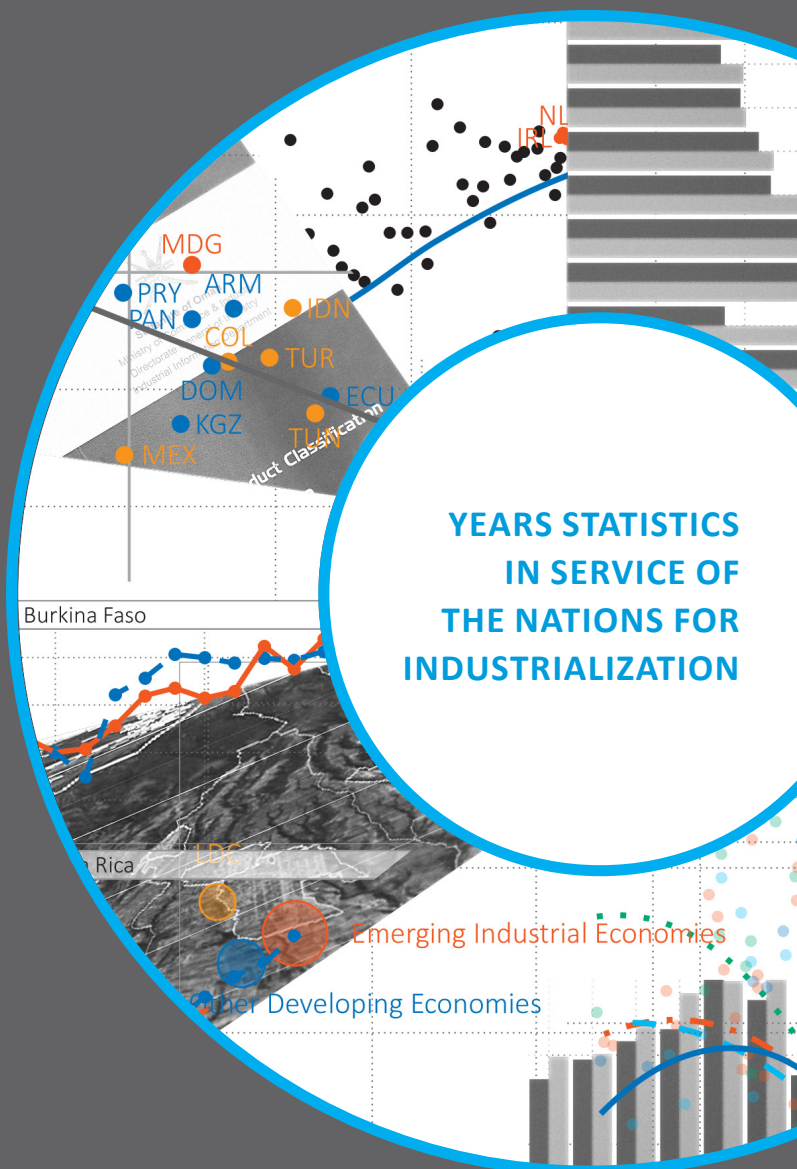
UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Proceedings of the International Seminar on Industrial Statistics



YEARS STATISTICS IN SERVICE OF THE NATIONS FOR INDUSTRIALIZATION

Dedicated to the 20th Edition of the International Yearbook of Industrial Statistics

RESEARCH, STATISTICS AND INDUSTRIAL POLICY BRANCH

Proceedings of the International Seminar on Industrial Statistics "20 Years Statistics in Service of the Nations for Industrialization" Dedicated to the 20th Edition of the International Yearbook of Industrial Statistics

11-12 June 2014
Vienna, Austria

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 2015

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Contributions to the publication were made by the meeting participants, i.e. national statistical offices, international agencies namely, the United Nations Statistics Division (UNSD), the Organization for Economic Co-operation and Development (OECD) and the Gulf Organization for Industrial Consulting, Edward Elgar Publishing Limited as well as other branches of UNIDO. A list of participants is included in the publication.

Special thanks go to the colleagues and consultants from the Statistics Unit who provided great support organizing and conducting the seminar: Rita Liang, Jürgen Muth, Raphaela Wirth, Kateryna Gumeniuk, Liliya Kirchberger, Regina McFerren, Maria Anna Di Palma, and Shohreh Mirzaei.

PREFACE

In the aftermath of the prolonged global economic recession, new policies to foster sustainable industrialization have been called for. In turn, the demand for statistical indicators and policy advisory services to accelerate industrial development and competitiveness while simultaneously promoting social prosperity and safeguarding the environment has increased.

These objectives are among the key mandates of the United Nations Industrial Development Organization (UNIDO). Its Statistics Unit works to develop statistical indicators to monitor the global progress made in inclusive and sustainable industrial development (ISID), a strategy adopted by UNIDO in 2013 at the 15th session of its General Conference.

UNIDO endeavors not only to increase the coverage of countries but also to take account of the recent major changes in the world economy and the structural changes it is yet to see. Diminishing natural resources and the new emphasis on the sustainability of industrial production in view of environmental issues require a new approach. These factors have led to dialogue with other UN agencies and international organizations about the definition of new statistical indicators.

To this end, and in dedication to the 20th edition of the International Yearbook for Industrial Statistics, UNIDO organized a seminar in Vienna, on 11-12 June 2014, of statistical experts from national statistical bodies and international organizations to discuss current practices and developments in survey methods and measurement issues as well as the role of industrial statistics in policy making, in coping with environmental challenges and the potential advantages of technical co-operation between UNIDO and national statistical offices (NSO).

The proceedings present the organizational matters surrounding the Seminar and summarize the presentations and papers presented during its course.

Dear colleagues,

It is my great pleasure to represent the Director General of UNIDO, Mr. Li Yong, in opening this international seminar dedicated to the 20th edition of the International Yearbook of Industrial Statistics. I take this opportunity to welcome the representatives of various national statistical offices, regional and international agencies attending this seminar.

The International Yearbook of Industrial Statistics is the most comprehensive statistical publication that is internationally available in the field of industrial statistics. It provides reliable and internationally comparable data on level, growth and structure of the global manufacturing. The Yearbook is published according to the international mandate from the UN Statistics Commission since 1995. It is my pleasure to note that the Yearbook is the only uninterrupted publication of UNIDO in last 20 years. On behalf of the Director General and on my own I would like to congratulate the entire team of Statistics Unit for their great accomplishment.

In compilation of the Yearbook, UNIDO cooperates with the national statistical offices and various international agencies. We value their cooperation and will continue our interaction in future.

UNIDO statisticians compile a large number of statistical tables exceptionally for the Yearbook. Statistics presented in the Yearbook provide a quick reference on the current status of global manufacturing. Users can make their own comparison of the industrial performance of one country with another. The Yearbook also shows the status of data availability of countries. Our member states often make inquiry when data for their country are missing in the Yearbook. Such inquiry results in technical cooperation projects for enabling national statistical offices to report their industrial data for in the Yearbook.

The Yearbook has also served as an excellent example of private-public cooperation. Since 1995, the Yearbook has been published and distributed by a commercial publisher - Edward Elgar Publishing Limited. The Yearbook reaches to data users in knowledge institutions, public libraries and commercial institutions through the wide and efficient sales network of Edward Elgar. We are very much satisfied with such cooperation intend to continue in coming years. Over the years, the number of countries reporting latest data has increased, so did the volume of data published and the size of the Yearbook. Yet we did not have to revise our agreement in last 20 years and I would like to sincerely thank Edward Elgar for their understanding and continued cooperation.

Statistics has earned a special place in UNIDO activities. UNIDO has a global mandate in promoting industrialization around the world. To formulate any development policy and monitor agreed targets we need reliable and timely data. Prolonged recession in global economy has demanded a new policy approach to industrialization. Demand for policy advisory and statistical services has significantly increased in recent years.

Statistics has played very important role in our debate on post-2015 development agenda. The last General conference of UNIDO held in Lima adopted our strategy of inclusive and sustainable industrial development (ISID), which covers economic, social and environmental dimensions of industrial development. Currently we are working with our member states and development partner agencies on adequate reflection of ISID in post-2015 development agenda. In this Statistics has been closely engaged in developing a set of relevant statistical indicators that helps to monitor the progress achieved by member states in ISID. I am glad to learn that this seminar includes a diverse set of topics related to different dimensions of industrial development.

I wish you a successful seminar and pleasant stay in Vienna.

Taizo Nishikawa
Deputy to the Director General

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Publisher

EDWARD ELGAR PUBLISHING LIMITED
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SEMINAR PROGRAM

Venue: Conference Room III, C Building
UNIDO Headquarters, Vienna International Centre, Wagramerstrasse 5, P.O. Box 300,
A-1400 Vienna, Austria

WEDNESDAY, 11 JUNE

10:00 – 10:45 SEMINAR OPENING
session chaired by Ludovico Alcorta, UNIDO
Opening speech by: Nishikawa Taizo, Deputy to the Director General, UNIDO
Welcome speech by: Shyam Upadhyaya, UNIDO
Greeting speeches by: Norbert Rainer, Statistics Austria, Austria
Ralf Becker, UNSD
Emily Mew, Edward Elgar

10:45 - 11:00 Break

11:00 - 12 30 SESSION 1: INDUSTRIAL STATISTICS SURVEY METHODS
session chaired by Suryamin, Director General of Statistics Indonesia
Presentations by: Abebe Kirkos Woldegebriel, CSA, Ethiopia
Uthayakumary Maheswaran, DCS, Sri Lanka
Pham Dinh Thuy, GSO, Vietnam

12:30 - 14:00 Lunch

14:00 – 15:30 SESSION 2: INDUSTRIAL STATISTICS SURVEY METHODS
session chaired by N. B. Lam, Director General of GSO Vietnam
Presentations by: Emil Azman Sulthani, Statistics Indonesia, Indonesia
Maria Lorena Naranjo Orozco, INEC, Ecuador
Emilia Guelentzova, International Department, NSI, Bulgaria
Natalia Kovaleva, NRU HSE, Russia

15:30-16:00 Break

16:00 – 17:30 SESSION 3: MEASUREMENT ISSUES
session chaired by Ralf Becker, UNSD
Presentations by: Norbert Rainer, Statistics Austria, Austria
Sangjin Park, KOSTAT, Republic of Korea

17:30 Reception at the Vienna International Center (VIC)

THURSDAY, 12 JUNE

09:30 – 11:00 SESSION 4: INDUSTRIAL STATISTICS FOR POLICY MAKING
session chaired by Nilgün Taş, UNIDO

Presentations by: David Kepplinger, UNIDO, 'Statistical Analysis of Relations between Key Indicators of Industrial and Social Development'
Bivas Chaudhuri, CSO, India, 'Statistics of Gender Gap in Employment and Wage Rates in the Manufacturing Industries of India'
Mariarosa Lunati, OECD, 'Overview of OECD Structural and Demographic Business Statistics'
Valentin Todorov, UNIDO and Saleh Taha, GOIC, 'Methodology for Evaluation of Statistical Information Systems: The GOIC Industrial Database'

11:00 - 11:30 Break

11:30 - 12:30 SESSION 5: INDUSTRIAL STATISTICS AND THE ENVIRONMENT
session chaired by Ludovico Alcorta, UNIDO

Presentations by: Ralf Becker, UNSD, 'Linking Industrial Statistics and Environment'
Susana Perez Cadena, INEGI, Mexico, 'National Statistical Directory of Economic Units (DENUE) '
Patrick Nussbaumer, UNIDO, 'Production Efficiency and Pollution Intensity Indicators'

12:30 - 13:00 Launch of UNIDO Statistics online data portal, Valentin Todorov, UNIDO

13:00 - 14:30 Lunch

14:30- 15:30 SESSION 6: TECHNICAL COOPERATION WITH NATIONAL STATISTICAL OFFICES
session chaired by Shyam Upadhyaya, UNIDO

Presentations by: Dong Guo, UNIDO, 'UNIDO Program on Technical Cooperation in Industrial Statistics'
Morrice Nyattega Oyuke, NBS, Tanzania
Faiza Hamed Al Musharfy, MCI, Oman, 'Oman Experience in Industrial Statistics'

15:30 - 16:00 Closing ceremony

19:30 Dinner

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INTRODUCTION

A two-day International Seminar on Industrial Statistics entitled "20 Years Statistics in Service of Nation for Industrialization" was held in Vienna, Austria, on 11 to 12 June 2014, organized by UNIDO in celebration of the organizations' 20th edition of the annually published International Yearbook of Industrial Statistics. Deputy Director General of UNIDO, Mr. Taizo Nishikawa, opened the seminar.

The seminar was divided into six thematic sessions, carefully designed to cover a variety of statistical issues. Topically, the first day was devoted to survey methods and measurement issues. On the second day, statistical issues, not directly related to the collection, processing, handling and dissemination of industrial statistics were covered. Industrial statistics and their role in policy-making, their linkage to the environment, and technical co-operation with NSOs were discussed.

These proceedings consist of three sections in addition to the introduction. Section 2 introduces UNIDO's statistical services, Section 3 provides summaries of the eighteen presentations given at the Seminar by either NSOs or statistics units from international organizations, and finally Section 4 lists background papers specifically prepared for the Seminar in support of a number of presentations. The presentation summaries in Section 3 are listed according to the six thematic sessions, i.e.: Session 1 & 2: Industrial Statistics Survey Methods; Session 3: Measurement Issues; Session 4: Industrial Statistics for Policymaking; Session 5: Industrial Statistics and the Environment; and Session 6: Technical Cooperation with National Statistical Offices.

Thanks to the significant expertise of practitioners within the field of industrial statistics, which fueled constructive, organic discussions during each chaired session, important steps to be taken in order to improve the quality and dimensions of statistical data, and increase their impact, were identified. Overall, for the production of industrial statistics, the Seminar enhanced the imperative value of setting up and maintaining a register of establishments in order to provide a framework for census and survey work. Especially, the importance of national industrial classifications for countries was emphasized, as they allow for policy-making to be directed at a much more detailed level of manufacturing. This is, for instance, essential in

cases where a limited number of manufacturing branches are dominant and a more detailed classification can give valuable insights into the structure of such branches. It is, however, important to ensure that such national classification can be aggregated to an internationally compatible classification. Moreover, several presentations provided examples of combining industrial statistical indicators with social or environmental indicators, demonstrating the diverse uses of such combined data. With the increasing demand for integrated solutions to the environmental, social and economic challenges in the world, the need for combined data is bound to grow considerably in the near future.

At UNIDO, the Statistics Unit fulfills a number of tasks to facilitate the development of globally sound industrial statistics. Its collection, storage and processing of industrial statistics has resulted not only in the establishment of comprehensive industrial databases available to the international community, but has also led to the publication of the International Yearbook of Industrial Statistics, which for the last 20 years has provided economists, planners, policymakers and business people around the world with international statistics on levels, structures and trends in the manufacturing sector. UNIDO's close contact with NSOs has led to an increased volume of industrial statistics, expanding both the databases and the Yearbook.

Furthermore, co-operation with other UN agencies and international organizations has resulted in a much wider use of industrial statistics through, among other things, increased connectivity between industrial and social development indicators. Work is ongoing to establish indicators that assist with the assessment of resource use by industry and its environmental impact with the objective to help countries reduce the negative impact of industrial activity on the environment. Finally, technical co-operation between UNIDO and its member countries contributes to more and improved quality of data as well as enhancement of international comparability of data. Such statistical activities serve as essential tools for better policy-making. The International Seminar on Industrial Statistics was an opportunity for UNIDO to learn from the practices and experiences of Member States and international organizations to improve its statistical services as to continuously being able to contribute to defining the high-bar for international statistics.

UNIDO STATISTICAL SERVICES

20 years of refining industrial statistics

Industrial statistics has been at the heart of UNIDO's activities since 1979, and today the organization has a unique role in the international statistics system. From the 1980s and onwards, UNIDO has, in co-operation with NSOs and the United Nations Statistical Division (UNSD), compiled industrial statistics. Together, they issued a biennial publication, the "Handbook of Industrial Statistics", up to 1992, which supplemented the United Nations' "Industrial Statistics Yearbook". At its 27th session, the United Nations Statistical Commission mandated UNIDO, in co-operation with the Organization for Economic Co-operation and Development (OECD), the full responsibility for the collection, storage, processing and dissemination of general industrial statistics on a worldwide basis with effect from 1994.

UNIDO's Statistics Unit has since then sent questionnaires to all Member States requesting the submission of industrial statistics. At first, these were mailed and very often countries would submit handwritten data. Today, data collection is mainly taking place on-line but through time close contact has been kept with every single NSO, in order to clarify, where necessary, discrepancies or assist where possible queries arise. Generally, each statistician at UNIDO is assigned the same countries every year, so that a high level of continuity is maintained.

