APPENDIX

METHODOLOGY

The following describes our approach to measuring the economic impact of mobile technologies.

Measuring mGDP

BCG developed a comprehensive *global production and consumption model* for this report, in order to account for the complexity and interdependency of companies across the mobile value chain. For the *consumption* side, we consider end-user sales of devices as well as intermediary inputs for device production for each country (for example, a device OEM needs components for its device production). For *production,* we break down the device retail price into discrete categories in order to calculate production along the device value chain (for example, retail markup, licensing, components, and assembly). For each of these steps we conducted a detailed analysis of the manufacturing location in order to attribute the appropriate portion of the value to each country. By assessing production values against consumption values, we determine net exports (or net imports) for each country.

To calculate mobile's contribution to overall GDP for our six countries, we used the expenditure method of GDP calculation.

Consumption. mGDP consumption includes spending on mobile devices, mobile connectivity services, and mobile commerce. Mobile device consumption includes purchases of feature phones and smartphones, tablets, and related accessories. Mobile connectivity services include spending on mobile data, voice, and text services. Mobile commerce transactions include goods and services sold via mobile devices, content and applications purchased via mobile devices, and mobile advertising spending. However, we do *not* include transaction values of money transfers via mobile devices (for example, over a banking app on a tablet).

Investments. For mGDP, we consider the relevant investments by mobile value chain participants. These investments include capital expenditures of mobile operators and all other value chain participants (retail and manufacturing of devices, mobile connectivity services, and the app economy). Further, we include investments in spectrum licenses and enterprise mobility investments. As is common practice, we do not include R&D investments.

Government spending. The largest portion of governments' contribution to mGDP is purchasing devices and providing connectivity services for government employees; these are already covered in our consumption measures. However, governments also contribute to mGDP via individual *subsidies and tax breaks* for the mobile sector in each

country (such as the lifeline program in the U.S.), and this is included in our measures of mGDP as well.

Net exports. Net exports capture the difference between exports and imports. For example, mobile-related products produced in the U.S. but consumed in other countries count toward U.S. GDP. However, products produced elsewhere but consumed in the U.S. do not count and must be subtracted from consumption.

Measuring Job Creation Linked to Mobile Technologies

For our jobs estimates, we calculated revenues for each step in the value chain, based on global market research data and our global production model. The jobs figures were then derived by dividing these revenues by the revenue contributions per employee for each business. These revenue contribution factors are based on leading pure players in each country for each business model separately.

We measured SME adoption of mobile technologies through our global survey.

To derive our estimates, we developed a comprehensive macroeconomic model, which builds on a number of sources including the following.

- A comprehensive bottom-up database of key financial and performance indicators (such as revenues, employees, capex, and R&D expenditures) of more than 500 companies participating in the mobile value chain
- Data provided by the leading market research organizations for this sector (including IDC, Ovum, Forrester, Gartner, IE Market Research, and Investment Reports) and data provided by official and government organizations (for example, national bureaus of statistics and the World Bank)
- Interviews with four senior experts on the mobile economy around the globe (internal BCG experts as well as external industry experts)

Measuring SME Adoption of Mobile Technologies

Our key findings on the economic impact of mobile technology adoption by SMEs are derived from our survey of the leaders and founders of SMEs. We used these data to segment respondents as mobile leaders, followers, and laggards and to project the economic impact of a portion of these companies moving to a higher level of mobile usage.

Survey Methodology and Design. From September through November of 2014, we surveyed around 3,500 leaders and founders of SMEs in the U.S., Germany, South Korea, Brazil, China, and India. Approximately 1,500 of these respondents completed the survey online. The remainder (respondents in China and India) completed the survey over the phone (in China) or were interviewed in person (in India). The surveys consisted of about 55 questions (the precise number depended on how certain questions were answered).

Survey respondents were screened according to several criteria. Each respondent was the company's CEO, founder, vice president or mid-level to senior manager. We made a conscious decision to focus on the business users of mobile technologies and not necessarily on the mobile/IT decision makers (for example, the director of IT). However, we required respondents to have a good understanding of how mobile technologies are used in their businesses.

As each country defines SMEs in a different fashion, we had to create a standard definition that could be applied to all countries. For the purpose of this study, an SME was defined as a company with up to 499 employees. Further, we grouped SMEs into three categories: microbusinesses (fewer than 10 employees), small businesses (between 10 and 49 employees), and medium businesses (50 to 499 employees).

