

## APPENDIX A METHODOLOGY

### 1. Sample Design

#### 1.1 Establishments with 1 – 10 persons engaged

The stratified systematic sampling was adopted for the survey. Bangkok and each province was constituted a stratum. The sampling units were establishments.

##### 1) Stratification

Bangkok and each province was constituted a stratum. There were altogether 77 strata. Each stratum was classified by TSIC at activities level into 409 sub-stratum.

##### 2) Selection of Sampling Unit

The sample selection of establishments was done by systematic sampling and performed separately and independently in each sub-stratum. The total sample were 61,782 from 388,183 establishments.

#### 1.2 Establishments with 11 persons engaged and over

All the establishments with 11 persons engaged and over were completely enumerated. There were 36,444 establishments.

In summary, the total number of sample establishments selected for enumeration were 98,226 classified by region and size as follows :

region	Total	1 – 10 persons engaged	11 persons engaged and over
Bangkok	13,221	4,609	8,612
Vicinity	14,714	5,047	9,667
Central	19,173	12,668	6,505
North	19,090	15,049	4,041
Northeast	21,364	15,747	5,617
South	10,664	8,662	2,002
Whole kingdom	98,226	61,782	36,444

### 2. Estimation method

The survey results were presented at regional level namely Bangkok, Vicinity (Samut Prakan, Nonthaburi, Pathum Thani, Nakhon Pathom and Samut Sakhon), the North, the Northeast and the South. All the establishments were classified by TSIC at activities level and divided into 6 sizes according to number of persons engaged as follows:

Size of establishment	1	2	3	4	5	6
Number of persons engaged	1 – 15	16 – 25	26 – 30	31 – 50	51 – 200	> 200

Let,

$$q = 1, 2, 3, \dots, n_{hijklmp} \quad (\text{sample establishment})$$

$$p = 1, 2, 3, \dots, 12 \quad (\text{size of establishment})$$

$$m = 1, 2, 3, \dots, 409 \quad (\text{activity})$$

$$l = 1, 2, 3, \dots, 164 \quad (\text{class})$$

$$k = 1, 2, 3, \dots, 78 \quad (\text{group})$$

$$j = 1, 2, 3, \dots, 28 \quad (\text{division})$$

$$i = 1, 2, 3, \dots, A_h \quad (\text{province})$$

$$h = 1, 2, 3, 4, 5, 6 \quad (\text{region})$$

### 2.1 The estimation for establishment with 1 – 10 persons engaged

The estimation total number of characteristics  $X$  of the establishments with 1 – 10 persons engaged for the  $m^{\text{th}}$  activity,  $l^{\text{th}}$  class,  $k^{\text{th}}$  group,  $j^{\text{th}}$  division,  $i^{\text{th}}$  province,  $h^{\text{th}}$  region was based on the formula:

$$\hat{X}'_{hijklm} = \sum_{i=1}^{A_h} \hat{X}'_{hijklm}$$

where

$\hat{X}'_{hijklm}$  is the estimate of the total number of characteristics  $X$  of the establishments with 1 – 10 persons engaged for the  $m^{\text{th}}$  activity,  $l^{\text{th}}$  class,  $k^{\text{th}}$  group,  $j^{\text{th}}$  division,  $i^{\text{th}}$  province,  $h^{\text{th}}$  region. Where

$$\hat{X}'_{hijklm} = w'_{hijklm} \sum_{p=1}^2 \sum_{q=1}^{n_{hijklmp}} x_{hijklmpq}$$

$x_{hijklmpq}$  is the value of characteristics  $X$  for the  $q^{\text{th}}$  sample establishment,  $p^{\text{th}}$  size of establishment,  $m^{\text{th}}$  activity,  $l^{\text{th}}$  class,  $k^{\text{th}}$  group,  $j^{\text{th}}$  division,  $i^{\text{th}}$  province,  $h^{\text{th}}$  region.

$w'_{hijklm}$  is the weighting factor of the establishment with 1 – 10 persons engaged for the  $m^{\text{th}}$  activity,  $l^{\text{th}}$  class,  $k^{\text{th}}$  group,  $j^{\text{th}}$  division,  $i^{\text{th}}$  province,  $h^{\text{th}}$  region. Where

$$w'_{hijklm} = \frac{N'_{hijklm}}{n'_{hijklm}}$$

$N'_{hijklm}$  is the total number of the establishments with 1 – 10 persons engaged for the  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region.

