ENTERPRISE SURVEYS

SAMPLING METHODOLOGY

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Introduction

1. The World Bank's Enterprise Surveys (ES) collect data from the private sector across countries in every region of the world. The Surveys use standardized survey instruments and a uniform sampling methodology to minimize measurement error and to generate data that are comparable across the world's economies. The Enterprise Surveys are also designed to provide panel datasets to facilitate dynamic analysis and to enable econometric approaches that require longitudinal data.

2. More specifically, the World Bank's Enterprise Surveys aim to achieve the following objectives:
   - provide statistically significant business environment indicators that are comparable across countries and time,
   - assess the constraints to private sector growth, productivity, and job creation,
   - build a panel of establishment-level data that will make it possible to track changes in the business environment over time.

3. The use of properly designed survey instruments and a uniform sampling methodology provide a solid foundation for recommendations that stem from this analysis. This note provides information on the sampling methodology for Enterprise Surveys. A complementary document, the Questionnaire Manual provides a detailed explanation of the questions contained in the questionnaire and how the questionnaire should be implemented.

Sampling Methodology

4. The sampling methodology of the World Bank's Enterprise Survey generates sample sizes appropriate to achieve two main objectives: first, to benchmark the business environment of individual economies across the world and across groups of firms within each economy; second, to conduct firm performance analyses focusing on how the business environment affect firm-level outcomes such as productivity, job creation, investment, and growth.

5. To achieve both objectives the sampling methodology:
   - generates a sample representative of the non-agricultural, non-extractive formal private economy,
   - generates large enough sample sizes for selected industries and other groups of firms to conduct statistically robust analyses with a minimum 7.5% precision for 90% confidence intervals[1] of:
     i. Estimates of population proportions (percentages); and
     ii. Estimates of the mean of log of sales.

[1] A 7.5% precision of an estimate in a 90% confidence interval means that the populationparameter is within a 7.5% range of the observed sample estimate, except in 10% of the cases.

Stratification

6. The Universe of Inference of the Enterprise Surveys includes the following list, following ISIC, revision 3.1: all manufacturing sectors (group D), construction (group F), services (groups G and H), transport, storage, and communications (group I), and subsector 72 (from Group K). Following ISIC revision 4 the Universe includes: sections C, F, G, H, I, and divisions 61 and 62 of section J.[2] Additionally, the Universe of Inference includes all establishments with five or more employees, fully or partially privately owned: one hundred percent government-owned firms, cooperatives, and firms with less than five employees are excluded.

7. Enterprise Surveys are stratified by sector of activity, firm size, and geographical location. Stratification by firm size divides the population of firms into 3 strata: small firms (5-19 employees), medium-size firms (20-99 employees), and large firms (100 or more employees); in very large economies a fourth size stratum is added, the top 1% of firms by size. Geographical stratification is defined to reflect the distribution of the non-agricultural economic activity of each country, which in most cases implies covering the main urban centers of the country. Around the world most of the non-agricultural, non-mining economic activity, the ES Universe, is clustered around the main centers of population.

8. Stratification by sector of activity depends on the size of the economy as measured by the Gross National Income (GNI). As described in Table 1, very small economies (below $20 billion GNI of 2016) are stratified into 2 groups: manufacturing and services with 75 interviews allocated to each group. For small economies, GNI between $20 billion and $30 billion, the universe is stratified into manufacturing, retail, and the rest services. Medium-size economies, GNI between $30 and 100 billion, single-out the 2 most important manufacturing industries and the remaining manufacturing industries are grouped together into a residual stratum, "rest of manufacturing"; retail and "rest of services" provide the final two strata. For large and very large economies, further manufacturing and services subsectors are single-out for stratification preserving the residual categories to complete exhaust the universe. Also, given the size of these economies the minimum sample size per level of stratification of 120 can be augmented to account for potential non-response to financial variables that are key for the computation of productivity. A 25% non-response would require a sample size of 160 per group in order to end-up with 120 usable observations.

[2] A more detailed correspondence of the Universe of Inference at the 4-digit level is available upon request as there is no one to one relationship between all sectors originally included in ISIC 3.1 and ISIC 4. Consequently, a few 4-digit activities had to added and others dropped when moving from ISIC 3.1 into ISIC 4.

