

INTRODUCTION

The Index of Industrial Production measures the relative change in the production of Industrial commodities, with respect to a given base year. Therefore the Index can be viewed as an economic indicator used to measure a country's manufacturing output over a period of time.

The measurement is related to a fixed year, which is referred to as the **base-year**. The base-year is 1994 and can be expressed as 1994=100. This indicates that the volume of production during this year, for any industry, is equated with 100 percent. Therefore the index is a number expressed as a percentage of the base period production levels. In subsequent time periods the changes in the index number above or below 100 would indicate the percentage increase or decrease in the level of production, of the relevant industry relative to the base year.

The 1994 Index covers an additional 32 companies, which were not in existence when the 1982 industrial census was carried out. The inclusion of these new companies has resulted in an increase in the number of production indicators. There has also been an increase of the number of indicators collected from those companies selected from the 1982 based index. There are now approximately **300 indicators** in the 1994 index as compared with the 1982 index, which had approximately **80 indicators**.

Scope

The Index of Industrial Production covers the industrial activities of Manufacturing, Mining and Quarrying, and the production of Electricity, Gas and Water. The production of Water is being included for the first time.

All the Manufacturing sub-sectors operating on the island are represented in the weighting structure of the Index. Indicators are obtained from a selected number of establishments, representative of each industry group.

Sources of Data

The source of data for the Index is the monthly *Survey of Production and Sales*. This covers the major establishments within each industry group and provides data on the output indicators used in the Index.

The selection of establishments surveyed is based on the establishments' contribution to *Net Value Added* as derived from the *Industrial Census 1994*. This *Value Added* is computed as the difference between an establishment's gross receipts (i.e. the value of its products sold plus all tangible income received from other sources) and its intermediate consumption (which is, the value of raw materials used plus expenditure on other goods and services utilized).

It is also important to note that the magnitude or the direction of the production indices do not necessarily correspond to the value of sales presented for the same period.

Establishments selected must have the capacity to provide consistent monthly indicators of production from 1994 to the current period. The final aim was to obtain a sample of establishments, the combined *Value Added* of which accounted for over 70% of the *Value Added* in each major industry group.

Output Indicators

The main indicators used in the Index are the volume or quantity of finished goods produced by establishments. In the event that this was not available, the quantity of the main raw materials utilized in the production process was substituted.

Weight and Comparison Base

The *Industrial Census 1994* provided more up-to-date information on the Industrial Sector in Barbados. As a result, the year 1994 was therefore selected as the base year for the new index. In addition, information collected from the census was used to provide the weights for the index.

Weighting System

Generally, a *weight* is used in the Index to reflect the relative importance of an item to the whole "basket" of items. Each item in the "basket" of items is given a number or weight and this is used when calculating an average for the group of items (i.e. a weighted average).

Weights are employed at three (3) levels in the Index:

- (a) **The Product level.** When an establishment provides data for two (2) or more products. The weight for each product is calculated as the proportion of its annual 1994 production value (sales are used as a substitute) to the value of the establishment's total production (i.e. total annual sales, in 1994).
- (b) **The Establishment level.** Within an industry group, the establishments included in the sample for the Index are weighted according to their *value added* contribution in 1994 (*Industrial Census 1994*). Where an establishment produces different products that span more than one industry group, its *value added* contribution in 1994 is prorated to each industry group in proportion to the value of annual 1994 sales of products in each of the industry groups.
- (c) **The Industry Group/ Division levels.** These weights are obtained from the estimated *net value added* contribution of *all active establishments* in the respective industry groups or divisions. These figures for the population of establishments are estimated from the results of the *Industrial Census 1994*. The *Value Added* weights are shown in Table 1. (See page 6)

METHODOLOGY

If the value of output of a country is measured in current dollars the index derived would reflect both changes in price and in physical output. Therefore to eliminate the impact of prices in a production index each quantity of output is valued at a base-year price.

Formula Used

The revised Index is calculated primarily on the fixed base method, according to **Laspeyres formula** - i.e. as a base-weighted average of quantity relatives.

The formula used is:

$$\text{Index} = (q_t/q_o) \times W_o \times 100 ,$$

where q_t = quantity produced in the reporting period,
 q_o = quantity produced in the base period,
 W_o = weight in the base period.

