from Western Europe to China rank market changes even

significantly more important than companies that follow any other strategy. Analyzing the sales activities of the companies investing in China as outlined in Exhibit 18 shows why. Already in 2014 for these companies China accounts for a significantly higher share of global sales than for other firms in our sample. Over the next three years these companies further expect to see a higher increase in Chinese sales. Moving production to China can therefore be seen as an enabler or accelerator for serving this vast and rapidly growing market.

Exhibit 15: Average share of global sales volume per region for companies that increase production volume in China

Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

Low-Cost Chasing Firms Primarily from North America Move Labor-Intensive Production out of China and to Some Degree to ASEAN

While China is the country with the single most reported decisions for increasing production volume, it is also the country with the third most responses (11%) quoting a decrease in production volume. About half of them report a shift of production volume to ASEAN countries along with a total of 16% of our sample.

Contrary to decisions to invest in China, no European but to a large degree North American companies report decreasing production volume in China as outlined in

Exhibit 16: Origin and industry affiliation of companies that decrease production volume in China

Percent

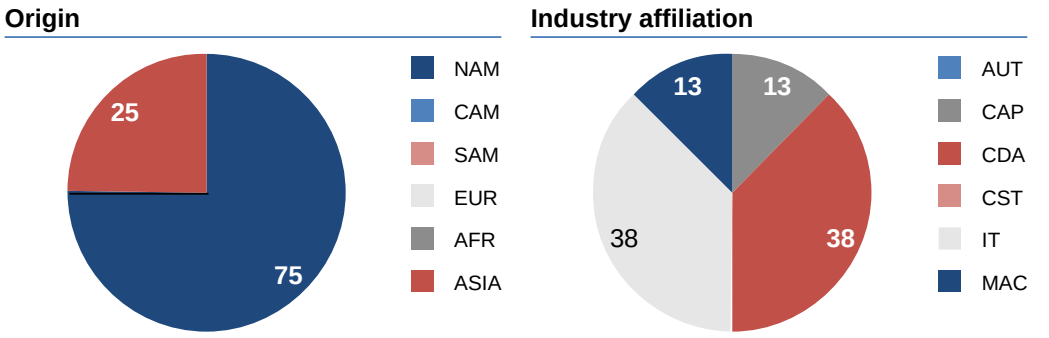
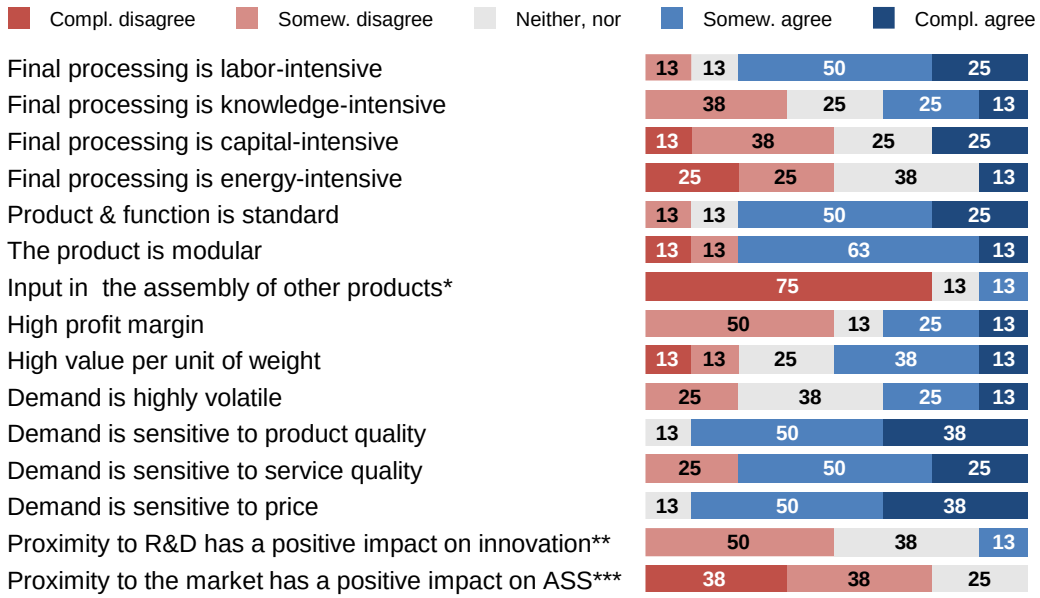


Exhibit 16. These companies relocate mostly production of labor-intensive final products, contrary to decisions to invest in China as shown in Exhibit 17.

For the decisions in this group, proximity of production to R&D or to the market is of low importance for innovation or for after sales service suggesting that the new manufacturing locations are used primarily as offshore manufacturing sources.

Exhibit 17: Attributes of products for which production volume is decreased in China

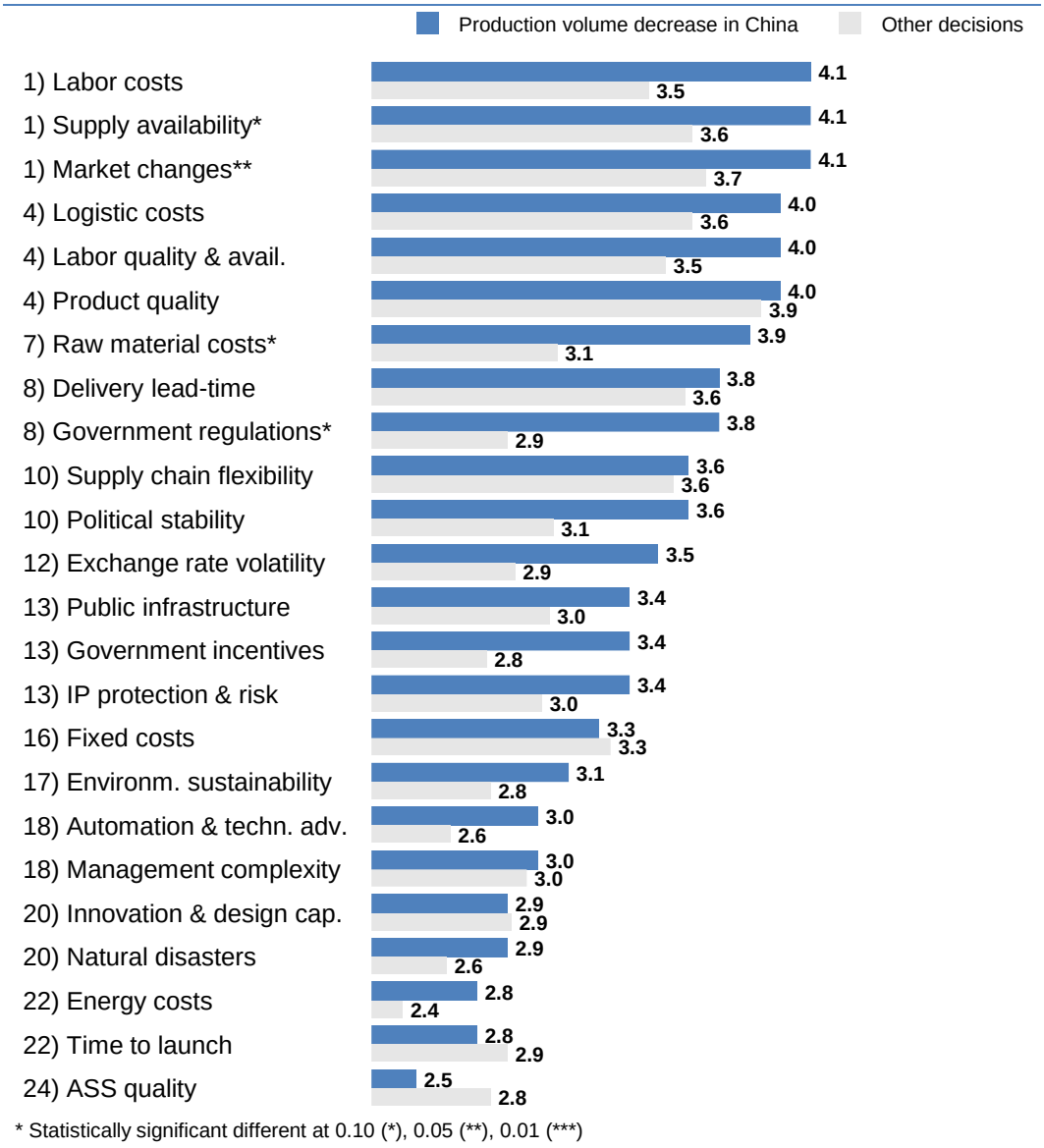
Percent



* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Exhibit 18: Importance of decisions drivers for production volume decrease in China

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



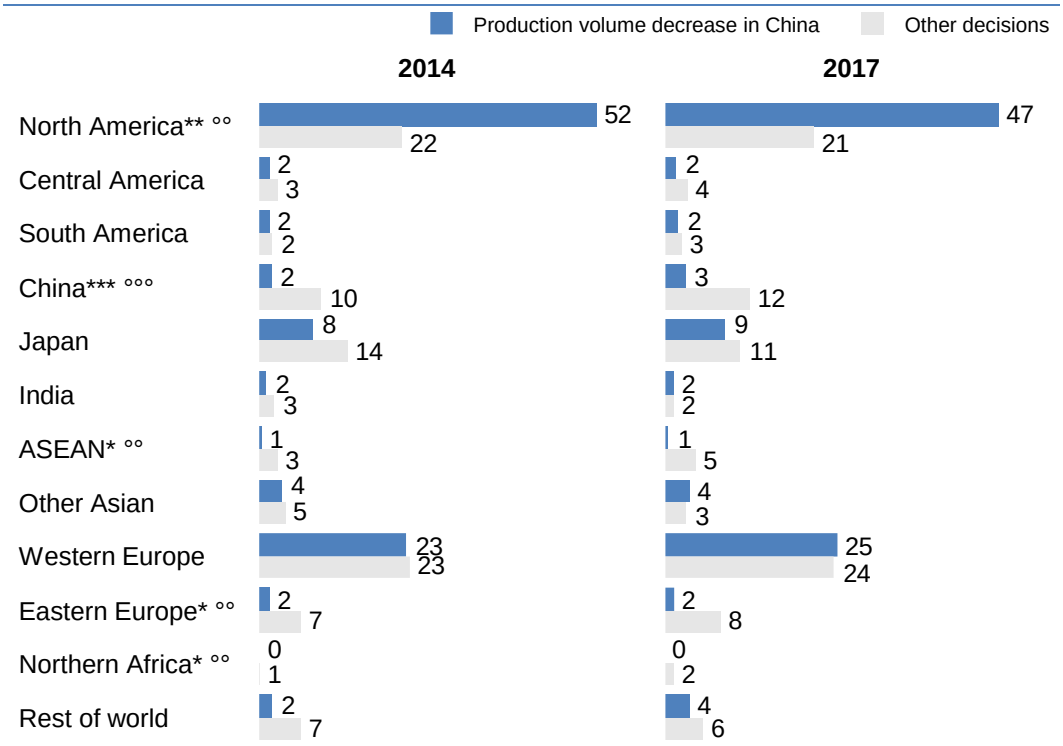
* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

Labor Cost Is the Primary Driver for Production Divestments

When asked about the primary decision drivers companies rank labor cost as most important, along with supply availability and market changes as outlined in Exhibit 18. In many industries cost pressure first hits the suppliers. Accordingly, the high ranking of supply availability and raw material cost next to labor cost suggests that these companies now follow some of their suppliers to lower cost locations outside China.

Exhibit 19: Average share of global sales volume per region for companies that decrease production volume in China

Percent



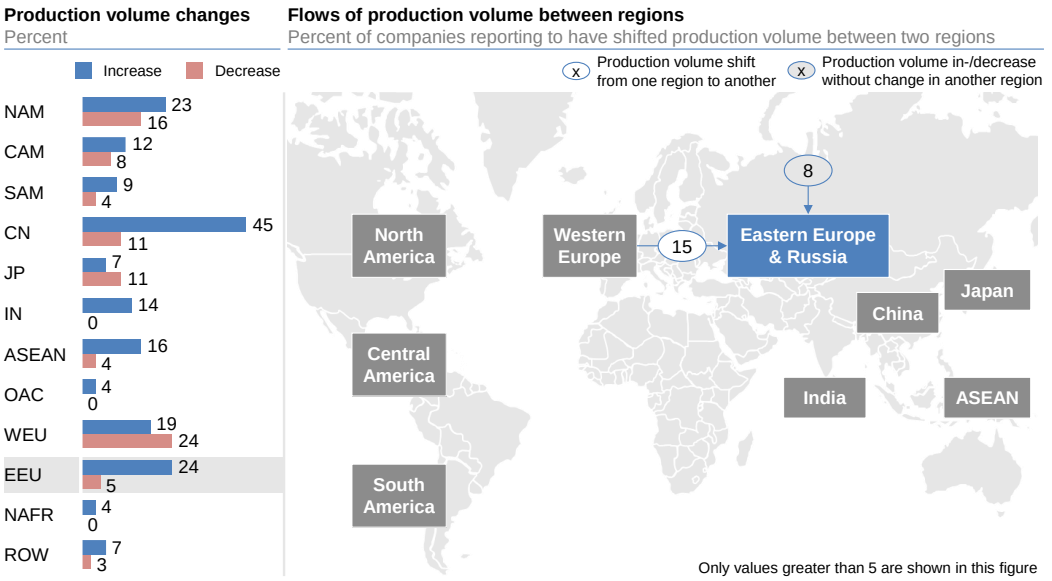
* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

Depending on the Markets Being Served, the Same Drivers Lead to Contrasting Decisions

Also market change is ranked as most important and significantly more important than by firms who followed other decisions. So, the very reason that made some companies, many of which were Western European, to invest in China, market changes, causes others, mainly North American, to divest. Analyzing where these markets are as shown in Exhibit 19, one can see, that companies that decrease production volume in China do not primarily serve the Chinese market. Instead, North America accounts for around 50% of their global sales. One can thus conclude that the production that used to be located in China was for offshore supply which is now in light of the changing global cost competitiveness, relocated to cheaper places or in places closer to demand. Even though the largest outflow of production out of China was into ASEAN countries the low-cost location close to demand could refer to the U.S. for companies serving the North American market.

EASTERN EUROPE & RUSSIA SERVE AS LOW-COST NEARSHORE PRODUCTION SOURCE FOR WESTERN EUROPE

Exhibit 20: Flows of production volume to and from Eastern Europe & Russia



After China, Eastern Europe & Russia ranked second in our sample in terms of attracting investments for production volume (24% of the responses). Moreover, only 5% of the respondents indicated a production volume decrease in Eastern Europe & Russia as outlined in Exhibit 20. More than half of the investments are associated with shifts of production volume from Western European countries. Not surprisingly, Western European companies from a wide range of industries account for the majority of decisions to invest in Eastern Europe & Russia as outlined in Exhibit 21. Accordingly, we will take the perspective of production volume shifts from Western to Eastern Europe to illustrate the driving forces of decisions to increase production volume in Eastern Europe & Russia.

Exhibit 21: Origin and industry affiliation of companies that increase production volume in Eastern Europe & Russia

Percent

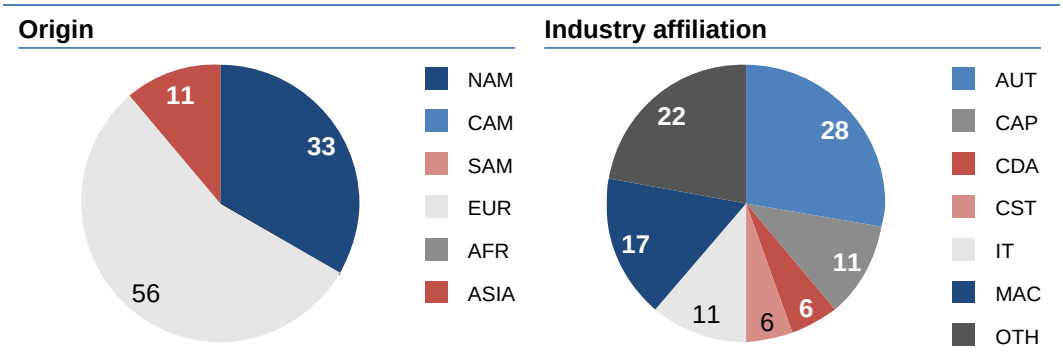
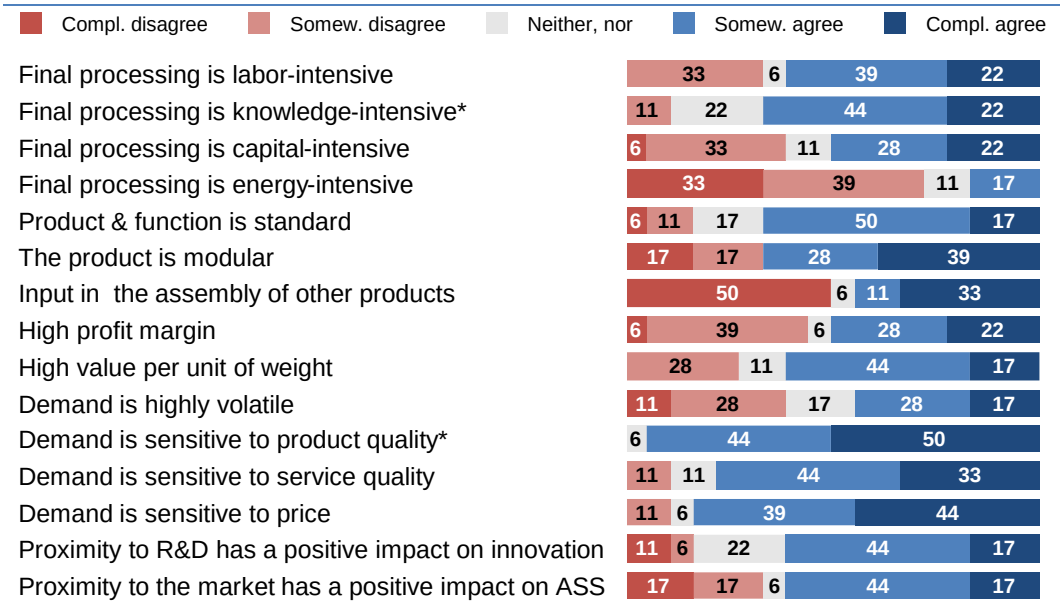


Exhibit 22: Attributes of products for which production volume is increased in Eastern Europe & Russia

Percent



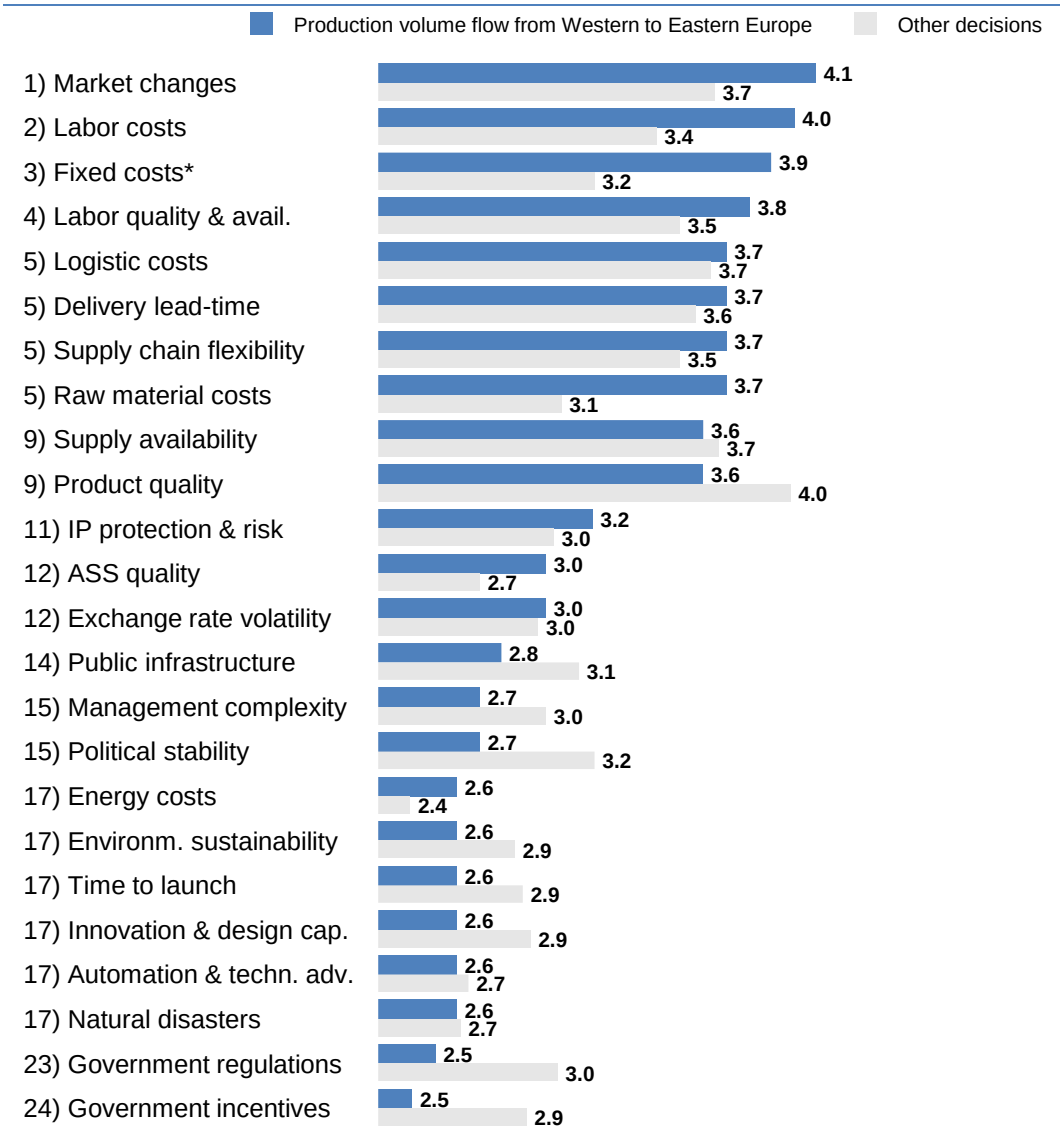
* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Rather Complex Production of Goods with Highly Price-Sensitive Demand Is Moved to Eastern Europe & Russia

Eastern European countries have a lower manufacturing cost than Western European countries. It is therefore not surprising to see in Exhibit 22 that primarily products which are price sensitive are typically moved to Eastern European and Russian facilities. However, this does not mean only production of labor-intensive products is shifted. In fact, production for the products shifted to this region are no more or less labor-intensive than those in the rest of our sample. Yet, the production of the moved products is relatively knowledge and capital-intensive. Unlike production moved out of China to low-cost locations primarily in ASEAN countries, production moved to Eastern Europe & Russia can thus be assumed to be for rather complex products with high demand for quality despite their price sensitivity.