Since 1995, UNIDO has published the "International Yearbook of Industrial Statistics" on an annual basis. This publication was devised to provide users, such as government bodies, policy-makers, researchers and economists with reliable, comparable industrial statistics.

Statistical databases

Over the years, UNIDO has developed a number of industrial statistics databases. To ensure the comparability of its data, UNIDO has strictly followed international classification systems as well as international definitions. Standards for international comparability are promulgated by the United Nations. Concepts and definitions are taken from the International Recommendations for Industrial Statistics 2008 (Statistical Papers, Series M. No. 90; United Nations publication, Sales No. E.08.XVII.8). The International Standard Industrial Classification of All Economic Activities (ISIC) is the norm for all industrial statistics and classifies manufacturing at the 2-, 3- and 4-digit level. This classification is frequently revised in order to adapt to changes in

the manufacturing sector and the latest revision in use is Revision 4, which has been adopted by about 60 percent of all countries regularly providing UNIDO with industrial statistics. For time series covering certain indicators it is important to convert different ISIC revisions to a common standard and thus Revision 3 is being used for this purpose.

The UNIDO industrial statistics databases are available online and on CD-ROM and cover the following areas:

Table 1 | Overview of UNIDO industrial statistics databases

Database	ISIC Revision	Time range	Country coverage	Sector coverage	Variables
INDSTAT4[a]	Revision 3	1990 onwards	138 countries	152 industries and sub-industries covering manufacturing	Number of establishments, number of employees, number of female employees, wages and salaries paid to employees, output, value added and gross fixed capital formation
	Revision 4	2005 onwards	59 countries	162 industries and sub-industries covering manufacturing	
INDSTAT2[b]	Revision 3	1963 onwards	166 countries	23 industries covering manufacturing	Same as INDSTAT 4 + index numbers of industrial production
IDSB	Revision 3	1990 onwards	116 countries	127 industries	Output, imports, exports and apparent consumption
	Revision 4	2005 onwards	54 countries	137 industries	
MINSTAT	Revision 3	1990 onwards	100 countries	7 industries, 14 sub-industries covering mining and quarrying, electricity gas and water supply	Same as INDSTAT 4
	Revision 4	2005 onwards	50 countries	10 industries, 19 sub-industries, covering mining and quarrying, electricity, gas, steam & air conditioning; water supply; sewerage, waste management	
MVA[c]		1990 onwards	200 countries		GDP, MVA and population

Notes I : [a,b] For INDSTAT2 and INDSTAT4 all value data are stored in national currency at current prices. The system can be used to convert these data from the national currency into current U.S. dollars.
[c] GDP and MVA data are given at current and constant prices (2005) in U.S. dollars. The data in constant prices for latest two years are estimated by UNIDO statisticians employing advanced statistical models.

The International Yearbook of Industrial Statistics

At its inception in 1995, the International Yearbook of Industrial Statistics was designed on the one hand as a reporting tool and on the other hand as an information base for major economic indicators.

Over the years, the number of countries that report manufacturing data to UNIDO has grown, partly due to the persistent efforts by UNIDO to obtain these data, and partly, owing to the fact that Member States have realized the value of such information not only for nation policy making but also for regional and/or international comparison. The key industrial statistics indicators collected for each country are:

- Number of establishments;
- Employment;
- Female employment;
- Wages and salaries;
- Gross output;
- Value added;
- Gross fixed capital formation.

These indicators give a picture of the concentration and/or diversification of the manufacturing sector in a given country. They provide information on, e.g. industries with high or low employment, high or low output or value added. By applying ratios of wages and salaries per employee or value added as a percentage of gross output, it can be easily discerned, which manufacturing sectors have the highest or lowest wages or produce the highest or lowest value added as compared to gross output.

Apart from the mere listing of industrial statistics by country, the Yearbook provides statistical indicators on the manufacturing industry. These are constructed with the aim of facilitating international comparisons. The data presented are compiled in accordance with the requirements of international comparison and are in line with standards laid out by the United Nations.

The Yearbook consists of two parts: one part offering an analytical and graphical overview of major trends in growth and distribution of manufacturing in the world (from 2000 and onwards), and a second part providing detailed data tables by country.

Manufacturing value added (MVA) is a key outcome of the Yearbook and it is estimated in line with the national accounting concept, i.e. the net contribution of the manufacturing sector to GDP. Data on both MVA and GDP is collected from a number of national and international sources, including the World Bank, the UNSD, the International Monetary Fund and regional development banks.

In order to facilitate comparison over time, every annual volume of the Yearbook follows the same structure and presents the same updated tables. The composition of country groups and/or economic clusters has also been kept constant.

A major part of the Yearbook is devoted to presentation at the 3-digit level of ISIC Revision 3 of selected characteristics of manufacturing industries, shown by country and grouped in accordance with regions. These characteristics are value added per employee, wages and salaries per employee in current 1000 dollars. The costs of input materials and utilities, costs of labour and operating surplus are shown as a percentage of total output. Data are presented for the year 2005 and the latest available year.

Thus, the Yearbook is a valuable data source and tool for policy-makers as well as economic researchers. UNIDO endeavors not only to increase the coverage of countries but also to take account of changes in the world economy. Diminishing natural resources and the rising emphasis on sustainable industrial production in light of environmental concerns require a new approach. These issues have led to dialogue with other UN agencies and international organizations to establish new statistical indicators that can take such global changes in industrial activity into account.

Summary of findings in the International Yearbook of Industrial Statistics 2014

The latest edition of the International Yearbook of Industrial Statistics, published in 2014, describes the bleak condition of world manufacturing production, which has exhibited low growth rates since the global economic and financial crisis. 2014 offered little change to the prolonged period of stall in the manufacturing sector with only a marginal improvement to show for (2.3 percent growth in MVA).

The 2014 Yearbook offers the following description about recent trends and the current situation in world manufacturing production:

The low growth in global MVA is attributable to a more or less unchanged growth rate of 1 percent in industrialized countries between 2010-2013; on the other hand, the developing country group and emerging industrial economies (EIE) are showing slight improvement (Yearbook 2014, Figure 1). Dominated by Europe, the industrialized world accounts for 64.1 percent of global MVA, the EIE for 14 percent, and a single country, China, for 18.4 percent (Yearbook 2014, Table 2). This distribution starkly juxtaposes the distribution of world population as evident by per capita MVA (Yearbook 2014, Table 3). However, developing and emerging economies have been rapidly catching up with growth rates in per capita MVA of 4.1 percent between 2010 and 2013; in the same period this figure grew with just 1 percent in industrialized economies (Yearbook 2014, Table 4). To understand the implication of these trends to overall economic development, the share of MVA in GDP becomes essential. In the former groups of countries, MVA makes up a fifth of total GDP, while the share is a little less than a sixth in the former group. (Yearbook 2014, Table 5)

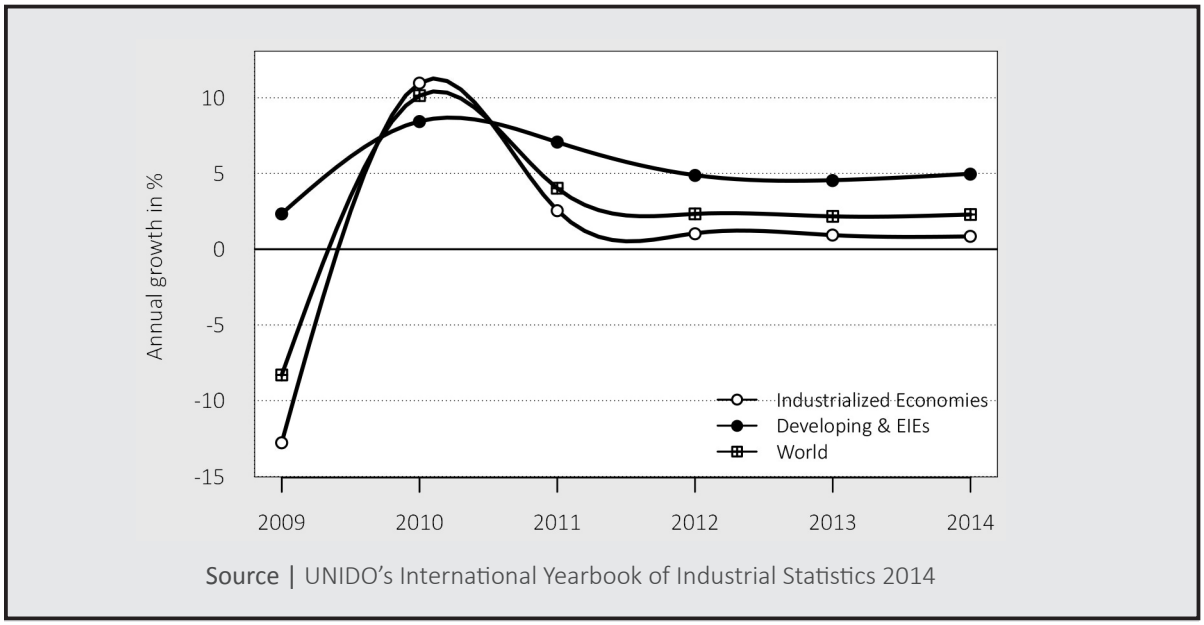

Fig. 1 | Annual growth rates of world MVA in recent years, by country group, at 2005 constant prices

The patterns of industrial structural change is evident from Tables 6 to 9 in the Yearbook 2014, which document the distribution of world value added per manufacturing industry group in industrialized, developing and emerging industrial economies. Hence, technologically more advanced industries with higher value added are primarily concentrated in the developed world, while developing countries sit on the labour-intensive industries. While there are signs of deindustrialization in several highly developed countries, knowledge-intensive industries are escalating in emerging industrial economies.

A clear gender gap, calculated as the difference in the percentage of male and female employees in total employment, is documented in manufacturing employment. Table 10 in the Yearbook 2014 shows that there are considerable variations across manufacturing industries. Between 2007 and 2011, more women moved towards high-skilled industries, while they usually are concentrated in labour-intensive industries, especially wearing apparel.

3. SEMINAR SUMMARIES

SESSION 1 and 2
Industrial Statistics: Survey Methods

Session chaired by Suryamin, Director General of Statistics Indonesia, and
Nguyen Bich Lam, Acting Director General of General Statistics Office Vietnam

MANUFACTURING INDUSTRY STATISTICS IN ETHIOPIA

Abebe Kirkos Woldegebriel, Senior Statistician
Central Statistical Agency
Addis Ababa, Ethiopia

About the Central Statistics Authority
A short overview of the work of Ethiopia's Central Statistics Authority is brought forward here, and a summarizing paper can be found in Section 4.

Ethiopia's Central Statistical Authority (CSA) was established in 1961 and presented its first statistical report in 1963. Already at this early point, the reportings covered many industrial sectors, amongst which the manufacturing sector with establishments engaging 10 or more persons was reported on based on a survey covering 200 factories employing power-driven machinery. Since 1968, regular surveys have been undertaken for the medium and large manufacturing industries, while small-scale surveys were conducted in 1997, 2003, 2006 and 2010. Since 2005 quarterly manufacturing business surveys have been conducted and quarterly data collected for the producer price index.

The CSA comprises eight directorates at Headquarters with 25 statistical officers. Manufacturing statistics are dealt with by the Business Statistics Directorates.

Survey methods
Collection of data is done by questionnaires and interviews; the data are then edited, encoded, checked, tabulated and aggregated at national and regional levels. Before the release of data, the consistency and reliability is checked and the report prepared. Survey data can be obtained online or in printed form from the CSA.

In line with UN recommendations, the variables covered in the survey are number of establishments, persons employed, production, value added, investment and value of fixed assets. The major manufacturing sectors covered are: food and beverages, non-metallic minerals, chemicals and chemical products, textiles

and furniture. The classification used is ISIC Revision 3.

Ethiopia's manufacturing sector in brief

According to the CSA's most recent survey, the contribution of manufacturing to the gross domestic product has been 3.7 percent to 3.9 percent between 2009 and 2013. As figure 1 below illustrates, the sector's value added had been rapidly increasing over the period, tripling in size from 2008-2012. The sector has also expanded in terms of employment and establishments.

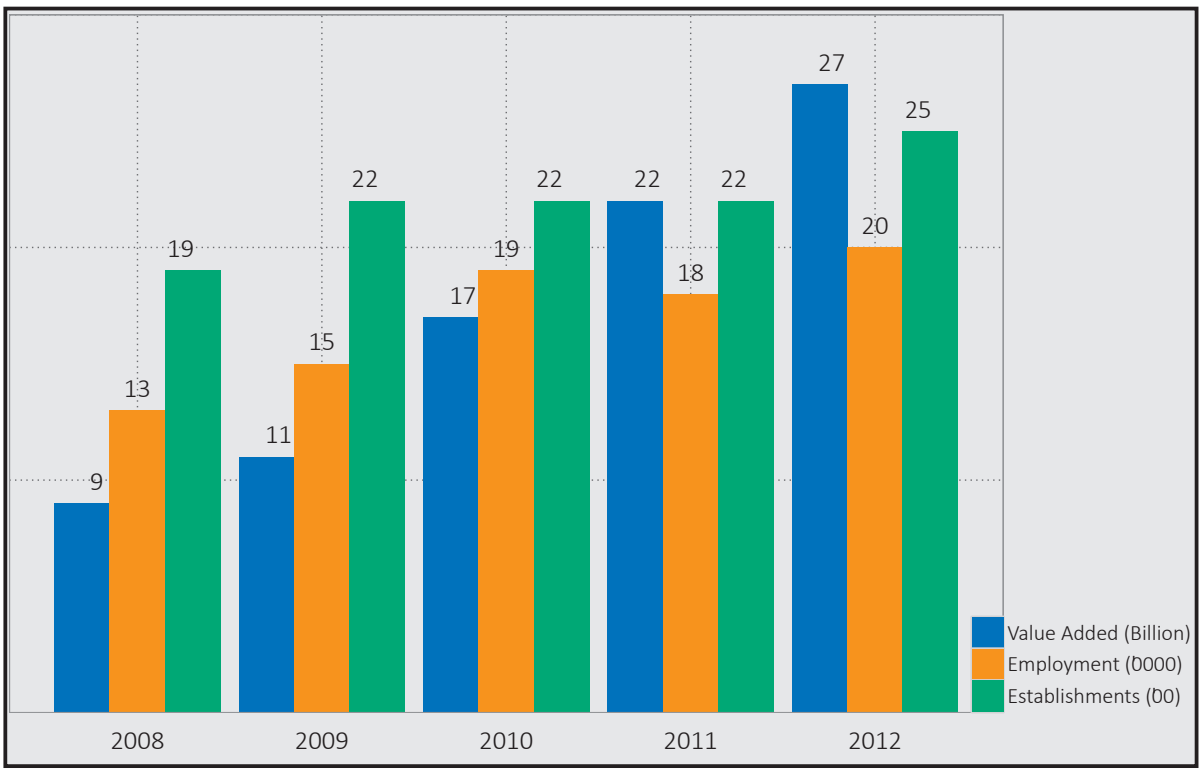

Fig. 1 | Manufacturing in Ethiopia, 2008-2012

Challenges and the way forward

The CSA has identified a number of challenges impeding the work of the Business Statistics Directorate and the quality of its statistical services. These include: data gaps, lack of a business register and a national classification system, low awareness of the need for industrial statistics and low response quality to survey enquiries. Furthermore, there is a considerable turnover of experienced staff. In order for the CSA to secure continued improvements of their statistical services, the above challenges will be addressed by gradually narrowing the data gaps, by establishing a national statistical industrial classification and by compiling a statistical business register. Efforts will also be made to retain experienced staff through appropriate rewards and to advocate the importance of industrial statistics to the business community.

GENERAL INDUSTRIAL STATISTICS AND ECONOMIC CENSUS – 2013/14 SRI LANKA

Uthayakumary Maheswaran, Deputy Director
Industry Division, Department of Census and Statistics
Colombo, Sri Lanka

About the Department of Census and Statistics

The Department of Census and Statistics (DCS) is the responsible agency for the conduct of regular censuses and surveys of the industrial sectors in Sri Lanka with the main objective to provide policy makers and international agencies with relevant and timely data. While Section 4 includes a paper presenting the DCS' work, a short overview is brought forward here.

