Office for National Statistics

Methodological improvements to foreign direct investment statistics: November 2017

An outline of the methodological changes to how foreign direct investment (FDI) statistics are produced following recommendations from the FDI National Statistics Quality Review published in July 2016.

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1 . Executive summary

This article details the methodological improvements made to UK foreign direct investment (FDI) statistics, to be published in the Foreign direct investment involving UK companies: 2016 statistical bulletin on 1 December 2017. Details on further methodological improvements to be introduced into future releases of foreign direct investment statistics are also presented in this article.

Methodological improvements presented in this and previous articles follow the UK National Statistics Quality Review (NSQR) published in July 2016. The review concluded that UK FDI statistics produced by the Office for National Statistics were fit for purpose, but 20 recommendations were outlined to improve the production and quality of FDI estimates.

This article focuses on the following NSQR recommendations:

- Recommendation 17: Improve FDI disclosure control processes and transparency

- Recommendations 1 to 4 and 16: Review the FDI sample design, size, selection, allocation and maintenance of world-base and non-world-base populations

The adoption of the above recommendations follows several other improvements made since the publication of the FDI NSQR. Our initial response to the FDI NSQR and details on methodological improvements already adopted can be found in ONS response to the National Statistics Quality Review of the UK's Foreign Direct Investment survey: October 2016 and Methodological improvements to foreign direct investment statistics: December 2016.

An update on our progress against all 20 recommendations made in the FDI NSQR can be found in the annex. All methodological improvements detailed in this article have been conducted in conjunction with methodological and subject matter experts.

2 . Introduction of a new disclosure methodology

The foreign direct investment (FDI) National Statistics Quality Review (NSQR) recommended that further methodological work should be conducted to ascertain whether a more efficient disclosure control method could be applied to allow greater accessibility of the data for the user. This was directly in response to high levels of suppression observed.

It is important that any new disclosure method adopted does not increase the risk of individual business units being publically identified. Statistical disclosure control experts therefore reviewed the existing methodology, with particular consideration to the treatment of negative values – as they were not accounted for under the previous method, which resulted in over suppression.

2.1. Previous disclosure methodology

A review of the disclosure measures highlighted that Stage 6 of the previous disclosure process (see annex B) – Is the total minus the top 2 contributors more than C% of the top contributor? was being bypassed if Stage 5 was satisfied – are there at least 19 respondents in the cell you are looking to publish? Bypassing Stage 5 in this way is undesirable, as it can result in under suppression in certain circumstances. The reason that Stage 5 could lead to under suppression of the data is that at high level aggregates, FDI data will contain more than 19 reporting unit (RU) contributors for the majority of survey estimates and these data being free to publish could present an additional risk by bypassing Stage 6. It was concluded that for Stage 5 of the previous method, protection of sensitive data, was low for the higher level aggregate estimates. As a result, a new bespoke method was developed that could effectively handle negative data and decrease the risk of disclosure with an improved version of Stage 5.

2.2. New disclosure methodology

A new bespoke disclosure control method for FDI statistics was developed, which takes into consideration the presence of negative data, whilst also preventing the risk of disclosing sensitive data.

As was noted in the FDI NSQR, there was a lack of documentation surrounding the previous method used. To address this, disclosure control experts have provided detailed methodological documentation to support the new method. An overview of the new disclosure control method can be found in Annex C.

It is important to note that since FDI respondents are not weighted – where prediction estimation is undertaken for each individual non-sampled business in the population – the rules do not need to take weights into consideration.

An overview of the application and benefits of the new disclosure process is as follows:

Stage 1 enables more data to be published for low-value cells, reducing the overall suppression rates.

Stage 2 is the same as stage 1 in the previous disclosure method, which addresses the legal requirements of the Statistics of Trade Act 1947. This disclosure rule is performed at the enterprise level, not the reporting unit level. This prevents situations where a single enterprise owns multiple reporting units within a given survey estimate, and so can accurately determine a competitor's contribution or have their own contribution discovered.

Stage 3 reduces suppression since it enables figures to be published that are protected by rounding. The uncertainty due to rounding is at least R%, meaning that even in the worst-case scenario of one highly dominant contributor the contribution is protected to at least R%.

Stage 4 outlines that when the largest contributor is estimated (that is, not returned data), the value is considered non-sensitive. Furthermore, if the primary contributor is both estimated and dominant within the cell, it is unlikely that the estimates will be fully accurate, providing more protection.

Stage 5 states that if a given survey estimate contains at least 20 non-zero enterprise groups and the sum of the absolute data values, less the top two, is at least Y% of the absolute value of the cell total then this method allows the P% rule (stage 6) to be bypassed, with the dominance rule (stage 8) still being applied. This disclosure rule avoids the problems for two of the major scenarios that made the original stage 4 rule a risk. This is because there cannot be a low number of enterprise groups contributing to a given survey estimate or a large number of very small reporting units that only have a slight effect on the survey estimate. It allows the P% rule to be bypassed for survey estimates where it is unlikely that sensitive data may be identified since any estimate produced this way will be very unreliable.

Stage 6 represents a version of the P% rule that accounts for negative values by using absolute values (abs). The standard P% rule examines whether the second largest contributor can determine the value of the greatest contribution to within P%. There are some situations not covered by this rule, but are covered by the extended version of the dominance rule (stage 8).

Mathematically this equates to:

If abs$[(T - X_1 - X_2)/ X_1]$ >= P then the cell passes this rule, otherwise it fails.

Where T equals weighted total, X_1 equals unweighted largest contribution and X_2 equals unweighted second-largest contribution. Since weighting is not used for FDI, the same method is performed using the survey estimate total and first and second contributions, as normal.

Stage 7 allows a cell to pass this rule if the primary contribution is positive and the total is negative, or vice versa. In these cases the margin of error of an estimate of the largest contribution is infinite, so the risk of disclosure is very low, and publication is acceptable assuming the survey estimate has passed stages 2 and 3.

Stage 8 is a version of the dominance rule that accounts for several potential situations where suppression should be applied; arising from the use of mixed positive and negative values. The dominance rule is typically used to ensure that no respondent can estimate the value of another respondent, who also contributes to the overall value of the estimate, to within a certain percentage.

For cases where both X_1 and T are either negative or positive, the rule disallows values that are within a certain percentage of the total. For positive values, a survey estimate where X_1 is between (100(1-P))% and (100((1+P))% of the total are prohibited, meaning that in cases where X_1 is much larger than T publication is allowed.

For negative values the inverse is true, but the concept is similar. A survey estimate where X_1 is between (100((1-P))% and (100((1+P))% of the total is again prohibited, but because a value above (100((1+P))% of T is lower for negative values, and below (100((1+P))% of T is higher, the signs are inverted.