Exhibit 23: Importance of decisions drivers for production volume flow from Western Europe to Eastern Europe & Russia

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



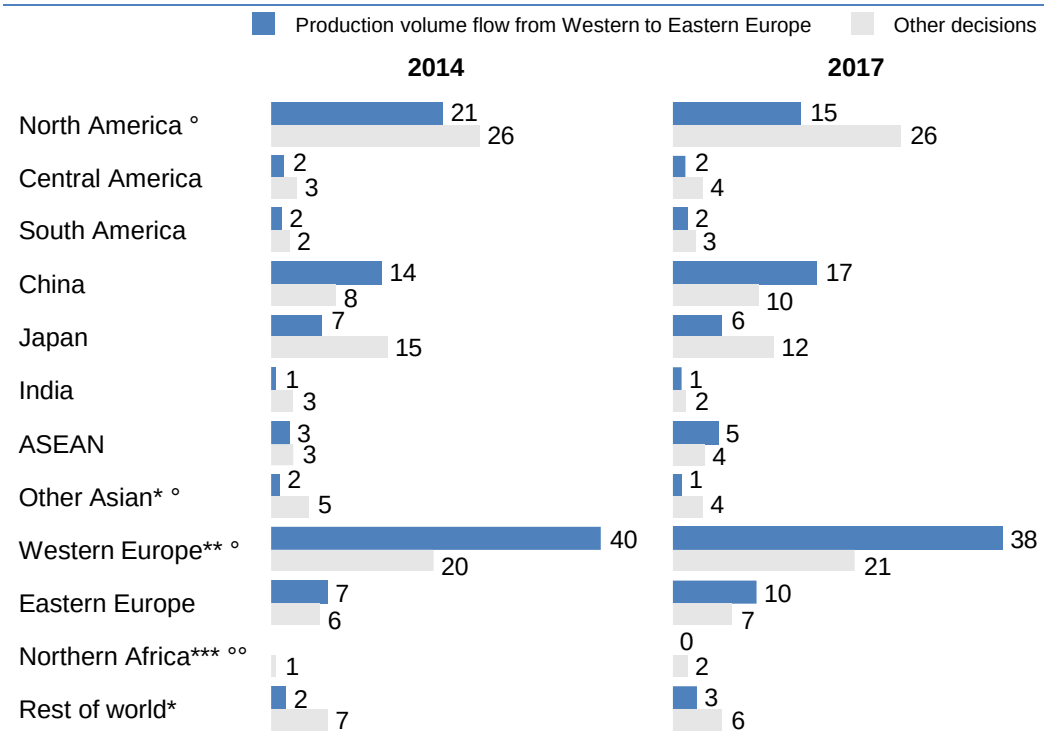
* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

Cost Drives Decisions to Invest in Eastern European & Russian Production

As outlined in Exhibit 23 respondents ranked cost (labor, fixed, logistic) as the most important drivers for decisions to shift production volume from Western to Eastern Europe. While global cost competitiveness is shifting, the notion of low-cost manufacturing in Eastern Europe & Russia still holds true.

Exhibit 24: Average share of global sales volume per region for companies that shifted production volume from Western to Eastern Europe & Russia

Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

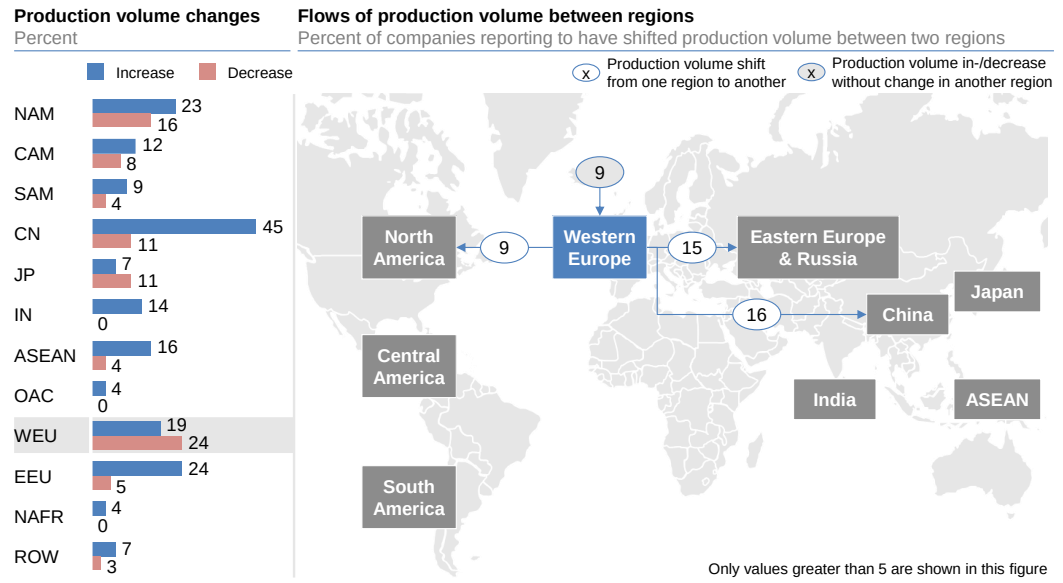
Production in Eastern Europe & Russia Is Used as Nearshore Supply for Western European Markets

Also for the decisions to shift to this region, market changes are reported to be the top driver while they are not significantly more important for the case of other decisions. Upon understanding where these markets are, it becomes clear that companies that shift production volume from Western to Eastern Europe serve to a large degree the Western European markets as shown in Exhibit 24. Production in Eastern Europe & Russia is thus used as low-cost nearshore supply location for Western European markets.

WESTERN EUROPEAN MANUFACTURING IS ON A DECLINE

Western Europe is losing ground in terms of its manufacturing competitiveness. As shown in Exhibit 25, it has the largest number of decisions to reduce manufacturing volume. Further, Western Europe is one of only two regions for which there are more decisions to decrease than to increase.

Exhibit 25: Flows of production volume to and from Western Europe

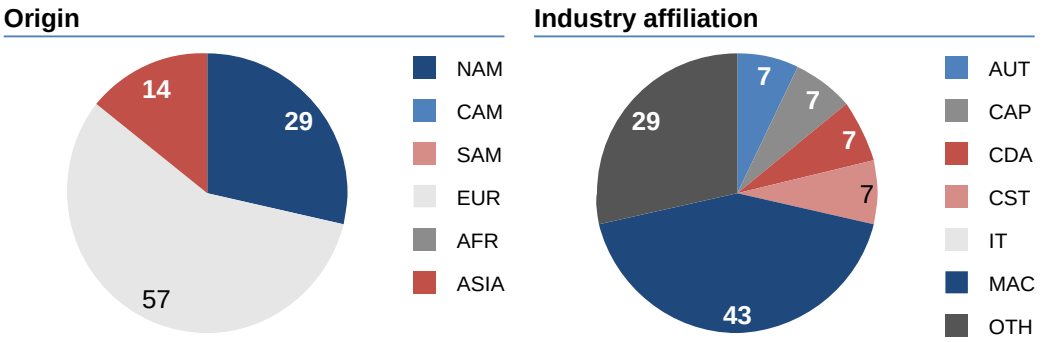


There are two main flows of production volume out of Western Europe as analyzed in connection with production volume increases elsewhere in previous sections: On the one hand 16% of our sample report shifting production volume to China. For these decisions, market considerations are of paramount importance. On the other hand 15% report a more cost-driven shift of production volume to Eastern Europe and Russia. For both shifts we observe that primarily European companies shift production away from Western Europe fleeing their home region. Interestingly, the manufacturing operations that are moved are rather complex and thus it is not just low-complexity manual labor jobs which have been offshored.

Yet, while many manufacturing operations leave or get scaled back, there is still a group of decisions (19% of total sample) that invest in manufacturing in Western Europe. Most of these investments (9%) occur without any reallocation of production volume. Since we have discussed the dominant divestment flows in previous sections, this section will focus on inbound investments in more detail.

Exhibit 26: Origin and industry affiliation of companies that increase production volume in Western Europe

Percent

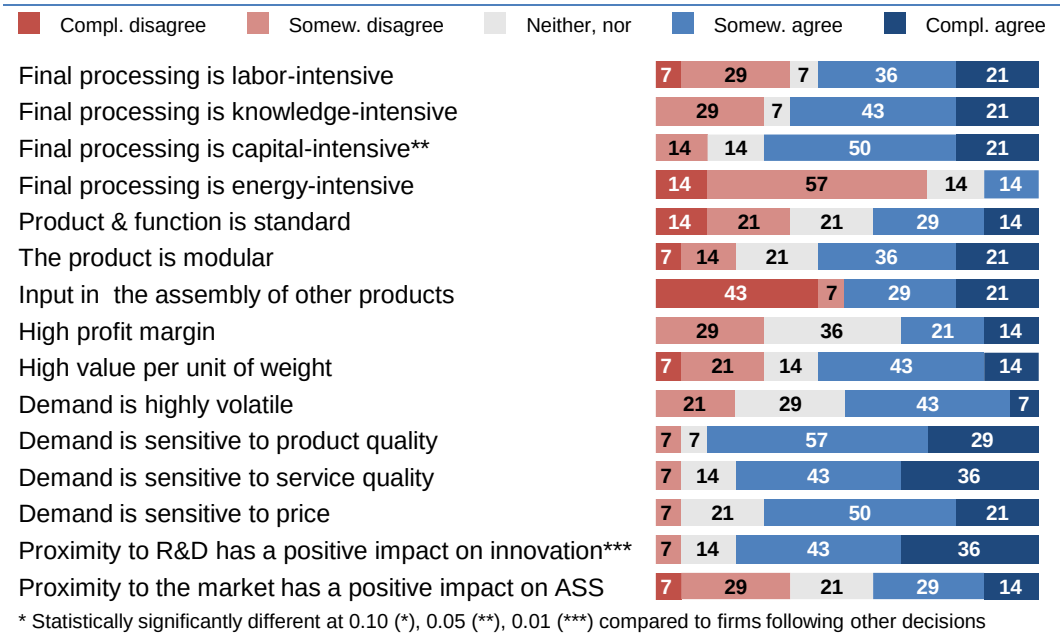


European machinery companies still invest in Western Europe

Many of the companies investing in Western Europe are machinery companies from Europe as shown in Exhibit 26. These companies invest in very capital-intensive production, (Exhibit 27), which is a type of production which lends itself less to relocation once a site has been established. Hence, even though a particular location is not preferred in a changed business environment, companies may invest in an existing site rather than in a new site of this type elsewhere in the world.

Exhibit 27: Attributes of products for which production volume is increased in Western Europe

Percent

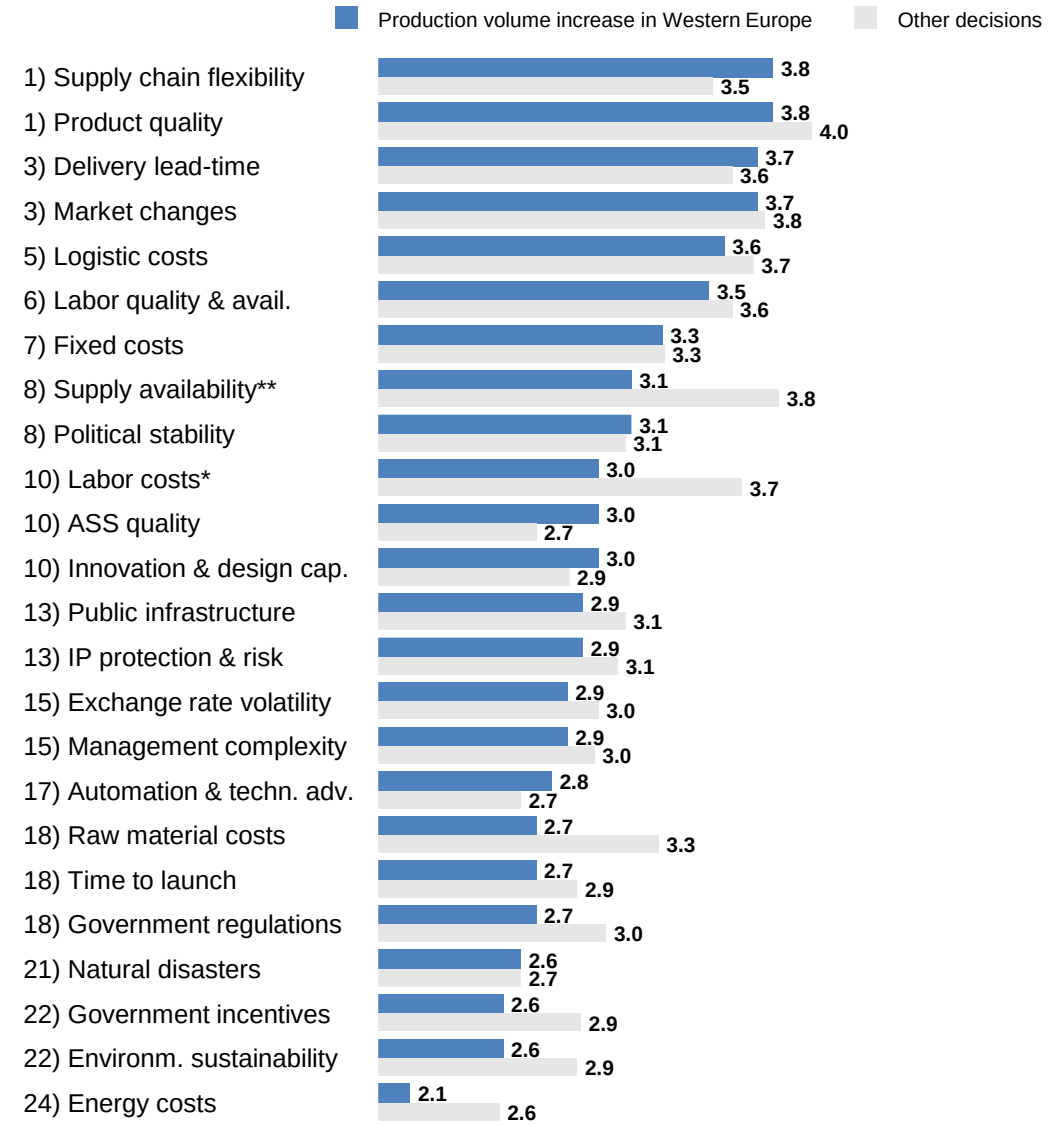


* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

In the majority of cases proximity between manufacturing and R&D is crucial for innovation. Given that R&D has not been offshored for so long and thus remains to a large degree still in Western Europe, for European firms investments in co-located manufacturing operations appear to be consequential.

Exhibit 28: Importance of decisions drivers for production volume increase in Western Europe

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



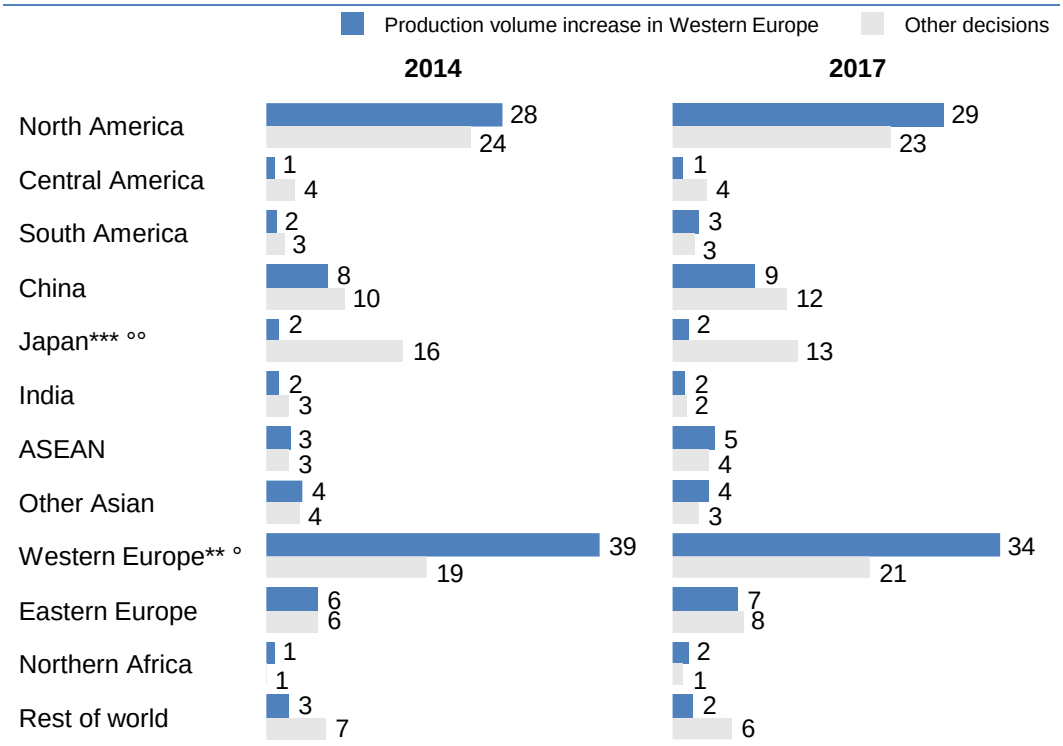
* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

Quality and delivery drive companies to invest in Western Europe

Exhibit 28 displays the assessment of the drivers as quoted by the respondents for decisions to increase production volume in Western Europe. As one would expect

Exhibit 29: Average share of global sales volume per region for companies that increase production volume in Western Europe

Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

labor cost is not among the top drivers (#10). Comparing this ranking of importance with the ones based on other decisions, we see that labor cost is ranked significantly less important, which is in line with the high capital-intensity of the products involved. On the other hand we see that for this case, product quality and delivery related factors (supply chain flexibility, delivery lead-time) are ranked most important along with market changes. These markets are, as Exhibit 29 shows, primarily in Western Europe. Firms thus nearshore when they invest in Western Europe.

JAPANESE MANUFACTURING SEEMS TO BE SUFFERING FROM THE REPERCUSSIONS OF FUKUSHIMA

After Western Europe Japan is the only region with a reported net outflow of production volume. More companies reported a decrease of production sourcing in Japan (11% of the sample) than an increase (7%).The shift of production volume to ASEAN countries accounts for half of the divestments in Japan as shown in Exhibit 30.