The first Census of Industries was conducted in 1946, and the latest was undertaken in 2003/2004. Only establishments, which are proven to have production facilities, keep documented accounts and have proper management and premises are included in the census and survey work. Annual surveys started in 1979 covering the manufacturing industries only but were extended to all industrial sectors after the 1983 Census. The sample frame covers industrial establishments as listed in the 2003/2004 Census. Since 1984, the DCS has also undertaken quarterly surveys of industrial production, which the objective to create economic indicators for GDP demonstrating short term trends of industrial sectors, their performance and their growth rates (at the ISIC 2 digit level).

In 2013/2014, it was considered necessary to conduct an economic census in replacement of the 2013 Census of Industries. The Economic Census was the first of its kind in Sri Lanka and was a reaction to the structural changes in Sri Lanka's economy, which had to be considered in the country's development planning, and an increased demand for data on economic activities in general and for small and medium scale enterprises in particular.

Between June 2014 and October 2014, the DCS had scheduled various industrial statistics activities, including listing of – using an adapted version of ISIC Revision 4 - industrial estates and establishments in industry, trade and services from which data was to be collected.

A statistical overview of the industrial sector in the Colombo district

A comparison between the 2003 and 2013 Economic Census (listing stage) for the Colombo district in Sri Lanka shows a predominance of small industries with 1-5 persons engaged in both points in time (see table 1 below). Such "micro industries" won further prevalence in this period, while large-scale industries decreased.

The DCS offers further detail to these numbers as they show the developments in major manufacturing industries in the Colombo district in the period. Noticeably, the highest growth has been in the manufacturing of textiles and wearing apparel (see table 2 below). On the other hand, the number of industries involved in the manufacturing of furniture and rubber and plastic products have declined. A probable reason for these developments could be the government policy to foster small and medium enterprises.

Table 1 | Number of industries in the Colombo district, 2003 and 2013

Number of Industries				
No. of persons engaged	**2003**	**%**	**2013**	**%**
1 -5	10,787	42.6	25,316	46.9
6-20	2,201	15.2	2,342	8.2
21-50	613	4.2	536	1.9
51-100	359	2.5	220	0.8
above 100	567	3.9	295	1.0
Total	**14,527**	**100.0**	**28,709**	**100.0**

Table 2 | Selected major industries in the Colombo district, 2003 and 2013

Major Industries	2003	2013
Manufacture of food products	1556	2374
Manufacture of textiles	346	1655
Manufacture of wearing apparels	2363	7623
Manufacture of wood and wood products	1019	2465
Manufacture of rubber and plastic products	543	334
Manufacture of furniture	3786	3554

INDUSTRIAL STATISTICS FOR POLICY MAKING

Suryamin, Chief Statistician
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Overview of Indonesia's economy

With 33 provinces and 511 districts Indonesia is the largest archipelagic country in the world. The economy, which is strategically situated between two oceans (Indian and Pacific) and two continents (Asia and Australia) ranks as number ten globally (measured in PPP GDP) and is the fourth most populous. Java, on which Jakarta is located and home of approximately 57 percent of the population, has, with 64 percent of all establishments, the biggest concentration of industry.

Most of the establishments in Indonesia (99 percent) are small and micro establishments. In numbers, only little more than 223 thousand of the almost 23 million establishments in Indonesia are large and medium sized.

Data collection

Table 1 below depicts the data collection method behind the manufacturing sector census and surveys. An economic census is conducted every ten year, the most recent one in 2006, covering every sector in the economy besides agriculture. Surveys specific for the manufacturing sector have been conducted annually since 1975, but focusing only on large and medium scale establishments (with 20 and more workers). Since 1991,

Table 1 | Industrial statistics data collection methods in Indonesia

Method	Large and Medium Scale Manufacturing	Small and Micro Scale Manufacturing
Census	• Being conducted every 10 years in year ended "6" • Including all established in every economy sector without agriculture	
Survey	• Data collection is conducted through The Large and Medium Scale Manufacturing Establishment Survey • Period: ◦ **Annually** (since 1975): It covers all manufactures/industries with 20 workers or above. ◦ **Monthly**: by Sample	• Data collection is conducted: ◦ **1991 to 1995:** The Small Scale and Household/ Cottage Industry Survey ◦ **2007 and 2008:** Estimated figures (No Data Collection) ◦ **2009 until now:** Micro and Small Scale Industry Survey. • Period: ◦ **Annually:** By Sample ◦ **Quarterly:** Oberving sample panel during one year.

micro and small-scale establishments have been surveyed separately through different formats.

The manufacturing sector

The manufacturing sector, with a contribution of 23.7 percent to Indonesia's GDP, is the second largest after agriculture (in 2013). This share has been declining from 27.7 percent since 2000. Moreover, it is the fourth largest employer in the economy and generates the highest investment flow – both in terms of domestic and foreign direct investments.

As with the economy as a whole, the number and size (measured in employees) of large and medium scale establishments compared to micro and small-scale establishments is relatively small. Even though it represents less than one percent of all establishments, it is the largest contributor to manufacturing value added - between 86 percent and 97 percent in the period 2010-2013.

As illustrated in Table 2 above, the largest employer in the group of medium and large-scale establishments is the industry

Table 2 | The 7th largest industries within medium and large-scale establishments

ISIC 5-digit	Industry	Unit establishment	Output value (Rp trillion)	Value added (Rp trillion)
10431	Manufacture of crude palm oil	478	309.88	97.62
12011	Clove cigarettes	361	132.10	83.76
29100	Manufacture and/or assembly of motor vehicles	16	99.00	69.94
29300	Manufacture of crumb rubber	204	94.09	54.58
22123	cooking oil made of plam oil	179	91.15	20.88
10432	Motorcycles two and three wheels	46	73.40	22.76
30911		14	66.84	36.53

for wearing apparel, followed by the clove cigarette industry. The industries of weaving of textiles, crude palm oil and furniture of wood are the next bigger employers with similar employment levels of approximately 140,000 to 150,000 per sector. Measured in workers per unit, the clove cigarette industry is the absolute major. Also noticeable, the wearing apparel industry employs the same number of workers per units as the crude palm oil industry.

Overall, the output value and value added per manufacturing worker has been increasing slightly over the period 2010 to 2012 in terms of national currency at current prices.

ECUADOR'S INDUSTRIAL SURVEY

Maria Lorena Naranjo Orozco, Director of Economic Statistics
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A brief history of industrial statistics in Ecuador

The first Economic Census in Ecuador was undertaken in 1980 to outline the structure of the country's industry. It became the basis for a register of establishments used for the Annual Survey of Industries and until 2010 the list was updated with each survey and included 3,723 establishments with 10 and more employees.

In 2012 the scope of the Census was broadened to cover establishments with 5 or more employees, thus adding about 11,000 establishments. Apart from manufacturing, the Census includes mining and quarrying, wholesale and retail trade, repair of motor vehicles and motorcycles as well as services.

Finally, in 2013, data collection for the Survey was expanded to the Internal Revenue Services and other surveys undertaken by the National Institute of Statistics and Census. Today, the Annual Survey of Industries is the principal source of industrial statistics in Ecuador and provides essential information about manufacturing, mining and quarrying, to evaluate changes in the country's growth, composition and structure.

Annual Survey of Industries

A total of over 600,000 establishments, covering all sectors of industry, are the sampling basis for the Annual Survey of Industries. Sampling takes place on both the national and regional level and includes establishments with 100 or more employees or sales of more than $2 million. This adds up to about 7,000 establishments. Additionally, some 9,000 establishments are selected with a probability proportional to a composite measure of establishment size. ISIC Revision 4 is used for the industrial classification and covers all industrial activities. Figure 1 below illustrates the Institute's data collecting process.

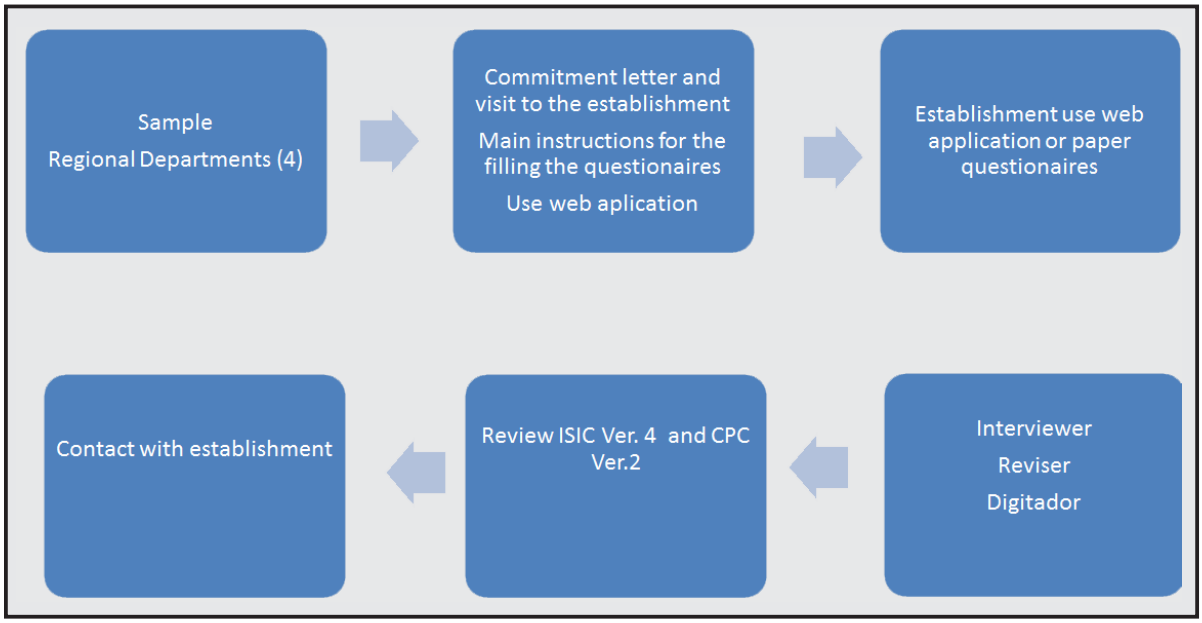

Fig. 1 | Industrial data collection by the National Institute of Statistics and Census

For the survey the following data are collected: Details on the establishment, fixed capital, working capital, number of workers, number of employees, wages and salaries, contributions to provident and other funds, total emoluments, total input, total output, depreciation and value added.

For the collection of data letters are sent to the establishments included in the sample and interviews are held with instructions on how to fill in the questionnaires either in paper form or electronically. All collected data are revised and reviewed before inclusion in the survey.

RUSSIAN INDUSTRIAL STATISTICS

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Industrial statistics in Russia: then and now

Russian industrial statistics have undergone 20 years of evolution. In the past, with a centrally planned economy, industrial statistics were geared to this system. A good organization and a strong statistical discipline existed; there were sufficient resources and adequate information available to satisfy the statistical needs of the planned economy. At that point, a good part of the information was closed to the public.

With new trends emerging, new approaches are required in order to satisfy the present needs, such as estimates of human resources in the country, investigation of the service sector and shadow economies, estimation of the size of the black markets, emergence of new types of business ownership, market relations, financial independence of enterprises and privatization issues.

Since 2002, the Institute for Statistical Studies and Economics of Knowledge (ISSEK), operating under the auspices of the National Research University, has supported the transformation towards a knowledge-based Russian economy. The Institute offers relevant research on industrial statistics and socio-economic development in science and innovation, and education.

The market oriented development in Russia and the implementation of the National Accounts System led to changes in the general approach to statistics. To this end, a new legislative base (The Federal Law on Statistics) was promulgated in November 2007.

The new statistical system

The new statistical system has as its main focus: standards, unification, establishment of a statistical register, and the development of a clear methodology, methods and instruments

in order to achieve international compatibility. It is also more orientated towards users (special research on demand and supply) and increased transparency through the publication of statistical data both in print and online.

A detailed system of enterprise observations has been developed. Big and middle-sized enterprises are monitored on a monthly and/or quarterly basis; the variables concerned are output, financial results, investment, employment and wages. Annually a structural survey is undertaken and output and facilities, consumption of fuel and energy and capital assets are reported. Small and micro entities are sampled and data on output, labour and wages are collected.

Figure 1 below depicts the innovations having been introduced to the Russian statistical system between 1989 and 2014. Annual R&D surveys with full international compatibility have been undertaken since 1994, including innovation surveys in manufacturing industries. Annual surveys on advanced manufacturing technologies and technology exports/imports have been compiled since 1997 and 1999 respectively. Other surveys have been undertaken to monitor the state of the knowledge economy such as the business climate in industry and services targeting 10.000 industrial enterprises annually, and the innovation behavior of NIS (national innovation system) actors in cooperation with the European Manufacturing Survey.

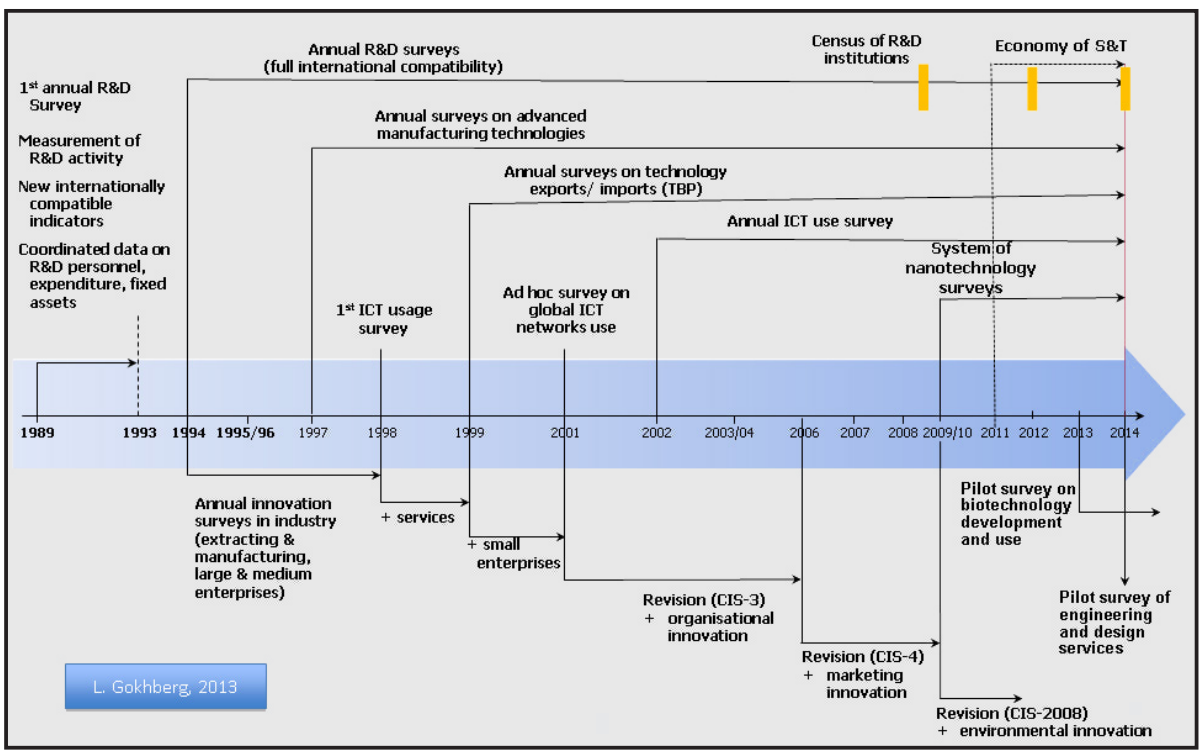

Fig. 1 | Timeline of innovations in the Russian statistical system

Since 2006, "foresight exercises" are planned and in operation on the federal, regional, sectoral and corporate level. Critical technologies, priorities for natural resources and demand for future skills are examples of fields approached on the federal level. At the sectoral and corporate level roadmaps for medicinal and pharmaceutical industry, water purification, composite materials have been concluded. The work on roadmaps for technology platforms and space navigation is ongoing. Roadmaps for energy efficiency and for the oil and gas sector are a long-term project and have been ongoing since 2007.