Survey Quotas. To help ensure a credible and comprehensive sample, we set quotas based on company size. Our sample was split equally among microbusinesses, small businesses, and medium businesses, with 150 respondents in each segment. (See Exhibit 18 for a detailed breakdown of our sample by country.)

We did not set quotas for mobile usage intensity since we wanted the sample to be representative of the average degree of technology adoption by SMEs in those countries. In addition, we targeted respondents from a broad range of industries without setting specific quotas by industry. Attention checks (simple, unrelated questions to test if a respondent is paying attention) were placed throughout the survey, and we controlled for straight lining (identical responses to a block of questions). Those who failed these controls were excluded from the survey results.

Types of Technology Users. Based on the adoption of specific mobile applications, we categorized each respondent in one of three categories of mobile intensity: mobile laggards, mobile followers, or mobile leaders.

We evaluated adoption of mobile applications in terms of three categories: basic productivity tools (such as voice calls or mobile e-mails), operational tools (such as real-time job tracking or mobile data capture), and sales and marketing tools (such as a mobile-friendly website or a company app). (See Exhibit 19.)

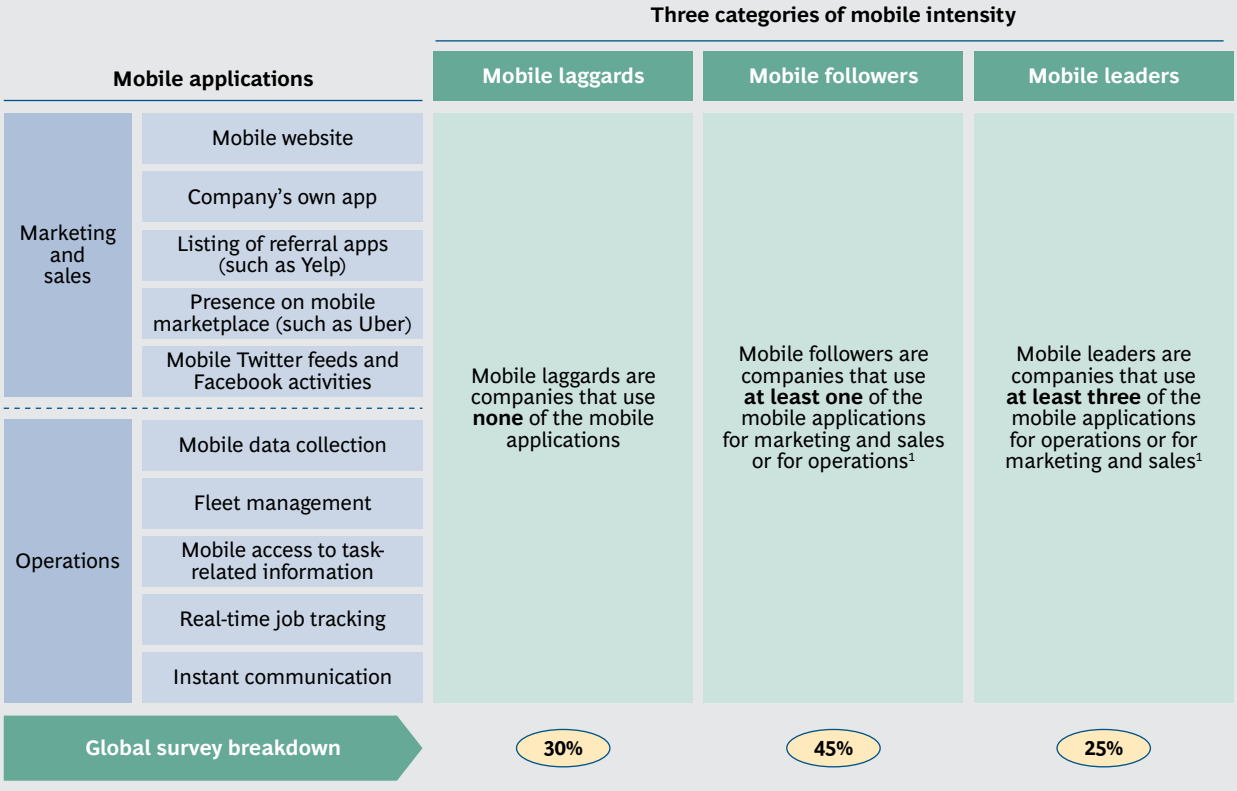
- *Mobile Laggards.* These SMEs do not use any mobile operations or marketing and sales tools.
- *Mobile Followers.* These SMEs use at least one mobile application frequently—either an operations tool or a marketing and sales tool.
- *Mobile Leaders.* These SMEs use at least three mobile applications frequently. The three applications had to be part of the same group of tools (that is, three operations or three marketing and sales tools),