2.3. Impact on annual FDI bulletin datasets

The new disclosure control method has been implemented into the production of annual 2015 and 2016 FDI estimates, in addition to quarterly FDI estimates. In order to determine the impact of this methodological change, analysis was conducted using inward and outward references tables from Foreign direct investment involving UK companies, 2015 published in December 2016. Levels of suppression were compared under the previous and new methodology. It should be noted that this analysis only considered initial disclosure control and therefore does not include secondary suppression.

Comparison of suppression rates under the two disclosure methods are shown in Tables 1 and 2 for inward and outward 2015 estimates respectively. Suppression rates are considered in terms of percentage, where 100% denotes all cells (that is, survey estimates) are suppressed and 0% denotes no cells have been suppressed.

As shown in Table 1, there was no change in suppression levels for overall aggregate-level estimates (reference tables 1.1, 1.2 and 1.3). With the exception of inward 2015 reference tables 2.1 and 2.3, data has observed less suppression through adopting the new disclosure control method than the previous method. The higher aggregate-level tables (reference tables 2.2, 3.1, 3.2, 4.1 and 4.2) observed the largest differences in suppression rates, whilst the lowest aggregate-level tables (reference tables 2.3, 3.3 and 4.3) experienced the smallest changes in suppression.

Table 1: Comparison of suppression rates for inward foreign direct investment, UK, 2015

Reference table	Data description	Previous method total cells suppressed (%)	New method total cells suppressed (%)
1.1	Total flows	0	0
1.2	Total positions	0	0
1.3	Total earnings	0	0
2.1	Total flows by geographical region	11	13
2.2	Total flows by component and geographical region	22	12
2.3	Total flows by industry and geographical region	28	32
3.1	Total positions by geographical region	16	2
3.2	Total positions by component and geographical region	18	4
3.3	Total positions by industry and geographical region	26	23
4.1	Total earnings by geographical region	13	2
4.2	Total earnings by component and geographical region	20	13
4.3	Total earnings by industry and geographical region	27	25

Source: Office for National Statistics

Table 2 shows that overall, outward 2015 data has experienced more suppression through implementing the new disclosure control method. The reason behind the rise in suppression can be attributed to the fact that the outward survey typically observed larger negative values in 2015, which originally would not have been taken into consideration with the previous methodology. With the new disclosure method acknowledging the presence of negative values, it has resulted in more suppression, which would have not been picked up previously. In addition to this, outward flows data is typically more volatile data that can contain more negative values than positions and earnings; this can be observed through the largest changes in suppression rates in reference tables 2.1, 2.2 and 2.3.

Table 2: Comparison of suppression rates for outward foreign direct investment, UK, 2015

Reference table	Data description	Previous method total cells suppressed (%)	New method total cells suppressed (%)
1.1	Total flows	0	0
1.2	Total positions	0	0
1.3	Total earnings	0	0
2.1	Total flows by geographical region	1	16
2.2	Total flows by component and geographical region	10	18
2.3	Total flows by industry and geographical region	30	41
3.1	Total positions by geographical region	3	3
3.2	Total positions by component and geographical region	7	17
3.3	Total positions by industry and geographical region	32	34
4.1	Total earnings by geographical region	0	6
4.2	Total earnings by component and geographical region	6	15
4.3	Total earnings by industry and geographical region	31	35

Source: Office for National Statistics

In summary, while there is no anticipated change at an overall aggregate estimates level for inward and outward estimates of FDI earnings, flows and positions, change in suppression is expected for lower-level survey estimates. Under the new disclosure methodology, we anticipate that we can publish more granular data than we previously have done for estimates of inward FDI. However, this is offset by an increase in suppression for outward FDI estimates due to the volatile and negative data observed.

3 . FDI population improvements

The change in the inward and outward foreign direct investment (FDI) populations is an important driver behind the FDI sampling review, supporting the fact that all aspects of the FDI sampling process should be reviewed to ensure they remain fit for purpose. This section discusses the maintenance of the FDI populations and proposed improvements.

3.1. Current design of the FDI population frame

The inward and outward population frames are used to sample businesses that conduct foreign direct investment. In line with the Organisation for Economic Co-operation and Development (OECD) FDI benchmark definition, the FDI population frame lists UK companies that either have one or more foreign parents holding at least 10% of the voting power or UK parent companies that hold at least 10% of the voting power of one or more foreign affiliates or branches.

Each population frame is separated into two subsets of the population: "world-base" and "non-world-base". The non-world-base population is as a list of historically known large FDI contributors. This non-world-base population is maintained by the FDI survey team and, while only accounting for a small number of businesses in the overall FDI population frame, these businesses account for a notable proportion of the overall value of UK FDI. The world-base population is sourced from an annual data extract taken from Dun and Bradstreet's (D&B) Who-owns-Whom database of worldwide company linkages. This data is then cleaned and maintained by our business register team and matched against our Inter-Departmental Business Register (IDBR). A similar cleaning exercise is conducted for the non-world-base population to identify and remove dead or out of scope businesses.

The inward and outward FDI populations are updated annually, once the annual D&B world-base extract is available from the business register team. The FDI survey team match the most recent FDI non-world-base population with the latest D&B world-base extract to ensure there is no duplication between the two frames. This enables new businesses in scope for FDI to be introduced into the FDI world-base population. Additional businesses are introduced to the FDI population using data sourced by our mergers and acquisitions (M&A) survey, which enables timely identification of new FDI relationships resulting from M&A activity.

Prior to selecting the survey samples, any businesses that had reported a large international investment position for their respective industry, in the most recent annual FDI statistics, are "promoted" into the non-world-base population to ensure that such businesses have a higher probability of being sampled. Thresholds are used for each broad industry group as defined in the FDI sample design (see section 4.1 for more details) as shown in Table 3.

Table 3: Thresholds used to move world-base businesses into the non-world-base population

Industry	Inward – Net Book Value (£m)	Outward – Net Book Value (£m)
Oil	1,000	1,000
Finance	500	250
Manufacturing	500	500
Retail	250	100
Information and Communication	100	50
Professional, Scientific and Technical	30	500
Other	500	500

Source: Office for National Statistics

3.2. Population coverage

The number of businesses contained in the inward and outward FDI populations has naturally increased over time. Table 4 details the magnitude of this change over time in terms of the number of the apex enterprise groups, rounded to the nearest hundred.

Table 4: Foreign direct investment population counts, UK, 2013 and 2016

Survey	Population counts – Annual 2013 FDI estimates *	Population counts – Annual 2016 FDI estimates
Inward	20,900	23,900
Outward	6,000	10,900

Source: Office for National Statistics

Notes:

1. * Figures taken from FDI Quality and Methodology Information report published on ONS website (20 [th] January 2015).