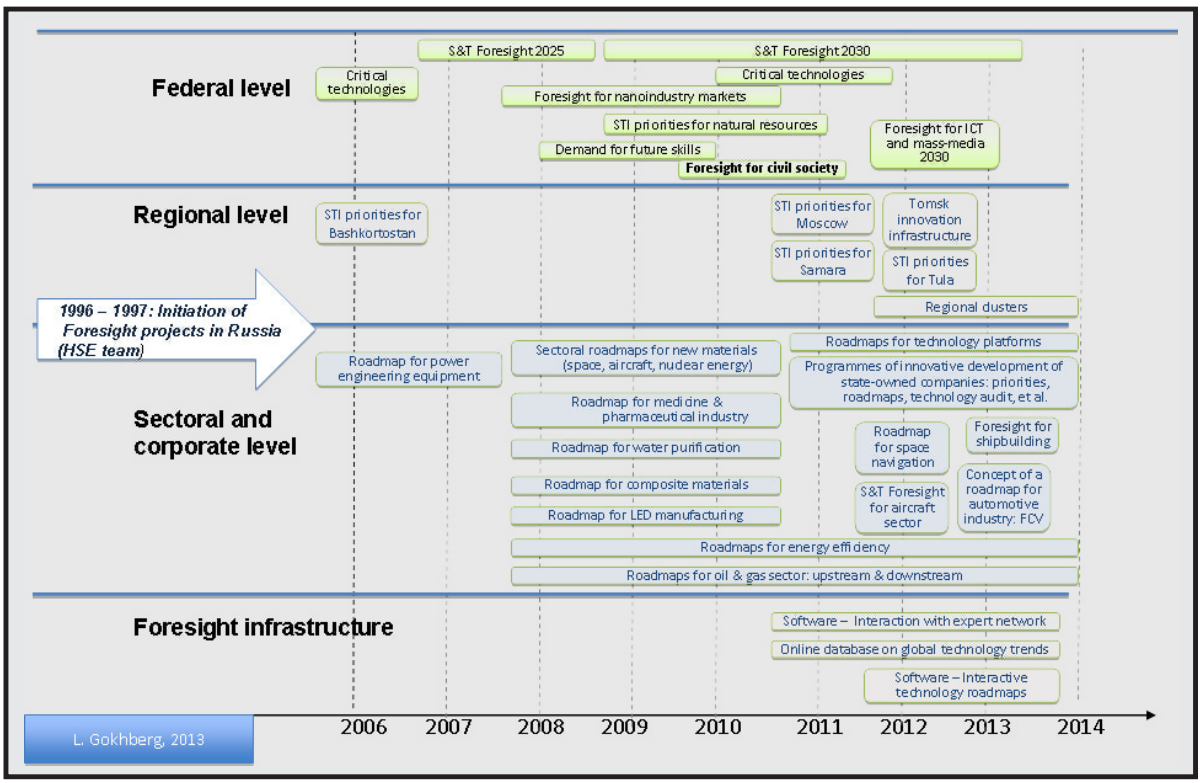

Fig. 2 | Foresight projects

SESSION 3
Industrial Statistics: Measurement Issues

Session chaired by Ralf Becker, United Nations Statistics Division

THE ROLE OF THE STATISTICAL BUSINESS REGISTERS FOR INDUSTRIAL AND OTHER BUSINESS STATISTICS

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On registers

A register is a structured (relational) database that shows units and their relation, has a system of identifiers and is regularly updated with time stamps. It is also important to understand the differences between a statistical register and an administrative register. Each of them is created for their intended use only, i.e. their coverage, variables and units are related directly to either statistical or administrative purposes. Moreover, while the former is updated regularly, the latter is updated according to administrative events.

The importance of statistical business registers

A statistical business register is characterized by an identifier system, which classifies enterprises, establishments and local units, and the coverage of which is defined in accordance with a classification on economic activities. Moreover, its stratification variables include activity, regional codes, size classes, etc., source information is included and regular updating is undertaken. While a maintenance strategy covers updating intervals and procedures, a quality strategy ensures relevance, accuracy, timeliness, accessibility, compatibility and coherence.

These registers are essential as a sampling frame for all business surveys and they facilitate the full co-ordination of source data. By ensuring consistent classification of establishments they are instrumental in providing consistency in surveys. Thus timeliness in the production of statistics can be improved and the respondent burden reduced.

A statistical business register combines different data sources, e.g. tax records and

other administrative records. The statistical business register not only provides a frame for statistical surveys, it is also a link to administrative data, and can be used for business and/or demography statistics and other statistical and non-statistical purposes. Figure 1 below summarizes the multiple roles played by a statistical business register.

Maintenance and update procedures, co-ordination and quality control make it possible to convert administrative and statistical data, together with survey feedback, into a register database, which provides survey frames and links to other registers.

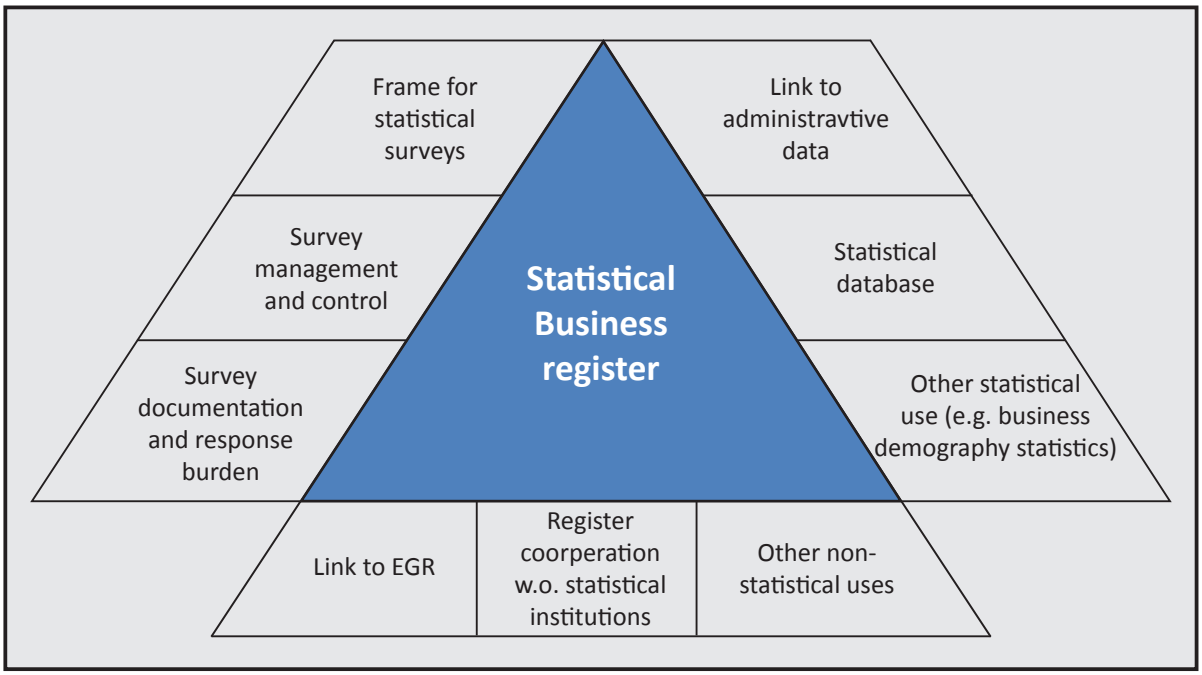

Fig. 1 | The various roles of a statistical business register

Overall, the statistical business registers co-ordinates and supports the production of statistics. It makes efficient use of administrative data, offers micro-data linking opportunities and reduces costs and response burden. It serves as a database for statistical analysis and can provide consistent business statistics.

INDUSTRIAL STATISTICS IN KOREA

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Overview of industrial statistics and classification in Korea

In the Republic of Korea (Korea from this point onwards) the statistical system is decentralized, with Statistics Korea (KOSTAT) being responsible for the coordination of all official statistics. KOSTAT, together with the statistical units in various government offices, ministries and agencies, compiles the statistical data. In particular, KOSTAT is responsible for two major manufacturing statistics surveys, i.e. the Annual Mining and Manufacturing Survey and the Monthly Index of Industrial Production.

The Korea Standard Industrial Classification (KSIC) was established to identify and track changes in the industrial structure of the Korean economy. KSIC is based on ISIC Revision 4 and its most recent revised classification includes: 21 sectors at the 1-digit level, 76 divisions at the 2-digit level, 228 groups at the 3-digit level, 487 classes at the 4-digit level and 1,145 sub-classes at the 5- digit level.

Annual Mining and Manufacturing Survey

As illustrated in Figure 1 below, in 2010 the Korean manufacturing sector constituted 9.7 percent and 19.4 percent of the economy measured in establishments and employment, respectively. Of all shipments leaving the country, 33.8 percent originates from the manufacturing industries.

In 2014, the 38th annual survey was carried out. These annual surveys provide data for economic policy-making and research, and they assist management planning for enterprises. The calendar year is the reference period and the survey covers the mining and manufacturing industries, classified according to the KSIC for all establishments and

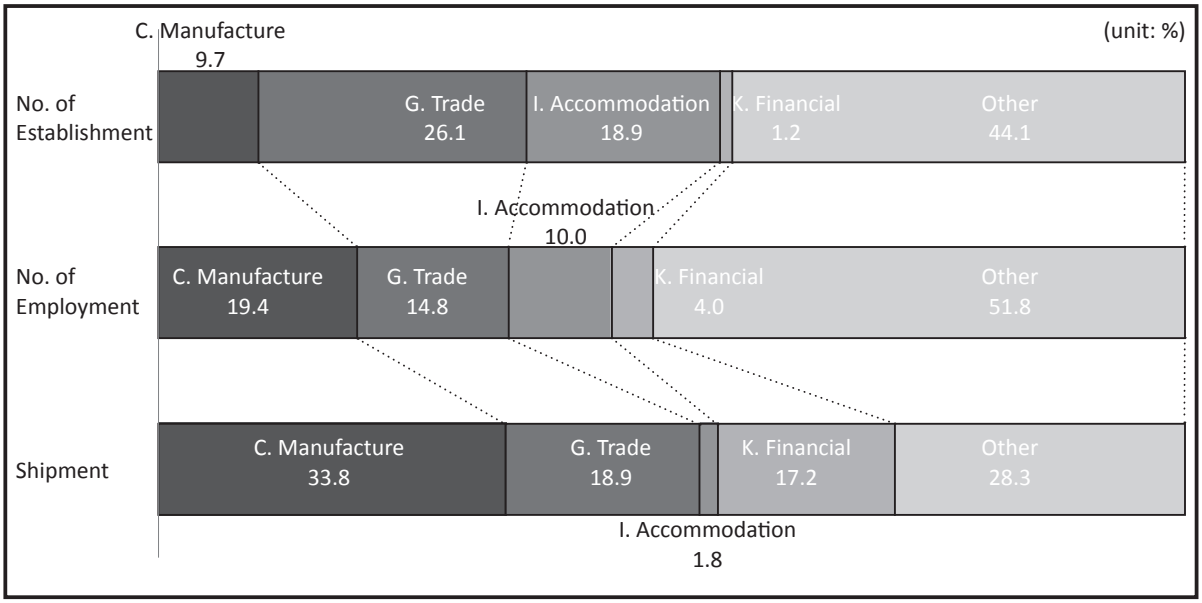

Fig. 1 | Profile of the Korean manufacturing sector

employing 10 and more workers. The survey excludes, among others, establishments under construction.

KOSTAT collects data at the establishment level by direct interview or via Internet – the majority (93 percent) of information is sourced through local governments and the remaining through local statistical offices.

Questionnaire items include details about the establishment itself, such as type of legal organization, number of workers, wages and salaries, value of shipments, costs, tangible assets, annual shipment and inventory by product, receipts for contract work by product and inventory by good.

A preliminary report is issued in November of the survey year with the final report (two volumes) released in December on both the regional and national level. Moreover, an abbreviated annual census on establishments is carried out for the purpose of providing a sample frame for various surveys. Details on the establishment as a unit, such as number of workers, type of legal organization and industrial classification are collected, mainly again by interview.

SESSION 4
Industrial Statistics: Policy Making

Session chaired by Nilgün Taş, United Nations Industrial Development Organization

STATISTICAL ANALYSIS OF RELATIONS BETWEEN KEY INDICATORS OF INDUSTRIAL AND SOCIAL DEVELOPMENT

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David Kepplinger, Consultant
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Connecting industrial development and social well-being

In view of the debate on the post-2015 development agenda, UNIDO emphasizes the importance of measuring the impact of industrial growth on social indicators and discusses in this light the relevance of different industrial statistics indicators. While Section 4 includes a paper presenting and discussing statistical evidence on how industrial development influences the well-being of populations, a short overview of its key points are brought forward here.

The Statistics Unit at UNIDO compiles and disseminates key indicators of industrial growth. Manufacturing value added (MVA) per capita is a widely used measure of industrial development in a country. Structural change and competitive aspects are covered in the so-called Competitive Industrial Performance (CIP) index, which is an indicator of the relative competitive ability of a country's industrial production.

Figure 1 below illustrates the correlation between the so-called Inequality-Adjusted Human Development Index (IHDI), which shows the actual level of human development taking into account inequality, and the two industrial indicators. The Figure depicts a high correlation between IHDI and both indicators. The paper demonstrates the same strong relationship between industrial growth and a number of other social indicators such as poverty, education and health.

The paper therefore concludes industrial growth has a considerable impact on the well-being of a country's population as it mitigates poverty, increases the level of education and improves public health.

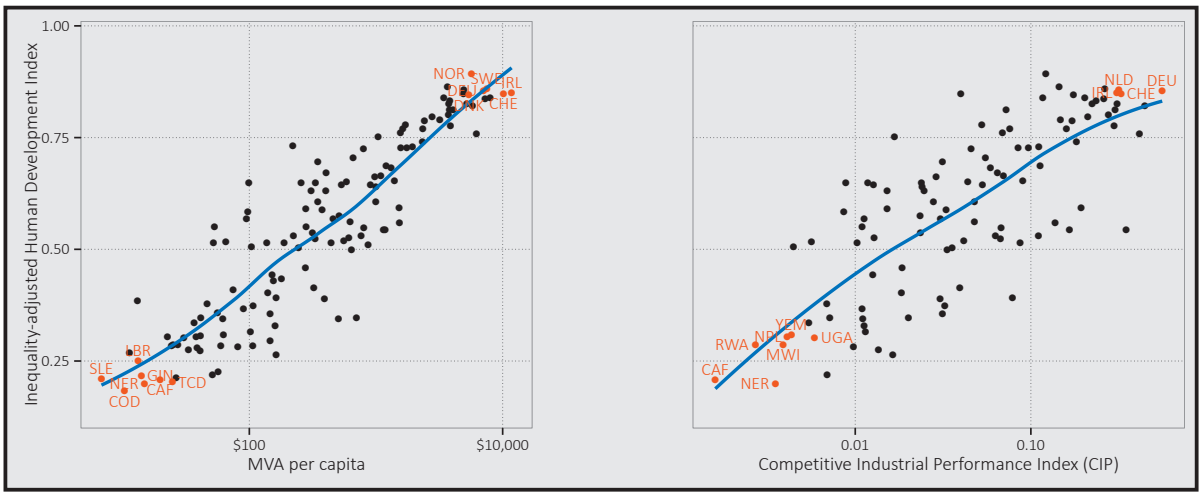

 Fig. 1 | Correlation between human development and industrial indicators

STATISTICS OF GENDER GAP IN EMPLOYMENT AND WAGE RATES IN THE MANUFACTURING INDUSTRIES OF INDIA

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United Nations Industrial Development Organization
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Gender gap in industrial context

Gender equality is a common goal in the international development agenda. When discussing gender gap in the context of statistics, one refers to the systematic difference between men and women in the outcome they achieve for their participation in industrial activities. The gap is measured by women's participation rate and the wage differences between men and women. Industrial statistics can measure these differences within sectors and thus provide useful information for policy makers on the main issues of the gender gap and consequently guide them towards suitable remedies for reducing this gap.

While Section 4 includes a paper presenting evidence on these issues, a summary is brought forward here.

The Indian case

Over the past 20 years India has become one of the fastest growing economies. The manufacturing sector contributes about 15 percent to GDP and provides approximately 50 million jobs corresponding to about 9 percent of India's total workforce. Evidence shows the prevalence of inequality between men and women in the sector measured in terms of labour participation and wages.

Such evidence is captured by the Annual Surveys of Industry (ASI), undertaken by the Central Statistical Office in India and covering large establishments with 10 or more persons employed, and surveys of the unorganized manufacturing sector (entire manufacturing sector not covered in ASI). Based on these surveys, gender gap indicators have been calculated as exemplified in Figures 1 and 2.

Calculations based on the surveys show that female participation rate in large-scale manufacturing has been decreasing between 2001 and 2011, partly due to emerging advanced technologies making more women redundant from the industrial workforce.