Table 1 – Stratification by Sector for Different Economy Sizes

Size	*GNI as of 2016*	*Manufacturing*		*Services*		Sample size
		# of manuf. industries	*rest of manuf.*	*# of services industries*	*rest of services*	
Very small	<$20 billion	75		75		150
Small	$20-30 billion	120		1 (120)	(120)	360
Medium	$30-100 billion	2 (240)	120	1 (120)	(120)	600
Large	$100-$1 trillion	~4 (640)	120	~1 (120)	120	1000
Very large	>$1 trillion	~6 (960)	120	~2 (240)	120	1440

9. For comparability purposes the preferred services sector to be single out is retail. Additional services sector, budget permitting, are typically hotels or construction. In the case of manufacturing priority sectors for comparability have typically been the food manufacturing sector and garments manufacturing. Additional industries are chosen at the two-digit ISIC level depending on the characteristics of the economy as based on contribution to value added, contribution to employment, and number of establishments.

Sample Size

10. Overall sample sizes for Enterprise Surveys are determined by the degree of stratification of the survey. For each degree of stratification sample sizes are defined to achieve an acceptable level of precision; that is, estimates at the three size levels (small, medium, and large), at the different regions of stratification, and for the different sectors of stratification should meet the pre-defined level of precision.[3]

11. Given that the Enterprise Surveys include more than 100 indicators the computation of the optimal sample size is complicated since it depends on the variance of each indicator. However, many of the indicators computed from the survey are proportions, such as percentage of firms that engage in X activity or chose Y action. In this case the computation of the sample size is simplified by the fact that the variance of a proportion is bounded. Assuming the maximum variance (0.5) sample size to guarantee a minimum level of precision can be easily computed.

12. Table 2 exhibits minimum sample sizes for different population sizes for estimates of proportions with 5% and 7.5% precision levels in 90% confidence intervals, assuming maximum variance.4 With 5% precision the minimum sample size, as population size increases, tends to

[3] For a technical discussion of stratified sampling, strata selection and sample size definition see Valliant et al. 2103, chapter 3 or Lohr, 1999, chapter 4.

[4] $n = \left[\frac{1}{N} + \frac{N-1}{N} \frac{1}{PQ} \left(\frac{k}{z_{1-\alpha/2}} \right)^2 \right]^{-1}$ where N=population size, P=population proportion, Q=1-P

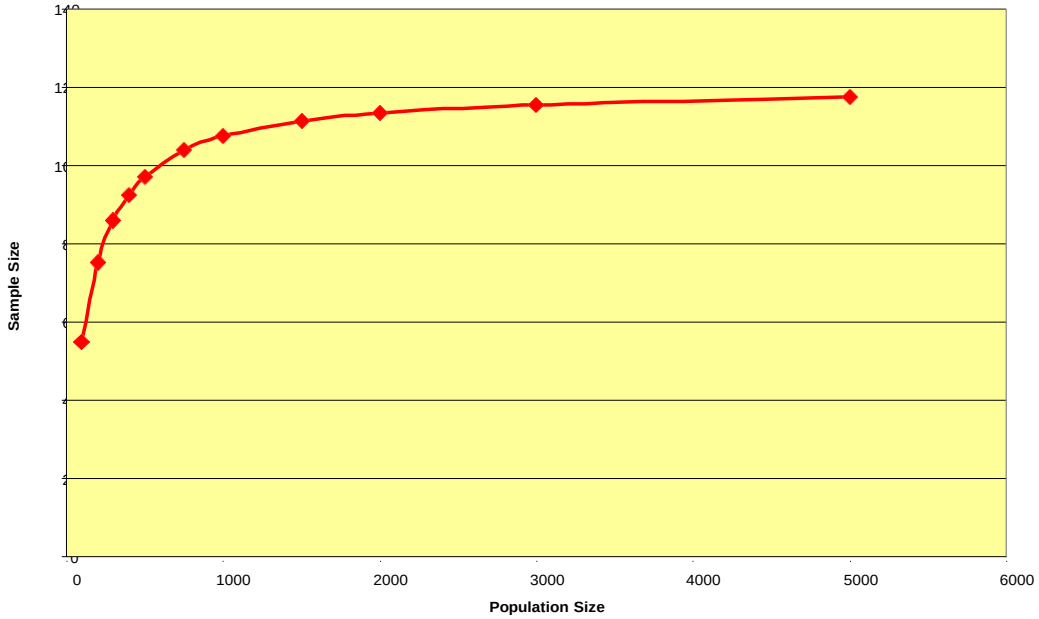
k=desired level of precision, $z_{1-\alpha/2}$ is the value of the normal standard coordinate for a desired level of confidence, 1-α.

