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Improving the International Comparability² of Industrial Statistics:
illustrations of UNIDO methods*

Prepared by the
Industrial Statistics and Quantitative Analysis Section
Industrial Policy and Perspectives Division

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John Smith

Introduction

The UNIDO Data Base (UDB)^{1/} contains series of industrial statistics that cannot be found elsewhere, not even in the national sources of countries to which they relate. These series are produced by the work of UNIDO statisticians and are used by a great number of international and national organizations as well as by private firms and researchers. Scrupulous users are legitimately concerned about the nature and the quality of the data put at their disposal and, aware of this, UNIDO has endeavoured to document its methods and to invite comments.

The present paper contributes to this effort by illustrating how UNIDO statisticians develop sets of international industrial statistics which meet acceptable standards of consistency and comparability in terms of the statistical definitions and concepts employed in compiling the country data. The purpose of this paper consists in presenting country-monographs emphasizing the most frequent types of problems encountered. As a consequence, relevant aspects of the routine work performed by statisticians are not discussed. These aspects include data screening, checking, editing and, last but not least, the work involved in the interface between statisticians and data base management system.

Problems addressed

The UDB includes data covering about 150 countries. The statistics are collected from the United Nations Statistical Office (UNSO), other international organizations, national statistical publications, specific subject matter sources as well as from field surveys. In addition, UNIDO generates its own estimates to redress anomalous data and to supplement missing information. By far the largest single supplier of data is UNSO. UNSO does not generate these data itself but gathers them in the form of questionnaires filled by the national statistical organizations.

The data reported in the questionnaires by the countries themselves constitute, of course, invaluable information if only because most of it is directly collected from industrial establishments. However, this information requires statistical scrutiny and, often, treatment before it can be incorporated in the UDB. The usefulness of a data base derives from its ability to relate diverse data files. In this respect, computer and software are powerful tools but they remain useless as long as the data to be related is not comparable. This indeed is the case with information emanating from many national offices. That data requires considerable standardization in order to be usefully entered in the UDB.

^{1/} Responsibility for the maintenance and development of the UNIDO Data Base lies with the Industrial Statistics and Quantitative Analysis Section, UNIDO, P.O. Box 300, A-1400 Vienna, Austria. Details with respect to the nature and contents of the data base will be given on request.

Although the international community sustains continuous efforts to promote international standards, divergences in national practices persist in the key areas of classification, concept definition and coverage. The classification used in the UDB is the International Standard Industrial Classification (ISIC). A number of countries adhere to ISIC or to classifications that can easily be matched with ISIC but many other countries do not. A lack of concordance between classifications can seriously jeopardize data comparability as can be seen from the following table:

Country A	Classification Country B	Country C
Machinery	Electrical machinery	Agricultural machinery and transport equipment
Other manufactures	Non-electrical machinery	Textile machinery and transport equipment
	Transport equipment	Other machinery and transport equipment
	Other manufactures	Other manufactures

For the pair of countries A and B, a dichotomy "Machinery/Other manufactures" can be constructed; for the pair B and C, a dichotomy "Machinery and transport equipment/Other manufactures" can be arranged; for the triplet A, B, C, a common denominator exists only at the most aggregated level of total manufactures. In all cases considerable detail is lost.

A second source of discrepancy results from the use of different definitions of the statistical items. To take one among many possible examples, "employment" in certain countries means the number of working persons employed by an establishment, less working proprietors and unpaid workers while in other countries it means the total number of persons working for the establishment.

Another source of discrepancy arises from the use of different valuation concepts. The valuation may be in producers' prices, in factor values (the equivalent of producers' prices less indirect taxes plus subsidies) or in some other form.

Finally, statistical coverage may differ considerably from one country to another. In some cases the data refer to all establishments engaged in manufacturing. In other cases they only apply to a subset of the establishments, i.e. those having a size in excess of a pre-determined cut-off point. The cut-off point itself is often defined in terms of the employment size of the establishment but other criteria - for example, annual turnover, use of motor power or type of ownership - are also used.

These sources of discrepancy are able to jeopardize data comparability not only between countries but also within a given country, through time. Indeed, in the course of time, coverage, valuation, definition and even classification undergo modifications which may alter drastically the entity to which the data refers. Standardizing as much as possible the information transmitted by UNSO is only one part of the statisticians' intervention. Another problem that needs to be addressed is to supplement missing information.

The basic requirements of the UDB, as far as industrial statistics are concerned, consists in yearly figures for the 28 branches comprising the manufacturing sector at the three-digit level of ISIC. Modest as it is this requirement is often not met by the information emanating from the national statistical offices. Collecting and processing data from hundreds or thousands of establishments is a considerable task involving resources scarcely found in any country: qualified manpower, financial means as well as a co-operative spirit between enterprises and administration. As a result the information is not collected or not processed for one or several branches, statistical items, years. The following table shows an imaginary availability report where dots and crosses respectively indicate missing and available information.