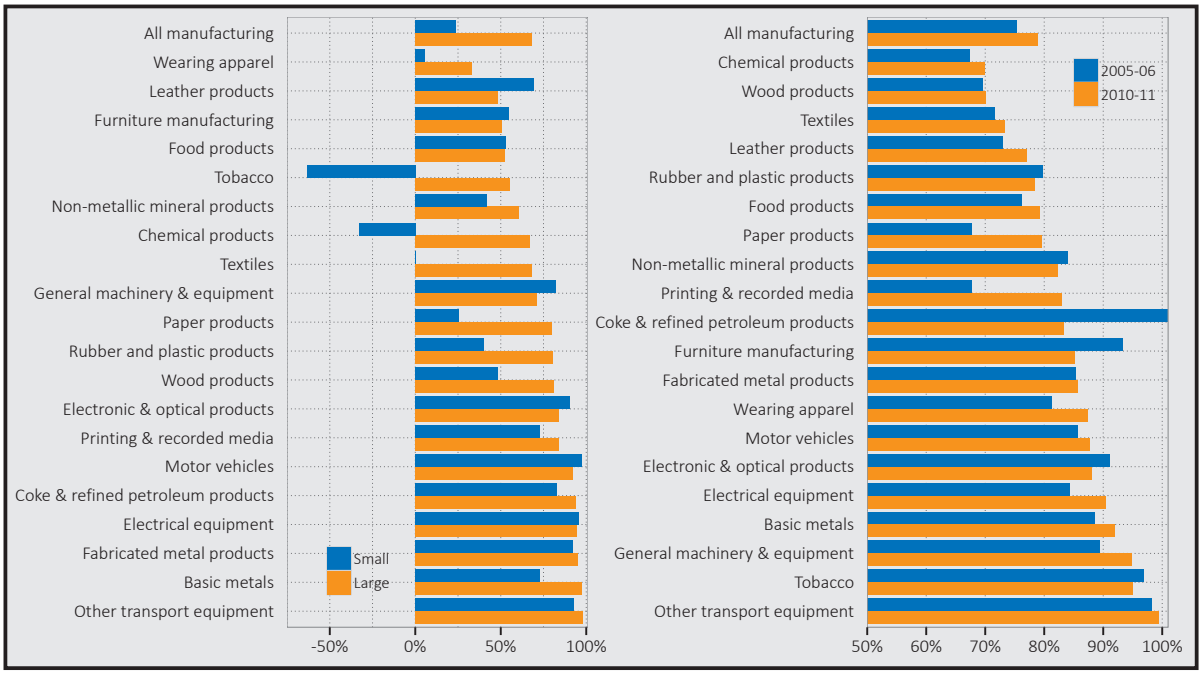

Fig. 1 | Value of gender gap in employment by manufacturing sector

Fig. 2 | Median wage rate of women in percentage to that of men

Generally, the female participation is lower in manufacturing industries employing high-technology technologies compared to those employing low- and medium-technologies. Increasing rates are seen in sectors that traditionally have high participation rates, e.g. tobacco products, chemical products, textiles and wearing apparel.

These developments are reflected in Figure 1, which shows the gender gap across manufacturing sectors, calculated as the percentage of male employment minus the percentage of female employment. The presented evidence suggests that policies promoting education and vocational training could make women more competitive in the labour market.

Figure 2 illustrates the wage differentials- the median wage rate of women as a percentage of that of men- across manufacturing sectors and shows that in all sectors the mean wages exceed those of median wages. This indicates that most female workers receive lower than average wages. The wage gap in organized manufacturing shows that women were paid 21 percent less than males in 2010-2011, which is a decrease from 24 percent in 2005-2006. Evidence also shows that wages of female workers is relatively low in sectors that are traditionally employers of females. On the other hand the wage gap is low in high tech sectors.

It is further concluded that the variation in wages is influenced by the lack of collective bargaining power. Scale of operation is also a factor. Daily wage rates are positively skewed for female workers but show a decreasing trend. This can also be attributed to improved empowerment and better availability of information.

OVERVIEW OF OECD STRUCTURAL AND DEMOGRAPHIC BUSINESS STATISTICS

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Structural and Demographic Business Statistics database

The OECD is faced with various challenges in its pursuit of harmonized data to populate its Structural and Demographic Business Statistics (SDBS) database. Data is sourced from statistical business registers through NSOs or organizations, and from a joint UNIDO-OECD questionnaire.

The following variables are collected:

- Structural business statistics: number of enterprises or establishments, employees or persons engaged, value added at basic prices or factor costs, turnover, total purchase of goods and services, gross operating surplus, compensation of workers, wages and salaries of employees, number of hours worked by employees and social contributions.
- Demographic business statistics: birth rate, death rate, survival rate, churn rate, employment creation and destruction by enterprise opening or closing, share of young entrepreneurs, employment of young entrepreneurs, share of high-growth enterprises and share of gazelles.

The challenges

The challenges for the SDBS lie in the differences in classifications used by national statistical offices, in size class thresholds and in industrial sector definitions, e.g. persons engaged versus employment and enterprise versus establishment. Thus, there exist various one-to-many and many-to-one relations. Whenever available, using national correspondence is the first-best solution. The second-best solution is to either add or divide quantities by or among ISIC codes depending on the type of relationship.

A number of strategies are currently explored as the OECD works to improve data timeliness. This includes assessing whether the SDBS's data can be directly sourced from NSOs' websites or if national specifications become too big a challenge for data availability. Another approach is to link quarterly data to benchmark datasets to create estimates for timely series.

Demand for new indicators

There is a rising demand for new or 'missing' indicators by policy makers. Some of the indicators that are considered desirable are:

1. international activities of enterprises measured in terms of, for example, export capacity of enterprises of different size, activities of new and young entrepreneurs, breakdown by age, or breakdown of non-exporting and exporting enterprises between foreign and domestic companies;

2. business performance and job creation;

3. demographic characteristics of owners, gender, migrants, young and senior; and

4. business demography data at sub-national level.

An example of a new OECD indicator for enterprises' international activities is shown in Figure 1.

One approach to identify and explore new indicators without additional costly surveys is to develop data linkages and longitudinal datasets. Such linkages can produce relevant insights on under-explored dimensions of businesses, such as the export capacity of different sizes enterprises, and reduce the need for expensive surveys. At present, however, NSOs produce few indicators based on data linkages.

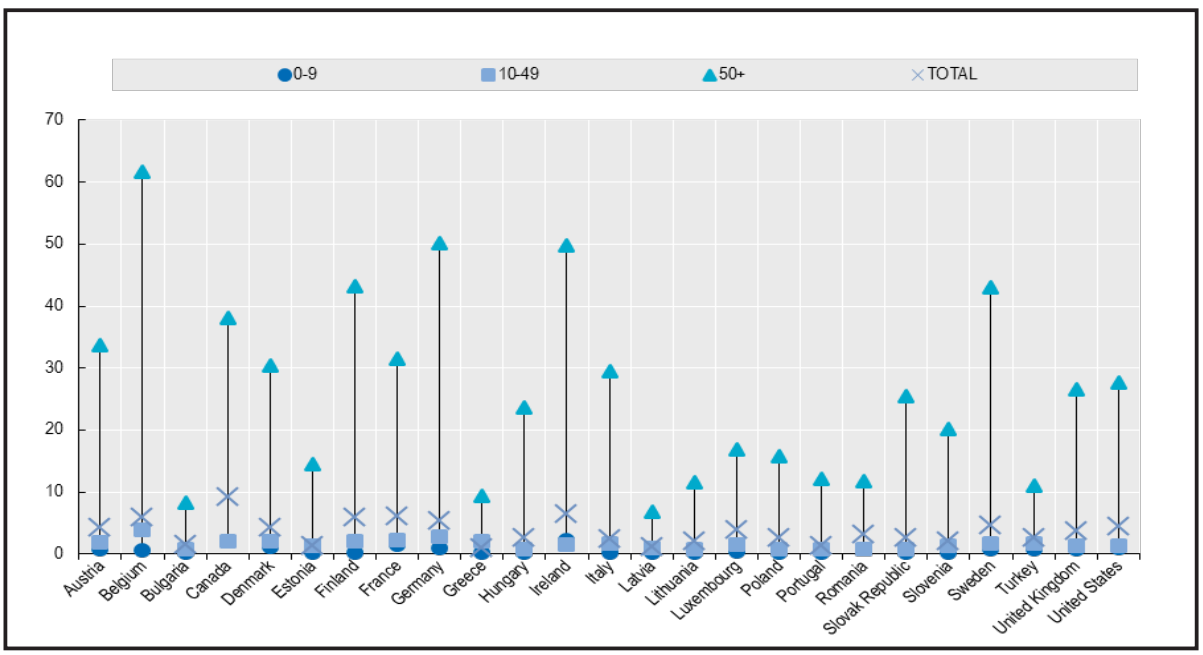

Fig. 1 | Average value of export per enterprise, by enterprise size (million USD, 2011)

METHODOLOGY FOR EVALUATION OF STATISTICAL INFORMATION SYSTEMS: THE GOIC INDUSTRIAL DATABASE

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Valentin Todorov, Senior Management
Information Officer,
United Nations Industrial
Development Organization
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Background

A request was received from the GOIC Industrial Database and Industrial Marketing Intelligence portal and the Directory of Industry in Gabon (Fichier Industriel Gabonaies) to prepare a study on methodologies for evaluating industrial statistical information systems. While the study can be found in Section 4, a short overview of its key points is brought forward here.

A vast literature already exists on the evaluation of information systems. Many of these studies take on a formal-rational approach such as a cost-benefit analysis, which is subject to criticism as it focuses on technical and economical aspects rather than human and social ones. The objective of the encouraged study was then to develop a methodology for analyzing the content and the statistical business process implemented in a statistical information system.

Towards a practical SIS evaluation model

The GOIC Industrial Market Intelligence System consists of a number of different databases. The GOIC Industries Database contains accredited information on more than 1500 manufacturers, products and licensed industrial projects in the Gulf States. It provides information on total project investments, companies, manpower as well as planned and actual production capacities. The database is particularly valuable for persons undertaking comparative analysis and seeking business opportunities. The database is evaluated against two models: the Generic Statistical Business Process Model and the DeLone and McLean model.

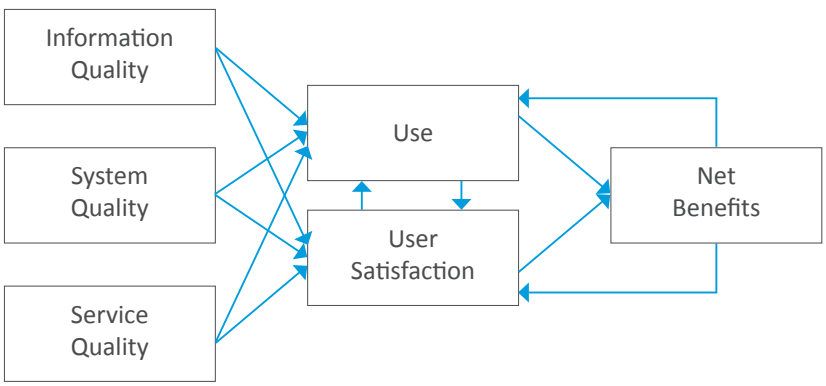

Fig. 1 | DeLone and McLean model

An adapted theoretical evaluation model by DeLone and McLean consists of the following components: system quality, information quality, usability, service quality and net benefits of users. The latter is measured in, for example, improved decision making of policy makers. However, to increase the practical use of the DeLone/McLean model to a system like the GOIC database, it is essential to consider the role of Internet in the dissemination of statistical data and the fact that certain quality dimensions exist for a SIS. According to the DeLone/McLean model, the GOIC database performs well in all dimensions (system, data and service quality).

The GOIC industrial database is also evaluated against the so-called Generic Statistical Business Process Model (GSBPM), a well-published and well-known model. Figure 1 illustrates the process view of the GOIC database.

Based on the evaluation, it is recommended that the visibility of the system is increased, that user satisfaction surveys are performed and that an audit reporting system is developed to measure many of the presented criteria more precisely.

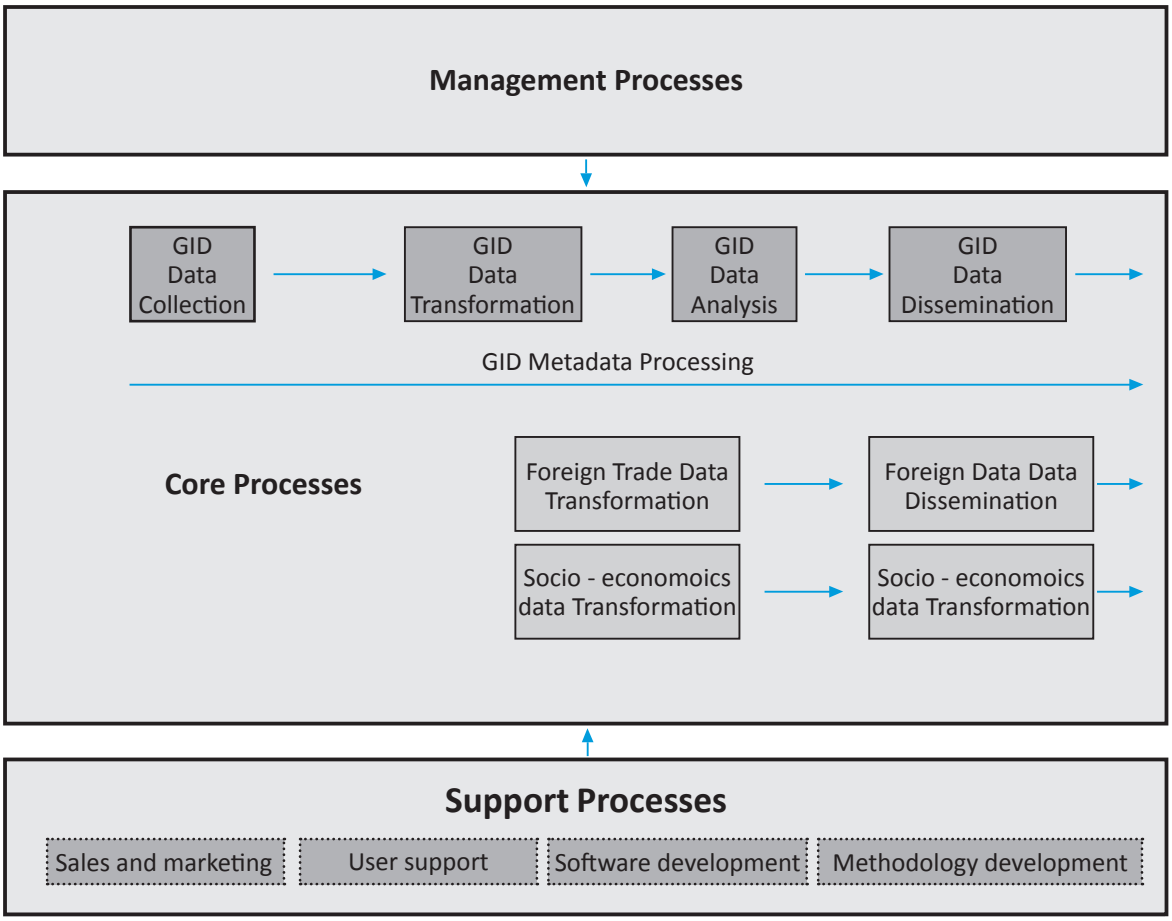

Fig. 2 | GOIC statistical business process model (process view)

SESSION 5
Industrial Statistics and the Environment

Session chaired by Ludovico Alcorta, Director, Research, Statistics and Industrial Policy Branch,
United Nations Industrial Development Organization

LINKING INDUSTRIAL STATISTICS AND ENVIRONMENT

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New requirements for industrial statistics

Historically, industrial statistics have had a fixed set of indicators describing the development of a given economic sector. Concepts in the field were consistent with or based on the System of National Accounts, i.e. the internationally agreed accounting techniques of economic activity.

Today, demand has grown for new indicators and/or giving more emphasis to some existing ones. Also more connections with other areas of statistics are sought and it needs to be established what should be included in the manufacturing statistics work program.

Sustainable Development Goals

The Open Working Group of the UN General Assembly, tasked with preparing a proposal for the Sustainable Development Goals (SDG), has currently drafted 17 goals and more than 200 targets. Many of these goals will draw on industrial statistics, i.e. employment by sector and gender, policies and incentives for small and medium scale enterprise development, share of high-productivity sector, energy efficiency, etc.

Particularly mentionable are Goal 9 – the promotion of sustainable industrialization - and Goal 12 – the promotion of sustainable consumption and production patterns. The latter is concerned with the interaction of industry and the environment to which major issues are connected:

1. resources drawn from the environment by industrial activities, and

2. their impact on the environment. Statistical indicators for the two goals are yet to be discussed but they are likely to be challenged by the availability of detailed basic data.