A more notable increase can be seen for the outward FDI population. This is due to improvements to the coverage of indirect FDI links incorporated as of annual 2016 FDI estimates. Historically, UK parent companies that control foreign affiliates directly (referred to as "child" relationships) have been captured within the outward population. However, coverage now also extends to UK parent companies that control UK subsidiaries, which in turn control a foreign affiliate (referred to as "grandchild" relationships).

3.3. FDI world-base concept

As previously discussed in section 3.1, the FDI populations are currently structured into world-base and non-world-base populations. Businesses are assigned to the non-world-base population once they have been sampled and identified as a large contributor based on their FDI position value in a respective industry.

The FDI National Statistics Quality Review (NSQR) recommended reviewing the procedure of moving businesses into the non-world-base population and has been considered as part of the FDI sampling review. It was acknowledged that moving large contributors into the non-world-base population is beneficial from a sampling perspective; however, the "promotion" thresholds used have become less optimal over time. The review therefore concluded that the concept of moving businesses between the two populations should instead change.

The newly recommended world-base definition proposes that all respondents in the world-base population should be moved into the non-world-base population the following year. Therefore, movement between the two populations would no longer be constrained by thresholds. Table 5 illustrates how the FDI population is currently split and how businesses will move over time as the FDI populations are updated annually.

Table 5: New concept of world-base and non-world-base populations

Current year population	Following year population
Non world-base	Non world-base
World-base: Sampled respondents	Non world-base
World-base: Sampled non-respondents	World-base
World-base: Non-sampled businesses	World-base

Source: Office for National Statistics

The benefit of this change is that over time, more businesses would move into the non-world-base population, where businesses are stratified by the value of their FDI positions rather than other auxiliary variables used in the non-world-base population. This change in concept will allow for better utilisation of respondent data to inform how we sample businesses in subsequent periods.

Businesses based within the world-base population, including new businesses identified via the D&B world-base extract, will remain in the world-base population until they are sampled and respond. These improvements will be implemented at the next available opportunity, subject to resource.

4 . FDI sampling improvements

A number of recommendations were made in the foreign direct investment (FDI) National Statistics Quality Review (NSQR) to review various aspects of the FDI sampling process. The following sections discuss each recommendation in turn and detail the proposed changes. These improvements will be incorporated into foreign direct investment statistics at the next available opportunity, subject to resource.

4.1. Sample design

The existing sample design, used to produce both annual and quarterly FDI statistics, differs between the world-base and non-world-base population subsets. As such, whether a business is based within the world-base (WB) or non-world-base population (NWB) is treated as a main variable for stratification, as these populations are mutually exclusive.

In addition to whether a business sits in the WB or NWB population, businesses are further stratified by their industry and FDI activity. There are seven broad industry groups: oil, finance, manufacturing, retail, information and communication, professional and technical, and "other" – which cover all remaining industries. A more detailed breakdown of these industry groups can be found in Table 6.

Table 6: Sample design - industry classification

Industry group	SIC 2007	Description
Oil	Division 06 and 09	Extraction of crude petroleum and natural gas; Support activities for petroleum and natural gas extraction, and other mining and quarrying
Finance	All SIC codes in division 64, 65 and 66 (excluding 64110 and 641910	Financial and insurance activities excluding Central banking and banks (data sourced directly from Bank of England)
Manufacturing	All SIC codes in division 11 – 33	All aspects of Manufacturing (excluding SIC division 10: Manufacture of food products)
Retail	Division 46 and 47	Retail and wholesale trade, except of motor vehicles and motorcycles
Information and Communication	Division 59 - 63	All aspects of Information and Communication (excluding SIC division 58: Publishing activities)
Professional, Scientific and Technical	Division 69 - 74	All aspects of Professional, Scientific and Technical activities (excluding SIC division 75: Veterinary activities)
Other	All remaining UK SIC 2007 codes	All other industries covered in the UK SIC 2007 classification, not otherwise specified

Source: Office for National Statistics

The variable used to determine the level of FDI activity in the WB population differs between the inward and outward surveys. Within each industry group, businesses based within the inward WB population are stratified by turnover, while businesses based within the outward WB population are stratified by the number of foreign affiliates associated with the UK parent company.

For both the inward and outward surveys, businesses based within the NWB population are stratified by their inward or outward FDI position respectively. The FDI position value may not necessarily be the business's response, but could be the latest imputed or estimated value if they did not respond in the previous period; although, these estimated values are considered the best estimate of the contributor's FDI position at that point in time.

While it is preferable to stratify by a variable that is strongly correlated with the variable being measured, such as a contributor's FDI position, such a variable is not readily available for all businesses contained within the WB population. However, changes to the WB and NWB definitions presented in this article does mean that, over time, more businesses will be accurately stratified by their FDI position value.

Within each industry group, there are a maximum of three size-bands. Tables 7 and 8 illustrate the existing inward and outward FDI sample designs used to produce annual 2016 FDI estimates.

Table 7: Existing inward foreign direct investment sample design, UK, 2016

Non-world base		World base	
Section	Size-band (Net Book Value £m)	Section	Size-band (Turnover £k)
Oil	All	Oil	All
Finance	x < 100	Finance	x < 10,000
	100 <= x < 500		10,000 <= x < 150,000
	x >= 500		x >= 150,000
Manufacturing	x < 30	Manufacturing	x < 25,000
	30 <= x < 500		25,000 <= x < 200,000
	x >= 500		x >= 200,000
Retail	x < 30	Retail	x < 14,000
	30 <= x < 250		14,000 <= x < 100,000
	x >= 250		x >= 100,000
Information and Communication	x < 100	Information and Communication	x < 10,000
	x >= 100		10,000 <= x < 100,000
			x >= 100,000
Professional, Scientific & Technical	x < 30	Professional, Scientific & Technical	x < 7,000
	x >= 30		7,000 <= x < 50,000
			x >= 50,000
Other	x < 75	Other	x < 14,000
	75 <= x < 500		14,000 <= x < 100,000
	x >= 500		x >= 100,000

Source: Office for National Statistics

Table 8: Existing outward foreign direct investment sample design, UK, 2016

Non-world base		World base	
Section	Size-band (Net Book Value £m)	Section	Size-band (Number of affiliates)
Oil	All	Oil	All
Finance	x < 10	Finance	x = 1
	10 <= x < 250		2 <= x < 5
	x >= 250		x >= 5
Manufacturing	x < 75	Manufacturing	x = 1
	75 <= x < 500		2 <= x < 5
	x >= 500		x >= 5
Retail	x < 10	Retail	x = 1
	10 <= x < 100		2 <= x < 5
	x >= 100		x >= 5
Information and Communication	x < 50	Information and Communication	x = 1
	x >= 50		x >= 2
Professional, Scientific and Technical	x < 500	Professional, Scientific and Technical	x = 1
	x >= 500		2 <= x < 5
			x >= 5
Other	x < 50	Other	x = 1
	50 <= x < 500		2 <= x < 5
	x >= 500		x >= 5

Source: Office for National Statistics

The improved approach for defining whether a business should be based within the WB or NWB population presented earlier in this article implicitly affects the FDI sample design, therefore making it necessary to review the industry and size-band definitions used within the sample design.

