EMPOWERING THE EUROPEAN BUSINESS ECOSYSTEM

METHODOLOGY APPENDIX

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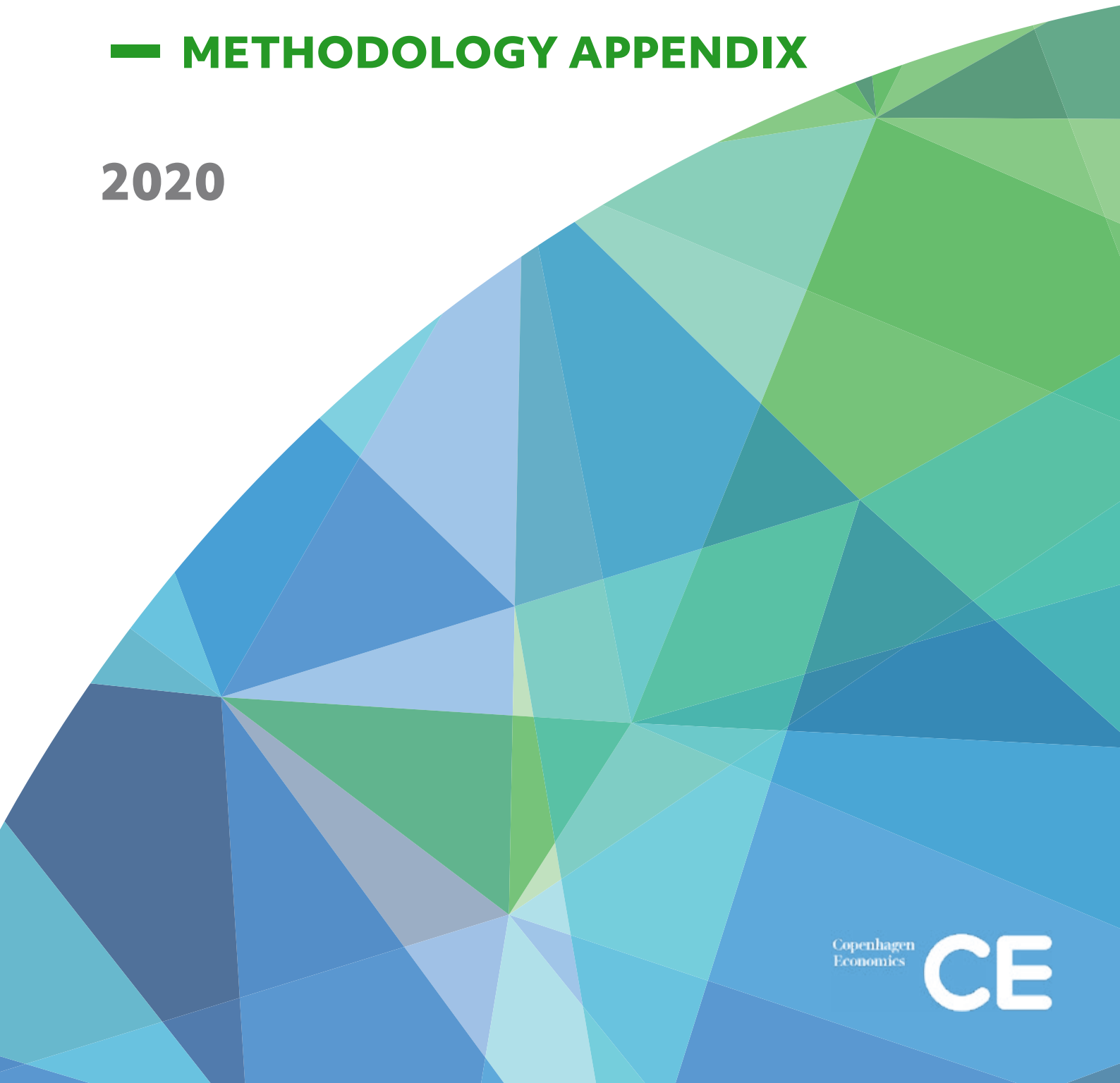

Copenhagen Economics

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UTIVE SUMMARY

Since their inception, digital technologies have transformed nearly every aspect of society. They have transformed the way people collect and share information, experiences, and stories with their friends, family, and society at large. This digital transformation is driven by the ever-increasing accessibility and availability of the internet and the devices, systems, apps, and technologies that connect us with it.

Digital technologies have also transformed the way businesses 'do business', and have irreversibly shaped the way companies find, grow, and develop relationships with their customers. This digital transformation from a business perspective has influenced and empowered businesses through their sales, exports, and employment – and therefore has influenced the economy as a whole.

In this report, we set out to gain a deeper understanding of how European businesses, in particular, use digital tools and social media to empower businesses throughout their lifecycle, from start-up to establishment and with every customer relationship.

There is significant evidence that a broad range of digital tools can help businesses in all industries throughout Europe by reducing the costs of marketing and sales, reducing the barriers to entrepreneurship, expanding the reach of export markets, and facilitating innovation within businesses and throughout industries.[1] To explore these effects, we conducted a survey focusing on the role of social media, using Facebook apps and technologies as an example. Representatives from more than 7,720 businesses in 15 countries across the EU responded. The survey results suggest that digital technologies, like Facebook apps and technologies, facilitate business growth, trade, and innovation.

[1] Note that the terms 'EU' and 'Europe', used interchangeably in this report, refer to the European Union (also known as EU-28), a political and economic union of 28 member states located in Europe.

METHODOLOGY

This study investigates how firms use Facebook apps and technologies to support their businesses and the corresponding macroeconomic effect. Our empirical basis is a survey of over 7,720 businesses.[2] Relying on national account classifications designed to be comparable globally, we have structured the survey questionnaire and the economic modelling along 14 industry classifications.[3]

As Facebook apps and technologies are most likely to contribute to businesses in the market economy, we adjust the number of industries by removing public sector industries, as their sales are most likely to be attributed to taxpayers, leaving us with 11 industries in total. Respondents were spread across all industries and all sizes of business across the 15 EU countries (which, taken together, account for 92 per cent of GVA in the EU).

7,720
BUSINESSES

15
COUNTRIES

11
INDUSTRIES

We use micro-level survey data of businesses' use of Facebook apps and technologies, as well as how much businesses credit Facebook apps and technologies in their sales, and infer macro-level estimates based on best available national account data. The survey results were aggregated at the smallest unit of analysis feasible (given the availability of macro data) for inference at the macro-level, namely the country-sector level. Thus, a general limitation with this type of estimation method is that the broad geographical and industry scope of the survey reduces the sample size from which extrapolation takes place.

While these countries span the European Union, the aggregate results reported in this study reflect the set of 15 countries rather than an EU aggregate. Our quantitative macro estimates measure gross value added (GVA), exports, and jobs created by businesses using Facebook apps and technologies (Facebook, Instagram, Messenger, and WhatsApp). This methodology is focused on the businesses using Facebook apps and technologies and the influence these tools have on their ability to generate sales. Thus, it is not within the scope of this analysis to capture the secondary impacts (indirect effects) through supply chains, nor the induced effects through employee spending.[4]

A further challenge is the reliance on online panels to conduct the survey. In particular, this poses a challenge due to the presumed correlation between online panel participation and level of digital activity, including the level of activity on social media. The Economic Impact Model accounts for the reliance on online panels by correcting for internet penetration across countries.

[2] Survey results cover Belgium, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom.