The annual Index in the base year 1994 is equal to 100. For monthly calculations of the Index, q_o is used as the *average monthly quantity produced in the base year 1994*. Correspondingly, q_t is the quantity produced in the reporting month.

The above formula is derived from the traditional Laspeyres formula, which is:

$$\text{Index (L)} = \frac{\sum (q_t P_o) \times 100}{\sum (q_o P_o)} = \frac{\sum (q_t/q_o \times q_o P_o) \times 100}{\sum (q_o P_o)}$$

where P_o = price (or *value added* per unit) in the base period.

From the above, it can be shown that the weight in the base period for an individual item, is equal to the following:

$$W_o = \frac{(q_o P_o)}{\sum (q_o P_o)}$$

i.e. the value added of an item, divided by the sum of the value added of all items in the group.

The use of the modified formula allows for calculation of the Index on a monthly basis. Since the weights are fixed for the base period, they are calculated only once. The base period quantity is known and the only variable is the quantity collected in the reporting period.

However, a limitation of this formula is that the index is based on the same fixed, predetermined number of items, in each time period. This does not allow the easy introduction of new data series (for indicators/establishments).

Data Collection

On a monthly basis, the questionnaire is sent via mail to selected establishments. In the case of delinquent respondents, follow-up is done by telephone or by field visits.

A form is sent to each establishment monthly, requesting a list of the major products/items produced. For each product listed, information is requested on the unit of quantity, unit price, quantity produced and the value of sales.

When the forms are returned to the Department, they are reviewed for completion and large deviations. Where there are any large deviations in production, contact is made with the respondents to provide an explanation.

Production data from the forms are then entered into a database for computation of the index. This database is updated monthly as data becomes available.

Computation

The first step is to compute *quantity relatives* for each product or indicator collected from individual establishments. This is done by dividing the quantity of the product produced in the reporting month by the average monthly quantity produced during the base-year, 1994. The result is then multiplied by 100 to obtain a percentage.

If an establishment produces only one product, the quantity relative computed as above would represent the quantity relative for the establishment. If more than one product is produced, quantity relatives need to be computed for each one. These quantity relatives would then be combined, using the **weights** for the *Individual Products*, to produce a weighted-average quantity relative for the establishment.

e.g. *Calculation of Quantity Relatives for each Product of Establishment 1*

Product	Unit	Quantity Produced		Quantity Relative
		Month 1	Monthly Average 1994	
A	Kg	1,200	1,000	120.00
B	Lt	2,600	2,000	130.00
C	No.	500	600	83.33

e.g. **Calculation of Quantity Relative for Establishment 1**

Product	Product Weights	Quantity Relative	Weights x Quantity Relative.
A	0.40	120.00	48.00
B	0.25	130.00	32.50
C	0.35	83.33	29.17
Total Establishment 1	1.00		109.67

Once the quantity relatives have been produced for each establishment, they are then combined at the industry level (i.e. using the individual establishment's 1994 *value-added* weights) - i.e. Each *establishment's quantity relative* is multiplied by the corresponding *establishment's weight*. These products are summed. Their total is then divided by the sum of the establishments' weights, for the particular industry group. This results in an index number for the industry group.

e.g. **Calculation of Quantity Relative for Industry Group B**

Establishments	Establishment Weights (VA 1994)	Quantity Relative	Weights x Quantity Relative.
1	6,000.00	109.67	658,020.00
2	13,000.00	103.00	1,339,000.00
3	2,500.00	125.00	312,500.00
Industry Group B	21,500.00	107.42	2,309,520.00

The index (quantity relative) for each industry group is next aggregated by major groups and divisions. This is achieved by using the **weights** at the *Industry group* level (i.e. the industry group's global *value-added* estimates for 1994, expressed as a *percentage of 1000*) to compute a weighted average figure (index).

e.g. **Calculation of Quantity Relative (Index) for a Major Industry Group/Division X**

Industry Groups	Industry Weights	Quantity Relative	Weights x Quantity Relative
F	81	107.42	8,701.02
H	32	112.00	3,584.00
M.I.G./Division X	113	108.72	12,285.02

The above procedure is used to compute the *All Industries* index. That is, the index computed for each division is multiplied by the corresponding division's weight. The resulting products are summed for all divisions. Finally, this total is divided by the overall industry weight (i.e. the sum of all the divisions' weights), thus producing the required index.