a sample size of 270; with 7.5% precision the sample size tends to 120. Note that if the population size of an industry falls below 1,500, the required sample size for proportions may be reduced (figure 1). Although 5% precision would be desirable, a precision of 7.5% is more in line with budget constraints and consequently, an operational 120 samples size per stratum was selected.

Table 2 - Sample Sizes Required with 5% and 7.5% Precision and 90% Confidence

Population size	Sample Size 5%	Sample Size 7.5%
50	42	36
100	73	55
200	115	75
300	143	86
400	162	93
500	176	97
600	187	100
700	195	103
800	202	105
900	208	106
1000	213	107
1250	223	110
1500	229	111
1750	234	113
2000	238	113
2500	244	115
3000	248	116
5000	257	117
10000	263	119
50000	269	120
100000	270	120

Figure 1: Optimal Sample Size 7.5 precision, 90% confidence interval



10. The survey also includes several quantitative variables which are unbounded such as time to obtain a permit, number of employees, or sales. For practical purposes, the most important quantitative variable in the survey is total sales; it is used as the key variable for several performance

indicators such as labor productivity and total factor productivity. It is also highly correlated to many other firm-level outcomes such as employment and exports. The minimum sample size for this variable was computed utilizing information from previous surveys. Because sales have a largely skewed distribution, the required sample size for inferences about its mean turned out to be too large.3 However, it is standard practice to work with sales in log form which takes away its large variability. Using around 50 different surveys the minimum sample size required for a 7.5% precision on estimates of log of sales was computed for each sector stratum. This was compared to the minimum sample size for proportions under highest variance. For most strata, the minimum sample size for proportions was larger than the ones required for log of sales. For instance, Table 3 illustrates the sample sizes required for different industries in a large economy, Ukraine, using actual universe numbers -N- for 2005, following a conservative design by sector.[5]

Table 3 – Example of Sample Sizes required by Sector

	N	Min. sample size for proportions 7.5%	Min. sample size for log sales 5%	Coef. Of variation
Food manufacturing	4,184	117	22	0.143461
Garment manufacturing	1,389	111	20	0.13629
Machinery & equipment	2,257	114	18	0.129497
Other manufacturing	15,574	119	21	0.139216
Retail	10,297	119	24	0.149958
Other services	50,971	120	20	0.135673

11. As Table 3 shows, the minimum sample size required to guarantee a 7.5% precision for estimates of proportions in most cases guarantees the minimum sample size required for inferences about the mean of log sales with a more demanding level of precision of 5%. In general, this result holds for large universe numbers as long as the coefficient of variation of the quantitative variables is less than 0.5. Checking on the existing survey information for around 50 countries, the coefficient of variation of log of sales for all industries is typically below 0.5 in all of them.

12. With three levels of stratification, size, sector and location and a minimum sample size of 120 per level of stratification to guarantee estimate precision the optimal sample design for any given economy is a linear programming optimization problem: obtain the optimal cell allocation- combination of size, sector and location- to guarantee that at least the minimum sample is attained across each one of these dimensions.[6] In order to achieve the minimum sample size allocation in each level of stratification cell sizes must depart from a proportional distribution following the universe distribution rendering different probabilities of selection across stratification cells (a proportional distribution would result in equal probability of selection across all cells). That is, each combination of size, sector and location will have a different probability of selection π_{ijh}. Design weights, or base weights, defined as the inverse of the probably of selection, $w_{ijh} = {}^{1}/_{\pi_{ijh}}$ must then be used when combining observations from different cells to compute any estimate for the

[5] The formula in footnote 2 can be re-written as:

$$n = \left[\frac{1}{N} + \left(\frac{k}{z_{1-\alpha/2} CV_y} \right)^2 \right]^{-1}$$ where CV is the coefficient of variation of variable y.

