UK Manufacturers’ Sales by Product Survey (Prodcom) QMI

Quality and Methodology Information for UK manufacturers' sales by product (ProdCom), detailing the strengths and limitations of the data, methods used, and existing and suitable data uses and users.

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1 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the five European Statistical System dimensions of quality) as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about existing uses and users of the data
- help you to decide suitable uses for the data
- understand the methods used to create the data

2 . Important points

- The UK manufacturers' sales by product (ProdCom) presents annual statistics on the value and volume of products manufactured in the UK.
- The ProdCom statistics concern all manufactured products included in the EU ProdCom list.
- The survey sample covers UK businesses active in the mining, quarrying and manufacturing sectors (Standard Industrial Classification 2007: SIC 2007 Sections B and C).
- ProdCom outputs are used as part of the national accounts supply use tables, an integral part of the measurement of gross domestic product (GDP).
- The detailed level of ProdCom estimates often leads to data suppression, due to either a small number of producers, or one dominant producer, leading to a high risk of disclosing the sales figure for an individual business.
- The structure of the ProdCom publications was changed in 2015; the statistical bulletins are now shorter, with a greater emphasis on clarity and accessibility of data and analysis.

3 . Quality summary

Overview

The UK manufacturers' sales by product (ProdCom) presents annual statistics on the value and volume of products manufactured in the UK. The datasets provide estimates of value, volume and unit values (value per unit of volume) for each product heading (where possible). Other data available by industry include total turnover, merchanted goods, work done, sales of waste products and all other income.

The ProdCom statistics concern all manufactured products included in the EU ProdCom list. The survey sample covers UK businesses active in the mining, quarrying and manufacturing sectors (Standard Industrial Classification 2007: SIC 2007 Sections B and C).

Data are collected via a paper questionnaire from a sample of approximately 21,500 businesses, covering 240 subsectors of the mining, quarrying and manufacturing industry sectors and approximately 3,800 products. When returned to Office for National Statistics (ONS), the questionnaires are scanned and data are edited, with a selective editing method implemented in 2011. This method prioritises the validation of returns that have the largest potential impact on product level estimates. Imputation methods are applied to compensate for non-response and a non-linear estimation method is used to estimate for non-sampled businesses.

Provisional estimates, six months after the end of the reference period, are published online in June, with intermediate and final estimates, 12 and 24 months after the end of the reference period respectively, published in the autumn.

Reports are produced at industry level in both Excel and Extensible Markup Language (XML) formats, accompanied by a statistical bulletin. A dataset is then made available for approved researchers via the ONS Secure Researcher System (SRS) and UK Data Service.

The title "ProdCom" comes from the French "Production Communautaire" (translated as community production), which, in the UK, was formerly known as the Products of the European Community (PRODCOM) Survey. Prior to 1993, product information was collected through the Annual and Quarterly Sales Inquiries (ASI/QSI).

Following an extensive review of the Nomenclature of Economic Activities (NACE) in 2007, the UK Standard Industrial Classification (SIC) was revised to align both classifications. This resulted in changes in ProdCom estimates from the 2008 survey onwards to align fully with the NACE classification. In previous years, ProdCom estimates in some instances were published according to the UK Standard Industrial Classification 2003: SIC 2003, which only matched the previous NACE classification to the first four digits.

Prior to 2015, the Annual Minerals Raised Inquiry (AMRI) collected volume data on non-energy mineral production, which fed into the estimates produced for the other mining and quarrying sector (division 8). The AMRI survey ceased after the 2014 survey period so an alternative approach was required to collect and capture data for this. The change in source data for this division resulted in a level shift in the estimates between 2014 and 2015. To understand this and to construct a consistent time series, the estimates for this division have been suppressed within the ProdCom publication up to this point.

Analysis has been conducted using the new approach for this division with estimates now included as part of this release. Estimates published for other mining and quarrying are now a combination of AMRI data from 2008 to 2014, and the new source from 2015 onwards. Details of the full analysis and impact has been undertaken; you can find more information about this in Improvements in the estimation of product data for other mining and quarrying.