Exhibit 30: Flows of production volume to and from Japan

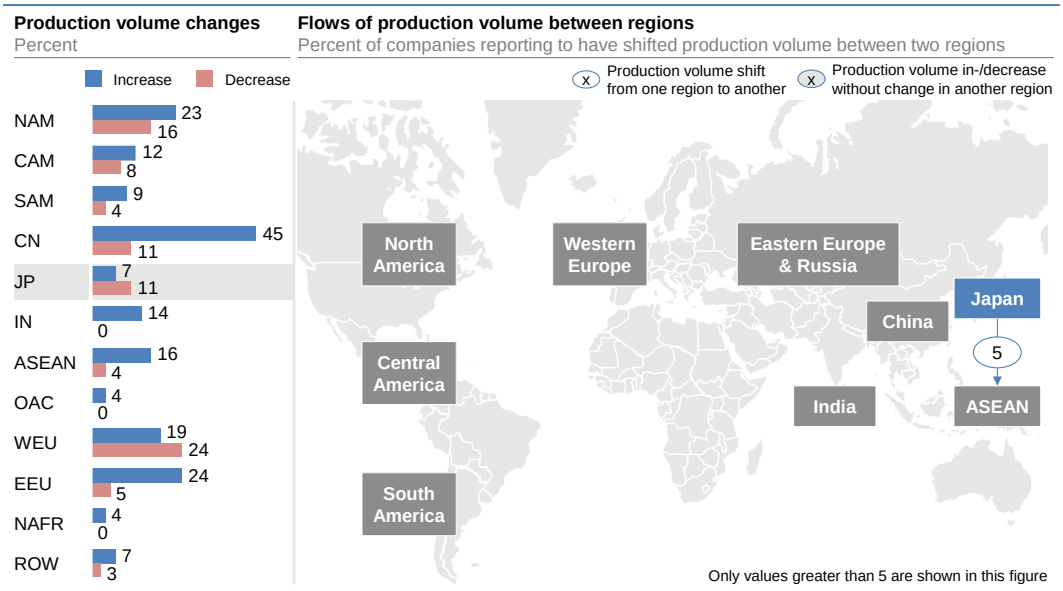
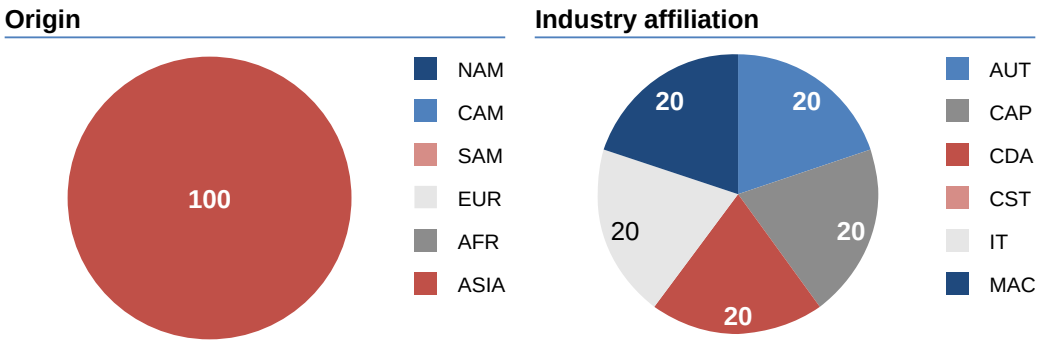


Exhibit 31: Origin and industry affiliation of companies that increase production volume in Japan

Percent

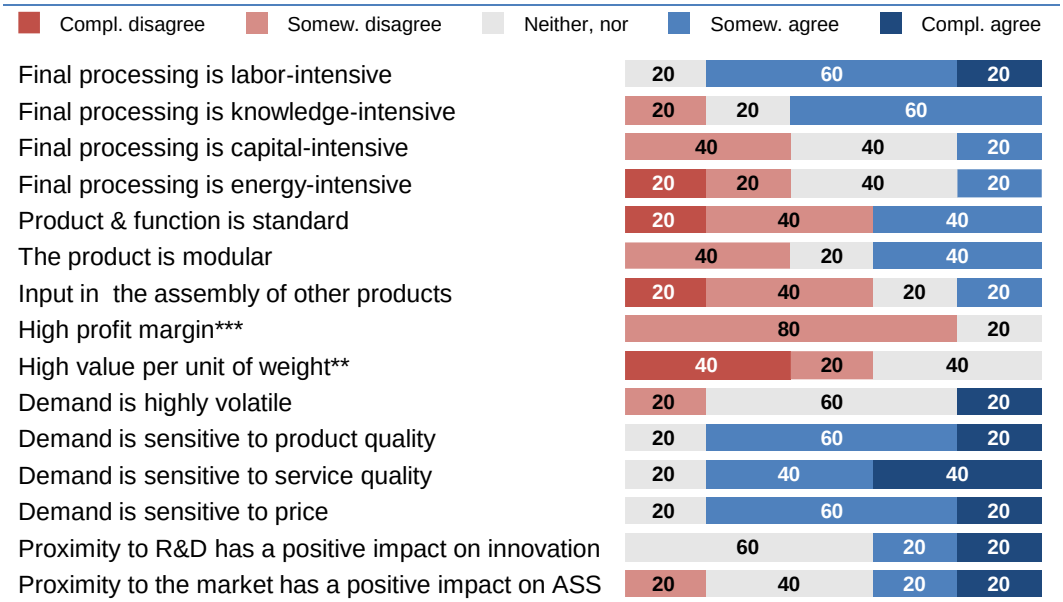


Only Asian firms invest in mostly labor-intensive production in Japan

Exhibit 31 outlines that only Asian firms in our sample invested in Japan. These companies have moved mostly labor- and knowledge-intensive production to Japan. As shown in Exhibit 32 these products have a significantly smaller profit margin and lower per weight value when compared to products for which other decisions were made.

Exhibit 32: Attributes of products for which production volume is increased in Japan

Percent



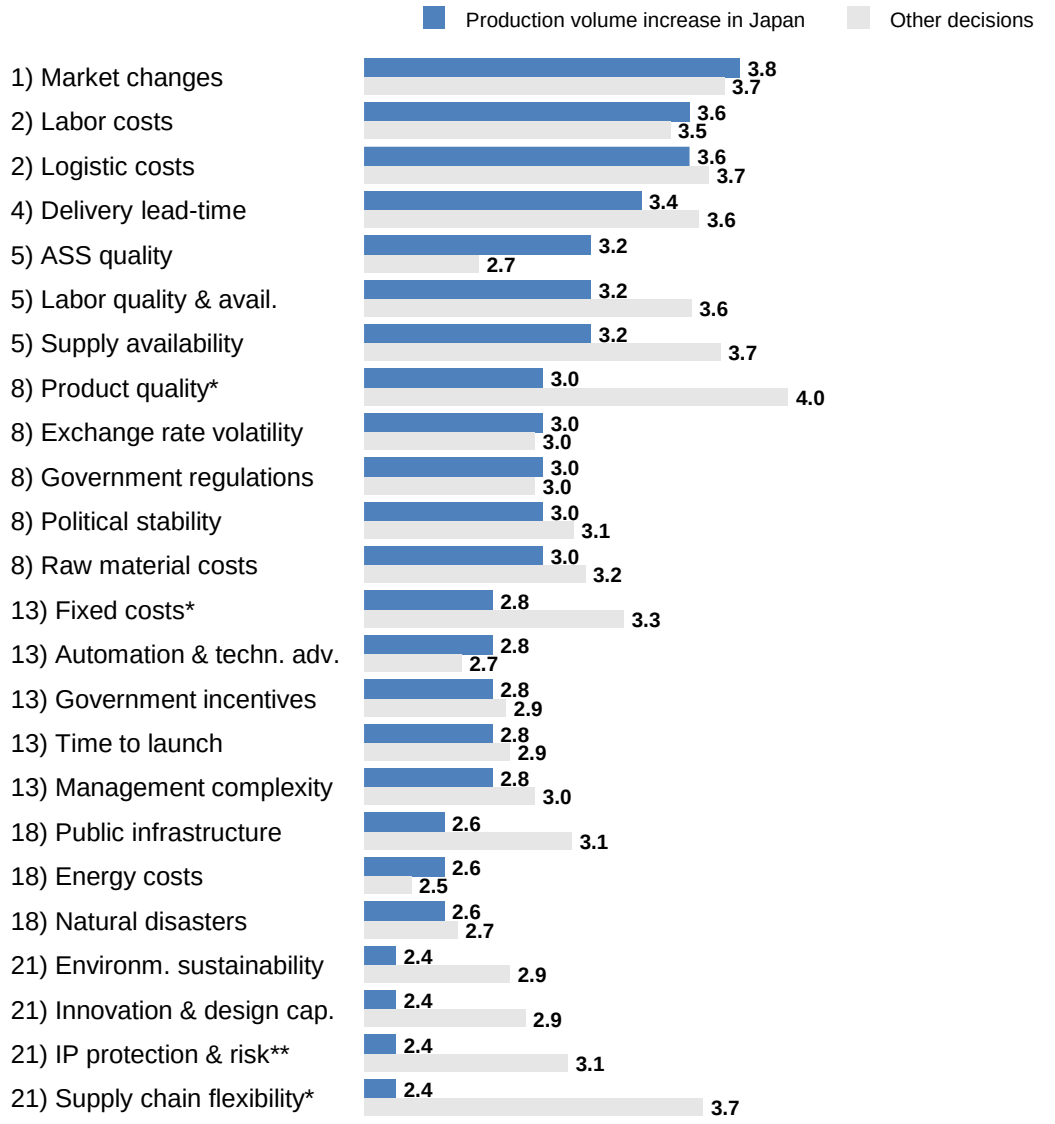
* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Investments in Japan are driven by a strong commercial interest in Japan and ASEAN countries

Companies that invest in production volume in Japan rank market changes, along with labor and logistic costs as the most important decision drivers as shown in Exhibit 33. Yet, none of these drivers differ in importance when compared to other decisions that were reported in our sample. One exception is product quality which differs significantly. It is of lesser importance for firms investing in Japan. Similarly, fixed costs, IP protection and risk as well as flexibility are ranked significantly less important compared to the ratings by firms not investing in Japan.

Exhibit 33: Importance of decisions drivers for production volume increase in Japan

Average weighting on scale from 1 (not important at all) to 5 (extremely important)

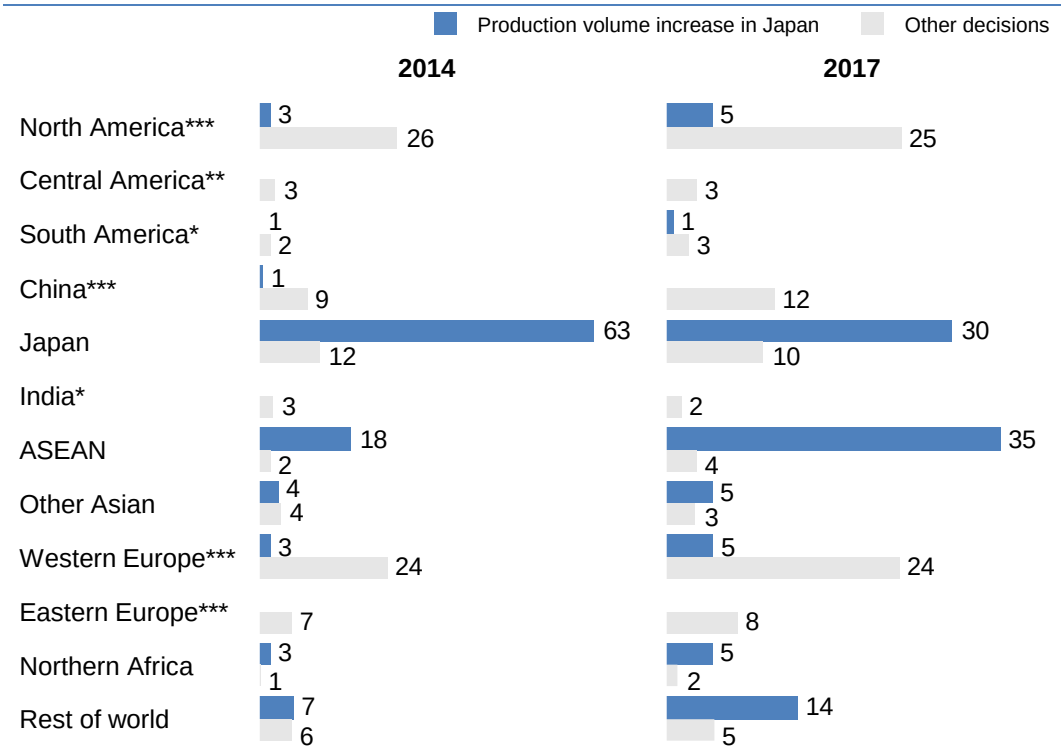


* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

We can also see that decisions to increase production sourcing from Japan seem to be driven by a strong commercial interest in the region. As Exhibit 34 shows, Japan along with the ASEAN countries account not only for the largest but also a substantially higher share of global sales when compared to firms making other decisions.

Exhibit 34: Average share of global sales volume per region for companies that increase production volume in Japan

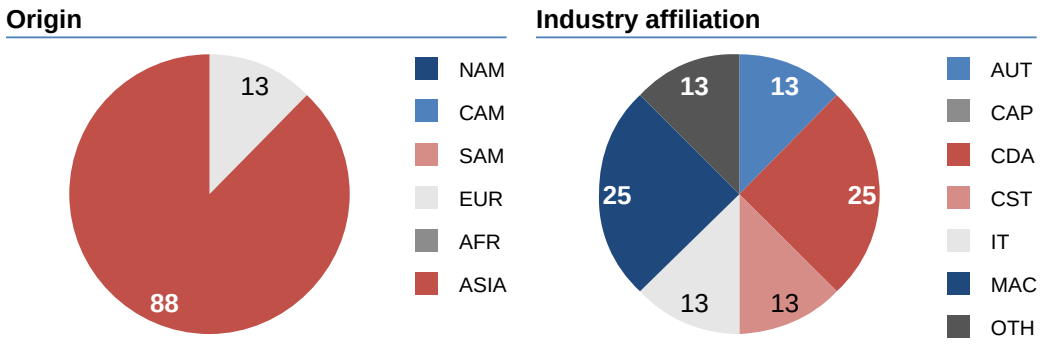
Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

Exhibit 35: Origin and industry affiliation of companies that decrease production volume in Japan

Percent



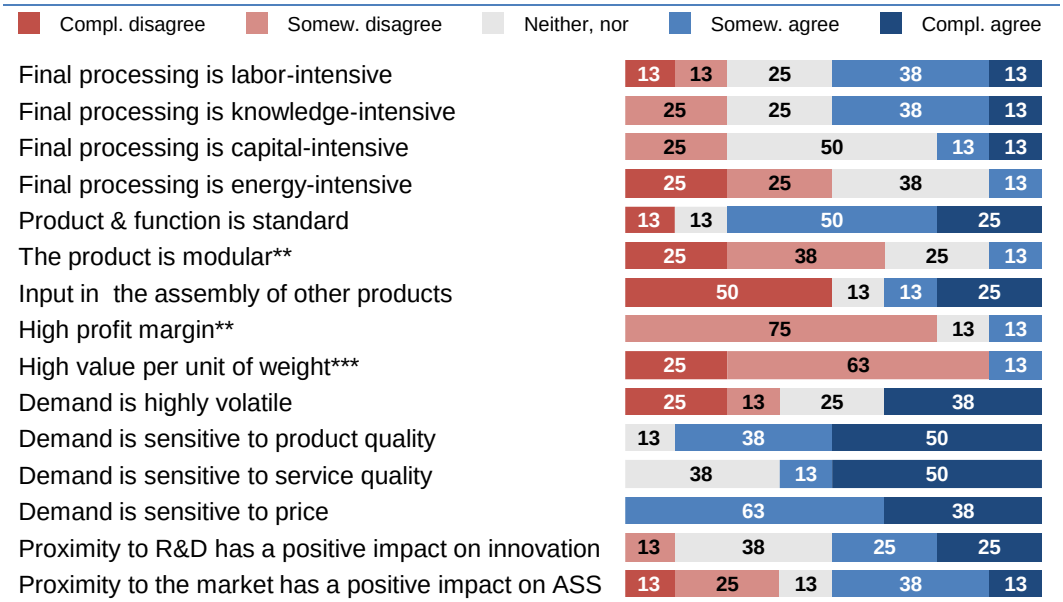
Firm and Product Profiles Are Similar for In- and Divestment Decisions in Japan

From a firm and product perspective, decisions to in- and decrease production in Japan are very similar. Both decisions are primarily made by Asian firms from a wide range of industries as outlined in Exhibit 35.

For both decisions the products affected have a low profit margin and low value per unit of weight, at levels that are significantly less than what was observed for the rest of the sample, as shown in Exhibit 36.

Exhibit 36: Attributes of products for which production volume is decreased in Japan

Percent



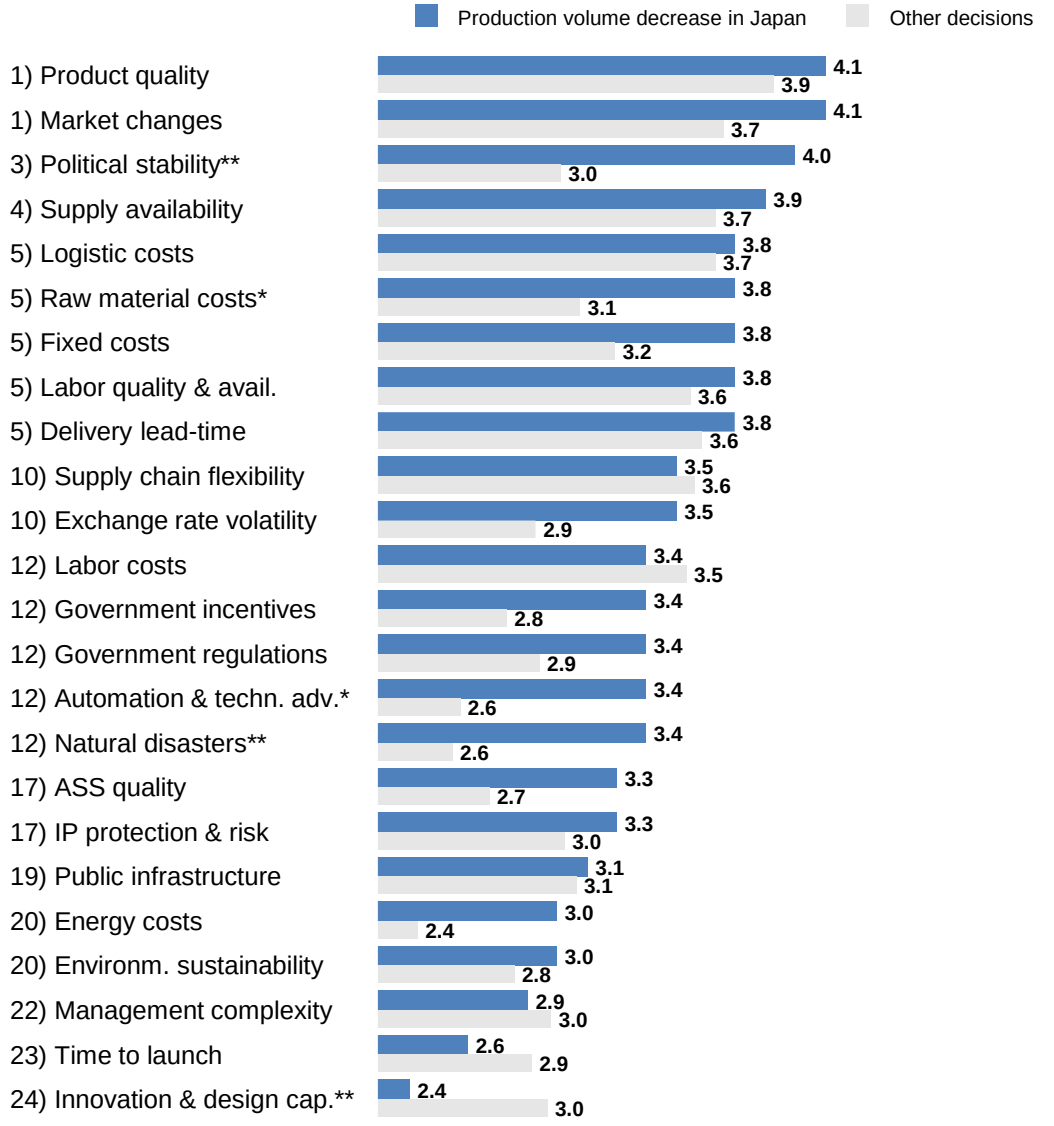
* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Political Stability and Natural Disasters Are Strong Differentiators for Decisions to Decrease Production Sourcing in Japan

Companies that divest in Japan rank product quality and market changes as most important decision drivers. Yet, the key differentiating drivers seem to be others as Exhibit 37 suggests: Raw material costs, automation, and innovation are of significantly greater importance for these firms. So are political stability and natural disasters which may well be a repercussion of the earthquake and nuclear incidents that occurred in Fukushima in 2011.