Years	Statistical item	Country A		Country B		Country C	
		Branch i	Branch ii	Branch i	Branch ii	Branch i	Branch ii
1	value added	...	x	x	x	x	...
	employment	x	...	x	x	...	x
2	value added	x	x	...	...	x	x
	employment	x	x	...	...	x	x
3	value added	x	...	x	x	...	x
	employment	...	x	x	x	x	...

Only one third of the desired information is missing yet the comparison between countries, branches of industry and years is limited. None of the six time-series is complete, neither the branches nor the statistical items can be aggregated over the three countries in any year, only 8 out of 28 productivity ratios (value added over employment) can be calculated.

In order to supplement missing information UNIDO gathers documents from a large array of sources: publications of national statistical offices, international organizations, field surveys conducted by experts, etc. Any data found able to fill a gap is extracted, checked and standardized but unavoidably the exploitation of supplementary sources brings about only a marginal improvement in availability.

Accordingly, data development includes a third stage consisting of imputations. Imputations are made only when a basis can be found in reliable data deriving from observation. The methods used are described at length in the country cases. Once adjustments are completed, all data compiled from UNSO, supplementary sources and estimates are checked again for errors and inconsistencies before incorporation in the UDB.

The four case studies presented hereafter have been selected to illustrate salient aspects of the work of the statisticians in the course of several phases of data development. To simplify the exposition only four statistical items have been retained: number of persons engaged, wages and salaries, gross output and value added. A case study starts with a table displaying the data transmitted by UNSO and ends with a table showing the data that will be

incorporated in the UDB. The contrast between the two tables reflects the work of UNIDO statisticians. This work requires considerable application but also a good deal of initiative. Indeed, almost every country presents a specific problem. The cases of Argentina and Mexico have been selected to illustrate how a modest core of data provided through UNSO is combined with several supplementary sources to generate a complete set of estimates. The case of Burkina-Faso illustrates a situation where no data at all are provided to UNSO. Singapore is a case where, on the contrary, UNSO transmits an almost full set of data; the study shows how these data are amended to expand the coverage.

Argentina

As far as industry is concerned, Argentina is one of the major developing countries. Therefore, it is most desirable to have this country represented in the industrial data base by complete and reliable statistics.

Unfortunately, the figures supplied by the Instituto Nacional de Estadística y Censos to UNSO are far from complete. Table 1 shows an example of the data provided by UNSO for 1982. While comparing the contents of this table to the full set of data ideally required for 1982, three deficiencies are immediately apparent:

- (i) no information is available for value added;
- (ii) for the three other items, information is given only for 15 out of the 28 three-digit branches;
- (iii) no totals are available for the manufacturing sector.

A fourth, less evident, deficiency should be mentioned. The coverage of the 15 branches is limited to "selected industries" (see the footnote to table 1). The country note accompanying the statistics supplied to UNSO does not report the extent to which "selected industries" cover the respective 3-digit branches to which they belong. However, this coverage can be considered as very low. For instance, the industries selected to represent the textile branch (ISIC 321) are reported to have only 880 employees in 1982, a number which intuitively can be held as vastly inferior to the real numbers of employees in the textile sector of Argentina.

Correcting the four deficiencies without indulging in too much guess work requires the help of supplementary information. Accordingly, the first steps of the correction exercise consisted in assembling as much documentation as possible and in identifying information that could be employed usefully.

Outstanding in this respect was the Censo Nacional Económico 1974 which provides data covering all establishments for employees, wages and salaries, gross output and value added at the required 3-digit level for the year 1973. Indeed, all the desired information was in the Census but only for one year. The remaining task thus consisted in finding estimates for other years.

Table 1 Argentina - Data supplied through UNSO ^{a/}

ISIC	Industry	Average number	Wages & Salaries	Gross Output	Value
		of employees	(million Argentine pesos)		Added
		(number)			
		1982	1982	1982	1982
311/2	Food products	30560	235.4	4189.6	...
313	Beverages	2960	25.8	178.7	...
314	Tobacco	5180	71.0	2042.9	...
321	Textiles	880	9.1	100.2	...
322	Wearing apparel	...	...	...	...
323	Leather and products	...	...	...	...
324	Footwear	...	...	...	...
331	Wood products	...	...	...	...
332	Furniture, fixtures	...	...	...	...
341	Paper and products	12760	109.6	1127.7	...
342	Printing, publishing	...	...	...	...
351	Industrial chemicals	12180	125.3	1282.6	...
352	Other chemical products	10420	107.9	990.0	...
353	Petroleum refineries	...	...	...	...
354	Petroleum coal products	...	...	...	...
355	Rubber products	5600	76.1	950.9	...
356	Plastic products, n.e	150	1.0	4.7	...
361	Pottery, china, etc.	...	...	...	...
362	Glass and products	...	...	...	...
369	Non-metal products	8880	100.2	865.1	...
371	Iron and steel	18980	144.5	2829.9	...
372	Non-ferrous metals	...	...	...	...
381	Metal products	4120	34.4	255.2	...
382	Machinery, n.e.c.	3130	21.5	211.4	...
383	Electrical machinery	4080	33.7	578.3	...
384	Transport equipment	28390	388.7	1032.1	...
385	Professional goods	...	...	...	...
390	Other industries	...	...	...	...
3	Total Manufacturing	...	...	...	...