The computation outlined above, from the product's quantity relative stage to the All Industries Index, is done on a monthly basis.

Industry Groups

The same industry group categories used in the earlier Index (1982=100) are maintained, in order to allow some measure of comparability between the two Indices.

APPENDIX: Table 1

VALUE ADDED WEIGHTS (AT INDUSTRY LEVEL) BY INDUSTRY GROUPS 1994 and 1982

ISIC Code	Description of Industry	1994 Value Added WEIGHTS (%)	1982 Value Added WEIGHTS (%)
311-312	FOOD MANUFACTURING	14.8	15.6
313	BEVERAGES	8.1	7.8
314	TOBACCO	3.2	2.0
322	WEARING APPAREL	2.1	12.2
331-332	WOOD PRODUCTS, FURNITURE	1.6	2.9
351	INDUSTRIAL CHEMICALS	1.0	2.9
352	OTHER INDUSTRIAL CHEMICALS	2.5	1.7
353	PETROLEUM PRODUCTS	21.4	1.8
369	NON-METALLIC MINERAL PRODUCTS	3.5	3.4
383-El.c.	ELECTRONIC COMPONENTS	4.4	11.0
SUB-TOTAL 1		62.6	61.2
321, 323	TEXTILES, LEATHER PRODUCTS	0.6	
341	PAPER PRODUCTS	1.7	
342	PRINTING, PUBLISHING	5.1	6.5
354	ASPHALT	0.1	
355	RUBBER	0.1	
356	PLASTIC PRODUCTS	1.7	
381	PREFABRICATED METAL PRODUCTS	5.0	5.5
383-Other	OTHER ELECTRICAL EQUIP.	0.9	1.2
384-385	TRANSPORT & PROFESSIONAL EQUIPMENT	1.4	1.0
382	MACHINERY, EXCEPT ELECTRICAL	-	0.9
390	OTHER MANUFACTURING n.e.c.	0.5	
Unallocated	-	-	8.2
SUB-TOTAL 2	OTHER MANUFACTURING	17.1	23.3
DIV. 3	TOTAL MANUFACTURING	79.7	84.5
220	MINING	1.1	2.9
290	QUARRYING	1.5	2.4
DIV. 2	MINING & QUARRYING	2.6	5.3
DIV. 4	ELECTRICITY, GAS AND WATER	17.7	10.2
DIV. 2,3 & 4	ALL INDUSTRIES	100.0	100.0

INDEX OF INDUSTRIAL PRODUCTION - YEAR 1994
Base (1994=100)