EXHIBIT 18 | Our Survey Samples Balanced Numerous Considerations

	U.S.	Germany	South Korea	Brazil	China	India
SMEs survey	**Sample size** • 453 **Balancing** • ~150 each of micro, small, and medium businesses	**Sample size** • 412 **Balancing** • ~150 each of micro, small, and medium businesses	**Sample size** • 554 **Balancing** • ~150 each of micro, small, and medium businesses	**Sample size** • 454 **Balancing** • ~150 each of micro, small, and medium businesses	**Sample size** • 474 **Balancing** • ~150 each of micro, small, and medium businesses	**Sample size** • 968 **Balancing** • SMEs • Geographic spread
Consumer survey	**Sample size** • 1,003 **Demographic balancing** • Age • Gender • Income	**Sample size** • 1,014 **Demographic balancing** • Age • Gender • Income	**Sample size** • 1,002 **Demographic balancing** • Age • Gender • Income	**Sample size** • 1,000 **Demographic balancing** • Age • Gender • Income	**Sample size** • 1,070 **Demographic balancing** • Age • Gender • Income • Tier 1 to tier 6 cities	**Sample size** • 2,640 **Demographic balancing** • Age • Gender • Income • Geography • Urban/rural
Survey type	Online survey	Online survey	Online survey	Online survey	**SMEs:** telephone survey **Consumers:** online survey (recruited offline)	In person

Sources: BCG consumer and SME surveys.

EXHIBIT 19 | Businesses Are Clustered into Three Categories



Sources: BCG Business Impact Survey; BCG analysis.
[1]We considered a mobile application to be used if a respondent reported *frequent* usage.

thus showing that the company had reached a high level of mobile sophistication within that category.

Weighting. Respondents were not weighted because we found that the contribution of micro, small, and medium businesses to GDP was roughly equivalent among these three categories.

We conducted analyses to verify that our findings were consistent across industries and regardless of company size. (See Exhibit 20.)

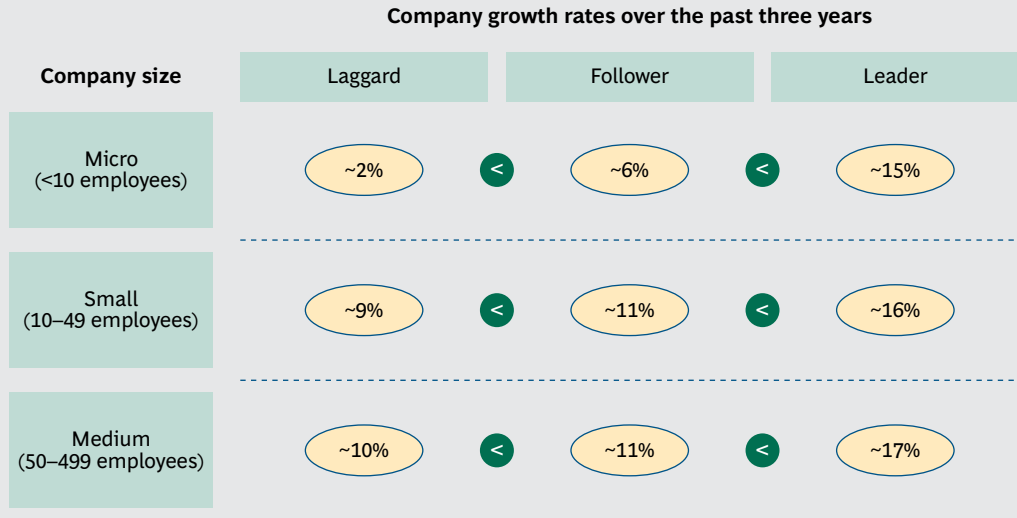
Revenue and Job Growth. A company's size was assessed on the basis of the number of its employees in 2014. A company's revenue growth and job growth were both based on self-reported data over the past three years.