Exhibit 37: Importance of decisions drivers for production volume decrease in Japan

Average weighting on scale from 1 (not important at all) to 5 (extremely important)

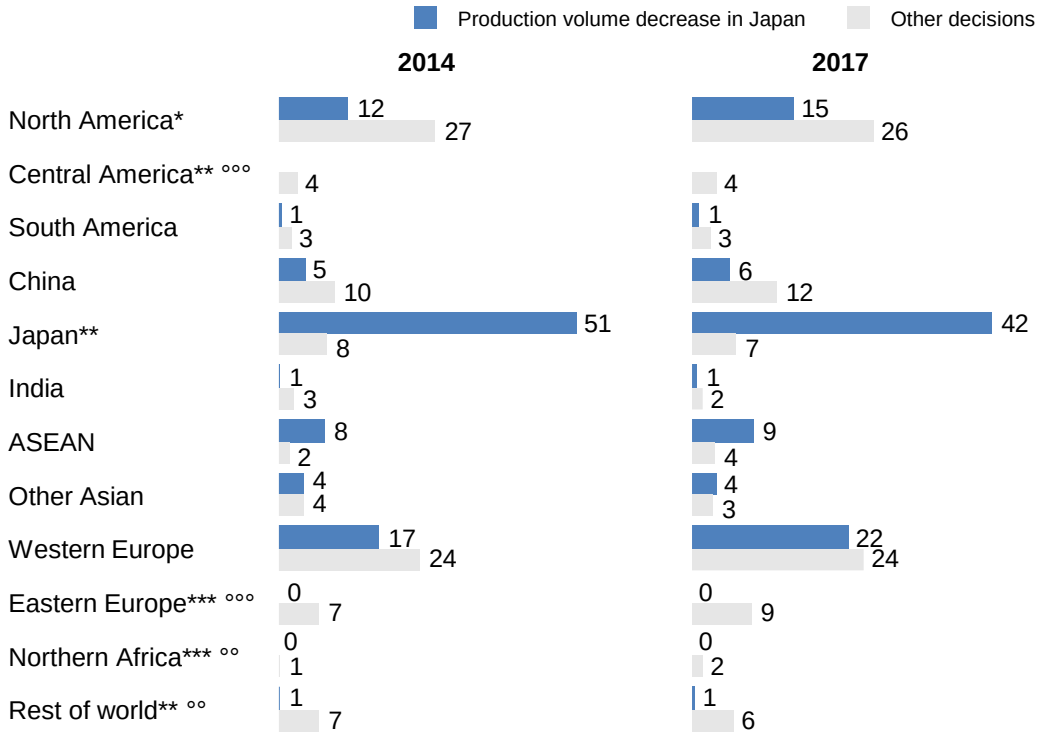


* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

Also with respect to global sales, decisions to in- and divest in Japan are similar. In particular, for firms divesting Japan accounts for the largest share of global sales as shown in Exhibit 38. The production volume reductions in Japan must therefore be replaced by an offshore supply or will serve one of the smaller markets.

Exhibit 38: Average share of global sales volume per region for companies that decrease production volume in Japan

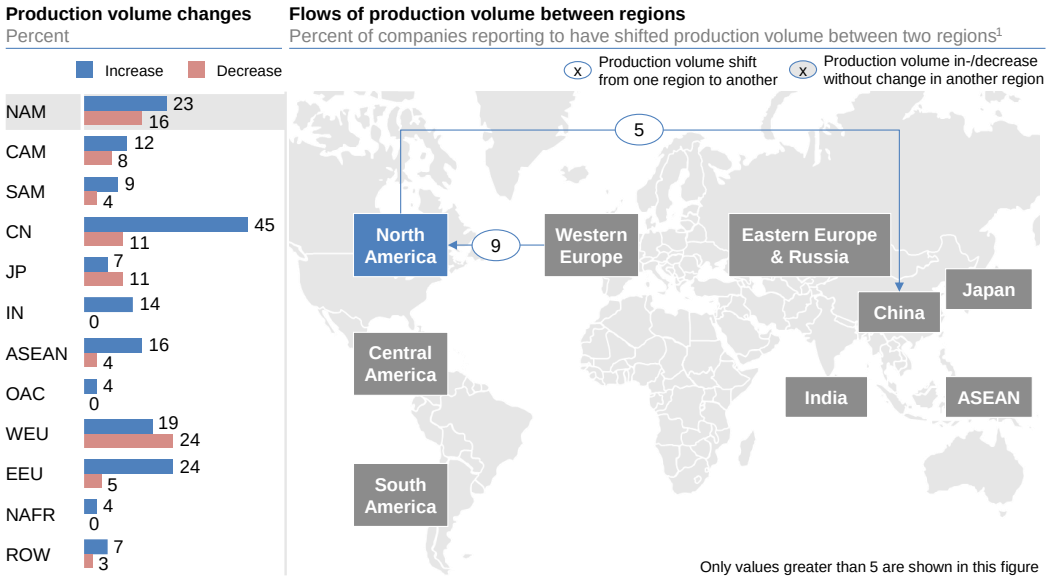
Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

NO RESHORING TO NORTH AMERICA IS OBSERVED, THIS REGION MAY STILL BE AT THE CUSP OF A MANUFACTURING RENAISSANCE

Exhibit 39: Flows of production volume to and from North America

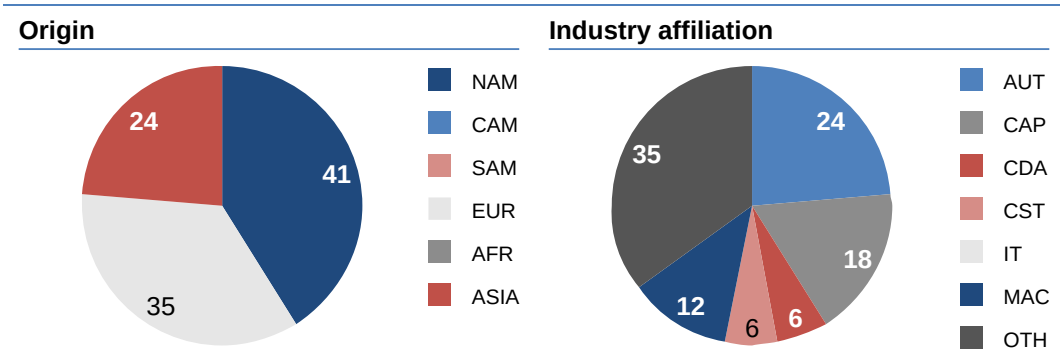


Earlier in this report we discussed our observations concerning reshoring to North America and had concluded that in our sample we do not find evidence for a large scale reshoring trend. While our sample reports a surplus of investment for production in North America, we noted that this phenomenon is driven only to a limited degree by American firms. In fact, as outlined earlier, American firms were more likely to decrease production volume in North America than to increase it.

The flows of production to and from North America in Exhibit 39 indicate that the largest inflow of production volume comes from Western Europe and not China.

Exhibit 40: Origin and industry affiliation of companies that increase production volume in North America

Percent



Given the massive offshoring wave of North American firms that occurred in the 1990s many have predicted that production will return to the U.S. through reshoring by U.S. firms. However, this is not consistent with our observations.

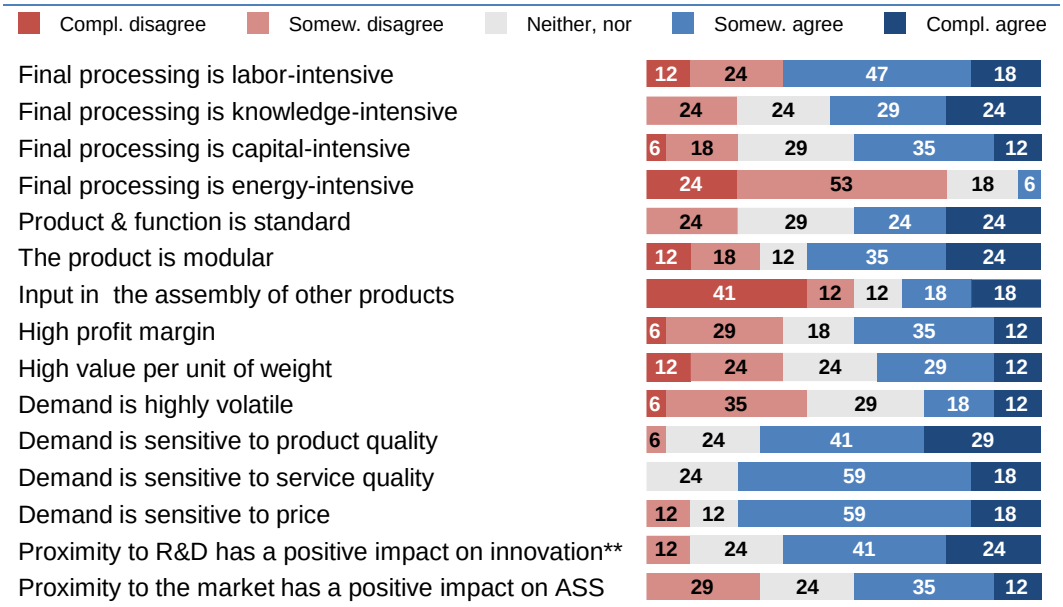
The breakdown of the respondents that reported an increase in production volume in North America as shown in Exhibit 40, confirms that North American firms account for only 41% of investment decisions into North America, while the majority are European and Asian firms. Nonetheless, it has to be concluded that North America, compared to other developed economies in Western Europe and Japan, has managed to attract more investments in production than divestments in our sample.

Decisions for North America Seek Proximity to R&D as Innovation Capability Is a Key Driver

Exhibit 41 outlines the product features of products whose production is shifted to North America. Proximity to R&D and its positive impact on innovation is ranked significantly higher than in the case of companies following other decisions. Looking at the importance of various decision drivers in Exhibit 42 we find that innovation and design capabilities are ranked among the more important drivers and are significantly more important than for other decisions. Decisions to increase production volume in North America thus are motivated by a desire to co-locate

Exhibit 41: Attributes of products for which production volume is increased in North America

Percent



* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

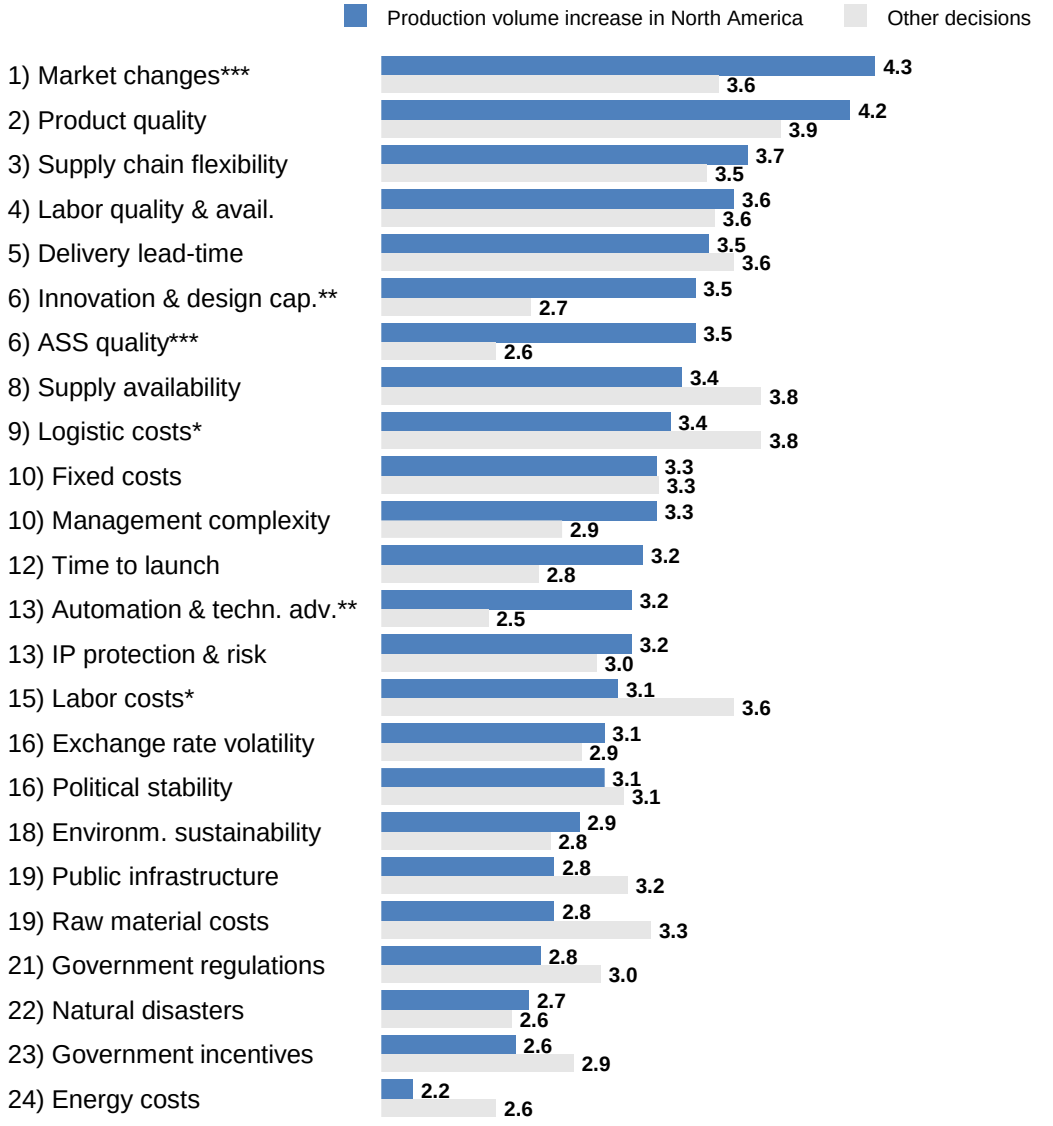
manufacturing and R&D. Just like in the case of investments in Western Europe, the fact that R&D functions had been offshored to a lesser degree than manufacturing in the past could now lead companies to return manufacturing to North America.

Labor-Intensive and Automated Operations Are Moved to North America

Production of goods that has been shifted to North America is further rated to be relatively labor-intensive and only moderately capital-intensive. Yet, labor cost,

Exhibit 42: Importance of decisions drivers for production volume increase in North America

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

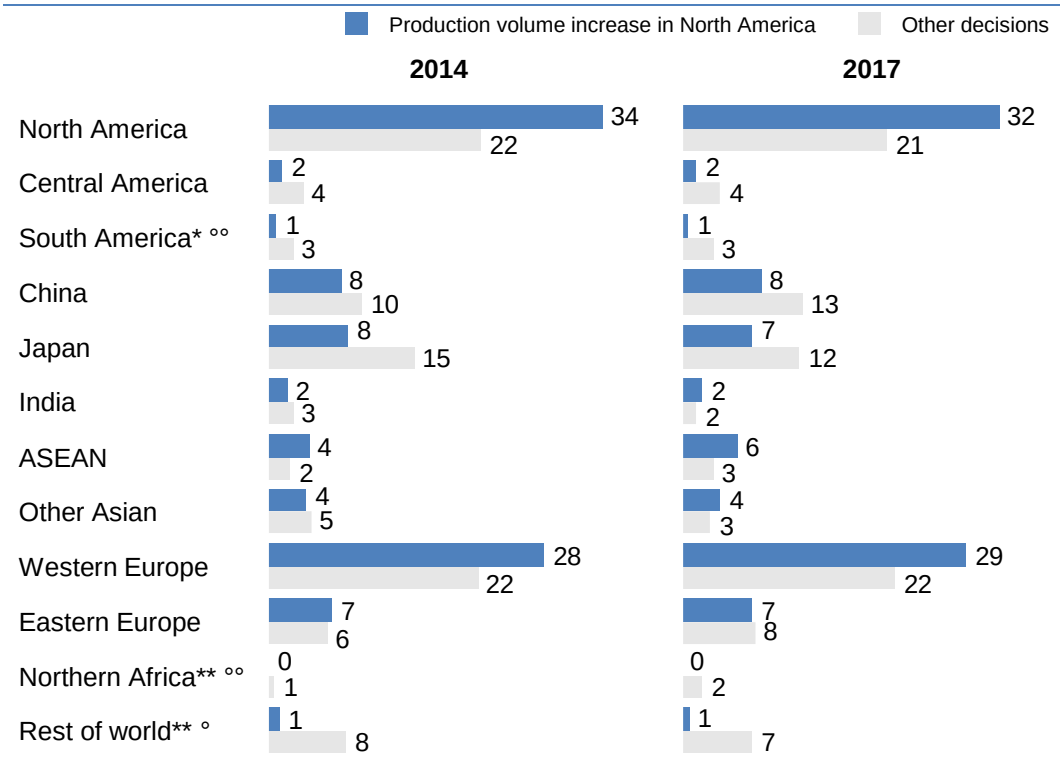
just like in decisions to invest in Western Europe, is not ranked as being very important and is significantly less important here than for other decisions as shown in Exhibit 42. On the other hand automation and other technological advancements for the production process are ranked significantly more important. From the responses in our sample we therefore cannot clearly conclude whether the manufacturing operations invested in are more associated with manual labor or with automated processes. We must therefore assume both types of processes are shifted to North America.

Proximity to Markets Is Crucial for Investments in North American

Apart from the afore mentioned drivers, firms that report an increase in production volume in North America rank quality and delivery (supply chain flexibility, delivery lead-time) as being important. Of course, companies that follow other decisions do as well. A differentiator here are market changes and after sales services quality. Both are ranked significantly more important for decisions to invest in North America. Market changes is even ranked as the most important driver. Considering that these companies serve to a large degree the North

Exhibit 43: Average share of global sales volume per region for companies that increase production volume in North America

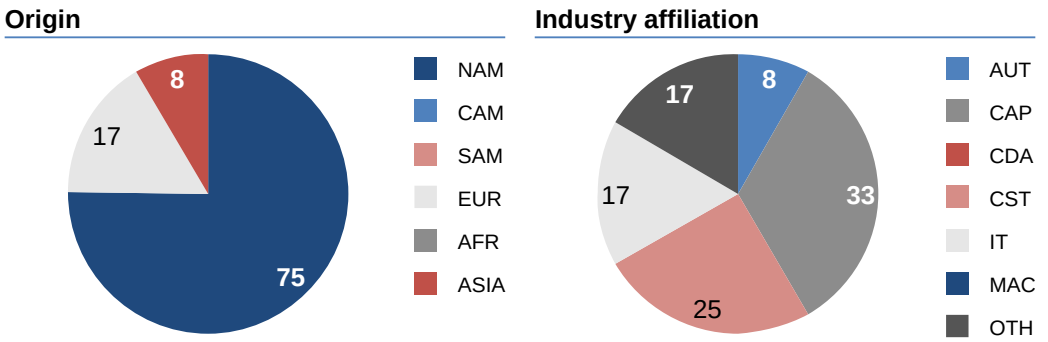
Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

Exhibit 44: Origin and industry affiliation of companies that decrease production volume in North America

Percent



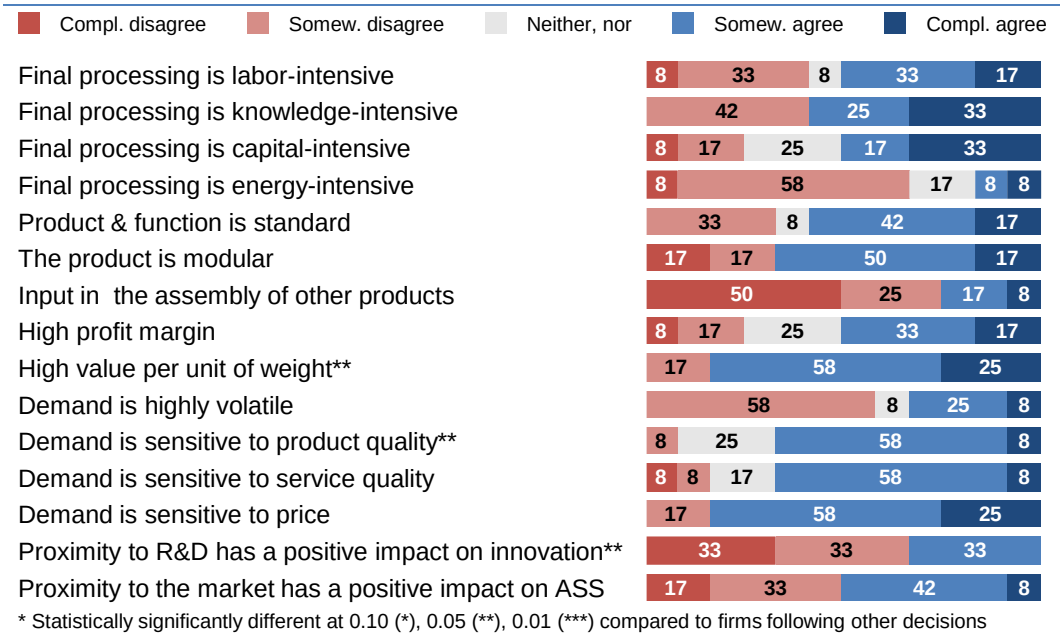
American market as shown in Exhibit 43, one can conclude that proximity to the North American market is of great importance and will be even more relevant as the U.S. economy continues to recover from the financial crisis.