a/ Selected industries:
ISIC 311/2: vegetable oils, wheat mill products and by-products, rice, sugar;
ISIC 313: beer; ISIC 314: cigarettes and cigars; ISIC 321: wool cleaning;
ISIC 341: paper, paperboard, cardboard and pulp for paper; ISIC 351: tanning
extracts, compressed and liquid gas, sulphuric acid, cellulosic and non-cellulosic
synthetic filament and fibres, plastic materials; ISIC 352: antibiotics; paints,
lacquers and varnishes; matches; soap; ISIC 355: tyres and tubes; ISIC 356:
plastic footwear; ISIC 369: cement, fibro cement products; ISIC 371: iron
smelting, iron and steel pipes and tubes; ISIC 381: gas heating apparatus and
cooking ranges; ISIC 382: sewing machines; refrigerators and washing machines;
ISIC 383: electric light bulbs and tubes, television receiving sets, phonograph
records; ISIC 384: motor-vehicle bodies; motor vehicles, motorcycles, scooters,
including agricultural tractors (ISIC 382).

As the nature of the supplementary information that could be assembled widely differed between items, it became necessary to use four different estimations, one for each statistical item. Each of these procedures will be described below with an example.

Estimation of number of employees

The same estimation procedure was applied to all the 28 three-digit branches. Accordingly, the example used will explain how one branch, food products (ISIC 311/2), was treated. Two sources^{1/} provide index numbers of employees. One covers the period 1970-1981, the other covers the period 1981-1985. The two series of index numbers were linked to each other in order to obtain a single series spanning 1970-1985 and this series was rebased to 1973. Multiplying the number of employees given by the 1973 Census by the index numbers the estimates for the years 1970-1972 and 1974-1985 were obtained.

Estimation of wages and salaries

For 1970-1976 an index for wages and salaries per employee (1970 = 100) was derived as follows:

$$\frac{\text{Index of manhours worked (1970=100)} \times \text{Average per hour salary index (1970=100)}}{100}$$

Both indexes in the formula were published in Economic Report, Statistical Review 1970-1980. For 1977-1981, index numbers for wages and salaries per employee (1976 = 100) were available in Evolución de la Industria Manufacturera 1970-1981. For 1981-1985, index numbers for wages and salaries per employee (1976=100 and 1983=100) were found in Boletín Estadístico Trimestral, various issues. These series were linked together in order to obtain a continuous series spanning 1970-1985 and the resulting series was rebased to 1973=100. The newly obtained series on wages and salaries per employee was then combined with the series constructed on number of employees to form a series on total wages and salaries:

$$\frac{\text{Index of wages and salaries per employee(1973=100)} \times \text{Index of employees (1973=100)}}{100}$$

To derive estimates for 1970-1972 and 1974-1985, the index numbers of wages and salaries (1973=100) were multiplied by the amount of wages and salaries given by the 1973 Census.

1/ Evolución de la Industria Manufacturera 1970-1981 and Boletín Estadístico Trimestral, several issues.

Estimation of Value Added

In addition to the 1973 Census three different sources from the World Bank provide information for 1970-1984.

- a) Total value added (ISIC 3) in current national currency is annually supplied to UNSO on magnetic tape.
- b) Data for value added at the desired 3-digit level, but only at 1970 constant prices, can be found in two World Bank country studies:
 - (i) "Argentina, Economic Memorandum", Vol. II (including data for 1970-1982)
 - (ii) "Argentina: Strategies Toward Industrial and Export Development" (including data for 1983 and 1984).

The first step was to calculate an index for total value added at current prices (1973=100) that could be applied to the 1973 base given by the Census. In the second step the newly obtained value added for 1970-1972 and 1974-1984 was disaggregated to the 28 three-digit branches.

In the absence of data at current prices by branch of industry shares were calculated based on value added at constant prices as provided by the two World Bank country studies. These shares were linked to the 1973 shares derived from the census data. Finally, the shares were applied to total value added at current prices to obtain estimates for the years 1970-1972 and 1974-1984.

Estimation of Gross Output

For 1970-1982 a World Bank country study "Argentina, Economic Memorandum, Vol. I", provides data on gross production in US dollars for all the desired 3-digit branches, except ISIC 390 (other industries). Estimates for the missing branch ISIC 390 were calculated, new totals were derived and converted in Argentinian Pesos. Since the data are not strictly comparable with the figures given in the 1973 Census they could not be directly incorporated. A similar estimation procedure, described in the previous paragraph for value added, was used.