The ProdCom questionnaire covers both generic questions and those tailored to the requirements of the business. The questionnaire is split into five sections, as follows:

- Section A: Products – this section contains the tailored questions or lists the specified products that are relevant to the business
- Section B: Additional Products – this section allows respondents to add any (minor) products (products with sales values of less than £25,000) not covered in Section A, giving a description of the product or item, Combined Nomenclature number (CN) if known and the value of sales
- Section C: Other Income – this section contains the generic Standard Heading questions that are asked of all respondents, including merchanted goods, work done, waste products and non-production income
- Section D: Company Totals – this is the sum of Sections A, B and C
- Section E: Your Comments – respondents can leave feedback or provide supplementary information for some questions in this section

Uses and users

ProdCom outputs are used as part of the national accounts supply use tables, an integral part of the measurement of gross domestic product (GDP). PRODCOM value estimates are required to analyse total turnover, work done and industrial services provided for each production industry at the input-output industry and product level. GDP is the primary measure of the overall state of a country's economy; it is extensively reported in the media to track the UK's economic performance.

ProdCom outputs are also used to create a sampling frame for the ONS Producer Price Index (PPI), as it identifies businesses that make particular products. PPI is used to monitor inflation "at the factory gate". A number of government departments and other bodies use ProdCom data to analyse industry trends and inform policy decisions. These include:

- the European Union: to make comparisons across the EU and to analyse the competitive performance of individual member states
- the Department for Business, Energy and Industrial Strategy (BEIS): to analyse sectors including healthcare and electronics
- business and marketing analysts: in undertaking planning and business decisions, for example, to assess the market conditions at the individual product or industry level
- trade associations: to inform and provide evidence in advocacy work

Strengths and limitations

The main strengths of the survey include:

- the survey is very comprehensive, covering many products at a much greater level of detail than other ONS surveys
- ProdCom is enforced by Eurostat, which enables international comparison of the UK's figures with those of other EU states
- ProdCom's response rate is consistently above 80% at the publication of intermediate results
- ProdCom tailors questionnaires to each business, minimising respondent burden
- the high level of detail in ProdCom statistics permits a thorough insight into where turnover is generated in particular sectors and what products may be driving or restricting growth in different sectors

The main limitations of the survey include:

- the detailed level of ProdCom estimates often leads to data suppression, due to either a small number of producers, or one dominant producer, leading to a high risk of disclosing the sales figure for an individual business

- the sampling frame for ProdCom does not cover businesses who manufacture as a secondary activity; the sampling frame covers SICs 8 to 33, so any business classified outside of these divisions, even though manufacturing may account for an important minority of their income, is not covered by the survey

- some products are produced by only a small number of manufacturers, meaning that there may not be enough manufacturers for a detailed and robust analysis and the sector may be volatile, requiring some estimation

- as ProdCom is an annual survey, there are restrictions on the timeliness of the data available; provisional estimates are published six months after the end of the reference period, with final results published 12 months after the end of the reference period

Recent improvements

There have been two important recent improvements to note:

- the structure of the ProdCom publications was changed in 2015; the statistical bulletins are now shorter, with a greater emphasis on clarity and accessibility of data and analysis

- between 1995 and 2015, the Annual Minerals Raised Inquiry (AMRI) collected volume data on non-energy mineral production; a number of problems were identified with this survey and it was cancelled in 2015, with the ProdCom survey collecting these data from this date

4 . Quality characteristics

Relevance

The ProdCom survey is governed by the European Union Regulation 3924/91 and covers industrial production in the mining, quarrying and manufacturing sectors. The survey does not cover recycling or energy products. The product definitions are standardised across the EU to enable comparisons between member states' data and the production of EU aggregates at product level.

The ProdCom List of Products is defined by the NACE classification and the Classification of Product by Activity (CPA). All product heading numbers (referred to as ProdCom Commodity Codes or PCCs) used for classification are defined by one or more headings of the Combined Nomenclature (CN), which is the EU system for classifying products used to collect trade data through customs procedures.