[3] The survey covers the following NACE classified industries: Agriculture, forestry and fishing (A), Mining and quarrying (B), Manufacturing (C), Utilities (D,E), Construction (F), Wholesale and retail trade (G), Transport, storage, and communication (H,J), Financial and insurance activities (K), Real estate, business and administrative activities (L,M,N) and Other services (R,S,T,U).

[4] Please refer to the Methodology Appendix for a description of the survey.

METHODOLOGY CONTINUED

As is customary in comparable literature, this methodology does not capture any displacement effects that may occur as businesses prefer to adopt new services, new technologies, and new ways of doing business. Therefore, this study reports gross economic impact (GVA, exports, jobs), and has not been adjusted for activity that may have been displaced by the businesses' decision to adopt Facebook apps and technologies as one of their business tools. In other words, the study provides a snapshot of the aggregate business activity that currently leverages Facebook apps and technologies. Defining and modelling a counterfactual world without online activity or without online tools such as Facebook apps and technologies is outside the scope of this study.

KEY RESULTS FROM THIS REPORT

Digital technology reduces the costs of marketing.

Social media and other digital tools have allowed businesses to reduce the costs of marketing. A recent study reported that 69 per cent of SMEs found lower costs of marketing to be the main benefit of using digital tools and social media for business purposes.[5][6]

69%

of SMEs found lower costs of marketing to be the main benefit of using digital tools and social media for business purposes.

The potential and cost-effectiveness of digital marketing is also reflected in a company's choice of advertising channels. In 2017, nearly half of all EU enterprises used social media for advertising purposes.[7]

Digital technology helps target core customers.

Online advertising allows companies to specifically target their customers, limiting the display of ads to those who are most likely to respond positively. This markedly increases the return on marketing expenditures; measured in cost per thousand impressions (CPM), some studies show that the cost of marketing through social media is more than 90 per cent lower than traditional television marketing.[8]

[5] According to the European Commission, SMEs are small and medium-sized enterprises with fewer than 250 employees.

[6] Accenture (2016): Five ways to Win with Digital Platforms

[7] Eurostat (December 2019): Social media use by type, internet advertising

[8] Lyfe Marketing (n.d.): Traditional Media vs. Social Media Advertising

Digital technology helps firms gain access to new markets.

Traditionally, the physical distance between sellers and customers has been the main barrier for growing sales – the farther away the customer, the lower the sales.

Digital tools, including social media, have been shown to be effective in reducing the impact of distance on sales. Recent studies suggest the negative effects of distance on sales can be as much as 65 per cent lower for online sales when compared to offline sales.[9]

The conclusions of the survey, conducted as part of this study, support the suggested link between export activity and the use of social media. We find that 7 in 10 businesses using Facebook apps and technologies are exporting to other countries, compared to the 5 in 10 of companies not using Facebook apps and technologies.[10] The same group of companies using Facebook apps and technologies also report that 19 per cent of their revenue stems from international sales, compared to 14 per cent for non-users.[11] Of those surveyed, 6 in 10 businesses using Facebook apps and technologies report them as helpful when entering new markets.[12]

Digital technology enables SMEs to grow.

Effective and cost-efficient marketing translates to lower costs of reaching relevant customers. The cost reductions offered by digital marketing tools and social media are of particular importance to smaller companies, which typically have lower marketing budgets than larger companies.

Our survey supports the general finding from the literature that digital tools can be especially helpful for small companies by breaking down barriers to growth. The surveyed SMEs using Facebook apps and technologies report the following:[13]

- 47 per cent find the apps helpful to start a new business
- 59 per cent report that the apps are important for growing their businesses
- 58 per cent find the apps helpful in lowering their marketing costs
- 55 per cent consider them instrumental in entering new geographical markets

Digital technology gives the customer a voice and adds intelligence to the business innovation process.

Online reviews and rating systems provide customers with the ability to share and consider information about quality and cost that best suit their preferences and budget. International surveys show that two out of three customers read consumer reviews on the internet before making an online purchase.[14]

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[9] Lendle, A. et al. (2012): There Goes Gravity: How eBay Reduces Trade Costs

[10] Please refer to the Methodology Appendix for a description of the survey.

[11] Please refer to the Methodology Appendix for a description of the survey.

[12] Please refer to the Methodology Appendix for a description of the survey.

[13] Please refer to the Methodology Appendix for a description of the survey.

[14] Digitas (2015): Connected Commerce: What's next in consumer shopping?

Digital tools allow suppliers and customers to interact at a lower cost and at a higher frequency than other means of communication. According to the survey in this study, 54 per cent of companies using Facebook apps and technologies use them to communicate with customers, and 63 per cent say Facebook apps and technologies are important in their efforts to improve customer service.[15]

The enhanced means of communication also provides a strong loop of information to improve a supplier's ability to develop, align, and market products that meet consumer needs.

For example, the feedback flows on customer preferences and ad performance have been shown to foster product innovation.[16] Improving the quality of existing products and coming up with new designs are essential for businesses to remain competitive. In our survey, businesses using Facebook apps and technologies report that the apps' embedded feedback options were helpful in this regard – 4 in 10 companies state they use this feedback to improve their product offering, while 3 in 10 companies use it to improve how their business is organised.[17]

63%

of surveyed businesses say Facebook apps and technologies are important in their efforts to improve customer service.

Digital technology empowers business and job opportunities.

Economic growth and social cohesion are two of the benefits that arise from a business environment that allows people from diverse social and economic backgrounds to become entrepreneurs and enter a global job market.

There are strong indicators that digital technologies, like social media, help attain this broadly founded performance lift by providing several tools that are available to business owners and managers, irrespective of background.

THE WIDER ECONOMIC BENEFITS AND POLICY IMPLICATIONS

To provide an EU-wide perspective of the economic impact of the business use of Facebook apps and technologies, we scale up the responses of the survey to attain estimates of economic impacts across the 15 EU markets surveyed. Notwithstanding the limitations of the survey described in the Methodology Appendix, our survey suggests that the impact could be substantial. The surveyed companies using Facebook apps and technologies attribute a large share of their business activity to the use of the apps, as reflected in attributed output, jobs, and exports.

Surveyed businesses across 15 EU markets say that using Facebook apps and technologies helped them generate sales corresponding to an estimated EUR 208 billion in economic activity last year.[18] When we take a deeper look into that,

[15] Please refer to the Methodology Appendix for a description of the survey.

[16] Bertschek, I. & Kesler, R. (2017): Let the User Speak: Is Feedback on Facebook a Source of Firms' Innovation

[17] Please refer to the Methodology Appendix for a description of the survey.

[18] Exact estimate of GVA is EUR 208,319,510,707. Economic activity here refers to gross value added (GVA) over the past 12 months. Please refer to the Methodology Appendix for a description of the survey.

using standard economic modelling techniques, this translates into an estimated 3.1 million jobs.[19]

Surveyed businesses across 15 EU markets say that using Facebook apps and technologies helped them generate international sales corresponding to an estimated EUR 98 billion in exports last year.[20]

When splitting export attributions, it is found that Facebook apps and technologies are useful in establishing and growing exports to countries inside and outside the European Union. Surveyed businesses credit EUR 58 billion worth of exports within the EU and EUR 40 billion worth of exports outside the EU to the use of Facebook apps and technologies.[21]

€58 BILLION

Surveyed businesses across 15 EU markets say that using Facebook apps and technologies helped them generate international sales within the EU corresponding to an estimated EUR 58 billion in intra-EU exports last year.[22]

These results suggest that the EU's effort to support the broad development of its digital single market has substantial merit. Concluding the findings of this study, we provide reflections on how three priority areas identified by the EU could be further developed by:

- Improving consumers' and businesses' access to online goods and services across Europe
- Creating an environment in which digital networks and services can flourish
- Maximising the potential of the European Digital Economy through the enhancement of digital skills

Despite the efforts to reduce barriers to cross-border trade, businesses still face challenges when expanding into new markets.[23] There is more that can be done to ensure equal access to the new opportunities provided by digital tools. One prerequisite for equal utilization of new digital opportunities is closing the 'digital skills gap'. More than one-third of Europeans in the active labour force do not have basic digital skills.[24] To realize the full potential posed by digital tools, the EU must make 'digital' a common language.