[6] See Valliant et al. (2013), Chapter 5. Richard Valiant was who originally suggested the approach using the Excel Solver to the Enterprise Survey team on the first review of the sampling methodology in July 4th, 2005.

population.

Non-response

13. As it is the case with most surveys the Enterprise Surveys may face some degree of non-response. Evidence shows that the degree of non-response varies by type of firms. Most of the approaches to correct for non-response rely on assumptions on how non-respondents relate to respondents. To avoid making any assumptions, the ES approach to non-response is substitution by cell of stratification; that is, establishments that refuse the interview are substituted with establishments belonging to the same combination of sector, size, and region cell of stratification. The expectation is that establishments in the same industry, size and region of the country face the same business environment and behave similarly. This approach also ensures that the original sample design is preserved. For transparency on implementation, non-response statistics are published along with the dataset in the Implementation Report of each survey. Any further treatment of non-response is left to researchers or other users of the data who may decide if and how to address non-response for their own analysis.

Sampling Weights

14. As explained above every Enterprise Survey is stratified by industry, establishment-size, and region. Whenever stratification is used as a sampling strategy, it is necessary to weight observations when making inferences to the full population or subsectors within that population. These weights are necessary to correct for the different probability of selection for elements within different strata. An exception is when the number of units selected in each stratum is strictly proportional to the population size within each strata; in these cases observations are self-weighted but these instances rarely occur one of the main objectives of stratification is to obtain a given number of interviews per level of stratification which requires deviations from proportionality (see Cochran, 1977 for a technical discussion, and Lohr, 1999 or Levy, and Lemeshow, 1999 for a more intuitive presentation).

15. Define i, j and h as follows:
i index for industry level of stratification i= 1, 2, … n
j index for size level of stratification j= 1, 2, 3[7]
h index for region level of stratification h= 1, 2, …m

Each combination (i, j, h) defines a cell of stratification. Then n_{ijh} is he number of realized interviews in stratum (i,j,h) and N_{ijh} is the number of establishments in universe cell (i,j,h), the probability of selection of any establishment is:

$$p_{ijh} = \frac{n_{ijh}}{N_{ijh}} \quad (1)$$

16. The base weight is defined as the inverse of the probability of selection:

$$w_{ijh} = \frac{1}{p_{ijh}} = \frac{N_{ijh}}{n_{ijh}} \quad (2)$$

Eligibility Adjustments

17. Base weights assume that N_{ijh} is an accurate number of the total number of establishments in each cell. Whenever the sampling frame used to draw the sample is the same to the Universe numbers or if it is derived directly from the same source, and during field work

[7] As explained above, in very large economies, j=4 is added and defined as very large firms or the top 1% of the size distribution.

incorrect entries are found, an adjustment is required. Under these conditions if establishments in the sample frame are found to be ineligible, this is prima facie evidence that N_{ijh} is incorrect and should be corrected. Examples of ineligible entries in the frame are establishments whose sector of activity is not included in the survey, State-owned firms, establishments outside the geographical area of the survey or with less than 5 employees.

18. The correction f_{ijh} is defined as the share of eligible establishments to the total number of contacts made during field work. That is:

$$f_{ijh} = \frac{e_{ijh}}{c_{ijh}} \quad (3)$$

where e_{ijh} is the number of confirmed eligible establishments in stratum (i,j,h) and c_{ijh} is the total number of contacted establishments.

19. In order to collect the necessary information for eligibility adjustments the in the ES standard global methodology, all contacts during field work must be classified into one of the codes in Table 4.). These the codes used in the Progress Report that every vendor should complete and a daily basis as control of the field work and the associated sample.