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- trade associations: to inform and provide evidence in advocacy work

A user satisfaction survey was carried out in 2013, with a summary of user feedback published on the ProdCom User Engagement and Survey Management webpage. Users can contact the ProdCom team with feedback, comments or requests via email at prodcompublications@ons.gov.uk.

Accuracy

The total error in a survey estimate is the difference between the estimate derived from the data collected and the true (unknown) value for the population. The total error consists of two main elements; sampling error and non-sampling error.

Sampling error

The error that arises because the estimate is based on a survey rather than a census of the population. The results obtained for any single sample may vary from the true values for the population, but the variation would be expected to be zero on average over a number of repeats of the survey.

Standard error

The estimated value of the average magnitude of the sampling error. Our estimate for a variable, plus and minus the standard error for the variable, gives the range in which the true unknown value for the population should lie.

Coefficient of variation (CV)

This is estimated by the standard error of a variable divided by the survey estimate. This is used to compare the relative precision across surveys or variables. The closer the CV is to zero, the less uncertainty there is in the estimate. To minimise the burden on businesses and to complete the survey within allocated resources, the sample size is limited, which can lead to large CVs and some uncertainty around detailed product estimates.

Estimated standard errors and CVs are available for product level estimates published in the ProdCom output and should be considered when using ProdCom estimates.

Non-sampling error

Non-sampling errors cover all errors unrelated to sampling methodology. These can be difficult to quantify and relate to errors in coverage, measurement, processing and non-response.

Response rate

The response rate gives an indication of the likely impact of non-response error on the survey estimates and are published as part of the statistical bulletins.

Response accuracy

It is difficult to accurately quantify the effect of response inaccuracy. Questionnaires are tailored to individual businesses where possible, so that they are only asked to return sales values and volumes that we know they currently produce or have produced in the past. This helps to reduce inaccuracy in product coding.

Industry classification on the Inter-Departmental Business Register

Industry reclassification (moving from one Standard Industrial Classification (SIC) to another) can occur due to a relatively small change to the nature of its operation, but can have a significant effect on ProdCom estimates. When a survey does not cover the whole business population, as with ProdCom, re-classification can lead to units moving in and out of scope of the sample, even if the business is still manufacturing as a secondary activity. We minimise this error by ensuring that key respondents to products remain in the sample where possible.

In addition, the correction of mis-classified businesses can lead to bias, particularly when there is systematic movement from one industry to another. This is because, where classification updates are identified via survey returns, it is only units in the survey sample that are updated.

Coverage errors

The coverage of the ProdCom survey is impossible to assess, because it is not possible to identify all of the businesses that manufacture goods included in the ProdCom List. Consequently, as the Inter-Departmental Business Register (IDBR) does not offer information on products, rather it only covers economic activity, the coverage of the ProdCom survey is generally assessed by using the enterprises' turnover or employment as a reference. This method ensures a general assessment of coverage and must be viewed with caution.

Reliability

Assessing the difference between the first published estimate and the final revised figure provides an indication of reliability. ProdCom revises data for up to two years' previous by taking on late responses, or where a business revises its own return. More information on ProdCom revisions is published in the statistical bulletin of the intermediate and final estimates.

Output quality

To comply with EU regulation and to provide more timely data, provisional survey estimates are published on or around the 30 June each year, six months after the reference period. At this time, the survey response rate, by number of questionnaires returned and validated, is approximately 60%. To provide more accurate estimates, data are revised and published, as detailed in the Timeliness and punctuality section.

Coherence and comparability

ProdCom is designed in accordance with Eurostat regulations (EU Regulation 3924/91) to ensure comparability across European Union member states. An important aspect of this is the use of UK SIC, which is consistent with the European Union's NACE system of industry classification.

ProdCom estimates can be assessed for coherence against three other outputs: External Trade Statistics, the Annual Business Survey (ABS) and the Index of Production (IoP).