Many North American Firms Still Offshore High-Value Products from North America

While 23% of our sample report increased production in North America another 16% report that they are divesting. Most of these companies are North American capital goods and consumer staples firms as indicated in Exhibit 44. These

Exhibit 45: Attributes of products for which production volume is decreased in North America

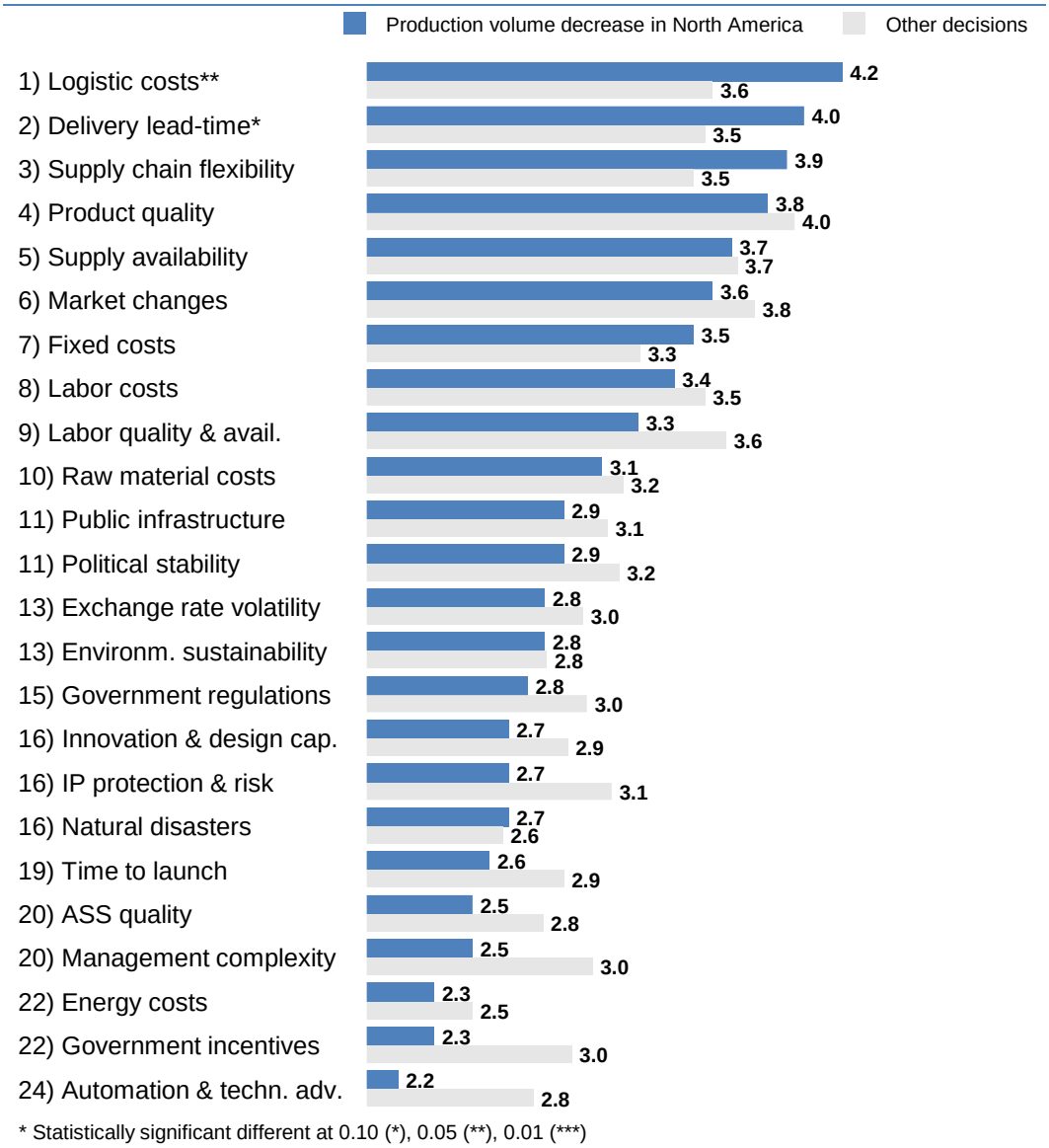
Percent



* Statistically significantly different at 0.10 (*), 0.05 (**), 0.01 (***) compared to firms following other decisions

Exhibit 46: Importance of decisions drivers for production volume decrease in North America

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

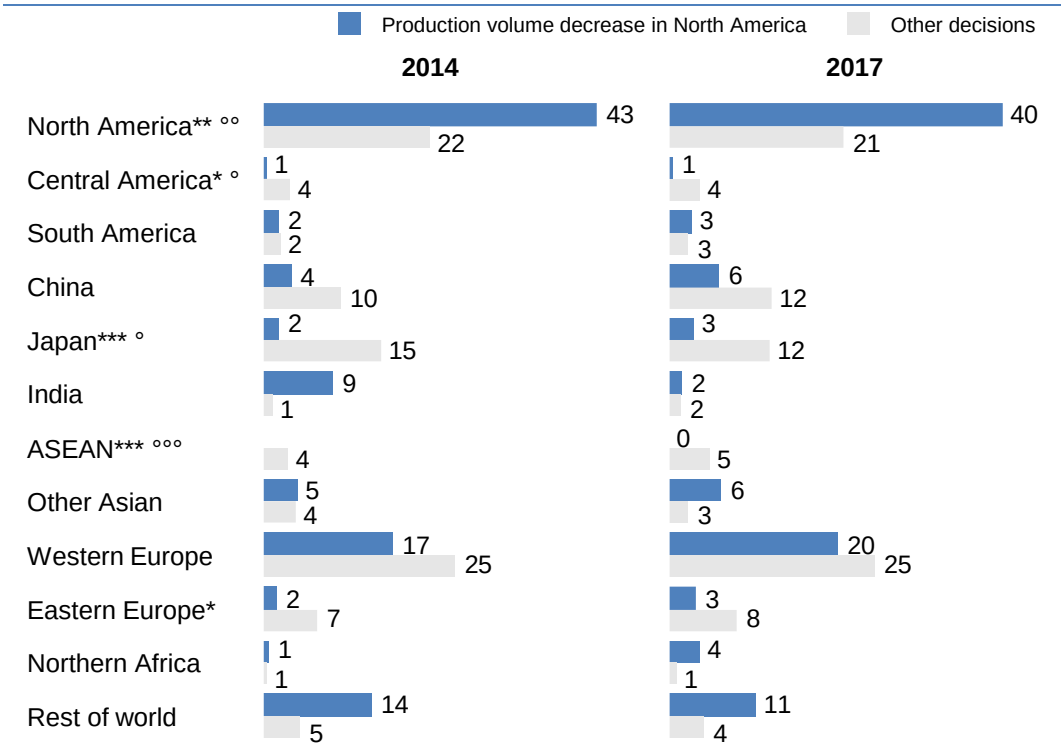
companies offshore products of significantly high-value and with a significantly lower sensitivity of demand to product quality compared to products for which other decisions were made.

Production in North America Is Decreased in Favor of Locations Closer to Demand

Contrary to decisions leading to investments in North America, proximity of manufacturing to R&D is significantly less important for those that chose to divest production in North America, as shown in Exhibit 45. Instead, proximity to demand

Exhibit 47: Average share of global sales volume per region by companies that decrease production volume in North America

Percent



* 2014 values statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)
° 2017 values statistically significant different at 0.10 (°), 0.05 (°°), 0.01 (°°°)

seems to be more important. According to Exhibit 46 delivery related factors such as logistic cost, lead-time and flexibility are ranked most important. Thus production in North America must be decreased in favor of locations closer to demand. Interestingly, North America is by far the largest market for these companies. The reported decisions must therefore be meant to serve some of the smaller sales regions. Looking at the shifts of production volume from North America one will find that the largest shift is to China, which is still a relatively small market for these companies as shown in Exhibit 47.

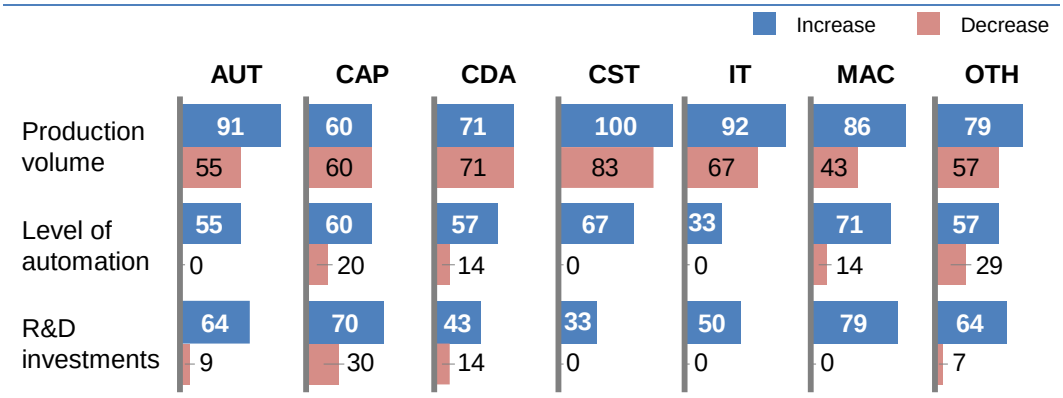
IV. An Industry Perspective

The Restructuring of Supply Chains Can Be Observed across All Industries

As we can see in Exhibit 48 the restructuring of supply chains is occurring across all industries. In particular, automotive, consumer staples, IT and machinery firms seem especially active in terms of increasing production volume. 86-100% of the companies in these sectors report invest in increased production volume. Consumer goods firms (CDA and CST) are at the same time active in divestments of production volume with 71-83% of the companies in these sectors. For consumer durables & apparel firms we observe that as many firms invest as divest.

Exhibit 48: Changes to global supply chain strategy by industry

Percent



Compared to the decisions made with respect to production volume we see that fewer firms report changing the level of automation in their plants or altering their R&D activities. Nevertheless, there is a large group of between 33-71% of the companies in each sector that invest in automation. This is especially true for machinery, capital goods, and consumer staples & apparel firms where more than 60% of the sample increased the level of automation. Information technology firms are at the lower end of investment activities in automation. From the IT firms in our sample only 33% invested in automation. Given that they produce to a large degree in China they may not yet see this necessary. With respect to R&D it is the consumer goods firms that invest the least with only 33-43% of the sample compared to up to 79% in machinery.

For both, automation and R&D, one can see that few companies in each industry are decreasing their activities. Only in other industries almost 30% decrease their level of automation and of the capital goods firms in this sample 30% report to decrease their R&D activities.

While we have observed that there is evidence of restructuring of supply chains across all industries, we note that firms from different industries are not necessarily alike in their decisions. In the Appendix we present the decisions about production sourcing and their underlying drivers on a per industry basis in more detail.

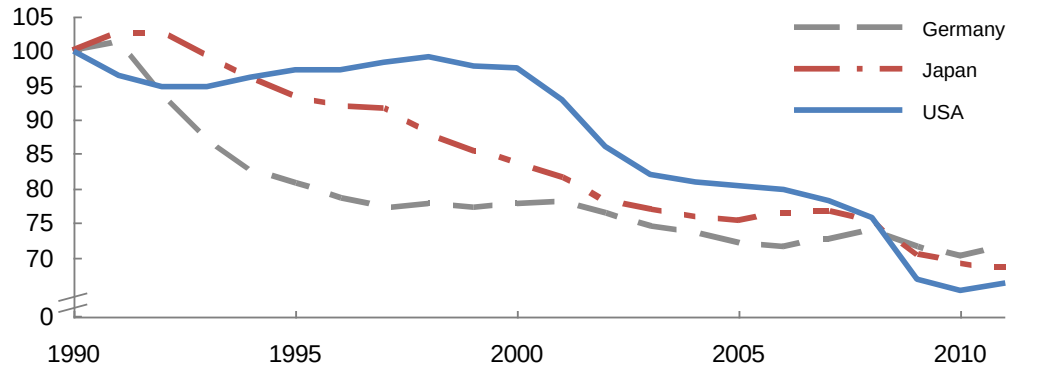
V. Impact on Employment

Impact on Employment Is the Focus of Public Attention

Much of the public attention in recent reports of changes to global manufacturing footprints focuses on the impact on employment in the manufacturing sector. This is not surprisingly, given the steady decline in developed economies as depicted in Exhibit 49. According to the U.S. Bureau of Labor Statistics manufacturing employment in Germany, Japan and the U.S. has shrunk to about 70% of its 1990 level by 2011. Manufacturing policy making designed in order to reverse this trend through reshoring has consequentially grown in importance in recent years.

Exhibit 49: Development of employment in manufacturing sector

Indexed, 1990=100



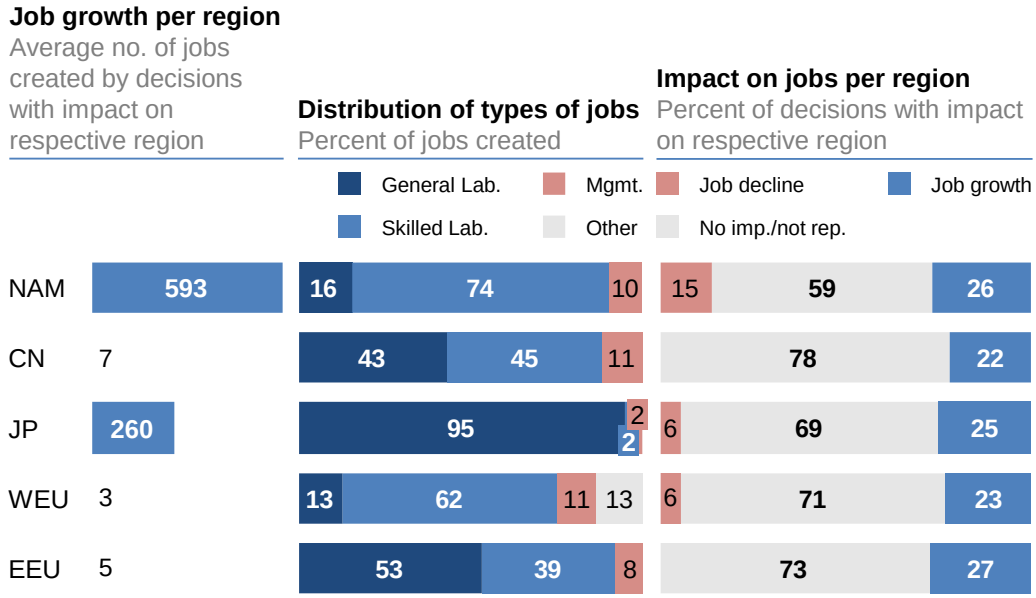
Source: U.S. Bureau of Labor Statistics

Little Information on Employment Changes Provided

In this study participants were asked not only about their recent decisions and their underlying drivers but also about the impact that these decisions have had, on business KPIs and employment. The results as shown in Exhibit 50 need to be interpreted cautiously. We must acknowledge that a majority (around 60%) did not report any changes in employment at all. This means that their decisions either had no impact or that they chose not to report the actual change. Given the sensitivity of this topic and its highly politicized nature, we see both options as valid and should keep this in mind when interpreting the figures reported as they may be biased due to self-selection.

Across all regions more firms report job growth than decline due to their decisions. E.g., 26% of the companies that altered production volume, automation or R&D in North America reported creating manufacturing jobs while only 15% reported a job decline as a consequence of their decisions.

Exhibit 50: Impact on employment



Only Seemingly Large Positive Effect on Employment in North America and Japan

The highest reported growth in jobs in our sample occurred in North America. On average 593 jobs were created in North America as a consequence of the decisions that respondents reported. Japan was second with an average of 260 jobs created. While this seems to be good news for both regions, we must note that both figures are largely driven by one particular outlier response. Without this outlier response the corrected figures would be 8 (NAM) and 11 (JP) jobs respectively created on average which is at the same level as the other regions. Yet, we must acknowledge the existence of this large-scale investment in manufacturing and employment in both regions. While they do skew our results, they show that growth in manufacturing employment is possible in both regions.

When we examine the types of jobs created we see that in North America and Western Europe primarily skilled labor jobs are created. In Japan however, 95% of the jobs created are for general labor which is yet again driven by the outlier response. In China and Eastern Europe general and skilled labor account for the majority of the small number of jobs created. The high share of skilled labor and the relatively low impact on employment in these regions are in line with the pattern of production sourcing decisions reported before. It is not necessarily labor-intensive production but also capital-intensive, high-value and -complexity operations that are shifted to those lower cost locations, where operations require fewer skilled employees rather than many unskilled workers.

VI. Conclusions

This study set out to shed some light on current trends in production sourcing. Motivated by much anecdotal evidence of companies reshoring to North America, going West within China, or other decisions we wanted to empirically ground a snapshot of current industrial practice. In particular, we addressed three questions.

What Global Production Sourcing Decisions Are Being Made in Industry?

We find evidence for a wave of global restructuring of supply chains. Across all industries, regions and firm sizes, companies in- and divest in production volume, automation and R&D. Indeed, the decisions reported by our sample are characterized by great diversity. China stands out in terms of attracting manufacturing investments. But we also found that firms are investing in many regions in the world. Eastern Europe & Russia as well as the ASEAN countries in particular are attracting investments in production volume. There are also many firms still investing in developed economies. These are at the same time the regions where the most companies are observed to be divesting. While for Western Europe and Japan a net outflow of production volume can be observed, manufacturing in North America has gained in attractiveness for the companies in our sample. However, we must note that it is not due to reshoring by American firms but rather, it is Asian and European firms that are offshoring to North America.

What Are the Drivers of These Decisions?

The underlying drivers are just as diverse as the reported decisions. Yet, what is clear from the responses is that it is no longer just cost that dictates where to source production. In response to the recent financial crisis and the increasing volatility in exchange rates, transportation, labor and energy costs, companies have come to the realization that cost advantages can only be temporary. Hence, instead of letting today's cost structure dictate tomorrow's supply chains we see complex trade-offs between cost, quality, delivery and risk being made. As some of these factors may be highly circumstantial and unique to the respective business situation and environment, the same driver is seen to lead to altogether different, at times even opposite decisions.

Common to almost all observed flows is that sustainability hardly plays a role in current production sourcing decisions. While policy makers around the world, even in the U.S. and China increasingly engage in fighting climate change this movement has apparently not as yet impacted industrial practice.

What Has Been Their Observed or Expected Impact?

Much of the public attention about this restructuring of supply chains centers around the impact on employment in the manufacturing sector. We find that the decisions outlined in this report have surprisingly little impact on employment. Divestments in Western Europe as well as investment decisions in China or Eastern Europe & Russia hardly impact employment at all. Only for North America and Japan do we see that individual large-scale investments yield a high number of manufacturing jobs raising the average above the level of the other regions.

What Is Next?

The reader of this report should take the opportunity to learn about the decisions made by our sample. The practitioner should use the insights presented here as a starting point to critically review their own supply chain and the way production sourcing decisions are being made. For the policy maker this report mirrors the attractiveness of many regions for manufacturing investments. Understanding the driving forces of today's manufacturing location decisions should inform the ongoing debate about manufacturing policy making which is directed to retain and attract manufacturing jobs.

We believe our findings provide important insights into the nature of current production sourcing decisions on a global scale and across a wide range of industries. Yet, there may well be other types of decisions not captured by this sample. Hence, one should not believe that what you read here is all there is. Nevertheless, we believe the decisions and drivers are representative and indicate the wide variety of decisions made and drivers that are being considered by firms today. We look forward to adding to this body of knowledge and refining the insights generated thus far.

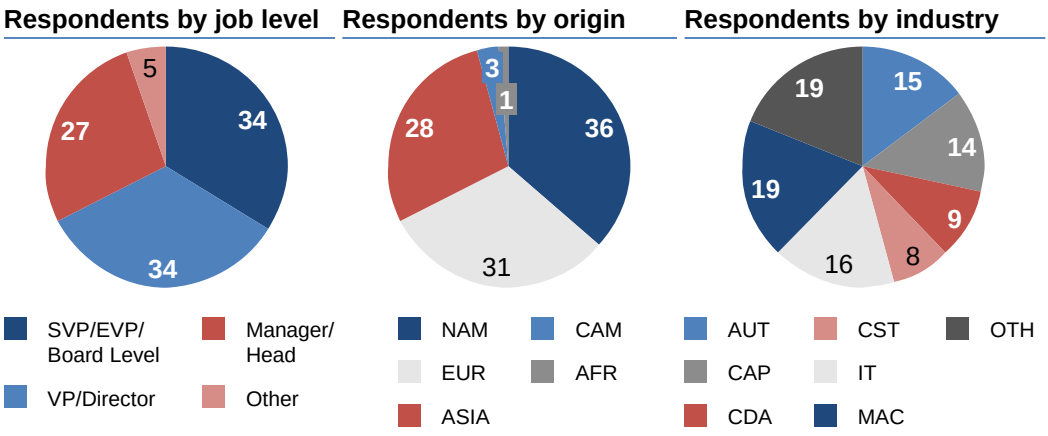
About the Research

This research is motivated by the results of a predecessor study with a focus on China conducted by Prof. Cohen and Dr. Cui with colleagues from Chinese universities.[8] After understanding the perspective of Chinese companies based on this study we set out to understand current industrial practice of companies from a wide range of industries in North America, Europe and Japan.

This study was conducted through multiple phases of data collection from August 2014 to July 2015. Data was gathered using a questionnaire (online and paper-based). The questionnaire focused on individual production sourcing decisions as the unit of analysis. We felt this was most appropriate given that our goal was to gain an in-depth understanding of decisions and not just an overview of intended decisions or policies that are made in general by a firm.

Exhibit 51: Sample profile

Percent



Accordingly the questionnaire covers multiple facets of a decision and is structured in seven main sections comprising: personal and company information, background information on the business unit, characteristics of the products for which changes to the supply chain strategy are reported, the changes themselves, drivers for the decisions and finally the impact predicted or observed.

We invited decision makers from manufacturing companies in North America, Europe and Japan to participate in the study in order to benchmark their respective

[8] For the results of the China study we refer to Chen, Y.; Cohen, Morris A.; Cui, Shiliang; Dong, M.; Liu, S.; Simchi-Levi, David (2015): Global Operations Sourcing Strategy. A Chinese Perspective. Working Paper. Shanghai University of International Business and Economics, Shanghai.

company practices and thus make the study mutually beneficial to both academics and the industrial partners.