[19] Please refer to the Methodology Appendix for a description of the survey.

[20] Please refer to the Methodology Appendix for a description of the survey.

[21] Please refer to the Methodology Appendix for a description of the survey.

[22] Please refer to the Methodology Appendix for a description of the survey.

[23] European Court of Auditors (December 2019): E-commerce: many of the challenges of collecting VAT and customs duties remain to be resolved

[24] European Commission (May 2019): A Digital Single Market for the benefit of all Europeans

Term / Abbreviation	Definition
CLT	Central Limit Theorem
The Facebook company	Facebook apps and technologies (including: Facebook, Instagram, Messenger, and WhatsApp)
FX	Foreign Exchange
GDP	Gross Domestic Product
GVA	Gross value added
Heckman Correction	The Heckman two-step correction is a statistical technique to correct bias from non-randomly selected samples or otherwise incidentally truncated dependent variables
ILO	International Labour Organization
IMF	International Monetary Fund
ISIC	International Standard Industrial Classification
Market economy	The whole economy minus industries dominated by the public sector (public administration and defence, compulsory social security, education, human health, and social work activities)
OECD	Organisation for Economic Cooperation and Development
Off-platform	Does not use any of Facebook apps or technologies
On-platform	Uses at least one of the Facebook apps or technologies
PPP	Purchasing Power Parity
R-Squared	R-squared is a statistical measure in a regression model that determines the proportion of variance in the dependent variable that can be explained by the independent variable
REV4	Revision 4
ROI	Return on Investment

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1. BACKGROUND AND OVERVIEW

The Facebook company commissioned this study to measure the economic benefits of its apps and technologies for businesses.[25] 'Facebook apps and technologies' include Facebook, Instagram, Messenger, and WhatsApp.[26] Notably, this study includes both businesses that use Facebook apps and technologies as free-to-use tools and also those that engage with paid advertising. The economic benefits are measured in terms of gross value added (GVA),[27] jobs, and exports that businesses have credited to their use of Facebook apps and technologies. This paper covers the methodology applied to the present study.

The estimates derived from the analysis should be viewed as gross figures; they do not take into account any substitution effects, displacement effects, or cannibalisation that may occur as a result of the use of Facebook apps and technologies or their potential substitutes. In other words, the study provides a snapshot of the aggregate business activity that currently leverages Facebook apps and technologies. The inherent challenges of defining and modelling a world without online activity, or without online tools such as Facebook apps and technologies, are beyond the scope of this study.

At the time of writing, there is no single accepted methodology for estimating the impact of digital platforms and multi-sided markets. Other public studies have used willingness-to-pay formulations and return-on-investment estimates for digital advertising, amongst other techniques. As such, guidance from the literature is sparse, and methodologies used by previous studies either use internal data[28] or are presented with a series of limitations that should be acknowledged at the outset. In this study, similar caveats apply and are discussed in detail throughout this Methodology Appendix.

[25] This study captured the impact on businesses' total sales, not total revenues, noting that revenues could arise from sources on which the Facebook company may have no impact.

[26] The term 'Facebook' is used when referencing the app. Instances of 'Facebook company' indicate the corporate entity, not the app.

[27] The component of gross domestic product that captures the contribution by industry.

[28] See Google (2018). *Economic Impact Report - United States.*

1.2 OVERVIEW OF APPROACH DEVELOPMENT

Throughout this study, the research team did not have access to any internal Facebook company data regarding businesses' use of Facebook apps and technologies, nor the value derived from their use. The methodology included a global survey supported and augmented by current and available public data regarding employment counts, output, and GVA. In reference to the above points, these estimates should be viewed as an approximate calculation using the available data.

The research identified an increase in sales that businesses credited to Facebook apps and technologies, and the corresponding economic values associated with the following perspectives:

01 Economic activity – GVA supported by the increase in sales credited to the Facebook company

02 Jobs – employment supported by the increase in sales credited to the Facebook company

03 Exports – the increase in international sales credited to the Facebook company

The analysis covered private businesses in the 'market economy'. Public sector industries are not included as their revenues are most likely to be attributed to taxpayers.

The aggregate economic contribution of the Facebook company was estimated using:

- a survey of 7,727 employees from 15 countries to identify insights on their businesses use (or non-use) of Facebook apps and technologies[29] [30]
- a collation of publicly available economic data by industry across every country within the survey sample

The remainder of this document presents the analytical method to derive the economic estimates and a detailed description of the survey design.

[29] The countries surveyed were as follows: Belgium, the Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom. Approximately 500 employees were surveyed in each of the 15 countries.

[30] According to Eurostat, the total GVA of the 15 surveyed countries was 92 per cent of EU GVA in 2018

2. ANALYTICAL METHOD

In this section we detail the calculations used to generate the economic measures. The calculations are undertaken at an industry level and then summed for the market economy across all surveyed countries. The equations within this section use variable notation consistent with Table 2.

Table 2: *Description of Equation Variables*

Symbol	Description
c	country
i	industry
b	business
%Sales	Lower bound of the proportion of a respondent's sales attributed to the Facebook company according to the survey
$Sales	A respondent's total sales according to the survey
GVA *(public)*	Total gross value added according to public data
Output *(public)*	Total output according to public data
GVA	The estimated GVA attributed to the Facebook company
Employment *(public)*	Total number of employees in an industry according to public data
%IntlSales	Lower bound of the proportion of a respondent's international sales attributed to the Facebook company according to the survey
$IntlSales	A respondent's international sales according to the survey

2.1 GROSS VALUE ADDED (GVA)

Calculating the contribution to GVA from businesses' use of Facebook apps and technologies used the following method:

- Calculate the dollar figure of the sales attributable to the Facebook company for our sample[31] by industry and country[32]
- Multiply in-sample sales attributable to the Facebook company by the industry and country-specific ratio of GVA to output according to publicly available sources[33]

[31] 'Attributable to Facebook' is defined within this study as survey respondents reporting the value of sales that occur with the Facebook company's assistance. It draws from the key question of 'In the past 12 months, how much do you think your total sales would have decreased if you did not use Facebook apps and technologies?' Conceptually, this is a hard question for respondents to answer because it requires imagining a counter factual world without the Facebook company. Therefore, the estimates should be viewed as a representation of the survey findings, applied to the national level across the 15 countries and could include inaccuracies. Further information can be found in Section 2.4.

[32] As respondents were asked for the proportion of sales they credited to the Facebook company from both a positively and negatively framed questions, i.e. Positively framed question: In the past 12 months, what proportion (%) of total sales in your business relied on Facebook apps and technologies? For example, this could be sales from targeted advertising or through people finding your business through Facebook apps and technologies. Negatively framed question: In the past 12 months, how much do you think your total sales would have decreased if you did not use Facebook apps and technologies? The responses to the negatively framed question were marginally lower than the positively framed question; this framing was chosen to be used in the study and thus produced a more conservative estimate. In answering these questions, respondents were provided percentage intervals, i.e. 11 to 20 per cent. The lower bound of this range was chosen as the most conservative measure to avoid overestimating the impact of the Facebook company.