Coherence with External Trade Statistics

Matching ProdCom estimates and international trade statistics helps to provide a more complete picture of domestic sales, consumption of goods and the UK trade balance. However, there are several differences between ProdCom and international trade statistics data sources, as follows:

- coverage – export values may include products not produced in the UK; a product may cross borders more than once in the reporting period

- volume units – a comparison of trade and ProdCom data is not possible if two different volume units are used and this is the case for several ProdCom products; these known differences in volume units are highlighted on the front page of the reference Excel tables (for 2012 intermediate estimates onwards)

- valuation – ProdCom products are valued at the price at which they are sold by the manufacturer; trade statistics use the value of the good when it is exported, which may include transport cost and profit by intermediary, for example; there may also be differences in the time that the transaction is recorded

Intra and extra EU imports and exports data, together with the trade balance and the UK net supply data, were previously published alongside estimates of ProdCom sales for users who may want to match both sets of data. However, as a result of comparability issues, as explored previously, this no longer occurs.

Following discussions with users, those who require trade estimates to match with ProdCom estimates may obtain data directly from HM Revenue and Customs (HMRC) from the 2013 intermediate and 2012 final estimates onwards. However, users are advised to consider the associated issues when making comparisons.

Coherence with the Annual Business Survey

The ABS also collects total turnover, alongside other variables similar to the standard headings collected by ProdCom. However, ProdCom focuses on products and ABS focuses on activities. The total value of production for business in an industry group may be different to the turnover reported by ABS for the same industry group. Enterprises may carry out other activities in addition to production that contribute to its turnover.

Coherence with the Index of Production

The IoP collects total production turnover, but not data about individual products manufactured. However, some differences in the sources can compromise the coherence between the outputs at industry level, as follows:

- volume measurement – the IoP volume measurement is a chained volume index, as opposed to ProdCom volumes, which equate primarily to units measured (for example, litres, tonnes or number of items)

- value of production – ProdCom estimates the value of production sold during the reference period, which may or may not be the same as the total production value as estimated by the IoP

Coherence across time series

Comparable time series are available going back to 2008. This is because available results for ProdCom between 1993 and 2007 are based on the UK SIC 2003 system, which was updated to become the UK SIC 2007 following a 2007 review. These updates were designed to reflect structural changes in the European economy, for example, the growth in technology industries.

Consequently, ProdCom estimates from reference year 2008 onwards are published according to the UK SIC 2007 and so are not directly comparable with earlier results published according to UK SIC 2003. Eurostat have published product level ProdCom estimates under both the UK SIC 2003 (NACE Rev 1.1.) and UK SIC 2007 (NACE Rev 2) from 1995 onwards.

Accessibility and clarity

Our recommended format for accessible content is a combination of HTML webpages for narrative, charts and graphs, with data being provided in usable formats such as CVS, XML and Excel. The ONS website also offers users the option to download the narrative in PDF format. In some instances, other software may be used or may be available on request. Available formats for content published on our website, but not produced by us or referenced on our website but stored elsewhere, may vary.

For information regarding conditions of access to data, please refer to the following:

- terms and conditions (for data on the website)
- accessibility

Timeliness and punctuality

Provisional survey estimates are published six months after the end of the reference period, intermediate estimates 12 months after the end of the reference period and final estimates 24 months after the end of the reference period. The long time lag between the collection and publication reflects the complexity of the survey and the detail of the published product level estimates. The publications are timely and fully compliant with Eurostat regulations and timetables.

For more details on related releases, the release calendar is available online and provides 12 months advance notice of release dates. If there are any changes to the pre-announced release schedule, public attention will be drawn to the change alongside full explanation of the reasoning behind it, as set out in the Code of Practice for Statistics. This itself has been recently updated, with a greater focus on statistical context and recommended usage.

Why you can trust our data

ONS is the UK's largest independent producer of statistics and its National Statistics Institute. The Data Policies and Information Charter, available on the ONS website, detail how data are collected, secured and used in the publication of statistics. We treat the data that we hold with respect, keeping it secure and confidential, and we use statistical methods that are professional, ethical and transparent. You can find out more about our data policies on our website.

The ProdCom survey has National Statistics status, designated by the UK Statistics Authority (UKSA) in accordance with the Statistics and Registration Service Act 2007. This designation signifies compliance with the Code of Practice for Statistics, which has recently been updated and focuses on trustworthiness of data in greater depth.