Table 4: Eligibility Codes for Field Work

Screening process:	
14	Screening in process (the establishment is being called/ is being contacted - previous to ask the screener)
13	Refuses to answer the screener
Eligible codes	
1	Eligible establishment (Correct name and address)
2	Eligible establishment (Different name but same address - the new firm/establishment bought the original firm/establishment)
3	Eligible establishment (Different name but same address - the firm/establishment changed its name)
4	Eligible establishment (Moved and traced)
16	Eligible establishment (Panel Firm - now less than five employees; this code applies only to panel firms.)
Ineligible codes	
5	Ineligible. The establishment has less than 5 permanent- full time employees
616	Ineligible. The firm discontinued businesses - (Establishment went bankrupt)
618	Ineligible. The firm discontinued businesses - (Original establishment disappeared and is now a different firm)
619	Ineligible. The firm discontinued businesses - (Establishment was bought out by another firm)
620	Ineligible. The firm discontinued businesses - (It was impossible to determine for what reason)
621	Ineligible. The firm discontinued businesses - (Other)
71	Ineligible legal status: not a business, but private household
72	Ineligible legal status: cooperatives, non-profit organizations, etc.
8	Ineligible activity: Education, Agriculture, Finances, Government, etc.
151	Ineligible. Out of target - outside the covered regions
152	Ineligible. Out of target - moved abroad
153	Ineligible. Out of target - Not registered with Statistical Authority
154	Ineligible. Out of target - establishment is HQ without production or sales of goods or services
155	Ineligible. Out of target - establishment was not in operation for the entirety of last fiscal year
156	Ineligible Duplicated firm within the sample
Unobtainable codes (eligibility depends on assumptions)	
91	Unobtainable. No reply after having called in different days of the week and in different business hours
92	Unobtainable. Line out of order
93	Unobtainable. No tone
94	Unobtainable. Phone number does not exist
10	Unobtainable. Answering machine
11	Unobtainable. Fax line- data line
12	Unobtainable. Wrong address/ moved away and could not get the new references

20. Different assumptions can be made regarding entries where the best information obtained during the contact is not sufficient to ascertain eligibility. The strict definition only includes codes 1,2,3,4,16, those for which there is clear evidence that they are eligible. All the rest of the codes are considered as ineligible. This assumption generates the adjustment factor for the strict weights. Adjusting the confirmed number of eligible units more freely to also include codes 10 (answering machine), 11 (fax line), and 13 (refusal to answer the screener), gives the adjustment factor that generates the median weights. Finally, if the confirmed number of eligible units additionally includes codes 91, 92, 93, 94, and 12, the adjustment factor generates the weak weights.

21. The methodology described above generates absolute weights. However, in many cells the realized sample may be considerably small relative to the overall population size, resulting in relatively large sampling variations due to extreme weights. A smoothing mechanism is implemented to produce relative weights. These weights are based on the three products of the relative rates for each sector, size, and region. As these relative rates are based on much larger samples than the individual cells, they are more robust and reduce the effect of small sample cells. The relative weight adjustment factor for cell (i,j,h) is defined as:

$$f_{ijh}^{r} = \left[\frac{\frac{\sum_{i,h} e_{ijh}}{\sum_{i,h} c_{ijh}}}{\frac{\sum_{i,h,j} e_{ijh}}{\sum_{i,h,j} c_{ijh}}}\right] * \left[\frac{\frac{\sum_{i,j} e_{ijh}}{\sum_{i,j} c_{ijh}}}{\frac{\sum_{i,j,h} e_{ijh}}{\sum_{i,j,h} c_{ijh}}}\right] * \left[\frac{\frac{\sum_{h,j} e_{ijh}}{\sum_{h,j} c_{ijh}}}{\frac{\sum_{i,j,h} e_{ijh}}{\sum_{i,j,h} c_{ijh}}}\right] * \left[\frac{\sum_{i,j,h} e_{ijh}}{\sum_{i,j,h} c_{ijh}}\right] \quad (4)$$

22. Consequently, equation (2) provides the final weight for stratum cell (i,j,h) when a sampling frame use to draw the sample and the universe totals are independent. Equation (5) provides the final weight for stratum cell (i,j,h) when the sampling frame and the universe totals are the same:

$$w_{ijh} = \frac{1}{p_{ijh}} * f_{ijh}^{r} = \frac{N_{ijh}}{n_{ijh}} * f_{ijh}^{r} \quad (5)$$

23. Note that the median weights are used for all indicators published on the Enterprise Surveys website and they are recommended for analysis since fax machines, answering machines or active refusals to the screener are very good indicators that those establishments exist. However, all datasets publish the three sets of weights.