[33] Public data was collated for: employment by industry, GVA by industry, output by industry, and exports of goods and services.

- Scale up the in-sample GVA attributable to the Facebook company to the industry level in each country, using the ratio of industry level GVA (from public data) to the in-sample GVA reported for each industry
- Sum GVA across industries and countries for an overall estimate of GVA supported by the Facebook company for the 'market economy' in the 15 countries surveyed

Figure 1: *Calculation of GVA Attributed to Business use of Facebook Apps and Technologies*

$$GVA = \Sigma_{c,i}\left(\Sigma_b\left[\left(\frac{GVA_{c,i}(public)}{Output_{c,i}(public)}\right) * (\%Sales_{c,i,b}) * (\$Sales_{c,i,b})\right] * \frac{GVA_{c,i}(public)}{\Sigma_b \$Sales * \frac{GVA_{c,i}(public)}{Output_{c,i}(public)}}\right)$$

This equation can be simplified as seen in Figure 2.

Figure 2: *Simplified Calculation of GVA Attributed to Business use of Facebook Apps and Technologies*

$$GVA = \Sigma_{c,i}\left(\Sigma_b[\%Sales_{c,i,b} * \$Sales_{c,i,b}] * \frac{GVA_{c,i}(public)}{\Sigma_b \$Sales}\right)$$

2.2 EMPLOYMENT

To estimate employment supported by the Facebook company, we divided GVA supported by the Facebook company (from the steps above) by the average GVA per worker across the surveyed economies. This is shown by the equation below.

Figure 3: *Calculation of Employment Attributed to Business use of Facebook Apps and Technologies*

$$Employment = \frac{GVA}{\left(\frac{\Sigma_{c,i} GVA_{c,i}(public)}{\Sigma_{c,i} Employment_{c,i}(public)}\right)}$$

2.3 EXPORTS

The steps to calculate exports are:

- Calculate international sales attributed to the Facebook company for our sample[34] by industry and country

[34] International sales credited to the Facebook company are defined within this study as survey respondents reporting the value of international sales (i.e. foreign sales from the domestic country) which they credit to the Facebook company.

- Scale up the in-sample international sales attributed to the Facebook company to the industry level in each country, using the ratio of industry level GVA (from public data) to the in-sample GVA reported for each industry
- Sum the international sales attributed to the Facebook company across industries and economies for an overall estimate across the 15 market economies surveyed

This equation is shown in Figure 4.

Figure 4: *Calculation of Exports Attributed to Business use of Facebook Apps and Technologies*

$$Exports = \Sigma_{c,i}\left(\Sigma_b\left[\left(\%IntlSales_{c,i,b}\right) * \left(\$IntlSales_{c,i,b}\right)\right] * \frac{GVA_{c,i}\,(public)}{\Sigma_b \$Sales * \frac{GVA_{c,i}\,(public)}{Output_{c,i}\,(public)}}\right)$$

2.4 OTHER CALCULATION CONSIDERATIONS

The following points capture refinements, analysis, and other aspects of the methodology that are important to note.

Quantifying the proportion of sales credited to the Facebook company

Survey questions were used to capture increases in total sales and international sales that the respondent credited to the business use of Facebook apps and technologies. This question is cognitively difficult to answer accurately, given other similar platforms could be used to derive sales in a manner similar to Facebook apps and technologies. The vast majority of businesses use multi-channel marketing approaches and therefore attempting to dissect this can lead to erroneous results.

As businesses are able to access engagement rates and other statistics through their use of Facebook apps and technologies, it is reasonable to suggest that users have a relatively informed judgement on how impactful Facebook apps and technologies are on their business' total sales, compared to other channels.

In an effort to limit any overestimation through survey questions, the respondent was asked a selection of questions regarding the sales the respondent perceives to arise from their business' use of Facebook apps and technologies. The question which produced the most conservative response was used within the economic analysis, as well as taking the lower bound of the selected answer (i.e. respondents were asked to choose the most suitable answer from ranges of 10 percentage points). Furthermore, responses where respondents selected they 'did not know' whether their business' use of Facebook apps and technologies had impacted sales were assigned a value of zero (i.e. their use of Facebook apps and technologies had not led to an increase in sales).

This method was chosen as the research team did not have access to internal Facebook company data that could provide statistics on advertising spend, click-through rates, and engagement statistics, amongst other useful data points. The responses to the questions regarding sales attribution to Facebook apps and technologies were tested for their distribution and produced low coefficients of variation.

Insufficient sample sizes to be able to calculate economic measures at the industry level for some industries

The economic analysis is undertaken at the industry level for each of the surveyed countries. In some instances there were a low number of responses at the industry level and estimating the total industry's economic impacts off a small sample size would have increased the calculation error (see Table C in the Appendix A.2). To minimise the noise from using a small sample that is less representative of the population, a refinement to the methodology was required.

The target sample size for the online survey was determined by balancing the study's objectives and constraints (see Section 3.2.1 for a description of the sample size design). The target sample size meant we were unable to obtain in all occasions a sufficiently large sample for each industry across all countries to estimate the Facebook company's contribution to economic measures with a consistent level of precision.[35] In an effort to reduce potential bias and thus maximise the precision of these estimates, in those specific occasions where this limitation emerged, we aggregated responses for a given industry across all EU countries. This is based on businesses within a given industry being more homogenous (including the usage of Facebook apps and technologies) than businesses within a given country. When When sample sizes for any industry in any country were below 20 (i.e. in 57 out of 210 sectors across the 15 countries), all values used in calculating the economic measures (e.g. total sales, international sales and the proportion of sales supported by the Facebook company) were imputed.

Aggregation of countries with insufficient sample sizes reduces the impact of random error on economic estimates, increasing the validity of overall results. However, this correction reduces specificity and is dependent on the assumption that the aggregated countries are homogenous (aggregation homogeneity), with each individual country being representative of the group. The net impact of this imputation was a reduction in estimated GVA supported by the Facebook company of approximately 8 per cent.

[35] While the central limit theorem (CLT) is frequently acknowledged as holding true with sample sizes over 15, financial metrics collected through the online survey (total sales and international sales) are positively skewed, with a large degree of variation. Where distributions are skewed, we anticipate that the CLT may take more than n~100 to be an accurate approximation of the finite sample.

Correcting for differences between the survey focus and the economy-wide activity

The survey was designed to estimate population characteristics relevant to an assessment of economic value via the effect of Facebook apps and technologies on business sales. However, not all organisations are oriented along sales principles, e.g. (most of) the public sector. As such, the Facebook company's impact was assumed to be zero for businesses in the following three industries, which consist predominantly of public sector organisations:

- Public administration and defence; compulsory social security
- Education
- Human health and social work activities

Through excluding these three industries, the estimates calculated through the methodology described within this paper do not assume any benefits to these industries from their use of Facebook apps and technologies. This is a more conservative approach than attempting to calculate the benefits from the public sectors' use of Facebook apps and technologies.

Correcting for differences in internet penetration

The survey was administered via online panels. Thus, by design, the survey cannot capture individuals that do not use the internet and which, by definition, cannot use Facebook apps and technologies as business tools. Given the breadth of the global study, this is considered more of an issue for developing countries within our sample, where internet penetration is typically lower. As estimates of the Facebook company's economic contribution are calculated using sample estimates, this bias towards online businesses may contribute to an overestimation of the value supported by the Facebook company. For this reason, we explored possible ways to control, insofar as possible, the inherent selection bias (see Section 3.2.4 – Accounting for bias, for further information).