It is preferable to maintain a common sample design across the annual and quarterly samples and to continue the use of cross-classifying industry and company size. The review considered the industry breakdowns used within the sample design through cluster analysis. The analysis concluded that two additional industry groups should be introduced: "electricity, gas, water and waste" (UK SIC 2007 divisions 35 to 39), which was previously stratified within the "other" industry group; and "life insurance" (UK SIC 2007 65110), which was previously stratified within the "finance" industry group. The analysis showed that respondent businesses within these industries reported significantly different FDI positions to other businesses within the same industry group. Therefore, moving these businesses into separate strata would seek to minimise survey data variability.

Due to the change in concept for the WB definition, a more detailed sample design was also recommended to ensure that the largest FDI contributors continue to be regularly sampled. The total number of size-bands was reviewed using a standard, best practice technique for our business surveys known as the "cumulative root-f rule" (see Cochran, 1977). The new sample design introduces a maximum of four size-bands for each industry group while harmonising the stratum boundaries for the inward and outward NWB populations.

Tables 9 and 10 illustrate the new inward and outward FDI sample designs that will be used to produce annual 2017 FDI estimates.

Table 9: New inward foreign direct investment sample design, UK

Non-world base		World base	
Non-world base		**World base**	
Section	Size-band (Net Book Value £m)	Section	Size-band (Turnover £k)
Oil	All	Oil	All
Finance	x < 100	Finance	x < 30,000
	100 <= x < 1000		30,000 <= x < 200,000
	x >= 1000		x >= 200,000
Life insurance	All	Life insurance	All
Manufacturing	x < 60	Manufacturing	x < 20,000
	60 <= x < 400		20,000 <= x < 100,000
	400 <= x < 1500		100,000 <= x < 500,000
	x >= 1500		x >= 500,000
Retail	x < 20	Retail	x < 15,000
	20 <= x < 100		15,000 <= x < 75,000
	100 <= x < 500		75,000 <= x < 350,000
	x >= 500		x >= 350,000
Information and Communication	x < 10	Information and Communication	x < 8,000
	10 <= x < 90		8,000 <= x < 45,000
	90 <= x < 500		45,000 <= x < 200,000
	x >= 500		x >= 200,000
Professional, Scientific and Technical	x < 20	Professional, Scientific and Technical	x < 4,000
	20 <= x < 150		4,000 <= x < 25,000
	150 <= x < 1000		25,000 <= x < 100,000
	x >= 1000		x >= 100,000
Electricity, gas, water and waste	x < 10	Electricity, gas, water and waste	x < 10,000
	10 <= x < 300		10,000 <= x < 100,000
	x >= 300		x >= 100,000
Other	x < 20	Other	x < 15,000
	20 <= x < 250		15,000 <= x < 150,000
	250 <= x < 1000		150,000 <= x < 650,000

x >= 1000   x >= 650,000

Source: Office for National Statistics

Table 10: New outward foreign direct investment sample design, UK

Non-world base		World base	
Section	Size-band (Net Book Value £m)	Section	Size-band (Number of affiliates)
Oil	All	Oil	All
Finance	x < 100	Finance	x < 4
	100 <= x < 1000		4 <= x < 20
	x >= 1000		x >= 20
Life insurance	All	Life insurance	All
Manufacturing	x < 60	Manufacturing	x < 4
	60 <= x < 400		4 <= x < 20
	400 <= x < 1500		
	x >= 1500		x >= 20
Retail	x < 20	Retail	x < 2
	20 <= x < 100		2 <= x < 10
	100 <= x < 500		
	x >= 500		x >= 10
Information and Communication	x < 10	Information and Communication	x < 3
	10 <= x < 90		3 <= x < 15
	90 <= x < 500		
	x >= 500		x >= 15
Professional, Scientific and Technical	x < 20	Professional, Scientific and Technical	x < 4
	20 <= x < 150		4 <= x < 25
	150 <= x < 1000		
	x >= 1000		x >= 25
Electricity, gas, water and waste	x < 10	Electricity, gas, water and waste	x < 2
	10 <= x < 300		2 <= x < 5
	x >= 300		x >= 5
Other	x < 20	Other	x < 4
	20 <= x < 250		4 <= x < 30
	250 <= x < 1000		
	x >= 1000		x >= 30

Source: Office for National Statistics

The inward FDI sample design has increased from a total of 36 to 56 strata, while the outward FDI sample design has increased from a total of 35 to 51 strata.

The greatest change in stratum boundaries are seen within the "information and communication" and "professional, scientific and technical" industries, which were previously limited to two size-bands. The new design stratifies these industry groups into a maximum of four size-bands, which will reduce the variability in survey estimates.

4.2. Sample size and allocation

As part of the FDI sampling review, the sample sizes used to produce annual and quarterly estimates of foreign direct investment were also reviewed. Following the recommendation of a revised sample design, it was also necessary to determine how the annual and quarterly samples should be allocated.

The review determined that an increase in the number of businesses sampled in the quarterly survey was necessary given the new sample design, while the existing annual sample sizes remain fit for purpose.

The current and revised FDI sample sizes are shown in Table 11.

Table 11: Comparison of foreign direct investment sample sizes, UK

Survey	Current sample size (Annual 2016 / Quarterly 2017)	New sample size
Annual Inward	4,062	4,062
Annual Outward	2,270	2,270
Quarterly Inward	1,021	1,454
Quarterly Outward	684	927

Source: Office for National Statistics

Both the existing and new sample designs have been developed to select a representative sample of businesses with respect to their FDI position. However, other leading measures of FDI are also of interest, such as the total income earned from FDI. As such, total profits (an important component of earnings) were also taken into account using the Neyman allocation method (see Sarndal, Swensson and Wretman, 1992) to minimise the overall variability of total profits.