The industry-environment nexus

The industry-environment issue is addressed by various concepts, such as Green Economy/ Green Growth and initiatives by different organizations.

While several organizations focus on policy aspects, UNSD will concentrate on suitable indicators and the development of basic statistics. Suitable indicators will be discussed with countries within existing frameworks including the Framework for the Development of Environmental Statistics. When discussing the green economy, focus is usually heavily on environmental aspects, while the economy is treated as a block. More detailed indicators, such as by industry division, is needed to allow for more targeted policy development.
The work of UNSD will concentrate on the areas of energy, industry, water and waste management. A current UN Development Account Project aims at improving timeliness, availability and accuracy of such basic data through co-ordination with other agencies, country assessments of statistical data and provision of direct technical assistance to countries to address their problem areas.

PRODUCTION EFFICIENCY AND POLLUTION INTENSITY INDICATORS

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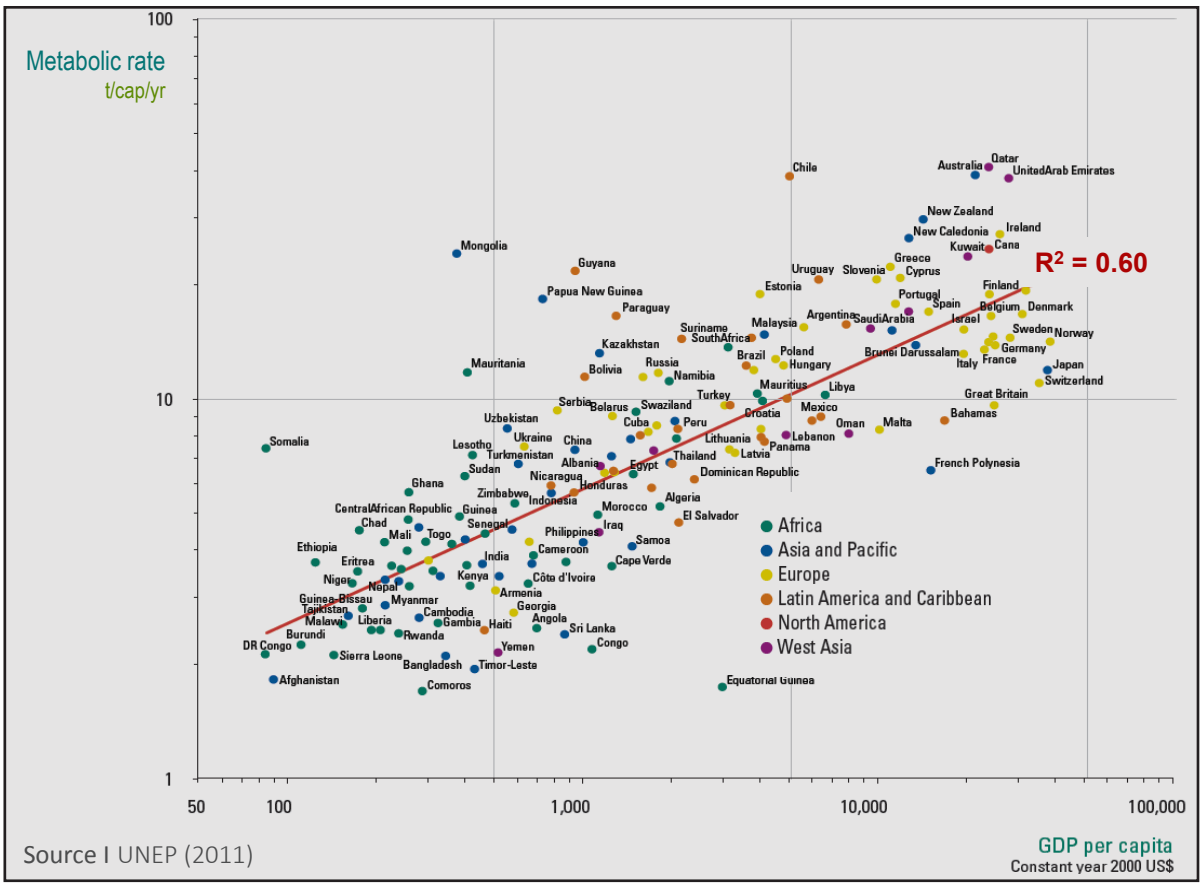
Context

Regression analysis shows a positive correlation between income - measures in GDP per capita - and the metabolic rate in an economy that is the annual per capita consumption of natural resources (Figure 1). As global material consumption is estimated to triple between 2008 and 2050 (if economic growth is not decoupled from natural resource use) the urgency of addressing the environmental issues in industry becomes clear.

In the classic Cobb Douglas production function, total output is not only a function of capital and labour input but also total factor productivity which include technology and efficiency . Calculations by the economic consultancy McKinsey and Company demonstrate the major business



Source I UNEP (2011)

 Fig. 1 | Income vs. resource consumption

opportunities, estimated as aggregated savings potential of 2.9 trillion USD by 2030, in improving global resource productivity. It is shown that technological enhancements will allow industries to realize such potential.

Resource Efficient and Cleaner Production indicator system

The Environmental Management Branch at UNIDO is engaged in technical assistance to foster Resource Efficient and Cleaner Production (RECP) in industries. Concretely, this translates into the continuous application of preventive environmental strategies to processes, products and services to increase efficiency and reduce risks to humans and the environment. RECP hereby aims at

1. increasing production efficiency;
2. introducing environmental safeguard policies;
3. reducing risks to people and communities from enterprises and supporting their development.

Presently, work is ongoing to assess the usefulness of 32 existing indicators in terms of measuring environmental impact and ultimately to be able to determine resource and impact decoupling in industry. It may be preferable to use a basket of indicators, e.g. environmentally weighted material consumption.

The need for such indicators is reflected in the significant uncertainties in multi-regional input-output data used to measure resource productivity and pollution uncertainty. Uncertainty in such data may give decision makers faulty information about the energy productivity of manufacturing sectors and hence which sectors to target through specific policies.

The RECP indicator system focuses on six absolute enterprise-level indicators as depicted in Figure 2, which are considered to collectively cover the key environmental aspects of business operation. Improvements in these areas generally bring about maximum benefits for the environment and the business. Specifically, an improvement in one part of the input (business)-output system is most likely to simultaneously improve performance in other parts of the system. Based on these absolute indicators, one is able to calculate relative indicators related to resource productivity and pollution intensity. Further details can be found in the publication on the matter at: http://www.unido.org/en/resources/publications/energy-and-environment/industrial-energy-efficiency/resource-productivity-guide.html.

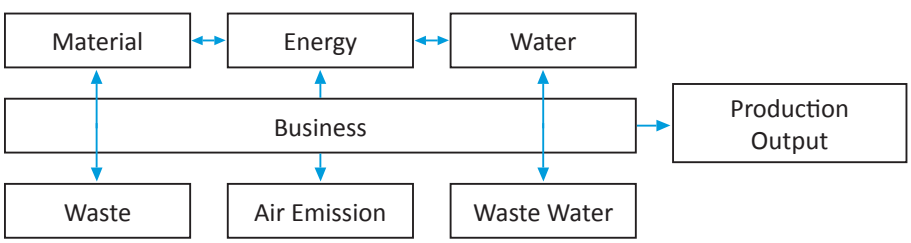


Fig. 2 | Enterprise-level indicators for resource productivity and pollution intensity

NATIONAL STATISTICAL DIRECTORY OF ECONOMIC UNITS (DENUE)

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About the National Statistical Directory of Economic Units

The National Institute of Statistics and Geography (INEGI) in Mexico is maintaining the so-called National Statistical Directory of Economic Units (DENUE), which covers all active establishments in the country. While Section 4 offers a paper presenting DENUE, a short overview is brought forward here.

DENUE, which is regularly updated, covers 4,410,198 establishments listing:

- Identification variables, such as name and type of establishment, activity class, and employment;
- Location variables comprising the name and type of road, building or floor level, town or city and whether industrial area, mall or public market. Furthermore for each establishment contact details are given;
- Contact variables;
- Flexible variables: The establishments can have, if so desired, information listed, such as logo, social networks, competitive advantages, main or specialty products or services, international trade and/or business group. Information on membership in a chamber or association, cluster, productive chain and supply and demand of products and/or services can also be incorporated.

DENUE's updating strategy distinguishes between large establishments (business with more than 100 employees or annual income exceeding 50 million pesos), and small and

Fig. 1 | Uses of DENUE

medium sized establishments. While updating generally takes place through administrative registers and the establishments themselves, National Economic Surveys and specific studies provide additional information about large units. All information in DENUE is updated every fifth year but selected content is updated continuously or annually. Figure 1 summarizes these uses. The directory serves a multitude of uses including policy-making, promotion of economic units, demand profiles for professional staff and market research.

Online queries

Establishments are filtered according to the NAICS classification, their size, which is based on the number of persons engaged, and the geographic area within which they are located. Further filters can be applied such as name, address, settlement or zip code. DENUE allows users to view the physical location of establishments via 2D and 3D images and maps. Search criteria, as entered by the user, are displayed on the screen and the user can also comment on the search system, which will allow an enhancement of the handling.

LAUNCH OF UNIDO STATISTICS ONLINE DATA PORTAL

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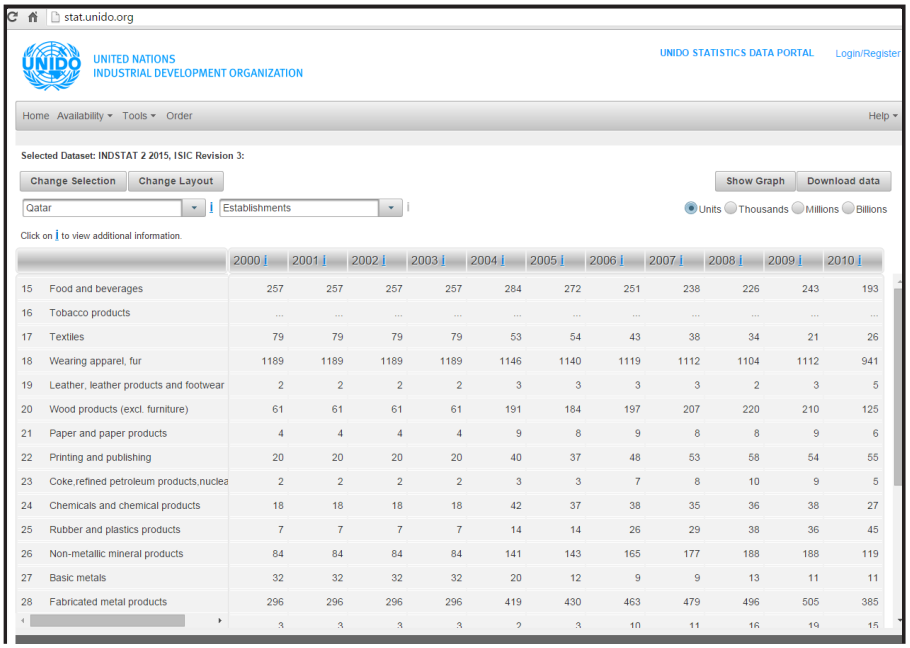
The UNIDO Statistical Databases contain up-to-date data on industrial production for most of its member countries as well as for many non-member countries. Currently, these data are disseminated through the (mostly annual) UNIDO publications: CD products (INDSTAT2, IDNSTAT4 and IDSB), the printed publication International Yearbook of Industrial Statistics as well as some new publications like the Quarterly Index report and the World Statistics on Mining and Utilities. Several pre-calculated data tables are available online under the name Statistical Country Briefs on the UNIDO web page and a limited amount of INDSTAT data are disseminated through the UN Data portal http://data.un.org.

Following the current trends of electronic data dissemination of official statistics accepted in most of the International organizations and many of the National statistical offices, and taking advantage of the enormous opportunities provided by the Internet, it has been desirable to make UNIDO industrials statistics data available online. The main objective of the new system has been to provide comfortable tools for online navigation through the UNIDO statistical data, to select and download data while guided by user specific views based on access rights. Of vital importance have been the tools for loading and maintaining the data warehouse in a way that would occupy the least possible resources from UNIDO Statistics Unit.

UNIDO's new online portal for statistical data on manufacturing, being officially launched at the present event, marks the biggest step forward after the migration of UNIDO databases from the mainframe to a client/server architecture in 2008. Essential for the success of this approach was the willingness of statistical staff to take part in the process as it sometimes meant a doubling of the workload. While moving to web dissemination of the databases, it does not mean that the CD products will be discontinued. There are several reasons for this, one being that users without good internet connection will not be able to download the hundreds of megabytes required. Other reasons are that in many cases it is much more comfortable to work with an offline data application and that the web user interface still cannot cope with the challenges of usability and responsiveness.



		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
15	Food and beverages	257	257	257	257	284	272	251	238	226	243	193
16	Tobacco products	...	...	...	...	...	...	...	...	...	...	...
17	Textiles	79	79	79	79	53	54	43	38	34	21	26
18	Wearing apparel, fur	1189	1189	1189	1189	1146	1140	1119	1112	1104	1112	941
19	Leather, leather products and footwear	2	2	2	2	3	3	3	3	2	3	5
20	Wood products (excl. furniture)	61	61	61	61	191	184	197	207	220	210	125
21	Paper and paper products	4	4	4	4	9	8	9	8	8	9	6
22	Printing and publishing	20	20	20	20	40	37	48	53	58	54	55
23	Coke,refined petroleum products,nuclea	2	2	2	2	3	3	7	8	10	9	5
24	Chemicals and chemical products	18	18	18	18	42	37	38	35	36	38	27
25	Rubber and plastics products	7	7	7	7	14	14	26	29	38	36	45
26	Non-metallic mineral products	84	84	84	84	141	143	165	177	188	188	119
27	Basic metals	32	32	32	32	20	12	9	9	13	11	11
28	Fabricated metal products	296	296	296	296	419	430	463	479	496	505	385
		3	3	3	3	2	3	10	11	16	19	15

Fig. 1 | UNIDO's industrial statistics database online portal

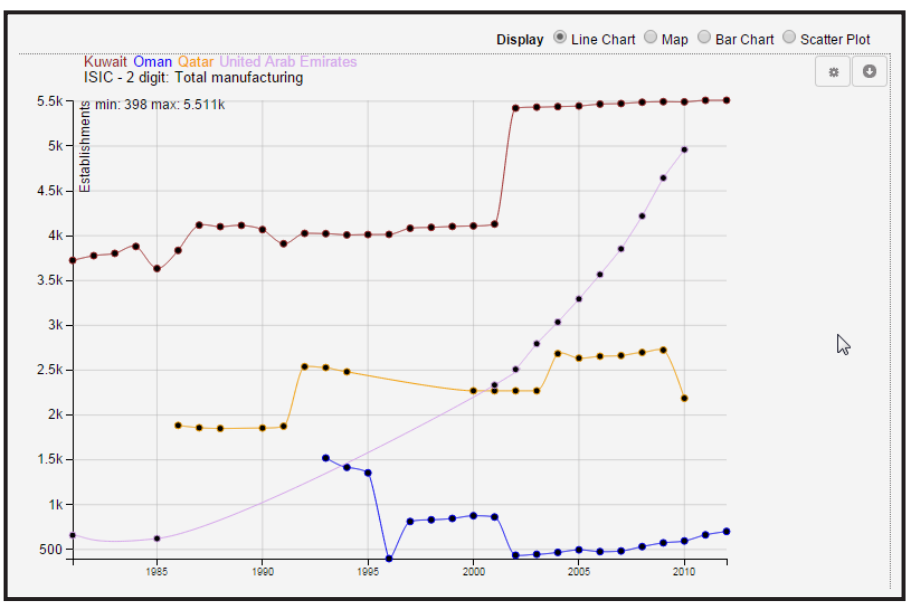


Fig. 2 | The UNIDO visualization tools allow users to view industrial statistics data from various time periods by country and industry

Statistical graphics are important tool for data analysis and presentation, and particularly dynamic graphics have become a modern trend for data dissemination. Most of the national and international organizations provide a version of this type of tool (see for example, the Data Mapper of the IMF and the ECB Inflation Dashboard, which are may be the most prominent ones). The UNIDO statistical database portal provides visualization services with which each selected data subset can be graphically presented in a variety of interactive graphical charts, specifically line plot, bar plot, scatter plot and a choropleth map.

UNIDO cooperated with Google and published a limited data set on the Google Public Data Explorer (PDE). Creating visualizations with the PDE is straightforward and is done within a matter of minutes.