24. Lastly, there are surveys where the sampling frame used to draw the sample is independent of the Universe numbers. Consequently, eligibility from the sampling frame does not necessarily provide evidence that N_{ijh} is incorrect. For instance, if the sampling frame is from a commercial source and the universe numbers are obtained from official sources. In these cases, the correction f_{ijh} is not be appropriate and is omitted. These cases are noted in the implementation documentation of each survey.

Weighting Panel Data[8]

25. As mentioned above collection of panel data is one of the objectives of the Enterprise Surveys. Consequently, establishments interviewed in one round of data collection (wave-1) are deliberately targeted to be re-interviewed during the next round of Enterprise Surveys years later (wave-2). These establishments that are interviewed in two or more waves constitute a panel. The other interviews conducted in wave-2 that are not panel are called 'fresh' sample. The inclusion of panel data together with the fresh sample in an Enterprise Surveys requires a modification of the weighting approach outlined above since sets of data bring valuable information for inferences to the population.

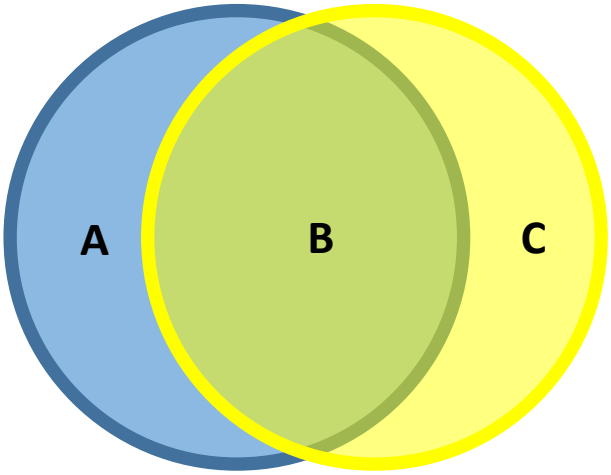
26. The panel and fresh samples are put together using the combining samples approach (see O'Muircheartaigh & Pedlow, 2002 for a description). An important reason for carefully putting these samples together and appropriately modifying the weighting approach is that many panel establishments are still operating when the wave-2 survey takes place. These establishments could have been part of the fresh sample even without their status as panel establishments. However, their

[8] The methodology presented in this section was first suggested by Joe Sakshaug and Jim Lepkowski, from the Joint Program for Survey Methodology at the University of Maryland and the University of Michigan, after the first wave of panel data of global surveys in 2010. Later, Stephanie Eckman developed a practical guide in "Report on Development of Wave 2 Cross-Sectional Weights for Establishment Surveys in Nepal and Russia", December 2014.

status as panel establishments influences their probability of selection into the sample. Consequently, adjustments must be made during the weighting of panel establishments to ensure that the weights are representative of the wave-2 population.

27. To illustrate how the weighting approach is modified, consider the composition of the population in wave-2 as illustrated in Figure 4. The population of wave-1 is in blue and the population of wave-2 is in yellow. The wave-2 population is composed of two components: one section that is common to the same population of wave 1, B, which are the establishments that existed in wave-1 and continued operations during wave-2; a second section which are those establishments created since the date of wave-1, C. Finally, section A represents the establishments that have gone out of business since wave-1 and, therefore, cannot be interviewed in wave-2. Panel establishments can only come from section B, whereas fresh establishment can come from sections B or C.

Figure 2
Populations of Wave-1 and Wave-2



28. The calculation of sampling weights in the presence of panel observations can be broken down in the following three stages:

i. calculate initial weights of panel observations to represent the universe of section B on Figure 2;
ii. calculate initial weights of fresh observations for sections B and C;[9]
iii. find and apply the appropriate scaling factor to put together panel observations from section B and fresh observations from sections B and C.