Annex D details the sample allocations for each FDI survey under the existing and new sample design. For ease of comparison across the existing and the new sample allocations, the total number of businesses sampled out of the total population within each stratum is expressed as a sampling fraction. This is a measure ranging from 0 to 1, where 0 means no businesses are sampled and 1 means all businesses are sampled. The new sample allocation provides a better distribution of the sample across the WB and NWB populations, although the NWB population continues to be more heavily sampled than the WB population as was the case in the existing sample allocation.

As shown in Annex D, there is also a split between long and short forms; this split is designed to minimise respondent burden, where short forms (that is, questionnaires with fewer questions) are dispatched to smaller businesses.

4.3. Sample selection

The FDI NSQR not only recommended reviewing the sample allocations used for FDI surveys, but recommended reviewing how these allocations are implemented. Currently, when businesses are selected to receive an FDI survey, they are sampled using stratum-defined sampling fractions as outlined in Annex D. The use of such fractions can result in varying sample sizes over time, depending on stratum population sizes, which can be difficult to manage from a resourcing perspective.

A new approach is therefore being adopted where rather than using a sampling fraction, sample sizes should be based on a fixed sample count per stratum. This provides a fixed sample count for all strata, with the exception of strata containing the largest businesses that are fully enumerated. This approach enables better control of the overall FDI sample sizes, varying only for reasonable change in the number of businesses within fully enumerated strata. This new approach will be introduced into the sampling process alongside all of the other recommended sampling improvements detailed in this article at the next available opportunity, subject to resource.

5 . Annex A: Update on the Foreign Direct Investment National Statistics Quality Review recommendations

Recommendation 1

The procedure of adding to the foreign direct investment (FDI) or non-world-base (NWB) frame companies sampled in the previous year's world-base (WB) sample and found to be large (in terms of FDI) should be discussed with our Methodology Group and changed as necessary to optimise the process.

Status – Completed

Update: A comprehensive review of FDI sampling processes has been conducted over the summer of 2017 in conjunction with methodological and subject matter experts.

The maintenance of businesses between the WB and NWB FDI populations has been included in the scope of this review and improvements are detailed in this article.

The new FDI population maintenance process will be implemented at the next available opportunity, subject to resource.

Recommendation 2

Commission methodological analysis to review in detail the specification of the sample design of the FDI surveys.

Status – Completed

Update: The FDI sample design has been included in the scope of the summer 2017 FDI sampling review and changes are detailed in this article.

The new sample design will be implemented at the next available opportunity, subject to resource.

Recommendation 3

Improve the implementation of the sample selection mechanisms, so as to bring them in line with good practice and intended specifications.

Status – Completed

Update: The FDI sample selection process has previously been based upon sampling fractions rather than fixed counts, which can lead to varying sample sizes year on year.

The FDI sampling review concluded that the FDI sample should be drawn based upon fixed sample counts leading to more stable counts over time.

Improvements to the FDI sampling system have been and will continue to be made to bring sampling processes in line with good practice in readiness for annual 2017 and quarterly 2018 FDI statistics and beyond.

The FDI sample continues to not apply sample rotation, though this is recognised as an area for improvement as stated in recommendation 5.

Recommendation 4

Review the sample size allocation implementation procedures, paying particular regard to the merits of keeping sample sizes or keeping sampling fractions constant over time.

Status – Completed

Update: As a result of the summer 2017 FDI sampling review, the FDI sample has been re-optimised in line with new sample design and changes are detailed in this article.

The new sample selection and allocation will be implemented at the next available opportunity, subject to resource.

Recommendation 5

Reintroduce sample rotation on the annual FDI surveys, co-ordinating the quarterly sample selection via correct use of PRNs (permanent random numbers).

Status – Pending collection of data under new sample design

Update: Due to the complex nature of the FDI sampling process, sample rotation was deemed out of scope for the sampling review undertaken over the summer of 2017.

Given the substantial changes being made to the FDI sampling process, it is proposed that this further work is postponed until a sufficient amount of data has been collected under the new sample design, size and allocation.

Recommendation 6

Data collection

1. Emphasise on the questionnaire that data on transactions and positions with indirect investors or investment enterprises are also requested.

2. Specify on the questionnaires how and where these data with indirect investors or investment enterprises and with fellow enterprises should be recorded.

3. Identify the questions on the questionnaires where data on reverse investment are requested.

Status – Pending resource

Update: Changes have been made to the FDI questionnaires to address any minor issues such as correcting typographical errors and improving definitions around certain questions.

However, further work is still required to address conceptual issues bringing data collection in line with OECD BMD4 (Organisation for Economic Co-operation and Development - Benchmark Definition) regulations, once resource becomes available.

Recommendation 7

Consider carefully the use of electronic questionnaires for FDI, and do this only once our electronic data collection (EDC) programme has delivered and embedded a proven, reliable and flexible tool. Do not simply transition the same questionnaire from paper to electronic form, without first researching whether this would prove effective for FDI, given its differences from most other business surveys.

Status – Awaiting office-wide transformation

Update: We have continued to actively participate in the work stream aimed at moving data collection for business surveys online. However, this work stream has been impacted by the wider transformation initiative we are currently undertaking, which has resulted in a delay in the transition to electronic questionnaires for FDI. At this stage, no indications have been provided as to when this transition is likely to take place.

In the interim, we will continue to use secure electronic file transfer (SEFT) methods to collect data electronically and have recently supported the transition of this process to a new provider, delivering an enhanced service.

Recommendation 8

Introduce measures with regard to data processing aimed at improving the quality of data collected on the quarterly surveys

Status – In progress

Update: As previously discussed in the ONS response to FDI NSQR published in October 2016, improvements to FDI response rates, particularly on the outward survey, are limited due to overseas respondents struggling to return data in line with tight UK National Accounts deadlines.

The rules used to validate FDI respondent data are currently being investigated to ensure they are consistent with the original methodological specifications. Any anomalies will be highlighted as development required for our existing data collection platform, CORA.

Recommendation 9

Continue the work under way to evaluate the benefits and drawbacks of moving the FDI data take-on system to the latest, current version of CORA. If a suitable arrangement can be obtained, migrate FDI to the current version, or otherwise update the FDI CORA.

Status – Pending resource

Update: As previously discussed in the ONS response to FDI NSQR published in October 2016, we acknowledge the benefits of having all our business surveys using a common system. However, due to the volume and complexity of the functionality required, coupled with the loss of IT developers, a decision has been taken by the wider organisation to halt the migration exercise. You will not experience a loss in data quality as a result of this decision.

Recommendation 10

The Official Statistics Code of Practice states that common classifications and coding standards (among others) should be adopted to promote comparability, and the reasons for any deviations made publicly available. We should seek to improve the coding used on FDI, and its presentation for respondents and users, on this basis.