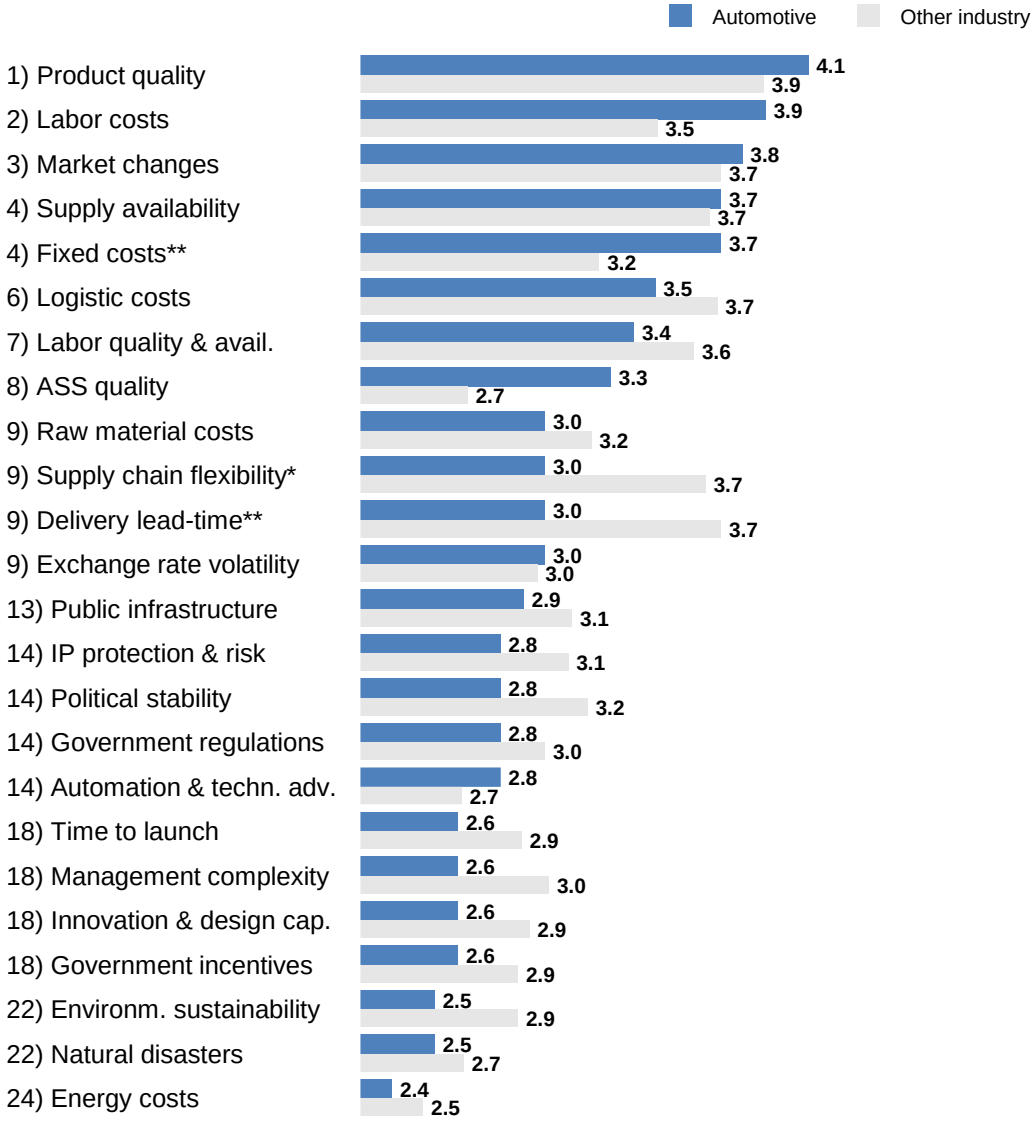
In a first step the questionnaire was disseminated through the direct network of the seven universities that are leading the research effort to yield initial insights and to test our methodology. Later it was sent out to a wider audience of companies including the customer network of our industrial partner Avnet. Eventually 74 companies accepted our invitation and participated in the study. The respondents are based in all regions of the world and come from a variety of industries. The majority of the respondents hold senior positions in their respective organizations suggesting that the information shared is based on a holistic perspective on the decisions that were made by the company.

Appendix

AUTOMOTIVE[9]

Exhibit 52 Importance of decisions drivers for automotive companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

9 Includes companies from the following industries: Automobiles, Auto Components

Exhibit 53: Changes to the production sourcing footprint of automotive companies

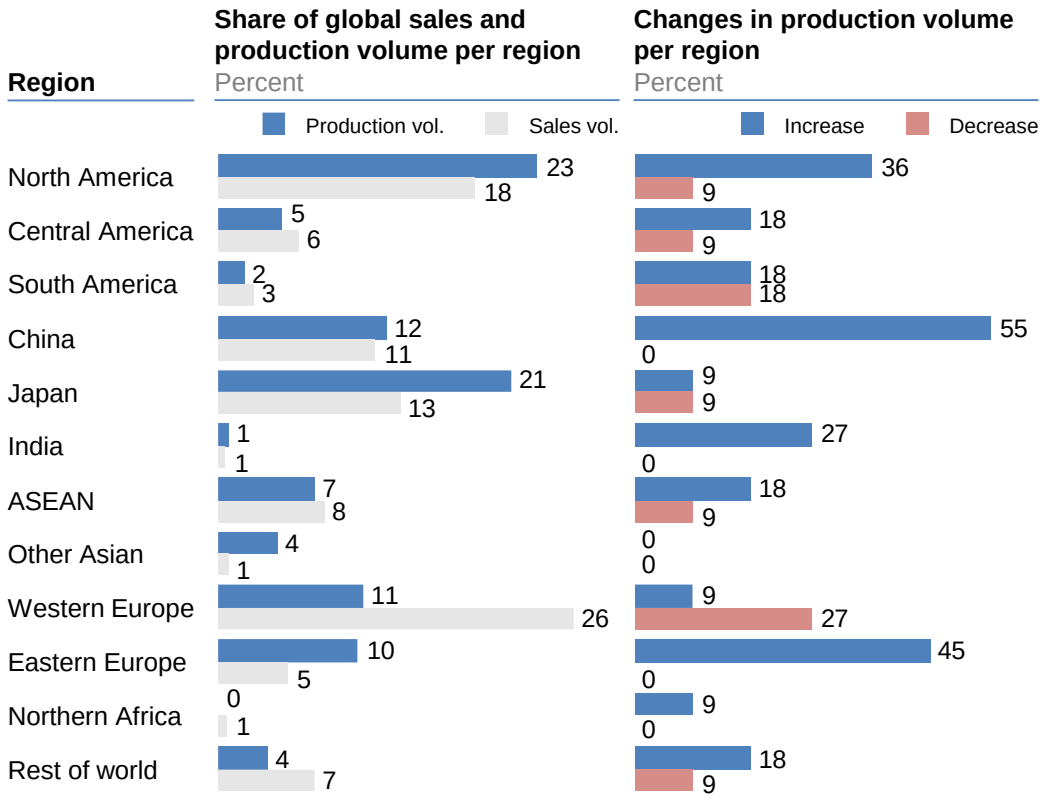
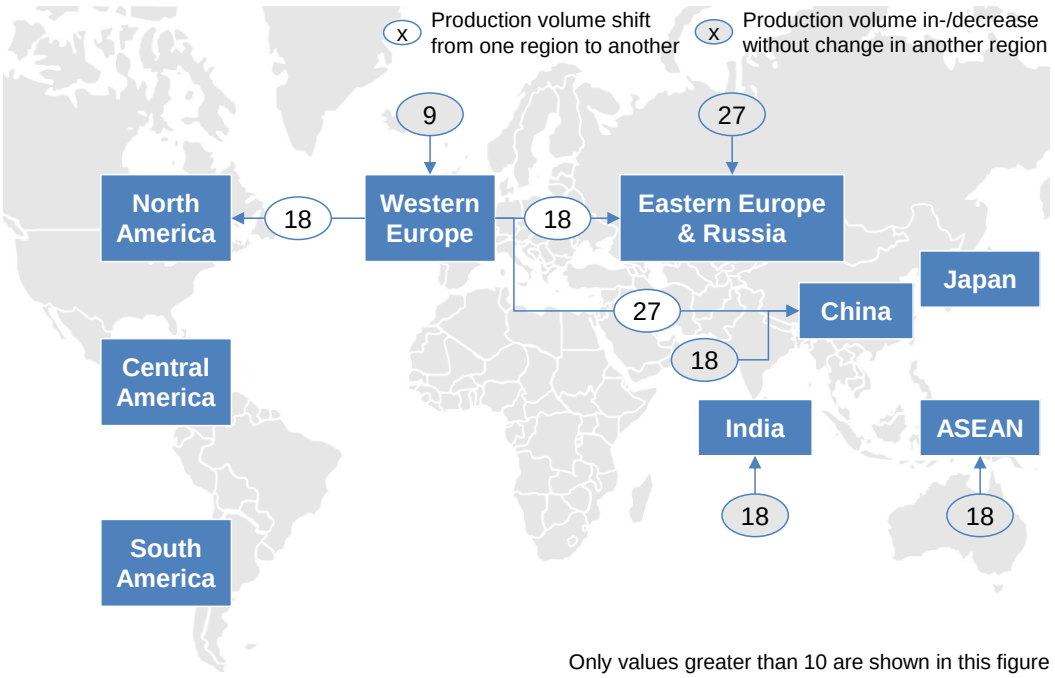


Exhibit 54: Flows of production volume between regions for automotive firms

Percent of automotive firms

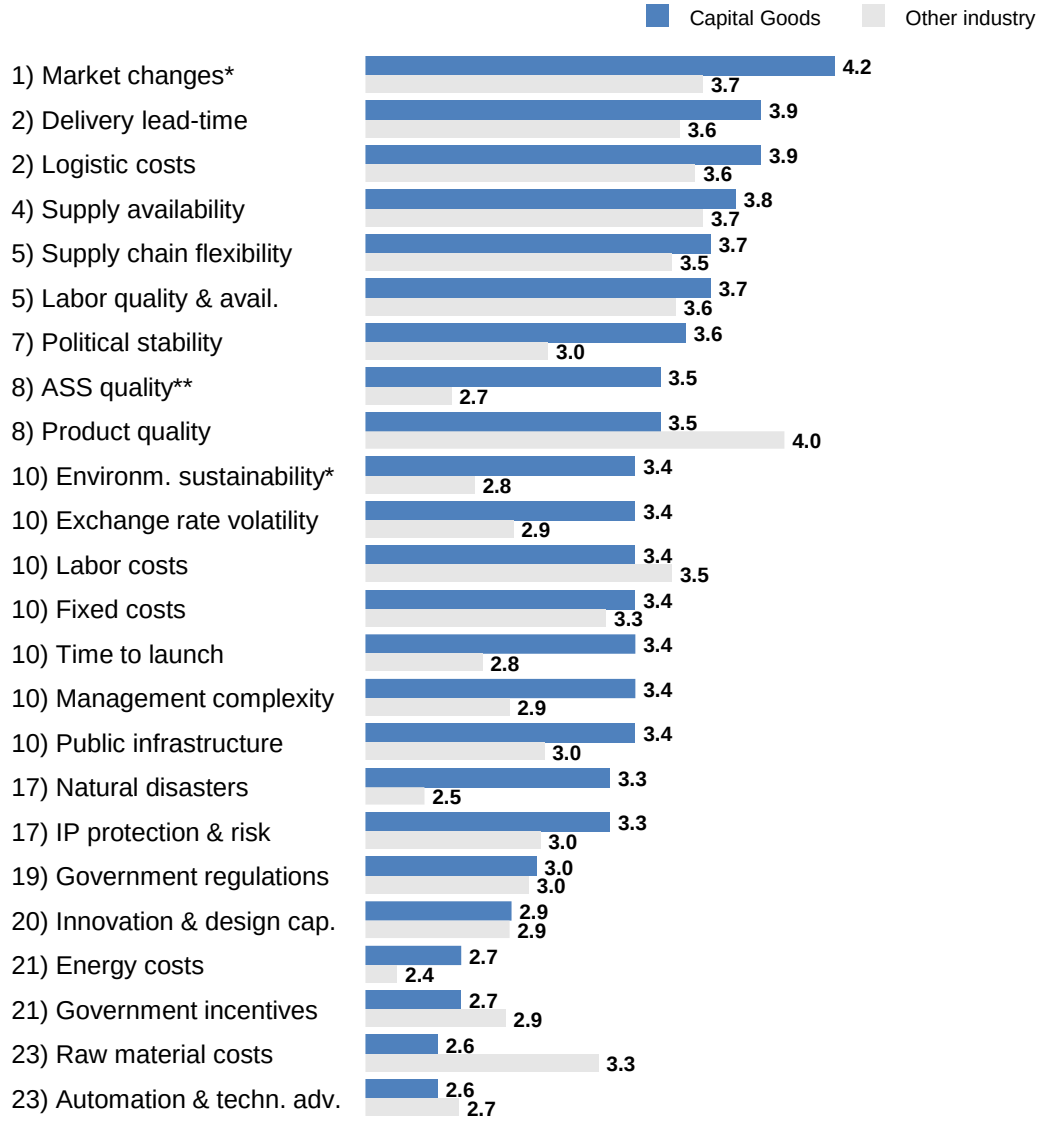


Only values greater than 10 are shown in this figure

CAPITAL GOODS[10]

Exhibit 55: Importance of decisions drivers for capital goods companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[10] Includes companies from the following industries: Aerospace & Defense, Electrical Equipment

Exhibit 56: Changes to the production sourcing footprint of capital goods companies

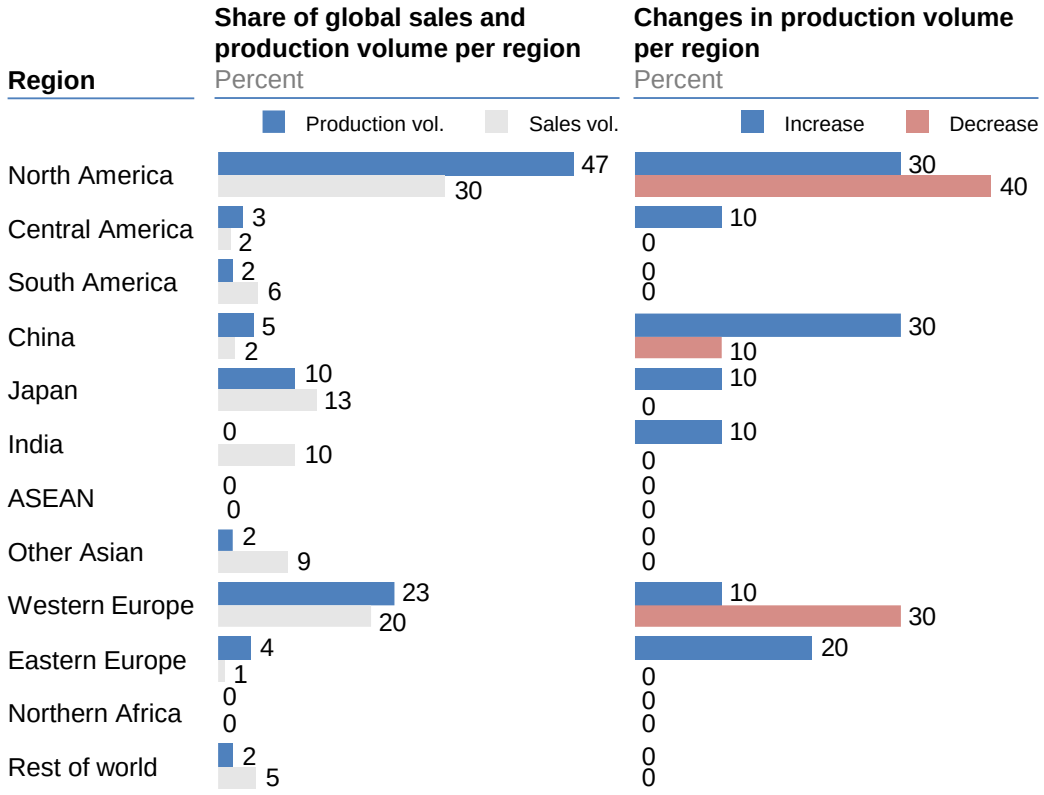
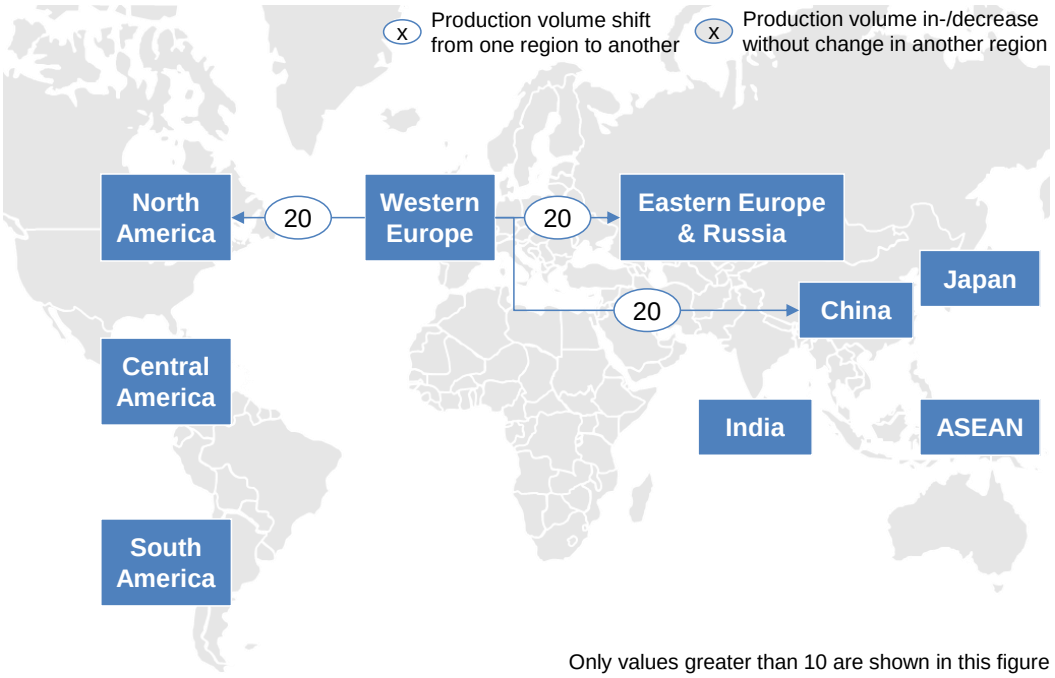


Exhibit 57: Flows of production volume between regions for capital goods firms

Percent of capital goods firms



Only values greater than 10 are shown in this figure

CONSUMER DURABLES & APPAREL[11]

Exhibit 58: Importance of decisions drivers for consumer durables & apparel companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)

* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[11] Includes companies from the following industries: Consumer Electronics, Household Durables, Leisure Products, Textiles, Apparel & Luxury Goods

Exhibit 59: Changes to the production sourcing footprint of consumer durables & apparel companies