A user can choose the data and how to visually represent it. Additional data can then be applied to different attributes of the visualization. The created views can be shared via permalink or embedded in any webpage.

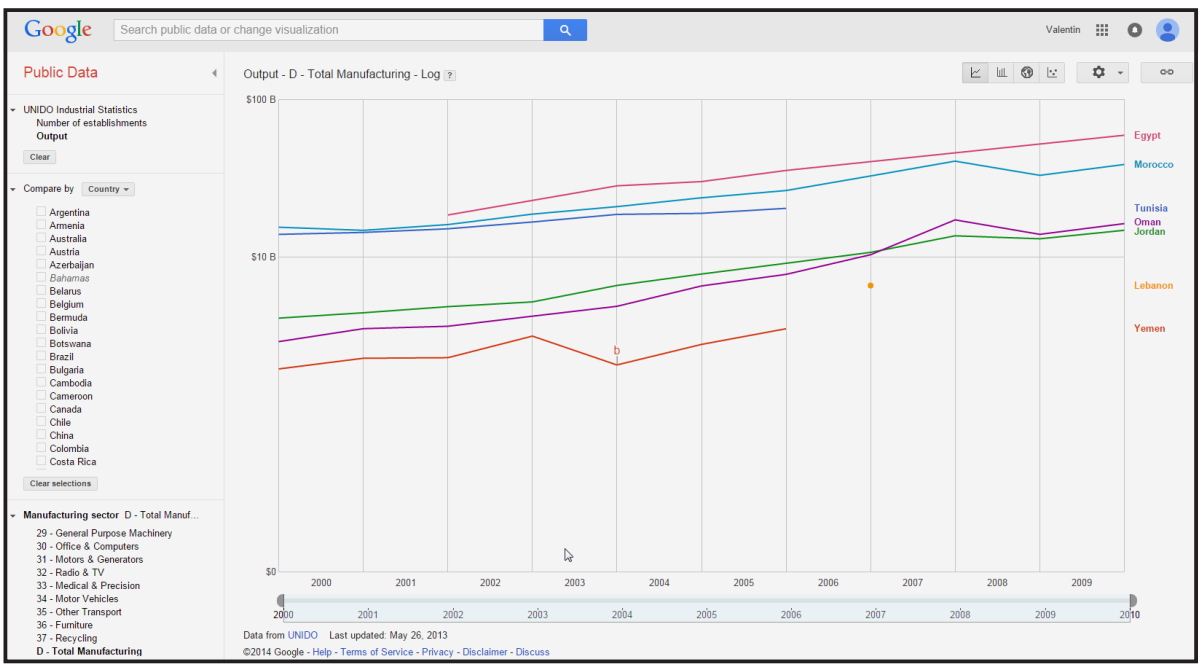


Fig. 3 | Visualization of UNIDO data in Google Public Data Explorer

SESSION 6
Technical co-operation with National Statistical Offices

Session chaired by Shyam Upadhyaya, Chief, Statistics Unit,
United Nations Industrial Development Organization

UNIDO PROGRAM ON TECHNICAL COOPERATION IN INDUSTRIAL STATISTICS

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Background

In the field of technical cooperation, UNIDO initiates country projects based on requests from national policy makers, requests from National Statistical Offices (NSO) to assist with solving a specific problem in their industrial statistics system or when a lack of data is identified in UNIDO's databases. The main topics for technical cooperation projects are related to the process of creating or the capabilities of maintaining a database on industrial statistics, i.e. business register, industrial survey or census, data processing system, management and dissemination, and data analysis and training.

A rapid response to NSO requests for technical assistance is of upmost importance and UNIDO makes every effort to comply with such matters in the shortest possible time. So far, UNIDO has undertaken projects in Ethiopia, Thailand, Myanmar, Mongolia and Congo. Projects that are tailored to the individual needs of a country, taking into account existing structures, can stand-alone or be part of an integrated program. Examples of the latter include Mozambique and Zambia in which projects are undertaken within integrated UNIDO programs, a project in Tanzania that is part of the internationally funded One-Fund program, and regional programs focusing on the CIS, Southeast Asian and EAC countries.

Training is a major component of project work. Efforts to enhance regional capacity focus on updating the latest international guidelines on economic and industrial statistics, and on best practices of industrial statistics sharing. The training programs take place on a central location within the targeted region most recently in Moscow 2014 where focus was on the CIS countries.

UNIDO currently has ongoing projects in, among others, Tanzania, Oman, Gabon and Russian Federation countries, while pipeline projects are laid out for Laos, Nigeria, Myanmar and Mozambique. The challenges for these projects concerns particularly lacking awareness on the importance of statistics, limited resources, capacity development and enhancement in regards to data production and utilization, and finally, the sustainability of such technical co-operation.

MANUFACTURING STATISTICS IN TANZANIA

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The National Bureau of Statistics in Tanzania is, inter alia, responsible for the collection, compilation and dissemination of industrial statistics (using ISIC, Revision 4) in the country in line with UN recommendations.
It has two major statistics activities:

- Compilation of the Producer Price Index (PPI) and the Production Index of Manufacturing Industry (PIMI) with the technical assistance from the United Nations Industrial Development Organization (UNIDO). Apart from direct assistance, UNIDO also provides equipment under this project.

- A census of industrial production covering 2013, the first since 1989, is in progress with data collection was to start in September 2014 and continue for two years.

The Bureau recognizes that the production of industrial statistics to feed both the Industrial Census and an update of PPI/PIMI will require further technical assistance from UNIDO.

OMAN EXPERIENCE IN INDUSTRIAL STATISTICS

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Development of industrial statistics in Oman

Oman is the only country in the Gulf area that undertakes an industrial census every year. A paper has been prepared to review and reflect on Oman's experiences on industrial statistics; while the paper can be found in Section 4, a short overview of its key points is brought forward here.

In 1990, the Ministry of Commerce and Industry in Oman established a special unit to collect data on the industrial sector in order to set up a database for the purpose of economic analysis and policy making. This happened under the guidance and assistance of JICA, the Japanese Agency for International Cooperation. JICA helped the Ministry to carry out its first industrial census in 1994, covering all existing industrial units, and to publish the annual Industrial Statistics book that compiled a broad range of indicators for the manufacturing sector.

The Ministry continued to conduct and develop annual industrial surveys. Due to the observation that the number of small-scale establishments (with less than 10 persons engaged) was declining between 1994 and 2000 and their contribution to value added became less for every year, the coverage of the census was limited to establishments with 10 or more persons engaged.

Towards a technical assistance project

Field enumerators were the chosen method for collecting statistical data for many years. These were to distribute the questionnaire and ensure that the completed forms were returned to the Ministry. The clear limitations

to this approach encouraged the Ministry to ask UNIDO for technical assistance to develop a new methodology.

The Ministry decided to upgrade their statistical methodologies in the preparation of industrial statistics and invited the Gulf Organization for Industrial Consulting (GOIC) for assessment and advisory. Per GOIC advice, in 2012 communication began with UNIDO on the scope and objectives of a technical assistance project.

Following a fact-finding mission, UNIDO submitted to the Ministry a project proposal with the main objective to enhance the institutional capacity of the Omani government for industrial development through improvement of the statistical infrastructure. The suggested means were to

1. revise and upgrade the statistical system by complying the questionnaire with 2008 UN standards (ISIC Revision 3 to ISIC Revision4) and the policy objectives of Oman;
2. by updating the technical database system;
3. develop performance indicators for the industrial sector for policy analysis purposes; and 4) review the internal processes and qualifications of staff involved in the statistical activities. The Ministry accepted the project and UNIDO began its work in the country in 2013.

The UNIDO-Oman technical assistance project is on schedule with 60 percent of the data having been collected and data editing and data input is in progress.

4. PAPERS

STATISTICAL ANALYSIS OF RELATIONS BETWEEN KEY INDICATORS OF INDUSTRIAL AND SOCIAL DEVELOPMENT

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Introduction

The Millennium Development Goals (MDGs), agreed at the Millennium Summit of the United Nations in 2000, are set to expire in 2015. There has been significant progress on reducing levels of poverty, with the goal to half extreme poverty and hunger met five years ahead of the target date. There have been other successes too, with child mortality almost halved and 90 percent of children in developing countries now in primary school. But the picture is a mixed one and as the world looks ahead to new development goals from 2015, there is recognition that the MDGs did not focus enough on integrating the economic, social and environmental aspects of sustainable development.

The lack of emphasis on economic dimension has been the major limitation of MDG indicators as a monitoring tool for overall development. The targets themselves focused on the final destination and not the journey, with little mention of the processes required in terms of economic development to make the MDGs a reality. In many developing countries, faster rising populations and deepening economic inequalities outstripped the pace of economic growth. This, in turn, increased the dependence of the population on natural resources causing further degradation of environment. Most importantly, the MDGs made no mention of the immense impact of industrialization on economic, social and environmental sustainability.

Development of a modern society is based on the foundations created by industrial revolutions. The industrialization over the past 200 years brought fundamental changes in the use of resources from primary production to manufacturing and related services. It created new skills and advanced technology, revolutionized transport and

communication and extended the market for the global exchange of goods and services. Industrialization rapidly accelerated economic growth and immensely influenced social structures. As economies progress towards industrialization, the demand of skilled labour rises and the average wage rate grows. The surplus labour from rural areas is absorbed by new industrial enterprises, leading to a rising number of middle-class households.

Although industrialization began in Europe more than two centuries ago the process is still far from complete. As of 1 January 2014, there were only 57 economies, making up less than 20 percent of the world population that were classified as Industrialized. At the same time, the gap between highly industrialized economies and least developed countries (LDCs) is increasing. The average per capita manufacturing value added (MVA) of industrialized countries is 10 times higher than that of developing countries and 90 times higher than the average of LDCs. Growing inequality among nations is the particular concern of the United Nations Industrial Development Organization (UNIDO), which was established in 1966 with the mission of promoting and accelerating industrialization in developing countries.

It is clear that citizens of modern, industrialized countries enjoy much more prosperous and healthy lives than those in LDCs. They benefit from high levels of education, better social security, sophisticated transport and communication networks, access to information, knowledge, technology and financial facilities necessary for businesses. The process of industrialization is closely related to their well being. By contrast, in many other countries the lack of productive employment and access to resources is accompanied by extreme poverty.

Sources and methods

To conduct reliable quantitative analysis of the relation between industrialization and human development, a vast amount of data is needed. Indicators on industrial development and a broad range of indicators spanning from health, over education, to poverty must be considered. Additionally, data must cover many countries and years. Therefore, readily published data from UNIDO and other international organizations were used throughout the analysis.

UNIDO Statistics compiles and disseminates the key indicators of the global industrial growth. The Manufacturing Value Added (MVA) Database contains country data for GDP and MVA in current and constant (2005) prices as well as population starting with 1990. MVA per capita, as the relative value of net manufacturing output to population size, calculated from this database, is a widely measure of a country's degree of industrialization and very important for the quantitative analysis presented herein.

For benchmarking and measuring the industrial competitiveness of nations, UNIDO also publishes the Competitive Industrial Performance (CIP) index. The CIP index is a composite index that consists of eight sub-indicators grouped along three dimensions of industrial competitiveness: a country's capacity to produce and export manufactured goods, its level of technological deepening and upgrading, and its impact on world manufacturing value added and trade. Therefore, the CIP index is a unique tool that allows comparing countries' relative industrial performance over time. Universally accepted social indicators are obtained from the 2013 Human Development Report published by the United Nations Development Programme and the World Development Indicators database

maintained by the World Bank. These two sources contain numerous indicators on the three dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. The 2013 Human Development Report introduced several new indicators available for 2012, which account for different inequalities within the countries.

Various graphical and statistical tools are used to assess the relation between an industrial and a social indicator. When comparing all available countries for a single year, the countries are shown as dots in the graph with the industrial indicator on the horizontal axis and the social indicator on the vertical axis. To visualize the overall relation, a local regression line (Loess Curve) is added to the graph. Countries that are simultaneously ranked in the top 10 (or bottom 10) by both indicators are highlighted and annotated in the graph. If all countries are to be compared for the years 1995 to 2012, the data is reduced to four time frames (1995- 1999, 2000- 2004, 2005 - 2009, and 2010 - 2012) in order to maintain clarity. For each time frame and country, the median value is shown as dot in the graph. This means, that in half of the years in the time frame the value was above and in the other half of the years the value was below the plotted value. Again, to make the relation more evident, a local regression curve for each time frame is displayed. With these basic tools the overall relation between an industrial and a social indicator can be adequately visualized.

It is also necessary to compare an industrial and a social indicator for particular countries over time. We adopted two methods to facilitate this comparison. The first is to calculate the compound annual growth rate (CAGR) of each indicator for every country of interest. The CAGR is the rate at which the indicator would have grown, if it grew at the same rate every year. The second method is to calculate the value of the indicator for a country relative to the value in the base year 2000. The relation can then be assessed by visualizing the trend over time of both indicators relative to the base year in which both indicators have the same relative value (100).

Statistical evidence

1. Gender Inequality

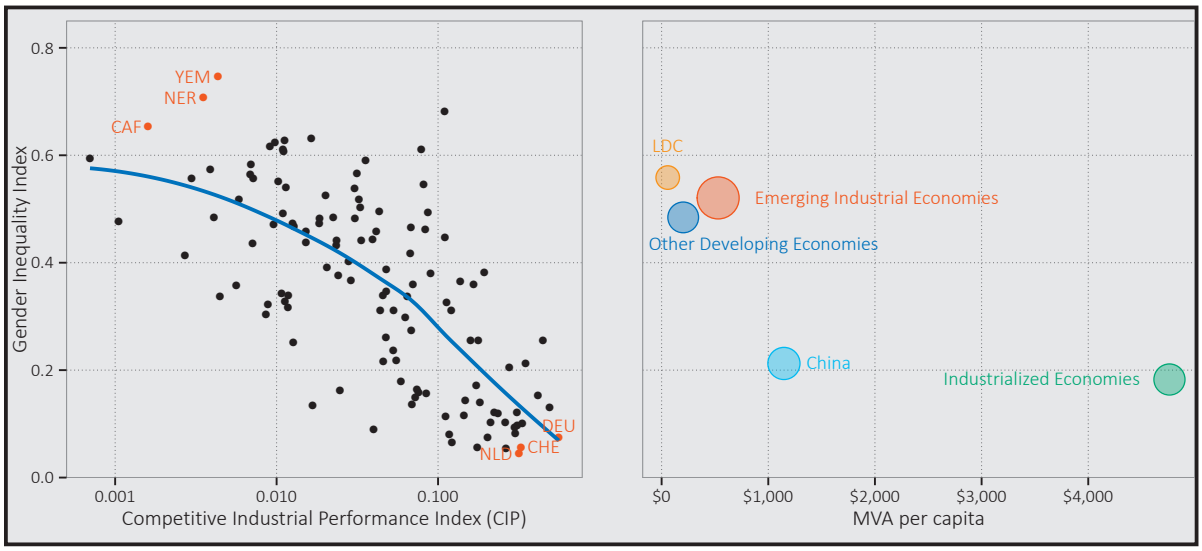

Fig. 1 | Relation between the Gender Inequality Index (GII) and the CIP index for 2010 as well as MVA per capita for 2012

The Gender Inequality Index (GII) is an important measure that shows the disadvantages women and girls face in a country. "All too often, women and girls are discriminated against in health, education and the labour market - with negative repercussions for their freedoms." (UNDP: Human Development Report 2013). The GII is a composite measure reflecting inequality in achievements between women and men in three dimensions: reproductive health, empowerment and the labour market. The inequality is expressed in values between 0 and 1, with lower values indicating less inequality between the genders.

From the left graph in Figure 1 it is clear that in 2012 women and girls faced less disadvantages in countries with higher CIP index than in countries with lower CIP index. This is also supported by a highly significant correlation of the ranks of 0.71. The industry in the Netherlands, Switzerland and Germany, for instance, are very competitive and the inequality between the genders is low, while in Yemen, Niger and the Central African Republic women face many disadvantages and the industry is not competitive.

Aggregating the values by country group (right graph in Figure 1), reveals that least developed countries (LDCs) have the highest gender inequality while in industrialized countries the inequality is lowest. In terms of gender equality, China has notably outperformed other emerging industrial economies with a similar level of MVA per capita. Women in China face less discrimination and the inequality between genders on average is about the same as in industrialized countries. Looking at the size of the bubbles in the graph, which is proportional to the total number of women living in the represented country groups in 2012, it becomes clear that more than half of the world's women live in countries where they are substantially disadvantaged (GII higher than 0.4).