First, an index (1973=100) for total gross output was calculated and applied to the 1973 base given by the Census. Second, the 3-digit branch shares of gross production were used to disaggregate total gross output for the years 1970-1972 and 1974-1982.

For 1982 the results of the different estimation procedures applied to the number of employees, wages and salaries, gross output and value added are shown in table 2.

Table 2 Argentina - Data estimated by UNIDO

ISIC	Industry	Average number	Wages & Salaries	Gross Output	Value
		of employees	(million Argentine pesos)			Added
		(number)			
		1982	1982	1982	1982
311/2	Food products	239 589	1 249	26 558	7 164
313	Beverages	47 551	212	5 680	1 819
314	Tobacco	7 591	80	1 995	289
321	Textiles	71 440	351	8 34.	2 658
322	Wearing apparel	31 966	96	1 435	503
323	Leather and products	15 551	43	774	253
324	Footwear	14 982	34	448	166
331	Wood products	44 429	143	835	427
332	Furniture, fixtures	23 970	43	1 079	391
341	Paper and products	25 010	163	2 545	864
342	Printing, publishing	30 510	183	1 588	806
351	Industrial chemicals	20 376	220	4 184	1 920
352	Other chemical products	50 097	373	5 670	2 416
353	Petroleum refineries	9 377	164	5 486	1 985
354	Petroleum coal products	3 127	13	336	98
355	Rubber products	18 156	36	1 761	832
356	Plastic products, nec	19 083	70	988	438
361	Pottery, china, etc.	4 903	41	194	123
362	Glass and products	10 362	61	692	372
369	Non-metal products	59 915	242	2 229	1 157
371	Iron and steel	50 446	294	7 645	2 944
372	Non-ferrous metals	11 830	80	1 364	427
381	Metal products	83 969	349	5 436	2 343
382	Machinery, n.e.c.	34 019	213	4 163	1 674
383	Electrical machinery	52 555	186	2 463	1 146
384	Transport equipment	101 362	814	7 217	2 607
385	Professional goods	5 463	34	254	137
390	Other industries	14 897	35	428	203
3	Total Manufacturing	1 082 526	5 822	101 794	36 162

Burkina Faso

This country is representative of a situation where very few figures are made available to UNSO. A glance at table 3 is enough to realize how much is left to be desired. Four problems have to be dealt with. First, no information is given for three statistical items: wages and salaries, gross output and value added. Second, the number of employees is given only for 6 out of 28 branches required as a standard disaggregation in the UDB. Third, no information is given for years after 1978. Fourth, it is unclear to which extent "principal enterprises" are representative of the population of enterprises. The coverage anyway seems to fluctuate significantly as suggested by the observation that the number of employees more than doubles between 1974 and 1975.

A search for supplementary information was carried out but remained fruitless. Imputation was not feasible due to the lack of a sound basis to produce estimates. As a last resource, UNIDO hired a consultant who collected non-published information from the Institut national de la statistique et de la démographie and produced his own estimates. The consultant's report

Table 3 Burkina Faso - Data supplied through UNSO

<u>ISIC</u>	<u>Industry</u>	<u>Average number of employees a/</u>								
		<u>(number)</u>								
		<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
313	Beverages	150	153	172	190	251	265	285	471	639
314	Tobacco	61	49	54	53	55	55	63	63	60
321	Textiles	521	553	591	585	606	629	635	616	745
323	Leather and products	19	23	36	34	37	38	46	46	48
324	Footwear	118	101	98	101	105	143	151	162	367
390	Other industries b/	453	462	479	359	460	2493	3569	3535	3222
3	Total manufacturing	1322	1341	1430	1322	1514	3623	4749	4893	5081

a/ In principal enterprises.

b/ Manufacturing activities other than those for which separate data are shown.

provided information concerning the four required items during the years 1974 to 1983. In general, the data compiled and estimated were retained satisfactory. In a few instances, however, the consultant's figures were substituted by UNIDO estimates. Two examples are given below.

Example A

Where number of employees (E) is expressed in numbers, wages and salaries (WS), gross output (GO) and value added (VA) are expressed in million CFA francs. The figures in brackets are those which have been substituted.

<u>Tobacco manufactures</u>						
<u>Years</u>	<u>E</u>	<u>WS</u>	<u>GO</u>	<u>VA</u>	<u>WS/VA</u>	<u>WS/E</u>
1974	260	48	259	161	.30	184615
1975	272	(30)50	328	174	(.17).29	(110294) 187500
1976	286	(43)57	370	196	(.22).29	(150350) 199301
1977	249	61	417	217	.28	244980

It can be seen that in 1975 and 1976 wages and salaries decrease while the three other items increase. The procedure adopted to redress this apparent anomaly was to interpolate the ratios of wages and salaries to value added (WS/VA) for the years 1974 and 1977 to the intermediate years. Multiplying VA by the new ratios gave new WS which divided by E gave new wage rates (WS/E).