Internet penetration rates for each country were obtained from International Telecommunication Union Statistics.[36] [37] In the calculation of the final GVA and exports figures, the internet penetration rates by country are multiplied by the scaled GVA and exports estimated to be credited to the Facebook company. For employment, this is implicit; as the formula for employment takes the final GVA figure as a starting point.

[36] International Telecommunication Union Statistics (2017). Percentage of Individuals using the Internet, Available at: https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx Accessed October 2019.

[37] ITU statistics refer to internet penetration for consumers rather than businesses. As no reliable and comparable source of business internet penetration exists for all 15 countries in the research scope, this was used as the best available source to apply the adjustment discussed above. Note that the use of consumer data will produce a more conservative result, which is preferred to overestimating the value supported by Facebook apps and technologies.

Measurement error

The use of survey data as an input to economic calculations introduces measurement error to the estimates provided relating to the Facebook company's economic impact. When used in calculations, due to error propagation, the magnitude of measurement error increases, decreasing the precision of calculation results. In order to gauge the overall estimate sensitivity, the skewness and precision of component variables were investigated. The key variables included in the calculations can be considered in two groups:

- Financial information, provided as a numeric response.
- Proportion of sales supported by Facebook apps and technologies, provided as a range, of which we have taken the lower bound.

When analysed for kurtosis, skewness, and precision, the first of these groups is positively skewed, with a large degree of variation. As a result, confidence intervals contain zero, with imprecise estimates. In comparison, while slightly skewed, responses to the second of these groups (proportion), the data is cleaner, with a smaller coefficient of variation, contributing to more precise estimates.

We note that the observed skew and substantial variance on key variables are likely to impact the precision of economic calculations and recommend due caution in how results are communicated.

3. DATA COLLECTION

The chosen methodology and calculations described in the previous section are based on inputs from both public and survey data. This section describes the process to collate public information across industries and countries, and the design and administration of the online survey used to explore businesses' use of Facebook apps and technologies.

3.1 PUBLIC DATA

3.1.1 DATA COLLECTION

The first step in the economic analysis was to collate public economic data for all countries. Consistent with the method for calculation of GVA, employment, and exports, this consisted of:

- employment by industry
- GVA by industry
- output by industry
- exports in terms of total goods and total services

Efforts were made to collate each component of economic data from a single source. This was desirable both from a consistency perspective and also for expediency reasons. However, this was not always possible for GVA and Output. Where needed, data is converted to US dollars using foreign exchange rates from the World Bank, IMF. The following provides a simplified list of the public data sources used in the analysis, with a detailed breakdown in Appendix A.1:

- Eurostat and OECD – GVA and output
- Eurostat and International Labour Organization (ILO) – employment
- Eurostat – exports
- World Bank and International Monetary Fund – purchasing power parity rates and FX rates

Given the multiple data sources, a sense check was performed as to the consistency of the public data compiled for this analysis against a single data source (the World Input Output Database, WIOD).[38] This check demonstrated the datasets used in the economic analysis were broadly comparable.

[38] This was performed for the latest available data. Source: WIOD (2016), Socio economic accounts release 2016, published February 2018. Available at http://www.wiod.org/database/seas16 Accessed October 2019.

Table 3: *Industry Classifications*

Industry Code in the survey (19)	ISIC REV4 (21)	ILO Industries[39] (14)	REV4 Industry Name	ILO Industry Name
1	A	A	Agriculture, forestry and fishing	Agriculture; forestry and fishing
2	B	B	Mining and quarrying	Mining and quarrying
3	C	C	Manufacturing	Manufacturing
4	D	D,E	Electricity, gas, steam and air conditioning supply	Utilities
5	E	D,E	Water supply; sewerage, waste management and remediation activities	Utilities
6	F	F	Construction	Construction
7	G	G	Wholesale and retail trade; repair of motor vehicles and motorcycles	Wholesale and retail trade; repair of motor vehicles and motorcycles
8	H	H,J	Transportation and storage	Transport; storage and communication
9	I	I	Accommodation and food service activities	Accommodation and food service activities
10	J	H,J	Information and communication	Transport; storage and communication
11	K	K	Financial and insurance activities	Financial and insurance activities
12	L	L,M,N	Real estate activities	Real estate; business and administrative activities
13	M	L,M,N	Professional, scientific and technical activities	Real estate; business and administrative activities
14	N	L,M,N	Administrative and support service activities	Real estate; business and administrative activities
15	O	O	Public administration and defence	Public administration and defence; compulsory social security
16	P	P	Education	Education
17	Q	Q	Human health and social work activities	Human health and social work activities
18	R	R,S,T,U	Arts, entertainment and recreation	Other services
19	S	R,S,T,U	Other service activities	Other services
20[40]	T	R,S,T,U	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	Other services
21	U	R,S,T,U	Activities of extraterritorial organisations and bodies	Other services

[39] International Labour Organization (2019), ILOSTAT - ILO modelled estimates: Employment by sector, Available at: https://ilostat.ilo.org/data/bulk/ Accessed September 2019.

[40] Industries 20 and 21 (T and U) were not included as an option in the survey as this was likely to add confusion for the responders, therefore there were 19 available selections (industries A to S) within the survey.

3.1.2 INDUSTRY CLASSIFICATION

The economic analysis could only be completed based on the industry classification of publicly available data (i.e. the analytical tool could only operate based on the industry distribution of public data with the fewest industry classifications because it is possible to combine industries to match groupings, but it is not possible to dissect industries that are already grouped). The fewest industry classifications used in public data was for employment figures, which followed the ILO industry classifications as shown in the table below (column: ILO industries). The industries used in public data (ISIC REV4) were mapped to the ILO industry classification, detailed in Table 3.

3.1.3 CALIBRATING A BASE YEAR

Not all public data was available for the most recent calendar year (2018). Therefore, to enable consistent analysis any data prior to 2018 was extrapolated to 2018 levels. For example, of the 15 countries' GVA data, 11 were from 2018, three were from 2017 and one from 2016. The extrapolation method used the GDP growth rates from the IMF to extrapolate GVA and output from the most recent year of available data to 2018.[41] For countries where we have more recent GVA data than output data (for example, 2018 GVA and 2017 output), the GVA ratio was calculated for 2017 and output for 2018 estimated as: GVA of 2018 divided by GVA ratio of 2017.

3.2 SURVEY

This section describes the design and administration of a survey that spanned businesses across all industries in the 15 countries included within the study. The research team designed the survey, which was distributed and administered by Qualtrics as the selected platform provider. In accordance with data privacy laws in the 15 surveyed countries, no personally identifiable information (PII) was collected during the research. The opt-in survey was distributed via email, with respondents offered a financial incentive for participating.[42]

3.2.1 DEFINE SURVEY BOUNDARIES

Countries surveyed

The survey was distributed to 15 countries selected by the Facebook company, listed in Table 4.

Table 4: *List of surveyed countries*

Belgium	Germany	Ireland	Poland	Spain
Czech Republic	Greece	Italy	Portugal	Sweden
France	Hungary	Netherlands	Romania	United Kingdom

[41] International Monetary Fund (2019), World Economic Outlook: Gross domestic product, current prices. Available at: https://www.imf.org/en/Publications/WEO. Accessed September 2019.

[42] The type of reward varied based on the panelist profile but included: cash, airline miles, gift cards, redeemable points, charitable donations, sweepstakes entrance, and vouchers. Value of incentives ranged from approximately $5-10 (USD).