ISIC Code	VALUE ADDED WEIGHTS (1994)													1994
		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL INDEX
220	11	94.9	89.4	102.4	99.0	106.7	97.9	104.5	101.1	102.3	104.2	94.7	102.9	100.0
290	15	100.3	111.3	124.8	84.6	88.0	87.0	87.8	82.3	104.1	75.3	130.2	124.4	100.0
DIV. 2	26	98.0	102.0	115.3	90.7	95.9	91.6	94.9	90.2	103.4	87.5	115.2	115.3	100.0
311/312	148	88.7	90.7	101.8	102.8	97.8	100.6	94.3	92.0	99.8	101.4	109.7	120.4	100.0
313	81	79.5	66.5	130.5	72.1	111.2	117.7	87.8	74.5	109.1	118.1	119.2	113.9	100.0
314	32	82.0	111.7	101.2	75.0	91.6	141.0	144.1	8.8	89.1	106.7	155.1	93.7	100.0
313/314	113	80.2	79.3	122.2	72.9	105.7	124.3	103.7	55.9	103.4	114.9	129.4	108.2	100.0
322	21	76.1	103.9	139.3	98.9	114.1	143.7	112.2	50.1	83.1	106.5	100.6	71.5	100.0
332	16	29.1	63.1	76.5	76.2	58.4	108.5	130.9	97.9	144.4	157.9	126.6	130.5	100.0
351	10	61.9	56.6	106.5	110.9	89.3	101.1	132.6	70.4	105.3	93.0	127.6	144.9	100.0
352	25	40.7	82.8	80.0	80.0	131.9	66.7	120.4	112.9	94.9	127.7	145.7	116.3	100.0
351/352	35	46.8	75.3	87.6	88.8	119.7	76.6	123.9	100.7	97.9	117.8	140.6	124.5	100.0
353	214	122.6	69.4	91.4	87.2	98.3	98.2	113.2	104.0	97.3	102.5	109.0	106.9	100.0
369	35	82.4	84.4	143.2	85.2	98.7	106.4	124.9	120.0	111.7	81.3	69.9	91.9	100.0
38-EI	44	106.0	106.7	115.8	109.3	78.5	116.3	93.4	68.5	111.1	101.6	104.0	88.8	100.0
SUB-TOTAL (1)	626	95.3	81.0	105.0	90.0	98.9	105.8	107.3	88.7	101.5	105.6	112.2	108.6	100.0
321,323	6	154.5	157.0	135.4	59.1	118.9	154.4	119.5	118.7	39.3	29.9	40.3	73.0	100.0
341	17	138.6	35.2	72.7	63.9	71.9	116.7	132.2	191.4	55.5	133.3	94.1	94.4	100.0
342	51	82.6	88.5	103.9	104.1	95.8	102.3	110.2	104.2	98.4	101.5	103.2	105.3	100.0
354	1	34.4	110.0	142.9	118.0	161.8	42.9	49.7	100.7	107.3	93.3	170.6	68.4	100.0
356	17	99.0	94.7	69.8	95.3	90.0	107.3	86.0	105.6	109.8	102.7	132.7	106.9	100.0
381	50	60.1	76.7	145.0	100.4	100.7	89.1	107.2	102.4	125.0	88.4	114.2	90.7	100.0
383-Other	9	98.9	96.0	106.1	98.2	74.1	100.4	99.0	95.3	110.3	107.3	109.5	104.9	100.0
384-385	14	42.1	59.7	95.9	96.0	121.4	105.4	115.4	144.5	113.7	101.1	109.7	95.1	100.0
390	5	59.4	236.0	117.3	91.9	148.4	94.7	83.4	67.8	41.0	110.2	70.7	79.2	100.0
SUB-TOTAL (2)	170	82.3	85.2	110.6	95.3	98.0	101.7	108.1	114.8	101.2	98.9	106.5	97.1	100.0
DIV. 3	797	92.5	81.9	106.2	91.1	98.7	104.9	107.5	94.3	101.5	104.2	111.0	106.1	100.0
DIV. 4	177	96.8	88.6	99.7	96.9	102.2	98.3	102.1	102.2	98.5	106.8	103.3	104.6	100.0
DIV. 2+3+4	1000	93.4	83.6	105.3	92.1	99.3	103.4	106.2	95.6	101.0	104.2	109.7	106.1	100.0

TABLE 1A

INDEX OF INDUSTRIAL PRODUCTION
(1994=100)

INDUSTRY	ISIC Code	2004	2003	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994
		JAN	DEC										
Mining	220	84.9	89.0	82.8	87.8	104.1	124.1	157.3	128.2	73.2	80.8	101.2	100.0
Quarrying	290	167.3	137.5	189.2	232.6	202.3	220.6	210.9	183.5	156.9	125.4	95.7	100.0
Mining & Quarrying	DIV. 2	132.4	117.0	144.2	171.4	160.7	179.8	188.2	160.1	121.5	106.5	98.0	100.0
Food	311/312	108.5	114.6	118.5	120.0	112.4	109.5	117.8	120.1	114.3	116.1	105.2	100.0
Beverages & Tobacco	313/314	57.7	82.4	84.9	79.6	92.4	102.8	110.5	101.8	82.8	74.6	93.7	100.0
Wearing Apparel	322	25.1	6.9	25.1	28.8	43.0	84.2	88.3	95.5	125.1	105.6	96.3	100.0
Wooden Furniture	332	120.7	192.4	148.9	150.2	68.7	68.3	41.5	92.9	107.5	120.0	112.7	100.0
Chemicals	351/352	87.8	80.7	102.7	96.7	96.1	110.0	133.8	134.8	148.3	145.1	141.2	100.0
Petroleum Products	353	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	120.2	111.7	104.9	100.0
Non-metallic Mineral Products	369	245.5	125.4	277.1	270.8	248.3	265.1	189.6	160.9	140.8	140.0	118.7	100.0
Electronic Components	38-EI	58.9	48.6	46.0	54.4	55.9	81.7	87.0	93.2	111.4	111.2	106.8	100.0
Other Manufacturing	3-OTHER	50.0	96.5	177.9	109.3	114.3	133.1	127.5	129.2	119.2	116.1	101.8	100.0
Manufacturing	DIV. 3	60.0	69.4	95.1	80.0	79.2	88.0	87.1	90.5	115.1	110.9	104.9	100.0
Electricity, Water & Gas	DIV. 4	110.9	142.9	136.1	132.1	127.6	122.2	120.6	117.8	114.5	111.1	105.6	100.0
All Industries	DIV. 2+3+4	70.9	83.6	103.6	91.6	89.9	96.4	95.7	97.1	115.2	110.8	104.8	100.0