Status – Completed

Update: As previously discussed in the ONS response to FDI NSQR published in October 2016, there is a legitimate need for FDI to use bespoke three-digit industry classification codes.

We would like to draw your attention to the background notes of the annual FDI bulletin, which details the industry classification codes covered by the FDI surveys.

Recommendation 11

Assuming no reason is found to retain use of the file, nor an updated version of it, we should discontinue use of the Chancellor's Initiative Data in FDI processing and report fully on the impact of its removal on historical estimates.

Status – Completed

Update: This recommendation was satisfied in the previous edition of the annual FDI bulletin, Foreign direct investment involving UK companies: 2015.

Further details of this change and impact on historical estimates were published in December 2016 in an article titled Methodological improvements to foreign direct investment statistics.

Recommendation 12

To be fully compliant with the method specified in the literature. As intended when specified for FDI, the full formula for prediction estimation would be used, and estimated from the data rather than being assumed to be zero. Investigate the practical need for an adjustment for clustering and the best approach for robustly estimating if required on an ongoing basis.

Status – Pending collection of data under new sample design

Update: Further methodological work is required in order to implement an alternative approach to prediction estimation.

Given the substantial changes being made to the FDI sampling process, it is proposed that this further work is postponed until a sufficient amount of data has been collected under the new sample design, size and allocation.

Recommendation 13

Complete investigations and report on the effect of switching outlier identification and treatment to Winsorisation. Once appropriate parameters have been established through analysis of recent data, make the switch to Winsorisation as soon as possible.

Status – Pending collection of data under new sample design

Update: Further methodological work is required to evaluate the impact and implement Winsorisation as an alternative outlier identification and treatment method.

Given the substantial changes being made to the FDI sampling process, it is proposed that this further work is postponed until a sufficient amount of data has been collected under the new sample design, size and allocation.

Recommendation 14

Implement the proposed standard error calculation without delay, carrying out the necessary quality assurance of results. Then resume the calculation and publication of measures of precision for the FDI output's principal annual estimates as soon as possible.

Status – Completed

Update: This recommendation was satisfied in the previous edition of the annual FDI bulletin, Foreign direct investment involving UK companies: 2015. Further details on reintroducing standard errors were published in December 2016 in an article titled Methodological improvements to foreign direct investment statistics.

The production of standard errors will continue for all future annual FDI bulletins.

Recommendation 15

Once standard errors have been calculated for annual surveys at the top level, extend the analysis to estimate measures of precision for lower-level domains and FDI quarterly.

Status – Pending resource

Update: Since the [ONS response to FDI NSQR published in October 2016](#), we have given further consideration as to how the method could be adapted to produce standard errors for quarterly FDI estimates.

Since there are no standalone publications that currently provide quarterly FDI estimates, we do not feel that there is an appropriate publication that could feature quarterly FDI standard errors. As such, no further work has been undertaken to assess how these can be produced and nor is it an area that we will be looking to investigate further at this current time.

Once resource becomes available, we will seek to estimate measures of precision (that is, standard errors) for lower-level domains of our annual FDI estimates.

Recommendation 16

Commission an investigation to determine appropriate sample sizes to meet precision requirements for principal FDI output when all the relevant information required has been established.

Status – Completed

Update: The size of the FDI sample was reviewed as part of the summer 2017 FDI sampling review. It was recommended that in line with the new sample design, the sample size used for the production of quarterly FDI statistics should increase and are detailed in this article.

The change in quarterly FDI sample size will be implemented at the next available opportunity, subject to resource.

Recommendation 17

Commission the further work suggested by the report, as a way to improve FDI's disclosure-control processes and transparency.

Status – Completed

Update: A comprehensive review of the FDI disclosure control methodology was conducted by methodological experts.

An improved methodology was developed with a view to minimise suppression whilst maintaining the confidentiality of respondent data. The new method also accounts for the presence of negative values, which can be typical for FDI data. The change in statistical disclosure methodology is detailed in this article.

This new method has been implemented into the latest release of FDI statistics, Foreign direct investment involving UK companies: 2016, and the final delivery of quarterly 2017 estimates to the balance of payments.

Recommendation 18

Conduct a more detailed review of benchmarking methods and approaches, exploring the various methodological options for benchmarking.

Status – Pending collection of data under new sample design

Update: As detailed in the FDI NSQR report, time series methodology experts reviewed the methods use to benchmark FDI data, which brought considerable improvements to the benchmarking production process.

It is also acknowledged that a more extensive review would be beneficial. However, given the substantial changes being made to the FDI sampling process, it is proposed that this further work is postponed until a sufficient amount of data has been collected under the new design and we can evaluate the revisions observed as a result of this change.

Recommendation 19

Increase the size of the FDI and International Transactions teams, to reduce the time pressure on regular production and allow more time to develop the survey and better understand the data.

Status – Completed

Update: As previously discussed in the ONS response to FDI NSQR published in October 2016, changes in team structure within the International Transactions branch have already taken place, bringing a balance of subject matter experts and analytical resource.

We are committed to reviewing the structure of the FDI teams on an ongoing basis and, where possible, explore options to increase staff numbers if business needs exist.

Recommendation 20

Review and increase the range of documentation available about the FDI surveys and outputs, making this available both internally and externally.

Status – In progress

Update: Since the FDI NSQR was published, the following articles focusing on aspects of FDI have been published:

UK foreign direct investment: trends and analysis: summer 2017

A review of foreign direct investment statistics: winter 2017

Methodological improvements to foreign direct investment statistics: December 2016

The impact of recent currency fluctuations on foreign direct investment (FDI) statistics: Quarter 2 (Apr to June) 2016

International perspective on UK foreign direct investment (FDI): 2014

In 2018, there are plans to update the FDI Quality, Methodology and Information (QMI) report to provide users with a concise overview of FDI methods and processing.

We also aim to publish an FDI user guide in the near future to further aid users' understanding of FDI statistics.

6 . Annex B: Previous statistical disclosure control methodology

Stage 1 Number of enterprises with returns in the cell is at least N?

Yes – Go to Stage 2.
No – Do not publish.

Stage 2 Is the cell sampled?

Yes – Go to Stage 3.

No – Do not publish.

Stage 3 Is the top reporting unit (RU) greater than A% of the grossed total?

Yes – Do not publish.
No – Go to Stage 4.

Stage 4 Is the top RU less than B% of the grossed total?

Yes – Publish.
No – Go to Stage 5.

Stage 5 Are there at least 19 RUs with returns in the cell?

Yes – Publish.
No – Go to Stage 6.

Stage 6 Is the total minus the top two contributors more than C% of the top contributor?

Yes – Publish.
No – Do not publish.

N is an integer constant no lower than 3.

A is a percentage constant used to define the protection level (upper bound).