Industries covered

The survey used a self-reported measure to identify the industry to which the respondent's business (or employer) is most aligned. The options provided were consistent with the United Nations (UN) International Standard Industrial Classification (ISIC) Rev 4, which categorises industries into 21 classifications.[43] Two industries (T & U) that are marginal components of GVA, were removed from the available list to reduce complexity and cognitive load.[44] Therefore, there were 19 industry classification response options.[45] This includes the three public sectors that are not used within the economic analysis, as the survey aimed to gather samples from all industries. To help respondents select the most appropriate industry, a definitional description on each industry was provided.

Sampling strategy

The survey aimed to uncover how businesses use Facebook apps and technologies across all industries and the in-sample countries. In each country, employees and business owners were used as proxy informants for the business they worked for and were invited to participate in an opt-in online survey.[4]

Characteristics of the business population for all 15 countries and industries are unknown. To the knowledge of the research team, there are no consistent public sources for the count of businesses for each industry, or geodemographic data for all 15 in-scope countries. This is especially true for the countries in our sample, where online panels were the only way to access employees at the scale required. Therefore, the selection of a representative sample is extremely hard to achieve. The results from the survey and corresponding economic analysis should not be viewed as being perfectly representative of the economies covered (see Section 3.2.4 for more information on selection bias in the survey sample).

Quota sampling was used in an attempt to minimise selection bias; maximum quotas were set for each industry based on the distribution of GVA across industries within that specific country.[47] We chose to take a tailored sample in proportion to the population by distribution of GVA as GVA was the central research variable of the study.

Sample sizes

To ensure appropriate coverage across industries in each country, and subject to fea-

[43] United Nations (2008). International Standard Industrial Classification of All Economic Activities (ISIC), Rev 4. Page 58.

[44] Industry T is 'Activities of households as employers; undifferentiated goods and services producing activities of households for own use'. Industry U is 'Activities of extraterritorial organisations and bodies'. Together these industries account for less than one per cent of the total GVA for the in-scope countries. It is expected that any survey respondents from these industries are likely to have reported they are within 'other service activities' which is within the same industry as T and U when grouped for analysis.

[45] While the survey provides a list of 19 industries for respondents to select from, due to employment data being provided for 14 industry classifications, the analytical tool operates on the basis of 14 industries (being the lowest common denominator). The mapping of the ISIC Rev 4 industries to ILO classification is provided in Section 3.1.1.

[46] Using employees as proxy informants is inferior to using auditable information regarding the business, but this is often not publicly available. Efforts were made to ensure survey responses were reasonable through screening out nonsensical respondents (i.e. outlier removal) and the inclusion of a survey question that screened out respondents with no input to decision making for their business (see Section 3.2.2 for further detail on screening questions).

[47] GVA data by industry predominantly taken from UNData and OECD. See Appendix A.1. for more information on public data sources.

sibility constraints, sampling quotas were set based on the distribution of GVA across industries for each country to ensure appropriate coverage of the sources of GVA within each economy. This provided a total sample size of 7, 727 responses.

Survey weighting

Survey weighting can be a useful tool to ensure that the sample chosen is as closely reflective of the population as possible when proportional sampling of the population is not possible. However, in order to use this technique appropriately, a rigorous understanding of the population is required.

As previously noted, there is no consistently available information on the number of businesses by industry and country, and therefore this view of the population is unavailable. Furthermore, consistent geodemographic data for each country is not available.

Therefore, a conservative approach, and one that does not introduce new bias, is to avoid survey weighting without a rigorous view of the size and demographics of the population. As such, these survey results should be considered as limited, and inference drawn on a larger population from these results should be done with due caution.

3.2.2 SURVEY DESIGN

The survey was designed to capture the relevant information regarding businesses across all industries in each of the sample countries. No personal information was collected through the survey to comply with data privacy laws in each of the surveyed countries. Respondents were invited to complete the survey in return for a small incentive. All respondents were free to terminate the survey at any point.

Survey translations

Two of the surveyed countries were English-speaking nations, and 12 were not English-speaking. To ensure the accuracy of the translations for those who did not speak English, a two-stage, native speaker verification process was used. Through this process, the questions were translated into the required language by a native speaker, and these were then independently translated back into English using a secondary native speaker to test for accuracy.

Screening questions

Screening questions were used to ensure the respondent was currently employed and had input into decision-making for the business they were responding on behalf of to help increase the accuracy of survey data.

Furthermore, minimum sales limits were introduced after multiple nonsensical answers were received during the pre-test (e.g. $16.15 (USD) and $8.07 (USD) total

sales value over the last 12 months). Based on analysis of the pre-test data and public data, a minimum annual total sales threshold of $3,700 (USD) was set[48] and converted into local currencies using average exchange rates for 2018, as well as the 2018 purchasing power parity values obtained from the World Bank.[49] This value was chosen based on analysis of the pre-test data to remove nonsensical responses without impacting the integrity of the analysis and removing legitimate micro-businesses. Additional outlier removal processes were used on the survey data for further cleansing of the results (covered in Section 3.2.5).

Facebook apps and technologies

The survey was designed to capture the overall impact of Facebook apps and technologies, rather than to attribute any perceived benefits to individual applications. Therefore, other than a question upfront which asked the respondent which Facebook apps and technologies they used, all further questions asked the respondent on behalf of all Facebook apps and technologies (whether the business used one or all four apps). A definition was provided on every page that asked for information regarding Facebook apps and technologies and was also included in the introductory pages of the survey.

Reverse-framed questions

Reverse-framed questions (i.e. set in terms akin to 'willingness to accept') were used to test for systematic response bias between positively and negatively framed questions that operationalise the percentage of sales supported by the Facebook company. On average, the negatively framed question was answered 5 percentage points lower than the positively framed question.

In line with the empirical literature on willingness to accept formulations of valuation questions, we have relied on the negatively framed question as the approach eliciting the most conservative valuation from the respondent.[50] Whilst this question cannot be portrayed as a basis to establish a fully causal link, we consider this as an approach to attribution that minimises positive response bias.

3.2.3 SURVEY TESTING (PRE-TEST)

An undeclared pre-test of the survey collected an average sample of 15 responses per country. The objective was to test the effectiveness of the survey questions and to refine outlier rules. Specifically, the sample was tested for the following:

- data quality

[48] A value of $3,700 (USD) was chosen based on a suitable value that prevented nonsensical responses from the pre-test data. As a reference point the research team found international precedent within the ABS' analysis of regional businesses where they do not include any businesses with total annual revenues below $7,000 (USD). It was decided that a threshold of $7,000 (USD) could prevent legitimate responses, and therefore $3,700 (USD) was a more sensible threshold based on the analysis of the pre-test data. As stated above, to take into account the real purchasing power across the in-sample countries this was converted into reasonable country-specific thresholds using the PPP rates from the World Bank (2018).

[49] World Bank (2019). Purchasing Power Parity. PA.NUS.PPP.

[50] Kamoen, N., Holleman, B., & van den Bergh, H (2013). Positive, negative, and bipolar questions: The effect of question polarity on ratings of text readability. Survey Research Methods, 7(3), 181-189. Respondents are more likely to disagree with a negatively-framed question.

- descriptive statistics and distribution of data
- time to complete
- additional sense check for counterfactual questions
- cultural understanding and accuracy of translations

Minor adjustments were made to a number of the survey questions on the basis of the analysis of the pre-test responses. The pre-test responses were not included in the final survey responses.