TABLE 1B

INDUSTRY	2004 JAN	2003 DEC	CHANGE OVER DEC		2004 JAN	2003 JAN	CHANGE OVER 2003	
			POINTS	%			POINTS	%
Mining	84.9	89.0	-4.1	-4.6	84.9	93.9	-9.0	-9.6
Quarrying	167.3	137.5	29.8	21.7	167.3	157.3	10.0	6.3
Mining & Quarrying	132.4	117.0	15.4	13.2	132.4	130.5	1.9	1.5
Food	108.5	114.6	-6.0	-5.3	108.5	126.1	-17.5	-13.9
Beverages & Tobacco	57.7	82.4	-24.8	-30.1	57.7	65.1	-7.5	-11.5
Wearing Apparel	25.1	6.9	18.2	265.7	25.1	7.3	17.7	242.7
Wooden Furniture	120.7	192.4	-71.7	-37.3	120.7	140.0	-19.3	-13.8
Chemicals	87.8	80.7	7.2	8.9	87.8	84.8	3.0	3.6
Petroleum Products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-metallic Mineral Products	245.5	125.4	120.1	95.8	245.5	206.4	39.0	18.9
Electronic Components	58.9	48.6	10.3	21.1	58.9	40.7	18.2	44.6
Other Manufacturing	50.0	96.5	-46.5	-48.2	50.0	100.7	-50.7	-50.3
Manufacturing	60.0	69.4	-9.4	-13.5	60.0	72.3	-12.3	-17.0
Electricity, Water & Gas	110.9	142.9	-32.0	-22.4	110.9	133.5	-22.6	-16.9
All Industries	70.9	83.6	-12.8	-15.2	70.9	84.6	-13.8	-16.2

SOURCE: Barbados Statistical Service

R - Revised

P – Provisional

Publication

A monthly bulletin is prepared for the Index of Industrial Production. This is routinely circulated to:

The Prime Minister
Permanent Secretary, Economic Affairs
Permanent Secretary, Ministry of Industry and International Business
Research Section, Economic Affairs
Director of Finance and Economic Affairs
Chief Budget Analyst
Research Department, Central Bank of Barbados
Chief Executive Officer, Barbados Investment & Development Corporation
Parliamentary Secretary, Ministry of Finance and Economic Affairs.

A numerical representation of the indices for each division is attached to the monthly bulletin.

The Index is also published in the Monthly Digest of Statistics of the Barbados Statistical Service, the monthly Economic and Financial Statistics of the Central Bank of Barbados and the annual Barbados Economic and Social Report, prepared by the Ministry of Finance and Economic Affairs.

CONCLUSION

Production within the economy is a dynamic process and the index is derived using a fixed base year. The Index has limitations due to the fact that newly acquired data cannot be immediately incorporated into the current index. The Index should be re-based on a regular basis to reflect any technological, economic or social change within the economy.

The Department maintains a policy of collecting additional data from companies whether or not these companies are included in the sample for the index. This is done largely to facilitate the transition to a new series. More importantly, to cover these instances where companies introduce new products or discontinue the production of others during the period under review. In some cases new companies that are included in a revised index may assume greater importance within the respective industry groups, because their relative value added contribution within the group has become significant. This would then result in the redistribution of the Industry group's weighting system.

The additional data collected, combined with data collected for the index are also valuable in providing response to requests for actual production within the various Industries.