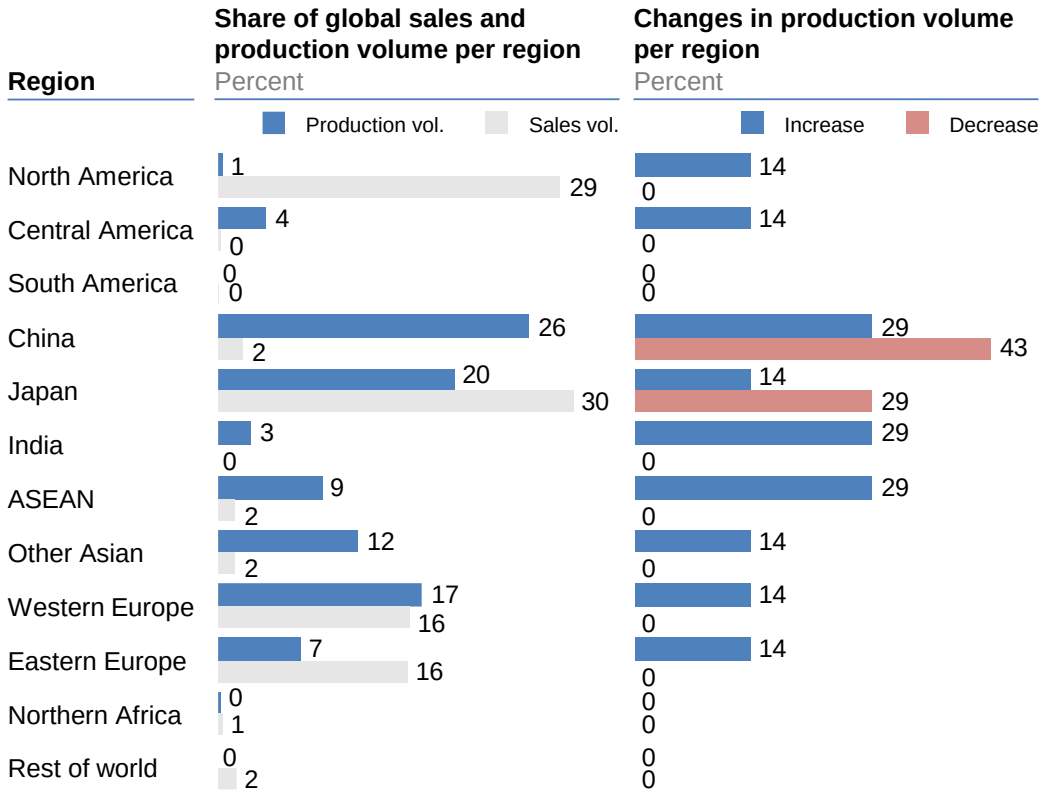
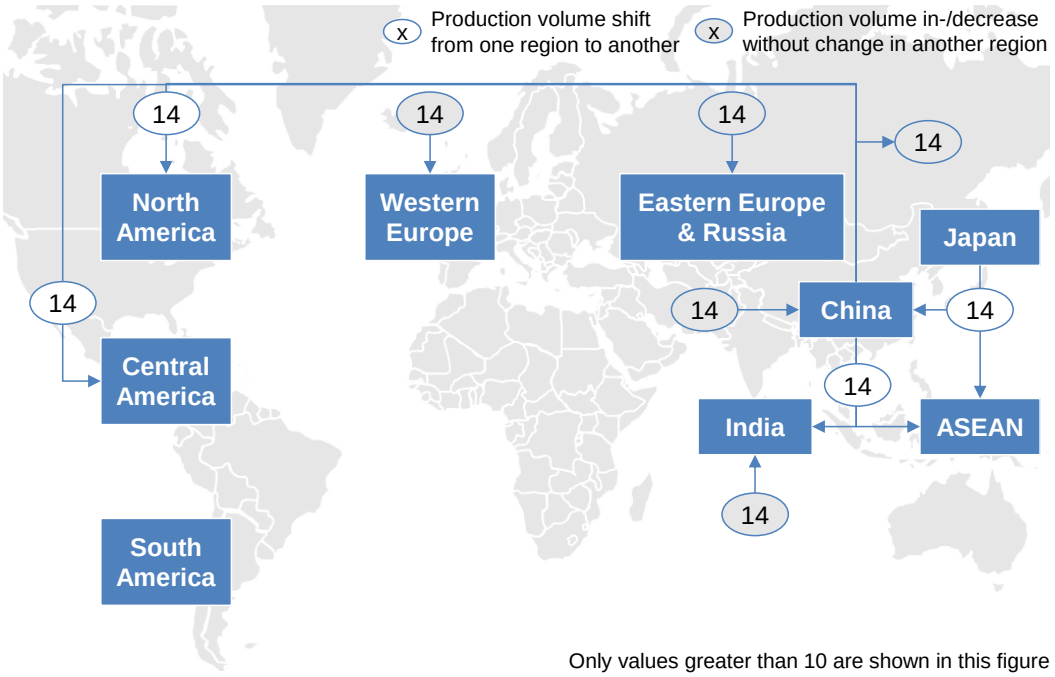


Exhibit 60: Flows of production volume between regions for consumer durables & apparel firms

consumer durables & apparel firms

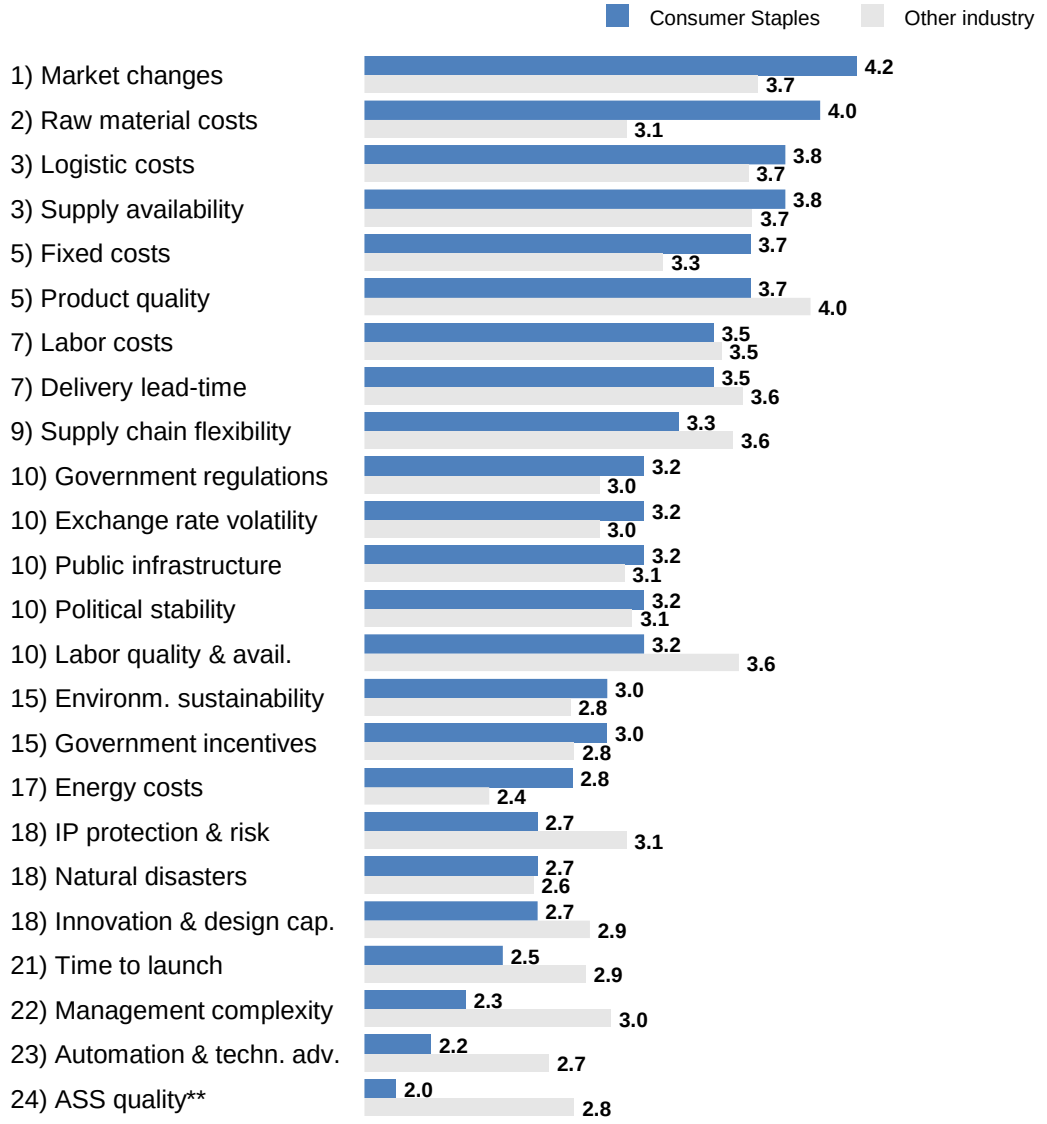


Only values greater than 10 are shown in this figure

CONSUMER STAPLES[12]

Exhibit 61: Importance of decisions drivers for consumer staples companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[12] Includes companies from the following industries: Food, Beverage & Tobacco, Household & Personal Products

Exhibit 62: Changes to the production sourcing footprint of consumer staples companies

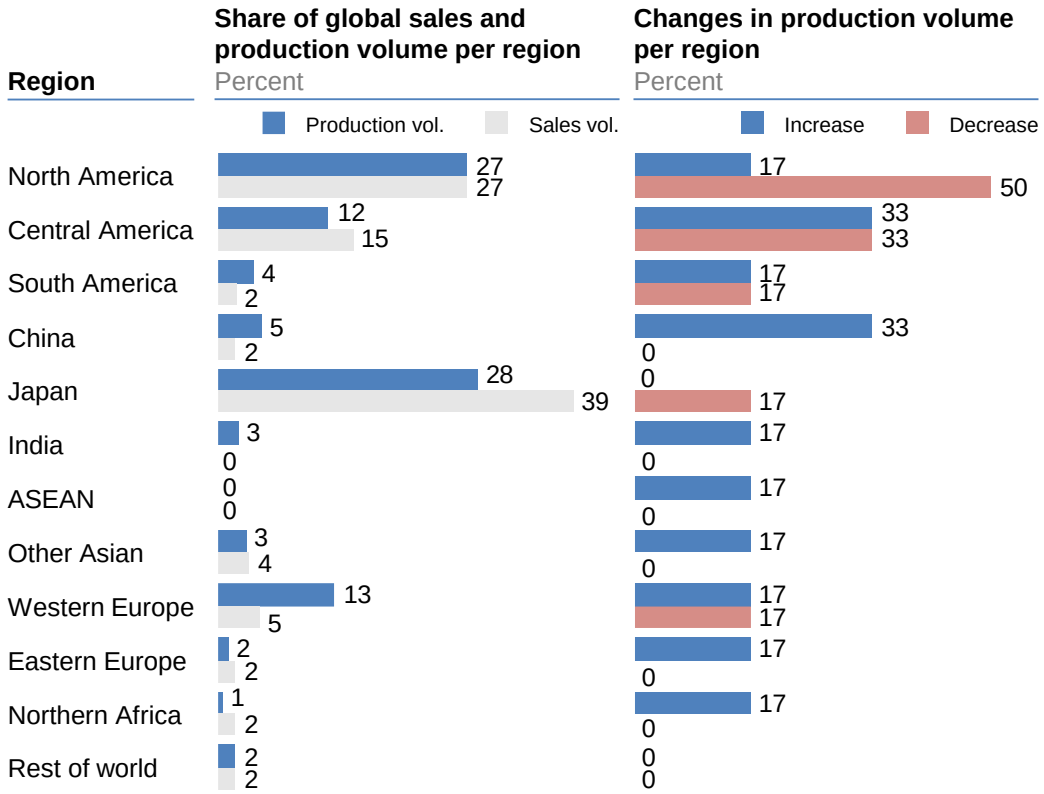
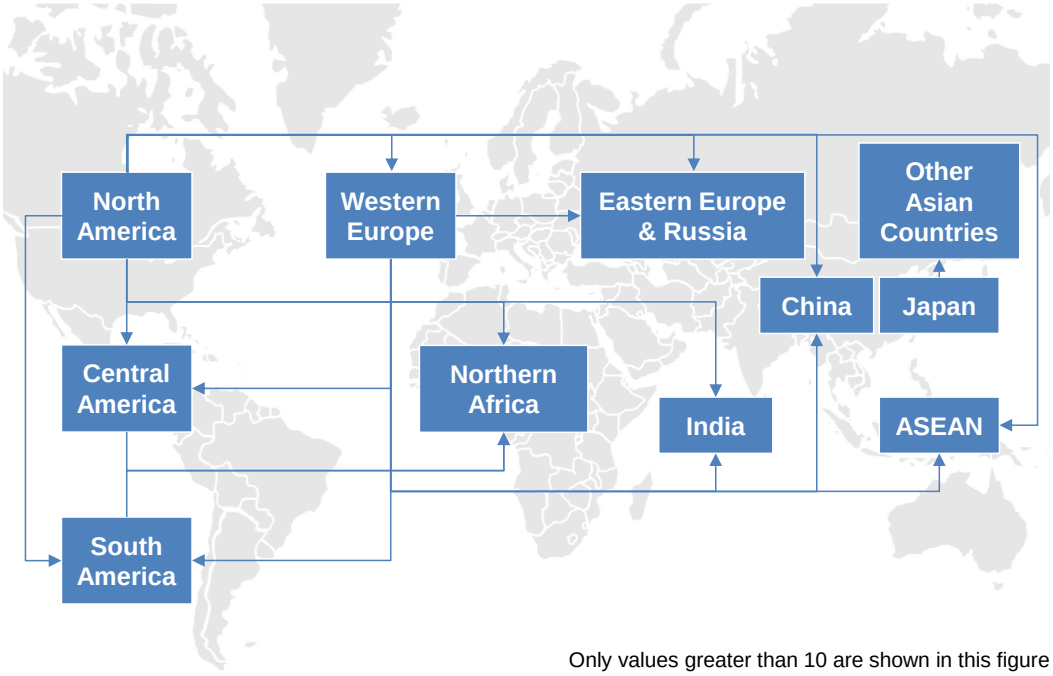


Exhibit 63: Flows of production volume between regions for consumer staples firms

All connections represent decisions by 17% of the consumer staples firms

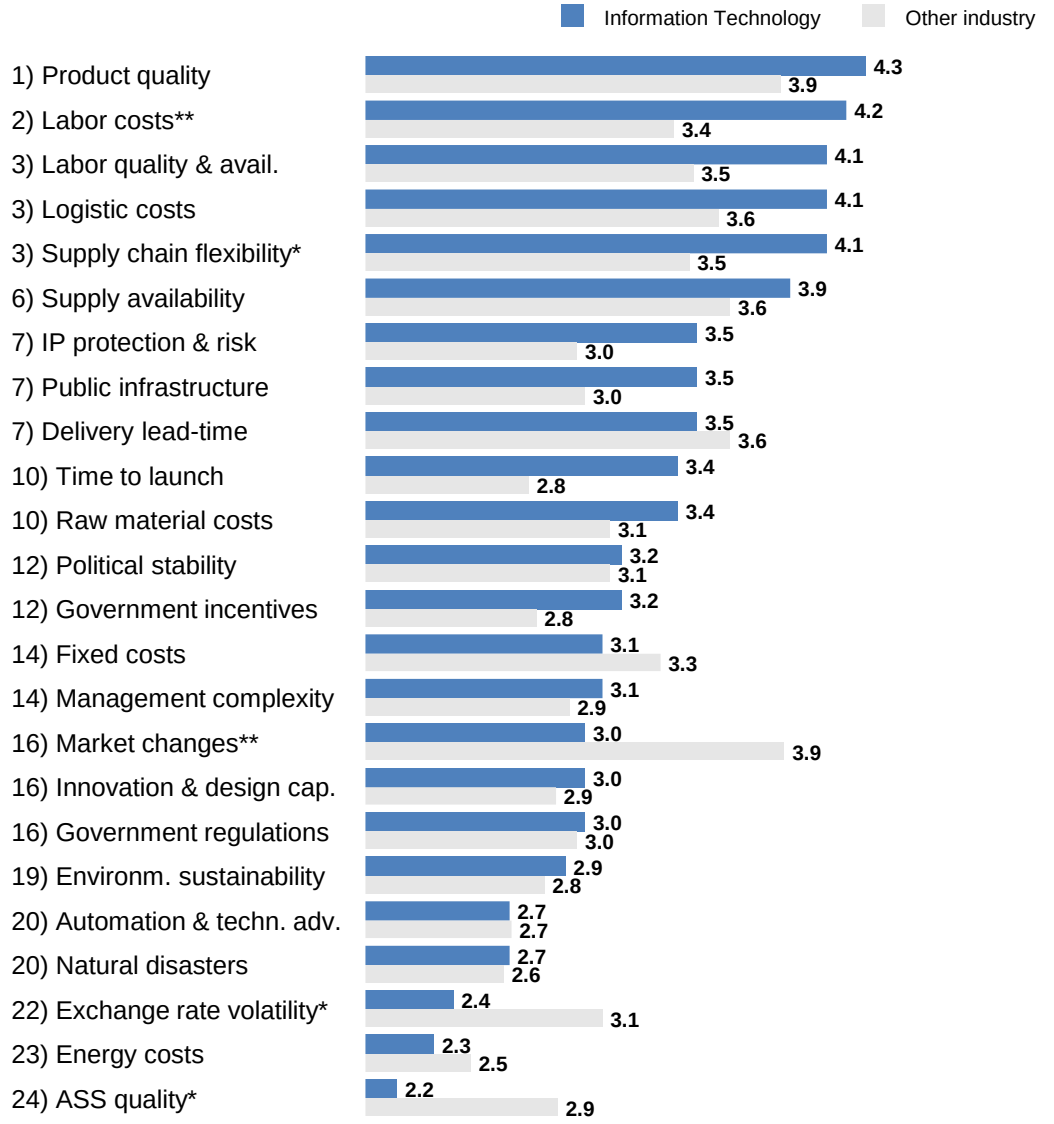


Only values greater than 10 are shown in this figure

INFORMATION TECHNOLOGY[13]

Exhibit 64: Importance of decisions drivers for information technology

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[13] Includes companies from the following industries: Semiconductors & Semiconductor Equipment, Technology Hardware & Equipment

Exhibit 65: Changes to the production sourcing footprint of information technology companies

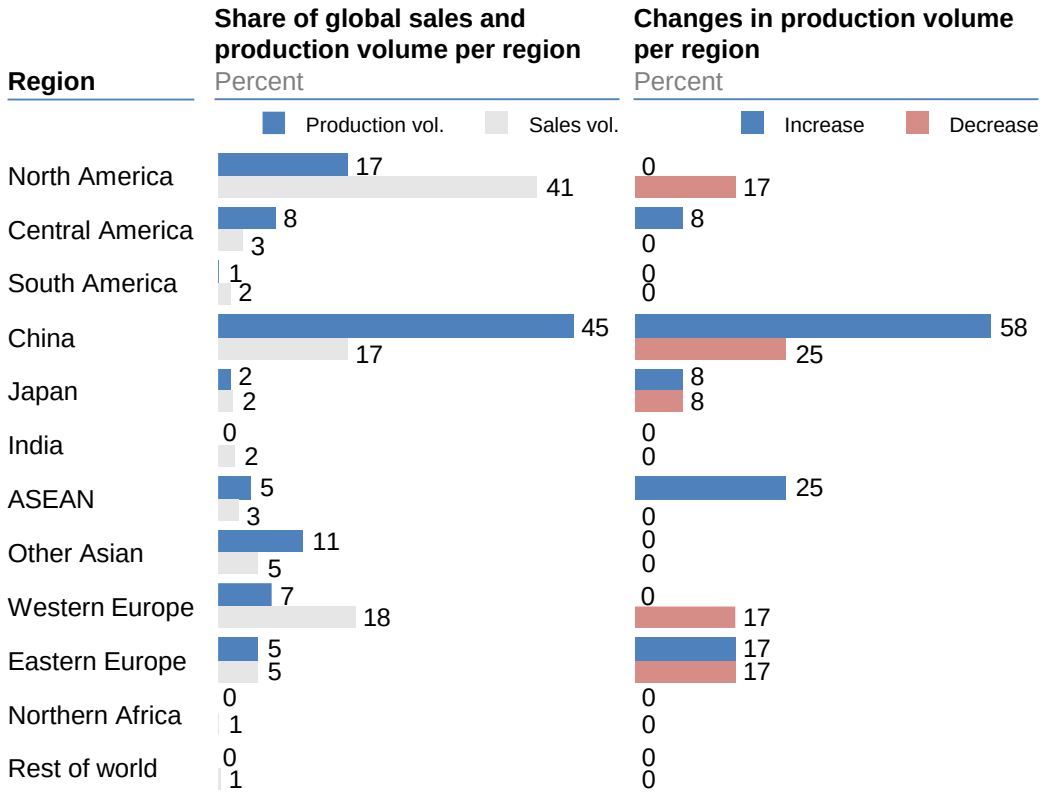
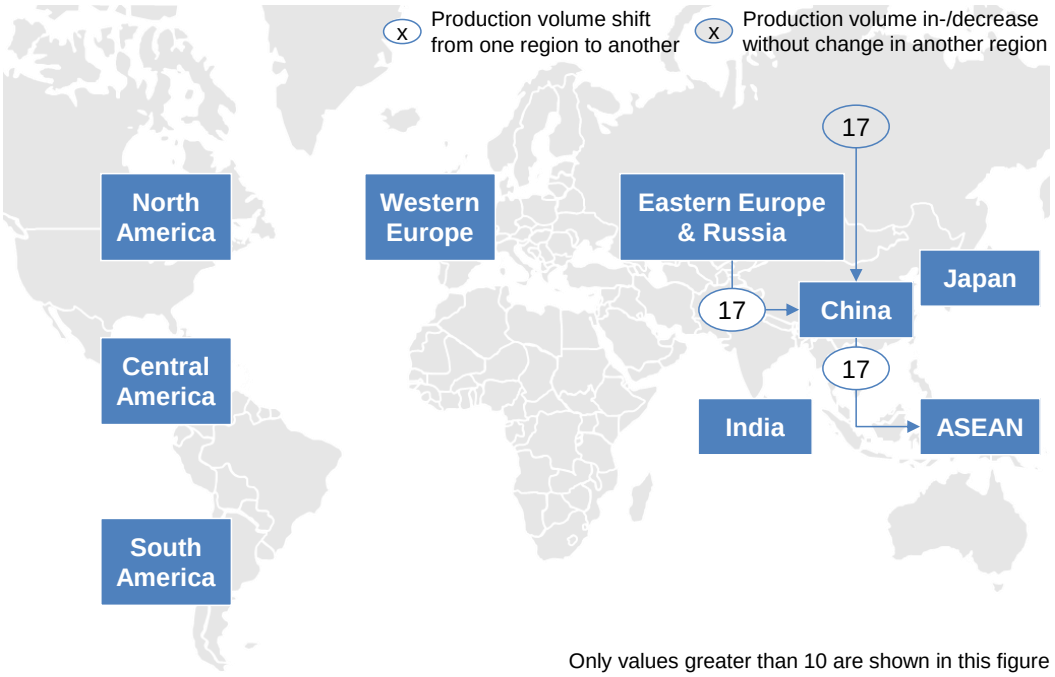