29. In stage i., panel selection in the second wave follows the same approach used to select any ES sample, namely panel observations are stratified and selected through simple random process within each cell of stratification. Consequently, the probability of selection is:[10]

$$p_{ijh}^{panel} = \frac{n_{ijh}^{panel}}{N_{ijh}^{panel}} \qquad (6)$$

where n_{ijh} denotes the number of panel interviews realized cell (i,j,h) cell and N is the number of establishments in the population cell (i,j,h), after full screening of all the wave-1 establishments to determine eligibility. Since, as discussed in paragraph 18 during the screening process assumptions

[9] Subject to availability of data to distinguish between B and C, i.e. firm-level operational start dates, the weights would be calculated separately.
[10] In some cells of stratification panel observations may be very few or even just one, so their probability of selection in the second wave could be 1, that is a certainty.

must be made regarding certain eligibility codes that only provide indication about the existence of some establishments (for instance, getting only an answering machine or fax, or this generates three estimates of N, strong, median, and weak with associated sets of panel probability selections for each set of assumptions. For simplicity, however, the three cases will be presented as one.[11] It is also important to highlight, that cell (i,j,h) will be defined in terms of wave-2 stratification, which may not be exactly the same as in wave-1 and that for some wave-2 stratification cells there may not be any realized panel observations.[12]

30. Given that the probability of selection for panel establishments was first determined in the first wave, the initial weight of each panel establishment is calculated by simply dividing the wave-1 weight by the probability of selection in the second wave. That is, using superscripts to denote waves, the initial weight for panel establishments is given by:

$$w^2panel_{ijh} = \frac{w^1_{jih}}{p^{panel}_{ijh}} * \gamma_{jih} \quad (7)$$

where w^1_{ijh} is the wave-1 weight for each panel establishment, p^{panel} is the probability of selection for the interview in the second wave as in equation (6), and γ is a scaling factor designed to ensure that these w^2panel weights project to the universe of establishments in section B of Figure 2. The scaling factor is thus defined as:

$$\gamma_{ijh} = \frac{N^{fresh}_{ijh}}{N^{panel}_{ijh}} \quad (8)$$

where N^{fresh}_{ijh} is the universe of firms in wave 2, and N^{panel}_{ijh} is the estimated universe of wave-1 in existence in wave 2, both of them defined for each cell of stratification (i,j,h) of the wave-1 sample design. Eligibility codes inform whether each panel observation falls in section A or section B of Figure 2; as explained above, they can follow the strong, median, and weak assumptions.

31. In stage ii. of the weights for fresh observations are computed separately for those in sections B and C in figure 2. For each, equivalent initial weights are computed by multiplying the inverse of probability of selection times a similar γ_{ijh} scaling factors. In particular:

$$w^2Bfresh_{ijh} = \frac{N_{ijh}}{n_{ijh}} \gamma_{ijh,B} \quad (9)$$

$$w^2Cfresh_{ijh} = \frac{N_{ijh}}{n_{ijh}} \gamma_{ijh,C} \quad (10)$$

where N is the number of cases in the universe (adjusted for eligibility if universe and frame are the same), n is the number of achieved cases in that cell, and γ_B and γ_C are scaling factors to ensure that the sum of the weights equals the number of units in the wave-2 frame for sections B and C, respectively.

32. In the final stage iii., weights $w^2panel, w^2Bfresh \text{ and } w^2Cfresh$ are combined together to properly represent the wave-2 universe, Section B and C of Figure 4. To achieve this only w^2panel and $w^2Bfresh$ need adjustments because they are both projecting to section B, the former from the perspective of the wave-1 data and the latter from the perspective of the fresh sampling frame. To appropriately put w^2panel and $w^2Bfresh$ together, all weights in the panel sample are multiplied by λ_{ijh} and all weights in the fresh sample by $1 - \lambda_{ijh}$. Thus, the weight is given by:

[11] Note that with panel eligibility assumptions enter into weights computation even in those cases where inferences in wave-2 are made to exogenous universe numbers, i.e., the frame in wave-2 is different from the frame in wave-2.

[12] In the cases where the universe of B and C are calculated separately, any cell for which there is no realized panel or fresh observations will require collapsing cells. The TTL of each project, in consultation with experts on the private sector of each country, will make the collapsing decision.

$$w_{ijh}^{2} = \begin{cases} w_{panel_{ijh}}^{2} * \lambda_{ijh} & if\ panel \\ w^{2}B_{fresh_{ijh}} * (1 - \lambda_{ijh}) & if\ fresh \end{cases} \quad (11)$$

The value of λ_{ijh} is determined by the relative sample size of the fresh and panel interviews in cell (i,j,h) within section B. For example, if there were 100 panel interviews selected and 500 fresh interviews then $\lambda = \frac{100}{500+100} = \frac{1}{6}.\lambda$

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