Example B

Manufacture of fabricated metal products except machinery and equipment

<u>Years</u>	<u>E</u>	<u>WS</u>	<u>GO</u>	<u>VA</u>	<u>VA/GO</u>	<u>VA/E</u>
1980	190	137	1295	208	.16	1094737
1981	200	145	1521	(336)243	(.22).16	(1680000)1215000
1982	210	120	1295	204	.16	971429
1983	220	124	1245	182	.15	827273

In 1981 value added increases significantly (62 per cent from 1980 to 1981) while the number of employees only increases by 5 per cent, wages and salaries by 6 per cent and gross output by 17 per cent. Here again, the ratio of value added to gross output for the years 1980 and 1982 was used for the year 1981. Multiplying this ratio by gross output gave a new estimate for value added in 1981 which, once divided by E, gave a new productivity ratio (VA/E). In table 4 data as finally incorporated into the UDB are shown for selected years.

Table 4. Burkina Faso - Data estimated by UNIDO

ISIC	Industry	Average number of employees (number)			Wages and Salaries (million CFA francs)		
		1976	1981	1983	1976	1981	1983
311/2	Food products	2883	2829	2884	957	2837	3518
313	Beverages	949	1196	1212	292	866	1198
314	Tobacco	286	300	309	57	126	174
321	Textiles	1109	1192	1223	698	1262	1302
322	Wearing apparel	13	26	30	9	22	25
323	Leather and products	74	74	76	32	78	88
324	Footwear	33	52	61	21	52	58
331	Wood products	15	21	25	10	31	38
332	Furniture, fixtures	192	194	195	85	272	336
341	Paper and products	34	49	51	26	40	52
342	Printing, publishing	124	120	121	65	202	235
351	Industrial chemicals	155	165	169	64	135	123
352	Other chemical products	46	50	50	21	45	41
353	Petroleum refineries	0	0	0	0	0	0
354	Petroleum coal products	0	0	0	0	0	0
355	Rubber products	467	500	514	197	416	381
356	Plastic products n.e.c.	330	362	370	137	289	265
361	Pottery, china etc.	53	31	40	23	15	19
362	Glass and products	0	0	0	0	0	0
369	Non-metal products	109	73	93	54	35	44
371	Iron and steel						
371A		103	109	115	31	99	111
372	Non-ferrous metals						
381	Metal products	165	200	220	57	145	124
382	Machinery, n.e.c.	63	77	80	25	63	85
383	Electrical machinery	135	163	176	47	120	164
384	Transport equipment	270	354	380	75	249	341
385	Professional goods	0	0	0	0	0	0
390	Other industries	201	213	216	133	198	266
3	Total Manufacturing	7809	8350	8611	3116	7597	8988

Table 4 (continued)

<u>ISIC</u>	<u>Industry</u>	<u>Gross output at factor cost</u> <u>(million CFA francs)</u>			<u>Value added at factor cost</u> <u>(million CFA francs)</u>		
		<u>1976</u>	<u>1981</u>	<u>1983</u>	<u>1976</u>	<u>1981</u>	<u>1983</u>
311/2	Food products	23152	44324	60441	8111	13645	22345
313	Beverages	6629	12691	16164	4090	6881	8525
314	Tobacco	370	708	902	196	330	496
321	Textiles	6201	14942	18414	2056	4967	6669
322	Wearing apparel	695	1676	2065	229	553	743
323	Leather and products	492	1186	1462	178	431	579
324	Footwear	740	1782	2196	362	869	1166
331	Wood products	102	211	239	22	49	63
332	Furniture, fixtures	866	1801	1989	197	431	555
341	Paper and products	95	159	200	49	86	84
342	Printing, publishing	241	807	907	125	437	382
351	Industrial chemicals	742	1165	943	282	378	335
352	Other chemical products	237	416	337	77	104	91
353	Petroleum refineries	0	0	0	0	0	0
354	Petroleum coal products	0	0	0	0	0	0
355	Rubber products	2033	2711	2196	794	1064	942
356	Plastic products n.e.c.	1074	1558	1262	397	533	473
361	Pottery, china etc.	215	62	77	104	36	40
362	Glass and products	0	0	0	0	0	0
369	Non-metal products	300	115	161	144	65	84
371	Iron and steel						
371A		249	849	1138	106	308	453
372	Non-ferrous metals						
381	Metal products	549	1521	1245	117	243	182
382	Machinery, n.e.c.	242	671	549	76	158	118
383	Electrical machinery	514	1424	1166	137	285	214
384	Transport equipment	1795	4971	4072	298	621	467
385	Professional goods	0	0	0	0	0	0
390	Other industries	3073	4517	5672	2090	3394	4245
3	Total Manufacturing	50606	100267	123797	20237	35868	49251

Mexico

Mexico is a peculiar case in the sense that the information received through UNSO is satisfactory for two variables, gross output and value added but deficient, on account of the UDB requirements, for the two other variables, wages and salaries and number of employees. The reason is simply that the answers to the questionnaires are compiled from the records of two different sources. Data related to employment and wages and salaries are derived from the industrial survey^{1/} covering a small number of selected industries whereas the data on gross output and value added are taken from national accounts estimates.