Exhibit 66: Flows of production volume between regions for information technology firms

Percent of information technology firms

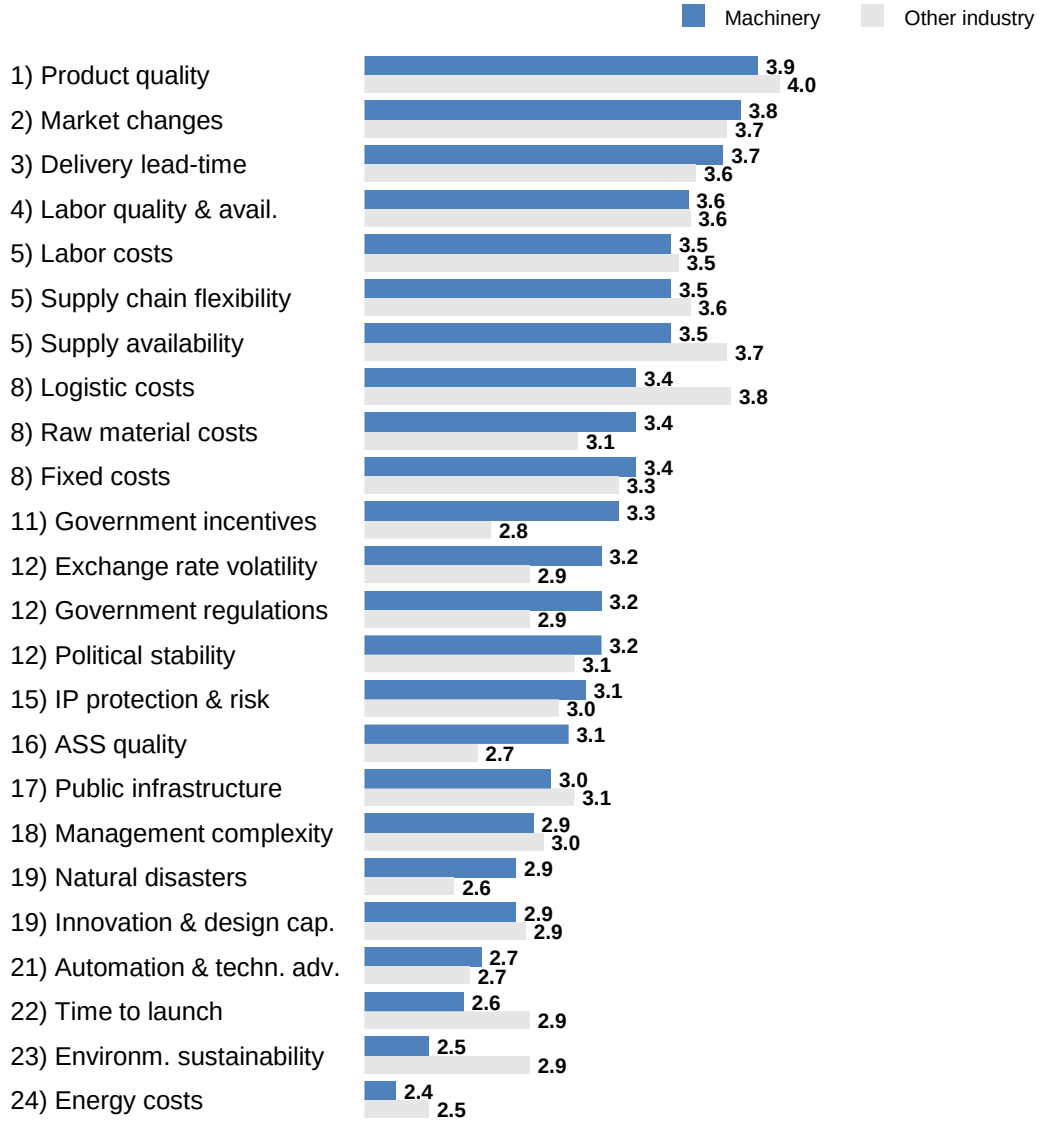


Only values greater than 10 are shown in this figure

MACHINERY[14]

Exhibit 67: Importance of decisions drivers for machinery companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[14] Includes companies from the following industries: Agricultural & Farm Machinery, Construction Machinery & Heavy Trucks, Industrial Machinery

Exhibit 68: Changes to the production sourcing footprint of machinery companies

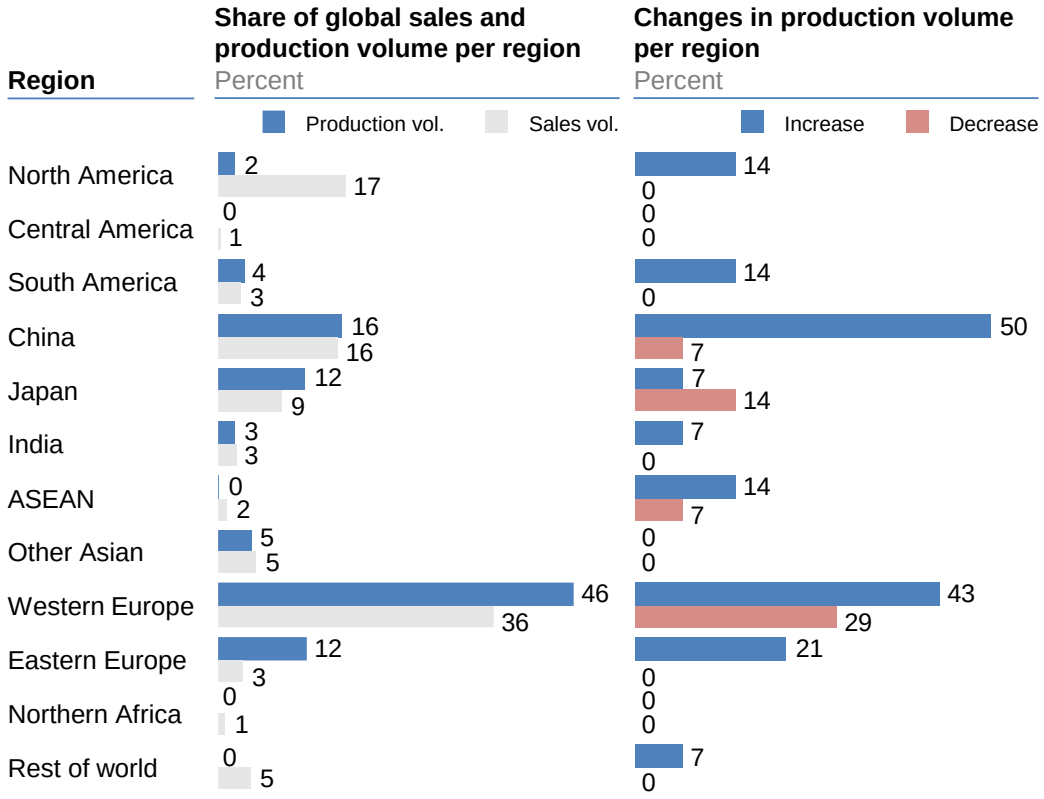
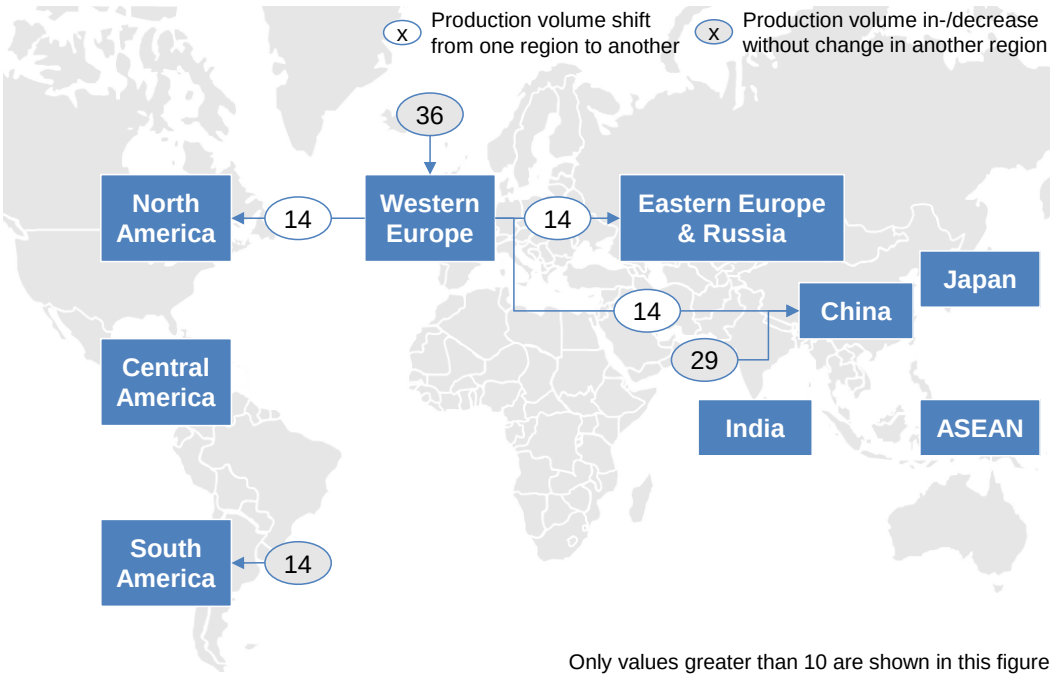


Exhibit 69: Flows of production volume between regions for machinery firms

Percent of machinery firms

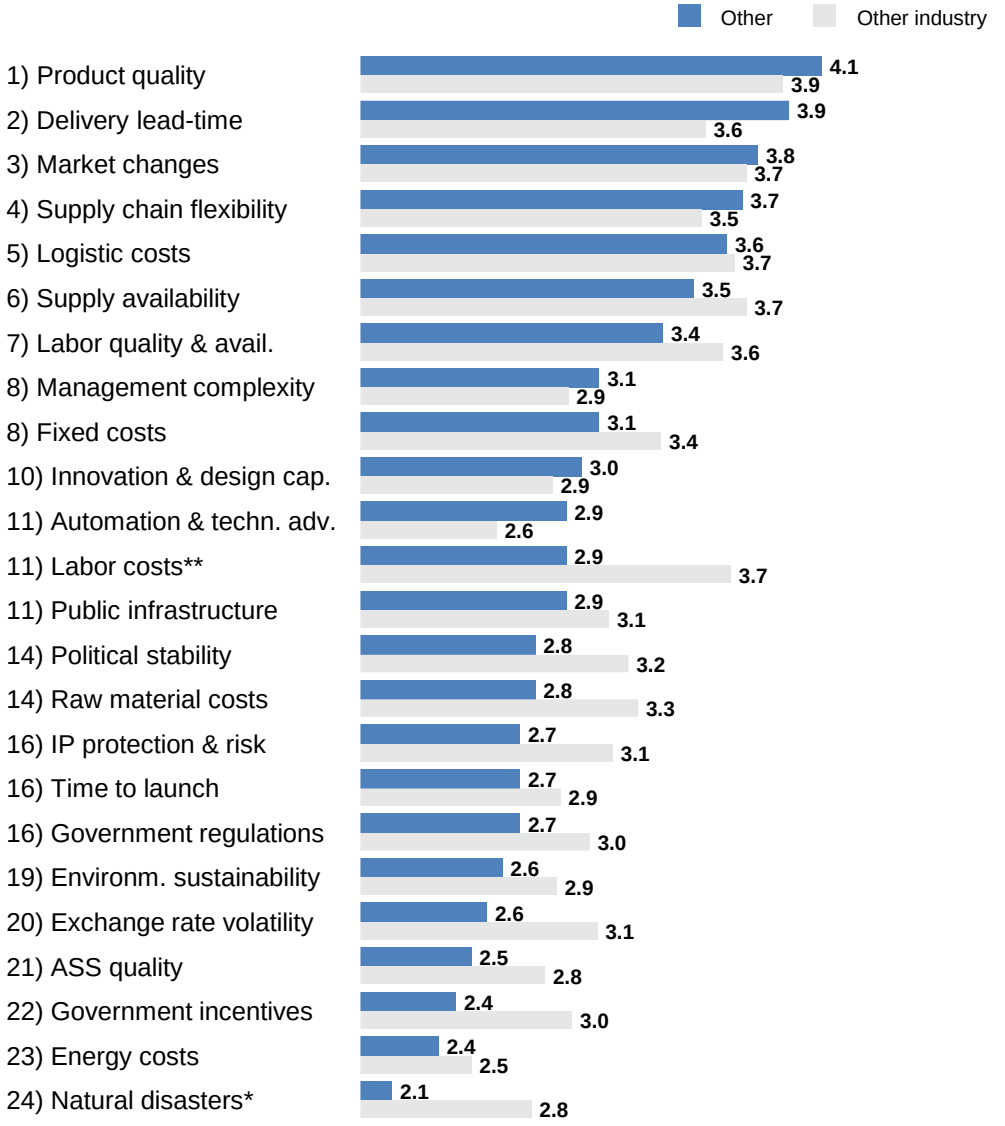


Only values greater than 10 are shown in this figure

OTHER[15]

Exhibit 70: Importance of decisions drivers for other companies

Average weighting on scale from 1 (not important at all) to 5 (extremely important)



* Statistically significant different at 0.10 (*), 0.05 (**), 0.01 (***)

[15] Includes companies from the following industries: Chemicals, Health Care Equipment & Services, Pharmaceuticals, Biotechnology & Life Sciences, Retailing, Transportation

Exhibit 71: Changes to the production sourcing footprint of other companies

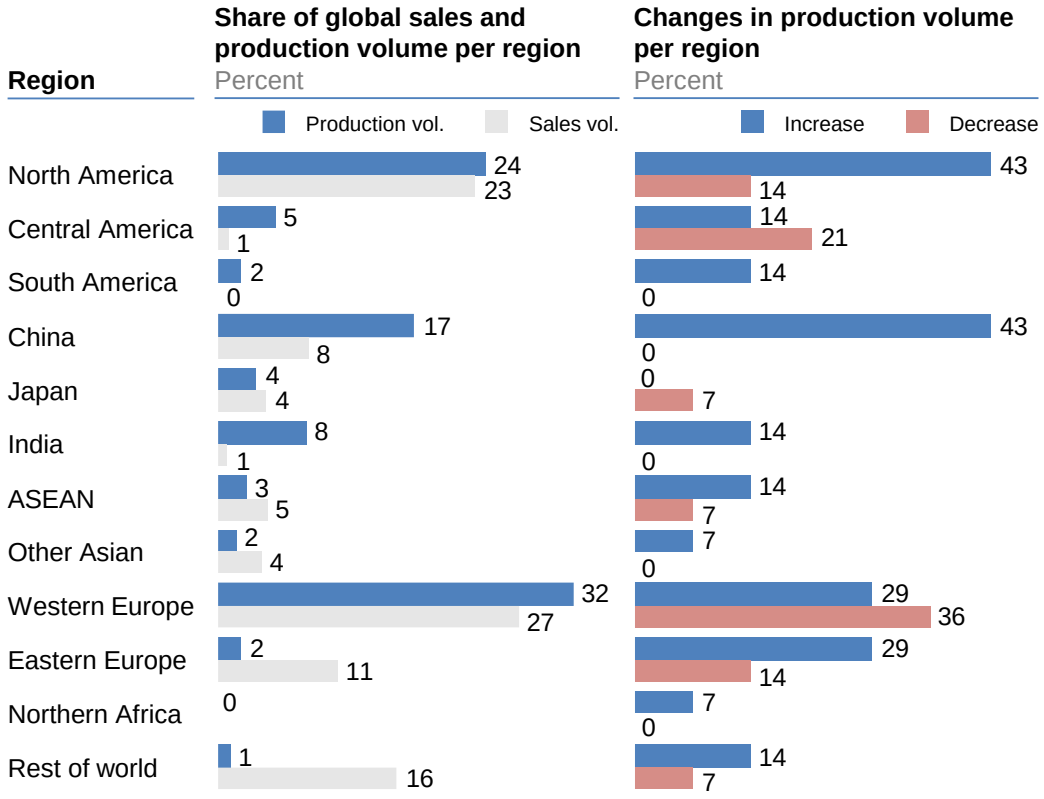
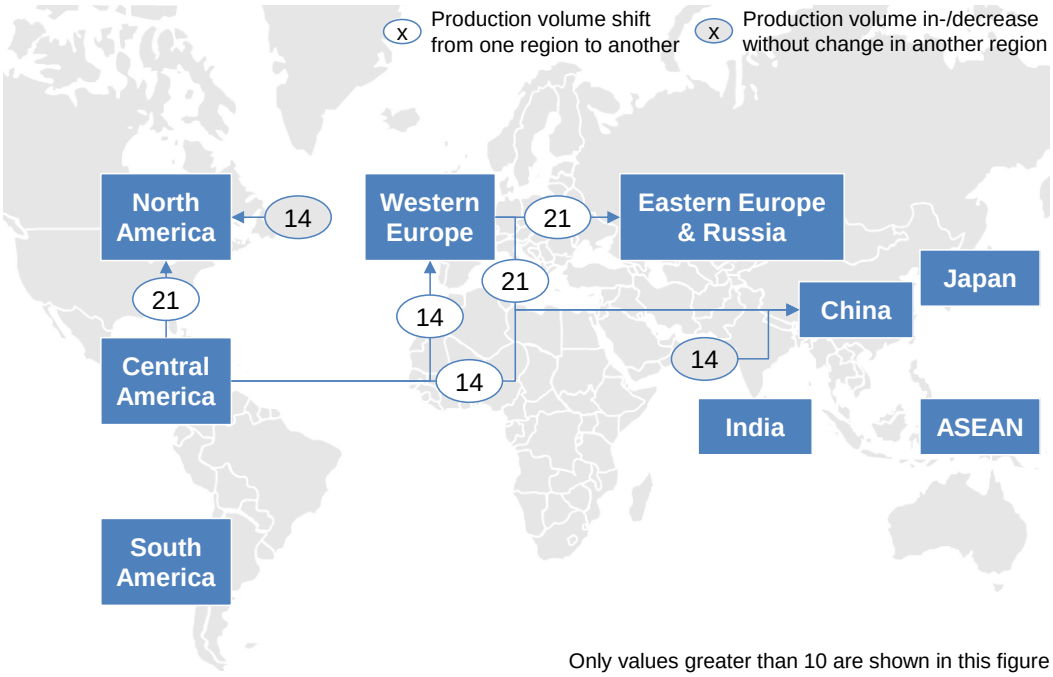


Exhibit 72: Flows of production volume between regions for other firms

Percent of firms from other industries



Only values greater than 10 are shown in this figure

CHANGES TO AUTOMATION AND R&D

Exhibit 73: Changes in level of automation by region, origin, industry affiliation

Percent

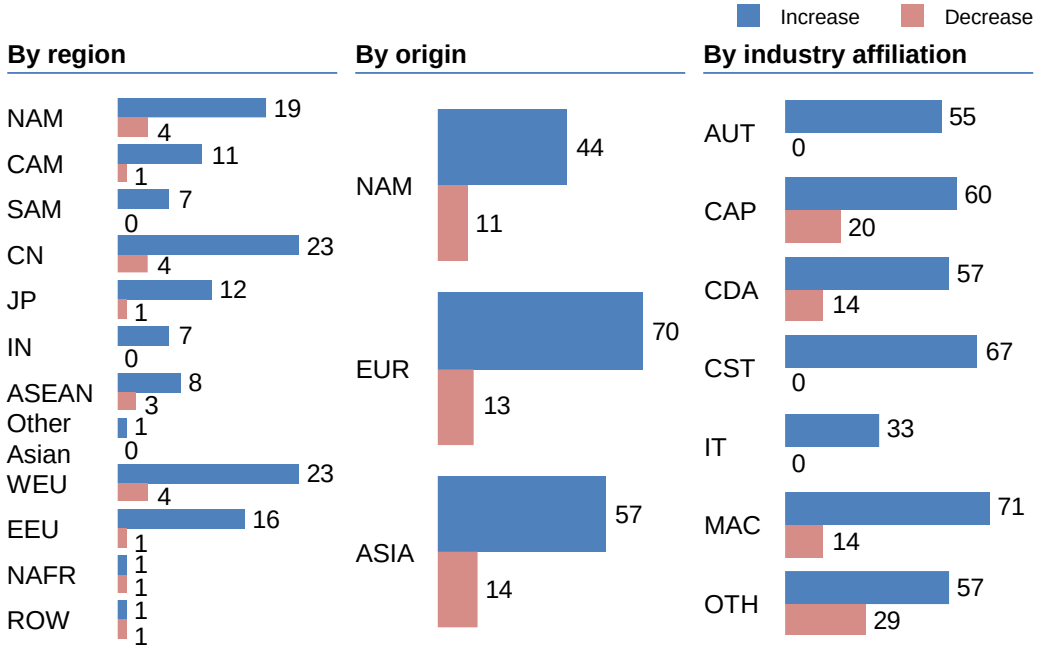


Exhibit 74: Changes in level of R&D by region, origin, industry affiliation

Percent