3.2.4 ACCOUNTING FOR BIAS

Bias arises in surveys where the sample systematically over- or underestimates a population parameter. Even after comprehensive design, bias can arise. The challenge is how best to mitigate the risks of encountering bias and errors, and therefore achieve the most reliable sample given the constraints of the study.

The following sections address some of the potential biases that were accounted for in the design, conduct, and analysis of the survey.

Selection bias

The survey was administered via online panels. These panels are unlikely to represent the true distribution of businesses by key geodemographic variables (e.g. size, industry, country), introducing systematic error into sample estimates. As the distribution of relevant geodemographic variables in the population is not known in all countries surveyed, it is not possible to correct for this bias in a valid and reliable way, e.g. by post-weighting to match known population characteristics.[51]

Efforts were made to ensure the survey sample was representative of the target population through quota sampling, using a sampling plan that was closely aligned to the distribution of GVA by industry for each country, as this is a known population characteristic.[52] However, as quota sampling is a non-probabilistic sampling technique, potential remains for selection bias, with key sources of bias considered on page 28.

- First, online panels are known to suffer from selection bias, in that all respondents have access to the internet. As a result, employees who do not have

[51] We note that the results of similar surveys have applied post-weighting to responses according to known geodemographic characteristics of the online population in a given country. This correction is not applied in the current methodology (1) as its validity is dependent on the assumption that the business and online populations in any given country are homogeneous; and (2) as this information is not available for all 15 in-scope countries.

[52] We set sample quotas that matched the distribution of GVA for the 11 industries in each country. The density of responses from an industry was not allowed to exceed the quota by more than 3 percentage points.

access to the internet were not observed in our sample. As the use of Facebook apps and technologies require internet connection (mobile, wireless, fixed line or otherwise), the use of an online survey is biased towards businesses and employees that are more likely to be on-platform. This is likely to contribute to an overestimation of the economic impact of the Facebook company (see Section below: Correcting for selection bias).[53]

- Second, due to the approach of using employees as proxy informants of their employer's business activities, it is likely that large businesses are overrepresented in the survey sample, compared to large firms' share of the overall count of businesses.[54] However, linear regression suggests that business size (operationalised using number of employees) is inversely related to the probability of a business being on-platform, and the proportion of sales supported by the Facebook company. As a result, qualitative differences on these factors are not likely to contribute to an overestimation of the value Facebook apps and technologies contributes to the global economy.[55]

Correcting for selection bias

A common statistical technique used to correct for selection bias is the Heckman two-step correction (the Heckman Correction).[56] Conceptually, this is a type of correction tool that may be applied by explicitly modelling the individual sampling probability of each observation (the so-called selection equation) together with the conditional expectation of the dependent variable (the so-called outcome equation). Doing so in a way that adds to the consistency of estimates requires prior information on the nature of sampling bias – information which in this context is limited.

A key root of sampling bias is partial internet penetration, logically driving a direct overrepresentation of online businesses (as the offline businesses and employees are not sampled, by design). To inform the identification of the most appropriate selection equation, we reviewed the density of observed geodemographic characteristics. This analysis indicated that in countries with poor internet penetration, respondents were more likely to be from on-platform businesses, as well as: founders or leaders of their businesses, from businesses with a founder who is under 25 years old, and from businesses with a founder who is university-educated. Given this positive association, we identified a potential risk of overestimating the economic impact of the Facebook company in countries with lower internet penetration.[57]

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[53] This is particularly true in countries with limited internet penetration, where the difference between online and offline businesses is larger.

[54] In countries where public data on the share of employment and firms by business size is available, our in-sample share of responses by business size is more closely aligned to the share of businesses by employment, than to the equivalent shares measured with respect to the overall count of firms.

[55] Businesses with many employees are likely to have a greater value of sales; since sample estimates are scaled using GVA for the industry and country selected, the risk of bias due to over-representation of large businesses is mitigated.

[56] Heckman JJ (1976). The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models. Annals of Economic and Social Measurement, 5(4), 475–492.
Toomet, O. & Henningsen (2008). Sample Selection Models in R: Package sampleSelection. J. Stat Softw 27(7):1-23. http://www.jstatsoft.org/v27/i07/.

[57] This is a post-hoc approach to defining the selection equation, which can increase the likelihood of detecting a false positive (through model over-fitting).While this is not the preferred approach, the analysis was undertaken, in an attempt to correct for the observed deficiencies in our sample.

In an effort to correct for this bias, we used a selection equation that corrected for the tendency of the business founder being in sample, when looking at the effect of being on-platform, industry, country, business type, and business classification on total sales.[58] All the model specifications had poor predictive power at the explanatory stage – likely due to insufficient information since available internet penetration data is at the country level and does not vary by industry. Thus, the Heckman correction could not yield reliable results. For this reason, we have set aside this approach and, as stated above, we applied a more direct approach to correct for varying levels of internet penetration across the surveyed countries.

Other biases

Retrospective reporting, or recalling past information through surveys, can give rise to measurement error. People can develop memory biases and gaps in information over time, which can distort the data captured, and reduce the precision of calculated estimates of the Facebook company's economic impact.[59] A number of steps were undertaken to minimise measurement error, including:

- the survey design minimised cognitive load for both question comprehension and memory recollection (e.g. survey respondents were provided with an option to report business data for a period of time they were comfortable with (i.e. 1-12 months), which was converted to an annual figure for the purposes of the economic analysis)
- the measurement instrument was pilot-tested to identify and correct potential response biases
- multiple measures were included for key constructs (e.g. including both a positive and negatively framed questions to quantify the proportion of sales supported by Facebook apps and technologies)

Furthermore, survey data (as stated above) was set up to provide financial metrics over the last 12 months, October 2018 – October 2019. In contrast, the public data used referred (or was extrapolated) to the 2018 calendar year (1 January 2018 – 31 December 2018). As a result, there is a small discrepancy in the time period covered by public and survey data. We do not expect this discrepancy to be significant, and, in lieu of reliable public data for year-to-date 2019, no further action was taken.

[58] Selection equation: Founder ~ business age + business headcount + industry + country. Outcome equation: Total sales ~ On-platform + industry + country+ business type (goods vs services vs both) + business classification (B2B vs B2B vs both).

[59] The confidence intervals around the base measures (such as total and international sales) were extremely wide due to large variations seen by country and industry. We note that, when used in calculations, due to error propagation, the magnitude of measurement error increases, decreasing the precision of calculation results. In addition, the methodology used to estimate the contribution of the Facebook company to the global economy required sample estimates to be scaled up to represent the size of the economy of a given industry in a given country. This further decreases the precision of economic estimates provided.

[60] As total sales have a floor of $3,700 (USD) and no ceiling, and international sales figures have a floor of $0 (USD) and no ceiling, this result was expected. The observed distribution of total sales and total international sales are positively skewed, with the sample median being less than the mean.

3.2.5 SCREENING OF OUTLIERS

Survey data scrubbing

Data scrubbing refers to the procedure of modifying or removing incorrect, inaccurately formatted, or repeated data in a dataset, with the objective to ensure that the data is accurate and consistent for further analysis. This process happens before survey cleansing (covered in the next section), which removes outliers from the data set.

Qualtrics analysed survey responses to help identify bad responders. This identified:

- responders attempting to game the system through multiple responses
- bots (machines) automatically completing the survey
- responders providing contradictory responses

Post scrubbing, there were a total of 7,727 responses.