B is a percentage constant used to define the protection level (middle bound).

C is a percentage constant used to define the protection level (lower bound).

7 . Annex C: New statistical disclosure control methodology

Stage 1 Is the weighted cell total (T) zero or rounded to zero?

Yes – Publish.
No – Go to Stage 2.

Stage 2 Is the number of enterprises within the cell at least N?

Yes – Go to Stage 3.
No – Do not publish.

Stage 3 Are the data rounded so that the rounding base of the outputs is greater than or equal to R% of the absolute value of the weighted cell total (T)?

Yes – Publish.
No – Go to Stage 4.

Stage 4 Is the largest contribution (X_1) estimated?

Yes – Publish.
No – Go to Stage 5.

Stage 5 Are there at least 20 enterprises contributing to the cell (excluding the largest two) that, after weighting, have a combined absolute value of at least Y% of the absolute value of the weighted cell total T?

Yes – Go to Stage 7.
No – Go to Stage 6.

Stage 6 Is the absolute value of [(T-X1-X2)/X1] greater than or equal to P?

Yes – Go to Stage 7.
No – Do not publish.

Stage 7 Is the weighted cell total T positive and X1 negative or vice versa?

Yes – Publish.
No – Go to Stage 8.

Stage 8 If both T and X_1 are positive: Is $X_1 < (1-P)*T$ or $X_1 > (1+P)*T$?

If both T and X_1 are negative: Is $X_1>(1-P)*T$ or $X_1<(1+P)*T$?

Yes – Publish.
No – Do not publish.

T is the weighted (published) cell total.

X1 and X2 are the largest and second-largest unweighted contributions to the cell respectively, when sorted by absolute value.

N is an integer no lower than 3.

R and Y are percentage constants used to define the protection level.

P is a constant between 0 and 1 (exclusive) used to define the protection level.

8 . Annex D: Comparison of existing and new sample allocations

Table 12: Existing inward non-world-base foreign direct investment sample allocation – Annual 2016 and Quarterly 2017

Section	Non world-base		Inward	
Section	Size-band (Net Book Value £m)	Form	Annual	Quarterly
Oil	All	Long	High	High
Finance	x < 100	Short	Mid-Low	Mid-Low
	100 <= x < 500	Long	High	Mid
	x >= 500	Long	High	High
Manufacturing	x < 30	Short	Mid-Low	Low
	30 <= x < 500	Long	Mid	Mid-Low
	x >= 500	Long	High	High
Retail	x < 30	Short	Mid-Low	Low
	30 <= x < 250	Long	Mid	Mid-Low
	x >= 250	Long	High	High
Information and Communication	x < 100	Short	Mid	Mid
	x >= 100	Long	High	High
Professional, Scientific and Technical	x < 30	Short	Mid	Mid
	x >= 30	Long	High	High
Other	x < 75	Short	Mid-Low	Mid-Low
	75 <= x < 500	Long	Mid	Mid-Low
	x >= 500	Long	High	High

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 13: Existing inward world-base foreign direct investment sample allocation – Annual 2016 and Quarterly 2017

Section	World-base		Form	Inward	
	Size-band (Turnover £k)			Annual	Quarterly
Oil	All		Long	Mid-Low	Mid-Low
Finance	x < 10,000		Short	Low	Low
	10,000 <= x < 150,000		Long	Mid-Low	Low
	x >= 150,000		Long	High	Mid-Low
Manufacturing	x < 25,000		Short	Mid-Low	Low
	25,000 <= x < 200,000		Long	Low	Low
	x >= 200,000		Long	Mid	Mid-Low
Retail	x < 14,000		Short	Low	Low
	14,000 <= x < 100,000		Long	Low	Low
	x >= 100,000		Long	Mid	Low
Information and Communication	x < 10,000		Short	Mid	Low
	10,000 <= x < 100,000		Long	Low	Low
	x >= 100,000		Long	High	Mid-Low
Professional, Scientific and Technical	x < 7,000		Short	Low	Low
	7,000 <= x < 50,000		Long	Low	Low
	x >= 50,000		Long	Mid-Low	Mid-Low
Other	x < 14,000		Short	Mid-Low	Low
	14,000 <= x < 100,000		Long	Low	Low
	x >= 100,000		Long	Mid-Low	Low

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 14: Existing outward non-world-base foreign direct investment sample allocation – Annual 2016 and Quarterly 2017

	Non world-base		**Outward**	
Section	Size-band (Net Book Value £m)	Form	Annual	Quarterly
Oil	All	Long	High	High
Finance	x < 10	Short	High	High
	10 <= x < 250	Long	High	High
	x >= 250	Long	High	High
Manufacturing	x < 75	Short	High	Mid
	75 <= x < 500	Long	High	High
	x >= 500	Long	High	High
Retail	x < 10	Short	High	Mid
	10 <= x < 100	Long	High	High
	x >= 100	Long	High	High
Information and Communication	x < 50	Short	High	High
	x >= 50	Long	High	High
Professional, Scientific and Technical	x < 500	Short	High	Mid
	x >= 500	Long	High	High
Other	x < 50	Short	High	Mid
	50 <= x < 500	Long	High	Mid
	x >= 500	Long	High	High

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 15: Existing outward world-base foreign direct investment sample allocation – Annual 2016 and Quarterly 2017

Section	World-base		Outward	
	Size-band (Number of affiliates)	Form	Annual	Quarterly
Oil	All	Long	Mid	Mid
Finance	x = 1	Short	Mid	Low
	2 <= x < 5	Long	Mid	Mid-Low
	x >= 5	Long	Mid	Mid-Low
Manufacturing	x = 1	Short	Mid-Low	Low
	2 <= x < 5	Short	Mid	Low
	x >= 5	Long	Mid	Low
Retail	x = 1	Short	Low	Low
	2 <= x < 5	Long	Mid-Low	Low
	x >= 5	Long	Mid	Low
Information and Communication	x = 1	Short	Mid-Low	Low
	x >= 2	Long	Mid	Low
Professional, Scientific and Technical	x = 1	Short	Low	Low
	2 <= x < 5	Long	Mid-Low	Low
	x >= 5	Long	Mid	Low
Other	x = 1	Short	Low	Low
	2 <= x < 5	Short	Mid	Low
	x >= 5	Long	Mid	Low

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 16: New inward non-world-base foreign direct investment sample allocation