Table 5 shows the data on employment and wages and salaries received through UNSO. The industrial survey covers only 58 industries out of the 225 industrial groups of the national industrial classification. In the case of food products, for example, the industrial survey covers only 16% of wages and salaries in 1980. Such a coverage is of course too low to be accepted in a pool of internationally comparable data. Moreover, a comparison with gross output and value added, which cover total manufacturing, is impossible.

The search for additional information uncovered two documents which were used to perform UNIDO estimates.^{2/} Sistema de Cuentas Nacionales de México, 1979-1981 (SCN) contains employment data^{3/} for the years 1975 and 1979-1981 disaggregated at branch level and covering all the manufacturing sector.^{4/} The other document La Economía Mexicana en Cifras gives employment data for the years 1970-1974, 1976-1978 and 1982. The coverage is complete but the information is not disaggregated at branch level. Only totals for the manufacturing sector as a whole are available. Concerning wages and salaries, the only supplementary information that could be found comes from the SCN and refers to the years 1979-1981.

As the availability of supplementary information is not the same for both items, two different estimation procedures have been used.

1/ Monthly Industrial Survey, Dirección General de Estadística, Secretaría de Programación y Presupuesto, Mexico, D.F.

2/ Sistema de Cuentas Nacionales de México, 1979-1981, Tomos I-III, Instituto Nacional de Estadística, Geografía e Informática, SPP, México. La Economía Mexicana en Cifras, Edición 1984, Nacional Financiera, México.

3/ The data obtained from SCN refer to persons engaged. They differ slightly from the standard definition of persons engaged, since they refer to the average number of paid jobs necessary for production.

4/ The national classification used in the SCN is not directly comparable to the ISIC, but can be converted to it in most cases. In those cases where it was necessary to subdivide the data given for one industrial subsector according to the national Mexican classification into two or more industrial branches according to the ISIC, the proportions used for this disaggregation were taken from the respective gross output figures.

Table 5. Mexico - Data supplied through UNSO

ISIC	Industry	Average Number of Employees (thousands)				Wages and Salaries (million pesos)			
		1970	1975	1980	1984	1970	1975	1980	1984
311/2	Food products	55.7	60.8	74.2	71.7	1086	2311	7118	34654
313	Beverages	15.1	51.5	67.4	67.6	508	2277	7548	37314
314	Tobacco	6.0	4.6	5.5	5.5	193	229	750	3798
321	Textiles	54.8	59.2	58.6	51.5	1213	2399	6069	26230
322	Wearing apparel	...	...	...	...	...	...	...	...
323	Leather and products	...	...	...	...	...	...	...	...
234	Footwear	...	...	...	...	...	...	...	...
331	Wood products	4.8	4.7	5.7	5.1	87	164	518	2206
332	Furniture and Fixtures	...	...	...	...	...	...	...	...
341	Paper and products	24.0	25.3	30.7	29.1	747	1507	4419	20880
342	Printing, publishing	...	...	...	...	...	...	...	...
351	Industrial chemicals	14.9	25.1	30.6	29.9	409	1342	4526	18471
352	Other chemical products	14.2	36.5	41.4	41.4	462	2393	6164	33028
353	Petroleum refineries	...	...	...	...	...	...	...	...
354	Petroleum, coal products	1.7	3.9	4.9	4.3	52	197	654	2839
355	Rubber products	6.6	8.3	11.0	11.7	310	751	2342	14244
356	Plastic products n.e.c.	...	...	...	...	...	...	...	...
361	Pottery, china, etc.	...	...	...	...	...	...	...	...
362	Glass and products	16.9	19.8	24.5	19.5	444	1038	3372	14223
369	Non-metal products, n.e.c.	10.0	16.1	20.5	22.1	313	1004	3306	18284
371	Iron and steel	42.0	47.4	64.4	64.2	1303	2887	10623	50328
372	Non-ferrous metals	10.6	12.9	16.8	17.1	283	650	2148	11046
381	Metal products	15.3	23.3	27.0	20.2	382	1022	3281	11043
382	Machinery n.e.c.	1.7	6.0	6.6	5.1	55	315	1044	4005
383	Electrical machinery	22.3	33.3	40.2	33.3	594	1444	4904	15710
384	Transport equipment	...	46.4	57.4	45.2	...	2788	9575	31539
385	Professional goods	...	...	...	...	...	...	...	...
390	Other industries	...	...	...	...	...	...	...	...
3	Total Manufacturing	...	...	...	...	...	...	...	...