Survey cleansing

Due to the right-tailed distribution of the data, classical outlier removal methods (e.g. removal of values more than three standard deviations above or below the mean) were not applicable as they removed significant proportions of the data. These methods are more applicable for data that is normally distributed.[60] A further method to remove outliers based on the median absolute deviation was also discounted as it had the unintended consequence of removing responses that were deemed reasonable. Therefore, a rule-based approach to removing outliers was used, based on the feasibility of responses.

The approach to removing outliers based on feasible possibility requires assumptions regarding the point at which a value becomes infeasible.[61] The assumptions taken in our approach are outlined below:

- Respondents should provide their responses in a currency commonly referenced in the country they have selected (i.e. local currency or US dollars in a country outside Europe; or local currency, US Dollars, GB Pound, or the Euro where the response is from a country within Europe)
- Headcount should not exceed that of the largest public company in the country selected
- Total sales growth should not exceed 100,000 per cent
- Total sales should not exceed either:

[61] Public data for Output and Exports for each industry in each country, as referenced in Section 3.1. Largest company in each country: Forbes (2019). The World's Largest Public Companies, https://www.forbes.com/global2000/list/#header:country. Accessed September 2019. https://Maximum sales growth: the figure for maximum sales growth (100,000 per cent) draws on a number of public sources, all of which cite maximum sales growth (over a 3 year period) as being less than 100,000 per cent, for example:

- 51,364 per cent – Financial Times (2019). FT1000: Europe's fastest growing companies, www.ft.com/content/238174d2-3139-11e9-8744-e7016697f225. Accessed September 2019.
- 36,680 per cent – Inc (2019). Inc. 5000: The Most Successful Companies in America, https://inc.com/inc5000/2019/top-private-companies-2019-inc5000.html. Accessed September 2019.

    - the total output (public data) for the selected industry in the selected country, or
    - the total sales of the largest public company in the selected country (public data)
- Headcount growth should not exceed 100,000 per cent
- International sales should not exceed the total exports for the type of business (i.e. total services exports if they are in the services sector and likewise for total goods exports) in the country selected (public data)
- The total value of sales supported by a single employee should not exceed $10,000,000 (USD)
- A respondent should not indicate that they are not a business leader or founder, and yet also claim to have sole decision-making authority

Responses that violated any of these assumptions were removed from our sample, resulting in the removal of 207 responses. The total number of complete survey responses received was 7,727, of which 5,836 were in the industries associated with the market economy. After the removal of infeasible responses, the sample size was 7,343, of which 5,629 were in the market economy

In instances where a respondent reported international sales greater than total sales, but had passed the prior outlier checks, a value for international sales was imputed using the smaller of either the respondents' total sales, or the average international sales for the selected industry in the selected country.

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PENDIX

A.1 PUBLIC DATA SOURCES

Table A: *Legend for data sources*

Employment	GVA	Output	Export, goods	Export, services
ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2018 year	OECD, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Eurostat, National Accounts employment data, data for 2018	OECD, National Accounts, data not consistent with the most recent year available for other countries and regions	OECD, National Accounts, data not consistent with the most recent year available for other countries and regions		
	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year		

Table B: *Summary of data collected, source, and the latest year of data available*

Country	Employment	GVA	Output	Export, goods	Export, services
Belgium	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Czech Republic	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
France	ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2018 year	OECD, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Germany	ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2018 year	OECD, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Greece	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Hungary	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, Balance of Payment statistics in services data, data for 2018
Ireland	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Italy	ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2018 year	OECD, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Netherlands	ILO, ILOSTAT, data for 2017 year	OECD, National Accounts, data for 2018 year	OECD, National Accounts, data for 2017 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Poland	ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2017 year	OECD, National Accounts, data for 2017 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Portugal	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018

Country	Employment	GVA	Output	Export, goods	Export, services
Romania	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Spain	ILO, ILOSTAT, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
Sweden	Eurostat, National Accounts employment data, data for 2018	Eurostat, National Accounts, data for 2018 year	Eurostat, National Accounts, data for 2018 year	Eurostat, Balance of Payment statistics in services data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018
United Kingdom	ILO, ILOSTAT, data for 2018 year	OECD, National Accounts, data for 2016 year	OECD, National Accounts, data for 2016 year	Eurostat, International trade statistics in goods data, data for 2018	Eurostat, Balance of Payment statistics in services data, data for 2018

Sources:

Eurostat (2019), National Accounts - Table nama_10_64a. National Accounts aggregates by industry, Available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a64&lang=en*; Accessed October 2019.*

Eurostat (2019), National Accounts employment data - Table nama_10_64a_e. National Accounts employment data by industry, Available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a64_e&lang=en*; Accessed October 2019.*

Eurostat (2019), International trade statistics in goods - Table ext_lt_intratrd, Intra and Extra-EU trade in goods by Member State and by product group, Available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ext_lt_intratrd&lang=en*, Accessed October 2019.*

Eurostat (2019), Balance of Payment statistics - Table bop_its6_det, Intra and Extra-EU trade in services by Member State, Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?wai=true&dataset=bop_its6_det*, Accessed October 2019.*

International Labour Organization (2019), ILOSTAT – ILO modelled estimates: Employment by sector, Available at: https://ilostat.ilo.org/data/bulk/*, Accessed September 2019.*

International Monetary Fund (2019), Exchange Rate Report. Available at: https://www.imf.org/external/np/fin/ert/GUI/Pages/CountryDataBase.aspx*, Accessed September 2019.*

*International Monetary Fund (2019), World Economic Outlook: Gross domestic product, current prices. Available at:*https://www.imf.org/en/Publications/WEO*, Accessed September 2019.*

Organisation for Economic Cooperation and Development (2019), National Accounts – Dataset: 6A. Value added and its components by activity, Available at: https://stats.oecd.org/Index.aspx?DataSetCode=SNA_TABLE6A*, Accessed November 2019.*

A.2 NUMBER OF SURVEY RESPONSES BY COUNTRY AND INDUSTRY

The following table shows the number of survey responses by country and industry (for the market economy sectors only) after the screening of outliers is applied.

Table C: *Count of survey responses by country and industry (post outlier screening)*

Industry Country	A	B	C	D,E	F	G	H,J	I	K	L,M,N	R,S,T,U	Total
Belgium	6	3	57	5	41	25	55	9	33	62	22	318
Czech Republic	11	6	138	10	38	37	62	14	10	55	26	407
France	11	3	59	17	30	33	44	12	30	70	29	338
Germany	5	10	102	13	27	34	59	17	31	50	33	381
Greece	23	0	38	13	25	57	41	34	23	71	35	360
Hungary	33	1	106	16	36	28	70	25	35	39	31	420
Ireland	16	2	65	17	29	44	64	29	46	63	18	393
Italy	14	4	68	13	40	16	49	6	31	49	108	398
Netherlands	10	3	71	7	26	46	62	6	41	54	30	356
Poland	10	5	113	12	51	35	66	10	35	51	27	415
Portugal	13	0	27	11	34	38	53	26	21	93	31	347
Romania	16	1	45	15	46	45	73	25	30	73	30	399
Spain	15	1	61	11	40	24	48	13	29	95	34	371
Sweden	12	3	72	10	35	18	71	15	24	43	29	332
United Kingdom	3	5	60	13	37	22	68	14	47	90	35	394
Total												**5,629**

Table D: *Industry codes*

Code	Industry
A	Agriculture; forestry and fishing
B	Mining and quarrying
C	Manufacturing
D,E	Utilities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H,J	Transport; storage and communication
I	Accommodation and food service activities
K	Financial and insurance activities
L,M,N	Real estate; business and administrative activities
R,S,T,U	Other services


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