5 . Methods

Sample frame

The ProdCom sample frame is the Inter-Departmental Business Register (IDBR). The IDBR covers businesses in all parts of the economy, except those that are not registered for Value Added Tax (VAT) or Pay As You Earn (PAYE), for example, very small business, the self-employed, those without employees and those with low turnover. Some non-profit making organisations are also not registered on the IDBR. The IDBR has details of approximately 2.4 million businesses and covers approximately 97% of UK economic activity. The IDBR is used by government departments, including ONS, as the sampling frame for most business surveys. ProdCom draws its sample from the 136,000 businesses classified to the mining, quarrying and manufacturing sectors in scope of the survey.

Sample design

ProdCom uses a stratified random sample design. This is grouped by:

- five employment size bands: 0 to 9, 10 to 19, 20 to 49, 50 to 99 and 100 plus
- industry class: four-digit UK Standard Industrial Classification 2007: SIC 2007

All businesses with more than 20 employees will automatically be included in the sample. Each of the industries has a cut-off threshold that has been calculated with respect to the product contribution within each stratum. For the businesses with employment below the threshold, a simple random sampling method based on a Permanent Random Number (PRN) is used for selection.

Sample size

ProdCom has a sample size of approximately 21,500 businesses across the UK mining, quarrying and manufacturing sectors.

Data collection

Data are collected from businesses primarily through tailored paper questionnaires, to minimise respondent burden. An example questionnaire is provided on the ProdCom quality and methods page.

Reminders are dispatched for non-response, in addition to a telephone exercise conducted by a dedicated respondent relations team. When questionnaires are received, they are scanned and transferred to a data validation team for processing.

Where applicable, newly-sampled businesses are telephoned in advance and products are added to their questionnaires prior to dispatch. When these newly-sampled businesses cannot be contacted in advance, they are asked to write their product description in the first questionnaire, which is then “coded” by analysts to the appropriate ProdCom codes.

Measured variables

The main variables for the ProdCom output are:

- the value of production
- the physical volume of production sold (volume units are dependent on product, for example, number of items or kilograms)
- the physical volume of total production manufactured (for some products only)
- unit values (sales value per unit volume) are then derived and published

In addition to production items, ProdCom also collects data on some non-production items to permit better comparisons with other sources:

- merchanted goods: these are manufacturers’ sales of goods that have not been subjected to any manufacturing process
- work done: revenue is recorded under “work done” when a manufacturer conducts work on materials that have been supplied to them by a customer
- waste products: these are manufacturers’ sales of products and residues that are considered as being waste

All other income: this is revenue derived from the provision of services and other non-production activity not specified elsewhere.

International Steel Statistics Bureau (ISSB)

In addition to the ProdCom survey questionnaire, data are also collected from the International Steel Statistics Bureau (ISSB). These data relate to iron and steel statistics for SIC 2007 industries 24.10, 24.20, 24.32 and 24.33 and are included in the PRODCOM statistics submitted to Eurostat. This use of data is primarily to avoid duplication and to reduce burden on businesses. Further information on the ISSB statistics is available.

How we process and analyse the data

Once the data are collected, the Integrated Annual Unit initially analyses responses and will contact businesses where substantial data changes are identified. The data are then aggregated and the Results and Processing Team conduct a further phase of validation checks. These represent thorough micro-level investigation, and respondents may receive further queries if important changes are highlighted, which would have an impact on product or industry-level data.

The following procedures are used for non-responders or non-sampled businesses, alongside atypical responses.

Imputation

Automatic imputation using ratio imputation is used when item non-response occurs. Imputation takes place at product level by calculating an average year-on-year growth for all businesses making that product irrespective of size-band or industry classification. The missing value can then be imputed by multiplying the average growth by the previous response.

An influential responder (a business that is known to make a significant contribution to the product estimates) has its details manually constructed if it does not respond. This construction is based on previously provided product breakdowns and specialist knowledge of survey analysis.