Estimation of persons engaged

For the years 1975 and 1979-1981 the data from SCN were taken as such. For the years 1970-1974, 1976-1978 and 1982 information is available for the sector as a whole but not by branches. The share of each branch was estimated by extrapolation of available data to the missing years. The number of persons engaged was then calculated by distributing the totals according to the extrapolated shares. For the years 1983 and 1984 the estimates of previous years were extrapolated in line with the trend of the data with limited coverage available from UNSO. (Example of estimates for employment are shown in table 6)

Estimation of wages and salaries

From the series available from UNSO, 18 branches were derived for series on wages and salaries per employee to be used as extrapolating indexes. Each of the 10 missing branches was assumed to follow the same trend as an available branch selected on the basis of its proximity in the ISIC structure. As no available branch is close enough to ISIC 385 (professional goods) and to ISIC 390 (other industries) the index assigned to both these branches was a weighted average of the indexes pertaining to the 26 other branches. The 28 indices obtained in this fashion were multiplied by the respective branch ratios of wages and salaries per employee derived from the national account sources. Years from 1970 to 1978 were multiplied by the ratios of the year 1979 whereas years from 1982 to 1984 were linked to the ratios of the year 1981. Finally, the estimated wages and salaries per employee were multiplied by the estimated number of persons engaged to derive estimates for wages and salaries. (Examples of estimates for wages and salaries are shown in table 6).

Singapore

Unlike the previous country examples, this one starts with a fairly complete set of statistics transmitted through UNSO. Examination of table 7, however, reveals two problems. First, two pairs of branches appear with aggregated data. Second, the coverage is restricted to the establishments of 10 or more employees.

With respect to the first problem, UNIDO found no way to disaggregate the first pair comprised of the branches "petroleum refineries" and "petroleum and coal products" but could split the other pair "pottery, china, etc." and "glass products". Information concerning the latter pair was available separately for the two branches until 1974. After that date, the national statistical office decided to combine the two branches in order to protect the confidentiality of statistical information. To perform a split of the combined data UNIDO statisticians measured the relative weight of the two branches in 1974 and assumed that the ratios found for each statistical item remained constant in all following years.

Table 6. Mexico - Data estimated by

<u>ISIC</u>	<u>Industry</u>	<u>Average number of Persons Engaged</u> (thousands)			
		<u>1970</u>	<u>1975</u>	<u>1980</u>	<u>1984</u>
311/2	Food products	385	412	461	395
313	Beverages	79	94	115	108
314	Tobacco	9	10	12	9
321	Textiles	128	158	215	204
322	Wearing apparel	109	112	88	55
323	Leather and products	33	38	43	40
234	Footwear	75	80	99	97
331	Wood products	47	54	85	84
332	Furniture and Fixtures	41	52	59	60
341	Paper and products	36	42	54	46
342	Printing, publishing	47	57	75	68
351	Industrial chemicals	43	62	82	86
352	Other chemical products	55	70	93	93
353	Petroleum refineries	21	23	28	26
354	Petroleum, coal products	8	10	10	9
355	Rubber products	19	22	29	27
356	Plastic products n.e.c.	28	35	48	46
361	Pottery, china, etc.	16	18	20	18
362	Glass and products	19	22	28	22
369	Non-metal products, n.e.c.	76	90	109	102
371	Iron and steel	47	59	81	77
372	Non-ferrous metals	17	17	21	20
381	Metal products	105	118	137	119
382	Machinery n.e.c.	47	70	112	121
383	Electrical machinery	107	124	129	104
384	Transport equipment	90	112	140	135
385	Professional goods	10	12	12	9
390	Other industries	29	29	32	29
3	Total Manufacturing	1726	2002	2417	2209

Wages and Salaries
(million pesos)

<u>1970</u>	<u>1975</u>	<u>1980</u>	<u>1984</u>
7367	15368	44121	184789
2954	4634	14815	66616
264	409	1446	5667
3029	6854	24181	115197
2198	4141	8288	25558
716	1512	4651	20422
1618	3165	10853	49640
742	1632	7114	34924
646	1538	4943	24805
1276	2852	8442	38139
1441	3349	9784	46064
1766	4950	18998	80263
2135	5465	16954	95433
1411	2589	9156	37886
249	520	1332	5866
840	1885	6631	35011
656	1588	5692	27504
318	713	2045	9500
688	1589	5429	22760
1519	3582	11150	52814
1914	4721	17921	83776
624	1185	3360	16468
2872	5650	18267	80813
1678	3981	18279	99467
3251	6866	18513	72230
3027	7693	25747	104190
280	628	1737	6342
837	1564	4426	19369
46316	100623	324275	1461513

Table 7. Singapore - Data supplied through UNSO
(Coverage: Establishments with 10 or more employees)