$n'_{hijklm}$  is the total number of the sample establishments with 1 – 10 persons engaged for the  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region.

$A_h$  is the total provinces in the  $h^{th}$  region, where  $\sum_{h=1}^6 A_h = 77$

## 2.2 The estimation for establishment with 11 persons engaged and over

The estimation total number of characteristics  $X$  of the establishments with 11 persons engaged and over ( $p = 3, 4, 5, \dots, 12$ ) for the  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region was based on the formula:

$$\hat{X}_{hijklmp} = \sum_{i=1}^{A_h} \hat{X}_{hijklmp}$$

where

$\hat{X}_{hijklmp}$  is the estimate of the total number of characteristics  $X$  of the establishments for the  $p^{th}$  size of establishment,  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region. Where

$$\hat{X}_{hijklmp} = \frac{N_{hijklmp}}{N'_{hijklmp}} \sum_{q=1}^{n_{hijklmp}} X_{hijklmpq}$$

$X_{hijklmpq}$  is the value of characteristics  $X$  for the  $q^{th}$  sample establishment,  $p^{th}$  size of establishment,  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region.

$N_{hijklmp}$  is the total number of the establishments for the  $p^{th}$  size of establishment,  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region.

$N'_{hijklmp}$  is the total number of the responding establishments for the  $p^{th}$  size of establishment,  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region.

## 2.3 The estimation of coefficient of variation of the estimate of the total number

1) The estimation of the variance of the estimate of the total number of characteristics  $X$  of the establishments with 1 – 10 persons engaged for the  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $i^{th}$  province,  $h^{th}$  region was based on the formula:

$$\hat{V}(\hat{X}'_{hijklm}) = N_{hijklm}(N_{hijklm} - n_{hijklm}) \frac{s_{hijklm}^2}{n_{hijklm}}$$

where

$$s_{hijklm}^2 = \frac{1}{n_{hijklm} - 1} \left[ \sum_{q=1}^{n_{hijklm}} x_{hijklmq}^2 - \frac{\left( \sum_{q=1}^{n_{hijklm}} x_{hijklmq} \right)^2}{n_{hijklm}} \right]$$

2) The estimation of the coefficient of variation of the estimate of the total number of characteristics  $X$  of the establishments with 1 – 10 persons engaged for the  $m^{th}$  activity,  $l^{th}$  class,  $k^{th}$  group,  $j^{th}$  division,  $h^{th}$  region was based on the formula:

$$C.V. \cdot h_{ijklm} = \frac{\sqrt{\sum_{i=1}^{A_h} \hat{V}(\hat{X}'_{hijklm})}}{\sum_{i=1}^{A_h} \hat{X}'_{hijklm}}$$

### 3. Data Collection

The interviewing method was employed in data collection. The enumerators who are permanent and temporary staff of the National Statistical Office were sent out to interview the owners or the entrepreneurs of manufacturing establishments during May 1 to August 31, 2012.

### 4. Data Processing

The information of establishments in provincial areas was processed at the provincial office with the technical supports from the central office, e.g. preparation of the software programs for data entry and tabulation, and drafting form of the report. Those data were aggregated to regions and the whole kingdom, as well as the detailed information of the establishments were processed at the central office.

### 5. In Round Figures

The summation of each amount may not equal to the total due to rounding.

## 6. Errors of the Data

Data presented in this report might be subject to sampling and non-sampling errors. For instance, errors from the imputation for missing values and non-response, intentional misreporting and errors arising at coding and data entry stages. However, the NSO tried its best to minimize such errors, thus the data should be used with appropriate cautions.

## 7. Data Presentation and Reporting

Results of the operational information of manufacturing establishments are presented into 3 levels of publication.

- 1) Preliminary report of the region and the whole kingdom level.
- 2) Provincial level report consists of totally 77 volumes.
- 3) Regional and Whole Kingdom level report of consists of 7 volumes, i.e. Bangkok, Vicinity, Central region, Northern region, Northeastern region, Southern region and Whole Kingdom.