Macroeconomic Impact Projections. For each country, we projected scenarios of how the job growth and revenue increases recorded in our survey data could translate into a broader economic impact. This allowed us to understand SME performance improvement in the context of the economic conditions of each country. The purpose of these projections was to provide a sense of the potential magnitude of the economic impact of SMEs' mobile technology advancement. The projections should not be viewed as predictions or precise valuations.

Broadly speaking, we developed a simple projection model based on the size of the SME contribution to the economy in terms of both employment and GDP. This required making specific assumptions about the SME sector. We used secondary research to assess the percentage of micro, small, and medium businesses in each country.

From our survey, we were able to estimate the proportion of laggards, followers, and leaders among the micro, small, and medium businesses that participated. We also calculated the growth rate, over the past three years, of the laggards, followers, and leaders in participating micro, small, and medium businesses.

EXHIBIT 20 | Regardless of Size, Mobile Leaders Grew Faster Than Laggards



Sources: BCG Business Impact Survey; BCG analysis.

We then compared the growth rates of laggards and followers with those of leaders and projected the difference onto the overall population of laggards and followers in order to estimate the financial and employment contribution of the SME sector.

Calculating Consumer Surplus

Key findings on the impact of mobile technologies on consumers are taken from the consumer impact survey we conducted across the six countries analyzed: the U.S., Germany, South Korea, Brazil, China, and India. The survey is comprised of three major sections: a multiple-choice questionnaire, maximum difference scaling (MaxDiff), and conjoint analysis.

Survey Methodology and Design. From September through November of 2014, we surveyed around 7,500 consumers in the six countries analyzed (1,000 or more respondents per country). Approximately 5,000 of these respondents completed the survey online. Exhibit 18 provides a detailed breakdown of our consumer sample by country.

In India, the survey was completed face-to-face, with computer-assisted personal interviewing and door to door sampling. Respondents in China were recruited offline but then completed the survey online at a survey center. This was to avoid selection bias in China and India, where consumers who use the Internet are more likely to be technologically advanced.

We balanced the sample across city tiers and geography in both China and India. For China, we chose five tier 1 to tier 2 cities (such as Beijing and Xi'an), four tier 3 to tier 4 cities, and three tier 5 to tier 6 cities, in order to get a broad range of respondents. For India, the overall sample design was based on the Indian Readership Survey, the largest syndicated survey conducted in India. Using this rubric, we balanced our sample by geography (north, south, east, and west) and by residential location type (urban or rural).

The online surveys consisted of around 45 questions (the precise number depended on how certain questions were answered). The survey was terminated for those who did not own a mobile phone, and only those who completed the whole survey were counted.

Survey Quotas. In each country, we set quotas based on demographics (age, gender, and income group) in order to ensure a comprehensive and credible sample.

Survey Analysis. Throughout the survey, we conducted attention checks and discarded respondents who selected the same answer throughout (straight liners). Results were also

"sense checked"—for example, we removed respondents who gave unrealistic valuations to their mobile phones (such as U.S. consumers who responded $100 million). Specifically, we rejected those who responded with valuations above the ninetieth percentile. This ensured a conservative approach to the valuation analysis.

Mobile technology valuation. To understand the value that consumers put on mobile technologies, we used an empirical research technique called conjoint analysis.

Conjoint analysis is used to extract the implicit valuation of a given product (or that of its features) by analyzing how people prefer different sets of bundled features for a product or service. This approach has two main advantages: It is more objective than self-reported valuation (people often struggle to put a price on their goods). And it provides a true valuation, as opposed to merely a willingness to pay.

For our conjoint analysis, we created a thought exercise for respondents, asking them to project themselves into an overcrowded mobile environment in which they were given the option to downgrade or give up their mobile phones for a certain period of time in exchange for a cash reward or other compensation.

Conjoint analysis revealed the true value consumers put on mobile technologies.

Four different variables (device, time, network, and access to Wi-Fi) were combined with different options and cash prizes, and respondents were asked to choose the combination they liked the best (or they could choose "none of them").