Section	Non world-base			Inward	
	Size-band (Net Book Value £m)	Form		Annual	Quarterly
Oil	All	Long		High	High
Finance	x < 100	Short		High	Mid-Low
	100 <= x < 1000	Long		High	High
	x >= 1000	Long		High	High
Life insurance	All	Long		High	High
Manufacturing	x < 60	Short		Mid	Low
	60 <= x < 400	Long		High	Mid
	400 <= x < 1500	Long		High	High
	x >= 1500	Long		High	High
Retail	x < 20	Short		Mid-Low	Low
	20 <= x < 100	Long		High	Mid-Low
	100 <= x < 500	Long		High	Mid
	x >= 500	Long		High	High
Information and Communication	x < 10	Short		Low	Low
	10 <= x < 90	Short		High	Mid
	90 <= x < 500	Long		High	High
	x >= 500	Long		High	High
Professional, Scientific and Technical	x < 20	Short		Mid	Low
	20 <= x < 150	Short		High	Mid-Low
	150 <= x < 1000	Long		High	High
	x >= 1000	Long		High	High
Electricity, Gas, Water and Waste	x < 10	Short		High	High
	10 <= x < 300	Long		High	High
	x >= 300	Long		High	High
Other	x < 20	Short		Low	Low
	20 <= x < 250	Long		High	Mid-Low
	250 <= x < 1000	Long		High	High
	x >= 1000	Long		High	High

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 17: New inward world-base foreign direct investment sample allocation

Section	World-base Size-band (Turnover £k)	Form	Inward Annual	Inward Quarterly
Oil	All	Long	High	High
Finance	x < 30,000	Short	Mid-Low	Low
	30,000 <= x < 200,000	Long	High	Mid-Low
	x >= 200,000	Long	High	High
Life insurance	All	Long	High	High
Manufacturing	x < 20,000	Short	Low	Low
	20,000 <= x < 100,000	Long	Mid	Low
	100,000 <= x < 500,000	Long	High	Mid
	x >= 500,000	Long	High	High
Retail	x < 15,000	Short	Low	Low
	15,000 <= x < 75,000	Long	Low	Low
	75,000 <= x < 350,000	Long	High	Mid-Low
	x >= 350,000	Long	High	High
Information and Communication	x < 8,000	Short	Low	Low
	8,000 <= x < 45,000	Long	Mid-Low	Low
	45,000 <= x < 200,000	Long	High	Mid-Low
	x >= 200,000	Long	High	High
Professional, Scientific and Technical	x < 4,000	Short	Mid-Low	Low
	4,000 <= x < 25,000	Long	Low	Low
	25,000 <= x < 100,000	Long	Mid-Low	Mid-Low
	x >= 100,000	Long	High	High
Electricity, Gas, Water and Waste	x < 10,000	Short	Low	Low
	10,000 <= x < 100,000	Long	Mid-Low	Mid-Low
	x >= 100,000	Long	High	High
Other	x < 15,000	Short	Low	Low
	15,000 <= x < 150,000	Long	Mid-Low	Low
	150,000 <= x < 650,000	Long	High	Low
	x >= 650,000	Long	High	High

Source: Office for National Statistics

Notes:

1. "High' denotes a sampling fraction between 0.5 and 1.

2. "Mid' denotes a sampling fraction between 0.3 and 0.499.

3. "Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. "Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 18: New outward non-world-base foreign direct investment sample allocation

| Section | Non world-base | | Outward | |
	Size-band (Net Book Value £m)	Form	Annual	Quarterly
Oil	All	Long	High	High
Finance	x < 100	Short	Mid	Mid-Low
	100 <= x < 1000	Long	High	High
	x >= 1000	Long	High	High
Life insurance	All	Long	High	High
Manufacturing	x < 60	Short	High	Mid-Low
	60 <= x < 400	Long	High	Mid
	400 <= x < 1500	Long	High	High
	x >= 1500	Long	High	High
Retail	x < 20	Short	High	Mid-Low
	20 <= x < 100	Long	High	High
	100 <= x < 500	Long	High	High
	x >= 500	Long	High	High
Information and Communication	x < 10	Short	Mid-Low	Low
	10 <= x < 90	Short	High	High
	90 <= x < 500	Long	High	High
	x >= 500	Long	High	High
Professional, Scientific and Technical	x < 20	Short	Mid-Low	Mid-Low
	20 <= x < 150	Short	High	High
	150 <= x < 1000	Long	High	High
	x >= 1000	Long	High	High
Electricity, Gas, Water and Waste	x < 10	Short	High	High
	10 <= x < 300	Long	High	High
	x >= 300	Long	High	High
Other	x < 20	Short	Mid	Low
	20 <= x < 250	Long	High	Mid-Low
	250 <= x < 1000	Long	High	High
	x >= 1000	Long	High	High

Source: Office for National Statistics

Notes:

1. ''High' denotes a sampling fraction between 0.5 and 1.

2. ''Mid' denotes a sampling fraction between 0.3 and 0.499.

3. ''Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. ''Low' denotes a sampling fraction below 0.1.

Notes:

High – a sampling fraction between 0.5 and 1

Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

Table 19: New outward world-base foreign direct investment sample allocation

Section	World-base		Outward	
	Size-band (Number of affiliates)	Form	Annual	Quarterly
Oil	All	Long	High	High
Finance	x < 4	Short	Mid-Low	Low
	4 <= x < 20	Long	Mid-Low	Mid-Low
	x >= 20	Long	High	High
Life insurance	All	Long	High	High
Manufacturing	x < 4	Short	Mid-Low	Low
	4 <= x < 20	Long	Mid-Low	Low
	x >= 20	Long	High	High
Retail	x < 2	Short	Low	Low
	2 <= x < 10	Long	Mid-Low	Low
	x >= 10	Long	High	High
Information and Communication	x < 3	Short	Low	Low
	3 <= x < 15	Long	Mid-Low	Mid-Low
	x >= 15	Long	High	High
Professional, Scientific and Technical	x < 4	Short	Low	Low
	4 <= x < 25	Long	Mid-Low	Low
	x >= 25	Long	High	High
Electricity, Gas, Water and Waste	x < 2	Short	Mid-Low	Mid-Low
	2 <= x < 5	Long	High	High
	x >= 5	Long	High	High
Other	x < 4	Short	Mid-Low	Low
	4 <= x < 30	Long	Mid-Low	Low
	x >= 30	Long	High	High

Source: Office for National Statistics

Notes:

1. 'High' denotes a sampling fraction between 0.5 and 1.

2. 'Mid' denotes a sampling fraction between 0.3 and 0.499.

3. 'Mid-Low' denotes a sampling fraction between 0.1 and 0.299.

4. 'Low' denotes a sampling fraction below 0.1.

Notes:

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Mid – a sampling fraction between 0.3 and 0.499

Mid-low – a sampling fraction between 0.1 and 0.299

Low – a sampling fraction less than 0.1

9 . Acknowledgements (alphabetical order)