ISIC	Industry	Average	Wages & Salaries	Gross Output	Value Added
		number of Employees (number)	(thousand dollars)	(million dollars)	(million dollars)
		1983	1983	1983	1983
311/2	Food products	10040	129700	1936	354
313	Beverages	2490	36500	318	148
314	Tobacco	860	19200	207	89
321	Textiles	4590	49900	272	94
322	Wearing apparel	26920	216100	939	333
323	Leather & Products	940	8200	41	13
324	Footwear	1190	10300	44	18
331	Wood products	5880	64800	468	139
332	Furniture & Fixtures	6740	63700	282	111
341	Paper & Products	3740	51500	331	146
342	Printing & Publishing	13580	196500	833	459
351	Industrial chemicals	2280	43200	383	142
352	Other chemical products	4540	90500	885	496
353)353A	Petroleum refineries				
354)	Petroleum coal products	3760	148000	13164	1383
355	Rubber products	2420	33900	531	73
356	Plastic products n.e.c.	8500	86500	547	195
361)361A	Pottery, china etc.				
362)	Glass products	990	16300	94	34
369	Non-metal products n.e.c.	6530	105000	1238	383
371	Iron & Steel	1640	36300	333	123
372	Non-ferrous metals	630	10700	154	33
381	Metal products	20930	276500	1815	692
382	Machinery n.e.c.	22250	365300	2050	870
383	Electrical machinery	81250	945600	8219	2357
384	Transport equipment	26890	467700	1866	929
385	Professional goods	5190	59900	269	120
390	Other industries	5320	55100	430	121
3	Total Manufacturing	270090	3586900	37649	9855

With regard to the coverage problem, it was decided to bring in to its fold data for establishments with 5-9 persons engaged. In certain branches, particularly the labour-intensive ones such as wearing apparel or furniture, the small-scale sector makes an important contribution to activity in employment. If this component is missing it may be quite misleading to bring Singapore into comparison with countries where the small-scale sector is better documented.

Figures for establishments with 5-9 persons engaged can be found in the 1973, 1978 and 1983 issues of the Report on the Census of Industrial Production. On the basis of these data, coefficients were calculated representing the contribution of establishments with 5-9 persons engaged as a fraction of the establishments with 10 or more persons engaged. The formula used is $M = M_L \times (C+1)$

$$\text{where coefficient } C = \frac{M_s}{M_L} ;$$

M_s is establishments with 5-9 persons engaged;

M_L is establishments with 10 or more persons engaged;

$M = M_s + M_L$, i.e., establishments with 5 or more persons engaged.

Since coefficients derived from census data were only available for the years 1973, 1978 and 1983 and as they remained stable over this period of time those coefficients were applied to all the years for which inadequate coverage existed. For the period between 1963 and 1973, the only available coefficients, those of 1973, were applied. Since another series of coefficients became available in 1978, the average of coefficients for 1973 and 1978 were applied to the years 1974-1977. For the year 1978 the coefficients of 1978 were applied and, again, the average of coefficients for 1978 and 1983 were applied for the years from 1979-1982. For the years 1983-1985, 1983 coefficients were the nearest in time and were thus applied. Data resulting from the application of these coefficients are shown in table 8.

Table 8. Singapore - Data estimated by UNIDO
(Coverage : Establishments with 5 or more employees)

ISIC	Industry	Average	Wages & Salaries	Gross Output	Value Added
		number of Employees (number)	(thousand dollars)	(million dollars)	(million dollars)
		1983	1983	1983	1983
311/2	Food products	11215	135536	2000	374
313	Beverages	2505	36573	319	148
314	Tobacco	860	19200	207	89
321	Textiles	4728	50698	280	96
322	Wearing apparel	28966	224528	1012	359
323	Leather & Products	1153	9086	50	17
324	Footwear	1680	12143	65	24
331	Wood products	6080	65966	482	143
332	Furniture & Fixtures	7657	68222	331	126
341	Paper & Products	3901	52272	339	149
342	Printing & Publishing	14517	256142	875	479
351	Industrial chemicals	2280	43200	383	142
352	Other chemical products	4703	91948	897	500
353)353A	Petroleum refineries				
354)	Petroleum coal products	3760	148000	1316	1383
355	Rubber products	2444	34137	533	73
356	Plastic products n.e.c.	8849	88836	568	202
361	Pottery, china etc.	182	1480	7	3
362	Glass products	898	15280	94	33
369	Non-metal products n.e.c.	6667	106260	1252	386
371	Iron & Steel	1640	36300	333	123
372	Non-ferrous metals	667	11010	160	34
381	Metal products	22144	284518	1886	719
382	Machinery n.e.c.	23763	37816	2126	905
383	Electrical machinery	81656	946546	8244	2366
384	Transport equipment	27562	473780	1905	945
385	Professional goods	5242	60319	271	121
390	Other industries	5740	57194	456	128
3	Total Manufacturing	281459	3707991	38239	10067