Estimation

Estimates are produced using a non-linear estimator. The estimation procedure is based on the employment of the non-sampled units (obtained from the IDBR), along with the sales per head (SPH) by contributor industry and product propensity, both of which are obtained from the sampled units. These are defined as follows:

- SPH: sales value of product or employment count
- product propensity (PP): proportion of businesses in strata making the product or number of businesses in the strata; this is the probability that a business within a particular stratum will make the product

Businesses with extreme SPHs are removed (see Outliers) and a SPH for the industry is calculated.

An estimate of the sales for the non-sampled units, including those that have never responded, is produced by multiplying the PP by the employment of the non-sampled business, which is then multiplied by the SPH for the industry.

The total UK manufacturer sales for the product is calculated by summing the total returned sales of the sampled units (including imputed and constructed values) and the estimated sales of businesses that have never returned their questionnaire or were not in the sample (non-sampled units).

Outliers

Removing atypical responses, or outlier trimming, is undertaken according to sales per head (SPH). Values within the top and bottom 5% of the average SPH are removed, where there are 10 or more observations in a stratum.

How we quality assure the data

Data are quality assured throughout the data collection, processing and analysis processes through regular consistency checks, investigation of anomalies, ensuring disclosure procedures and reviewing data sources. These checks are presented at regular curiosity meetings, where important internal stakeholders are able to interrogate the data and explore any anomalies or interesting findings. External stakeholders, for example, other government departments, also have regular opportunities to analyse the data and share feedback with ONS colleagues.

How we disseminate the data

ProdCom data are disseminated primarily through publication of statistical bulletins and ad-hoc releases on the ONS website. The publication schedule is detailed under Timeliness and punctuality. ProdCom publishes regular statistical bulletins, with releases increasingly promoted through the use of ONS social media accounts.

External stakeholders receive data ahead of release as part of the quality assurance process. ProdCom sends data to Eurostat to be used in the production of European statistics. ProdCom also submits data to the Secure Research Service (SRS), which allows approved researchers to access to the data, usually academics or researchers from other government departments.

We employ consistent disclosure control procedures ahead of publication, as detailed in this section.

The Government Statistical Service defines statistical disclosure control as follows:

“Statistical disclosure control (SDC) is the term used to cover the many methods of safeguarding the confidentiality of the information about individuals and businesses. Information obtained from surveys or administrative data is usually given in confidence. SDC is applied to ensure that individuals, businesses or other statistical units cannot be identified from published data, whether record level data or tables. This will involve modifying data so that the risk of identification is reduced to an acceptable level.”

ProdCom is conducted under the Statistics of Trade Act 1947. This Act imposes restrictions on the way that data collected during the survey may be used, to ensure that information that can be attributed to an individual organisation is not disclosed in any publication.

The Code of Practice for Statistics sets out practices for how we protect data from being disclosed. More information can be found on the ONS Disclosure Control Methodology page.

Disclosure is a particularly sensitive issue in business surveys, given the commercial confidentiality of the data collected. The following rules are applied to ProdCom estimates (except where the respondent is willing to allow the data to be published):

- minimum threshold rule: this rule states that there must be at least n reporting units (businesses) in a cell
- *P%* rule: the total contribution of the m largest contributors to the cell aggregated total must be less than *p%* of the total in that cell; sometimes this rule can be applied multiple times, with different values of *m* and *p*
- dominance rule: the estimated total of all the units in the cell (including those not included in the sample), without the *d* largest units from the sample, must be at least *s%* if the largest *b* units in the sample

Businesses whose data have been suppressed, due to the level of disclosure, may be contacted following publication of the data to request permission to publish disclosed data.

How we review the data

Future data are used to inform and revise previous reference periods, in order to ensure the quality of the time series. For example, if a business does not respond for one reference period, but a response is received for the following reference period, that response is used to inform previous data. Revisions are published 12 and 24 months after the end of the reference period.

Other information

In addition to this Quality and Methodology Information report, ProdCom releases include background notes to aid user understanding of published estimates, alongside a user guide to aid the interpretation of estimates.

A technical report, containing detailed methodological information on all aspects of the survey, is also available.

Further details, including history and background; news; links to publications; quality and methods; and user engagement and survey governance, are available via the ProdCom webpage.

For further information, please contact the ProdCom team via email at prodcompublications@ons.gov.uk.