2. Poverty

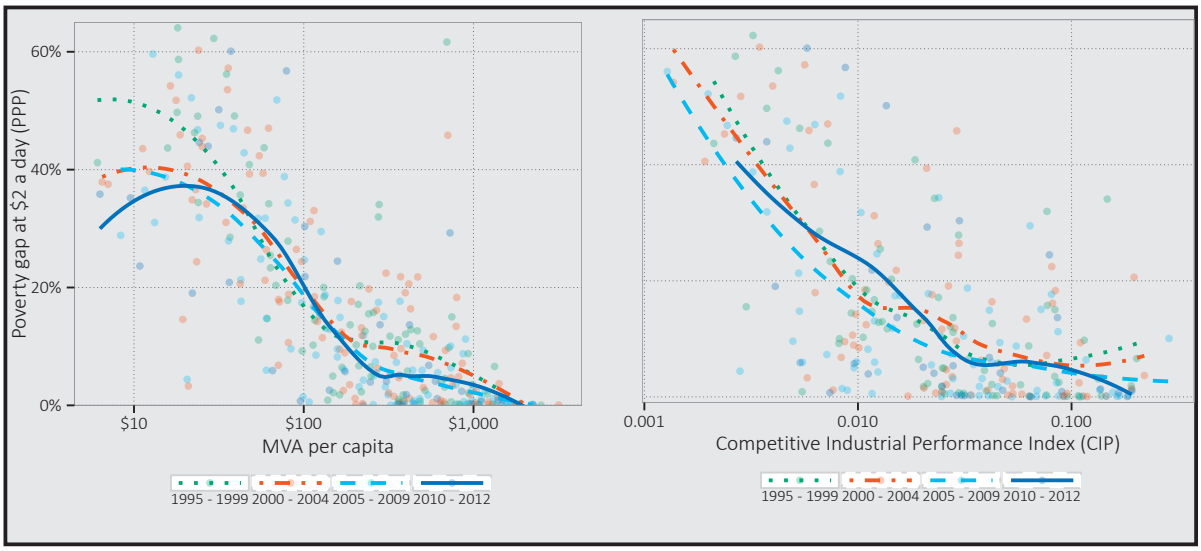

Fig. 2 | Relation between the poverty gap and MVA per capita as well as the CIP index between 1995 and 2012.

Industrialization helps to reduce income poverty through the creation of employment and self-employment opportunities. A rise in the level of industrial activity also enables other sectors, especially agriculture, to increase productivity and efficiency through the introduction of new technology, witnessed by higher levels of productivity in agriculture and service sectors seen in industrialized countries. Subsequently, industrialization generates wealth which is then available to support overall human development throughout society. This effect has been most clearly visible in parts of South East Asia where dynamic industrial growth in countries such as Malaysia, Singapore and the Republic of Korea have dramatically lowered levels of poverty in a relatively short time. With the continuous growth of manufacturing, the poverty index has fallen significantly in emerging industrial economies such as Brazil, China, and India too. By contrast, extreme poverty persists in many least developed countries (LDCs) where industrial development has been slower.

The depth of poverty as well as its incidence can be described by the mean shortfall from the poverty line of US$ 2 a day at purchasing power parity (PPP)[1] in a percentage of the poverty line (counting the non poor as having zero shortfall) and is expressed by the poverty gap. The relation with industrialization, as shown in Figure 2, is similar in all four time frames. On average, in countries with MVA above US$100 per capita the poverty gap is less than 20 percent, while for most of the countries with MVA per capita below US$100, it is at least 20 percent. The relation between the CIP and the poverty gap provides further evidence that in economies with higher level of industrialization, less severe levels of poverty are observed. Especially in countries with a CIP index lower than 0.01, the poverty gap is often above 20 percent and no decrease over time is visible.Beside the mean shortfall

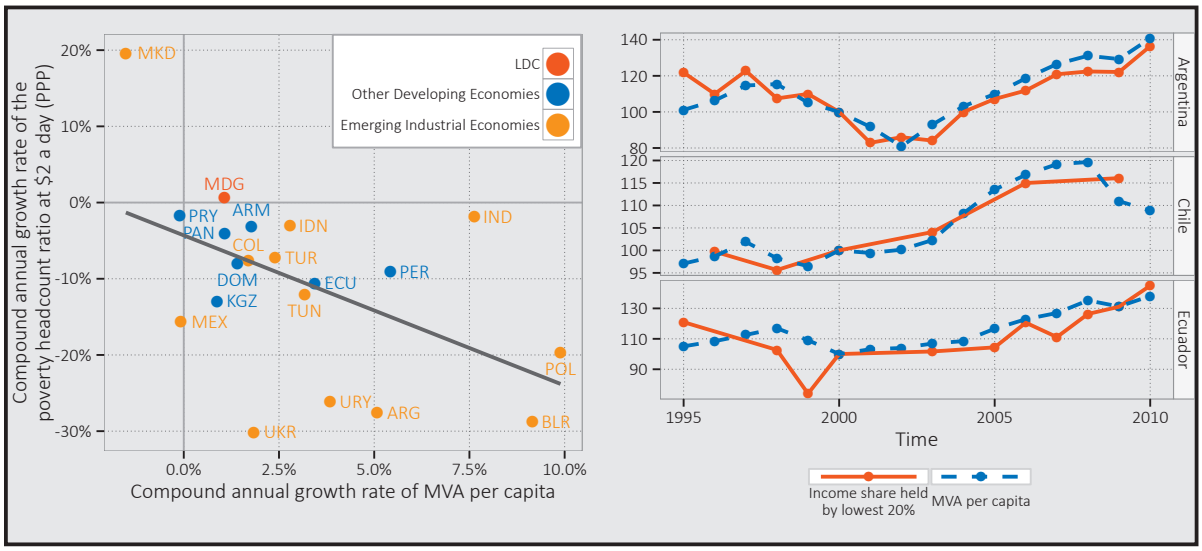

Fig. 3 | Poverty headcount ratio and income share. **Left:** Compound annual growth rate of the poverty head count ratio and MVA per capita (1990-2010). **Right:** The trend relative to the base year 2000 of the income share held by the lowest 20 percent in comparison to the trend of MVA per capita (1995-2010).

from the poverty line, the number of people living below the poverty line, relative to the total population, is of great interest. On the left in Figure 3 the compound annual growth rate from 1990 to 2010 of both indicators is shown. Although in almost all countries MVA per capita increased and the number of people living in extreme poverty decreased, the poverty headcount ratio decreased significantly faster in countries where the rate of MVA per capita growth was higher.

Poverty is also reflected in the inequality of the income distribution, usually measured by the income share that accrues to a subgroup of population. When looking at the trend of the income share held by the lowest 20 percent in Figure 3 (right) for Argentina, Chile, and Ecuador, the close resemblance to the trend of MVA per capita is obvious. Especially in Argentina these two indicators moved in tandem. Not only increases the income share held by the lowest 20 percent in years where MVA per capita increases, but also the observed growth rates are almost identical. The graphs presented in this section not only showed that the depth of poverty is lower in countries with a prospering industry, but also more people can escape from extreme poverty when the industry develops. Additionally, a diminution of the inequality of the income distribution can be observed in economies with a growing industry.

[1] PPP is defined as the number of units of the country's currency that are needed in that country to purchase the same quantity of individual goods or services as one unit of US dollars will purchase in the US.

3. Access to knowledge

An important and effective tool that helps people escape poverty is providing them with access to knowledge. There is a two-way relationship between industrial development and education. Growth in industrialization creates high demand for a skilled and trained workforce thereby encouraging youth into education, while at the same time providing revenues that can then be directed to further develop education. However, a lack of job opportunities for youth in developing countries has forced many to emigrate to industrialized countries, which has been the root cause of international human trafficking, one of the worst humanitarian problems faced by the global community today. Only industrialization and the creation of employment opportunities can provide the livelihoods to allow people in many developing countries to flourish in their place of origin.

Secondary education offers pupils more subject- and skill-oriented education by more specialized teachers and is important to meet the demand for skilled labour. Additionally, it lays the foundations for lifelong learning and thereby provides people with the ability to keep up with ever changing skills required. Figure 4 shows that the enrolment rate in secondary education is clearly higher in countries with higher industrial competitiveness. In almost all countries and time periods, a CIP value above 0.1 also indicates a school enrolment rate in secondary education of more than 75 percent, which is higher than in most countries with a CIP value of less than 0.01. Both Mexico and Turkey experienced times of growth and times of contraction in MVA per capita over the period from 1990 to 2011, and in periods with only moderate growth or even decrease in MVA per capita, the enrolment rate also decreased or increased only moderately.

A similar conclusion can be drawn for the progression rate to secondary school. In economies considered as least developed, developing, or emerging, a growth in MVA per capita is usually accompanied by an increase

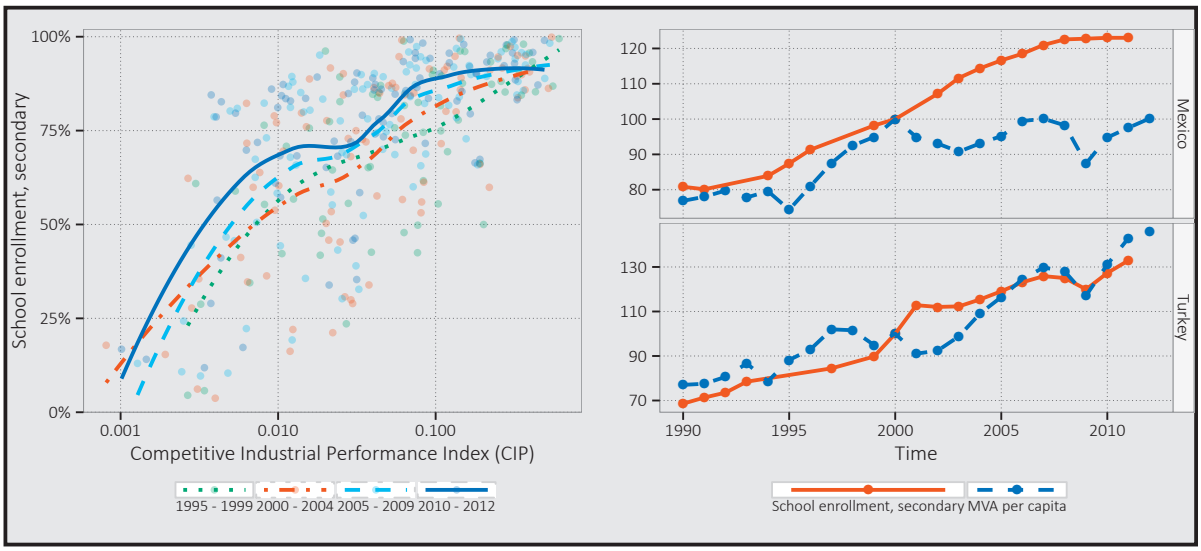

Fig. 4 | Relation between the enrolment rate in secondary school and the CIP index (left) and the trend of the enrolment rates and MVA per capita for Emerging Industrial Economies Mexico and Turkey

in the progression rate at an assimilable pace. In Costa Rica for instance, the progression rate and MVA per capita both were 1.15 times higher than they were in 2000. This indicates that more pupils were inclined to pursue secondary education and the education system had sufficient places available in secondary schools in times where MVA per capita grew.

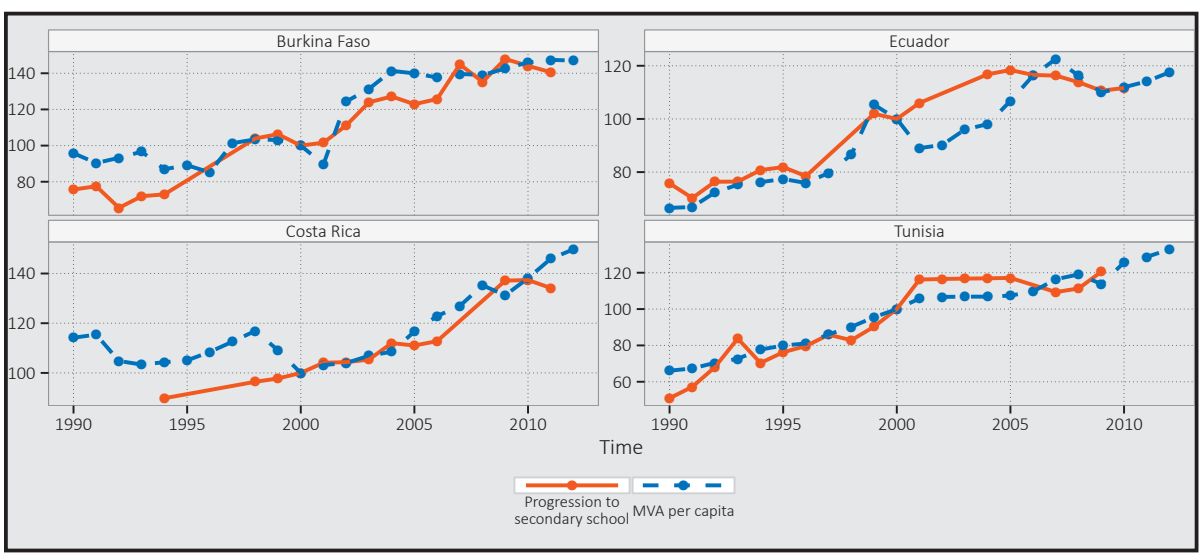

Fig. 5 | Trend of progression rates to secondary school and MVA per capita various countries, 1990-2010

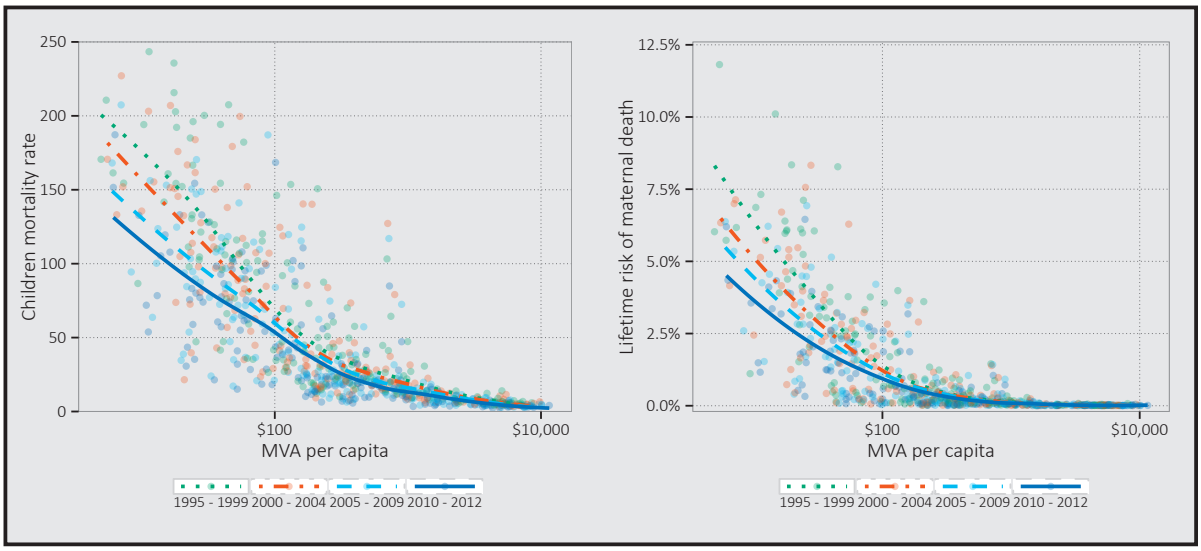

Fig. 6 | The relation between MVA per capita and child mortality (left) as well as risk of maternal death (right) for different periods between 1995 and 2012

The third primary dimension of human development is a long and healthy life and the fourth goal of the MDGs is to reduce child mortality. The left graph in Figure 6 shows that the probability that a newborn baby will die before reaching the age of five is smaller in countries with higher MVA per capita. Over time, child mortality rates have fallen in almost all countries around the world. Despite this, as recently as 2012 some countries with MVA per capita below $100 still had a child mortality rate of above 15 percent, with very few in this category achieving rates below 5 percent. The lifetime risk of maternal death, the probability that a 15-year-old female will die eventually from a maternal cause, is an important indicator for maternal health, which is the fifth goal of the MDGs. In countries with a medium or highly developed industry, the lifetime risk of maternal death is very low (right graph in Figure 6). But despite an overall downward trend over time, in countries with less than $100 MVA per capita, the risk of maternal death is still at a concerning level.

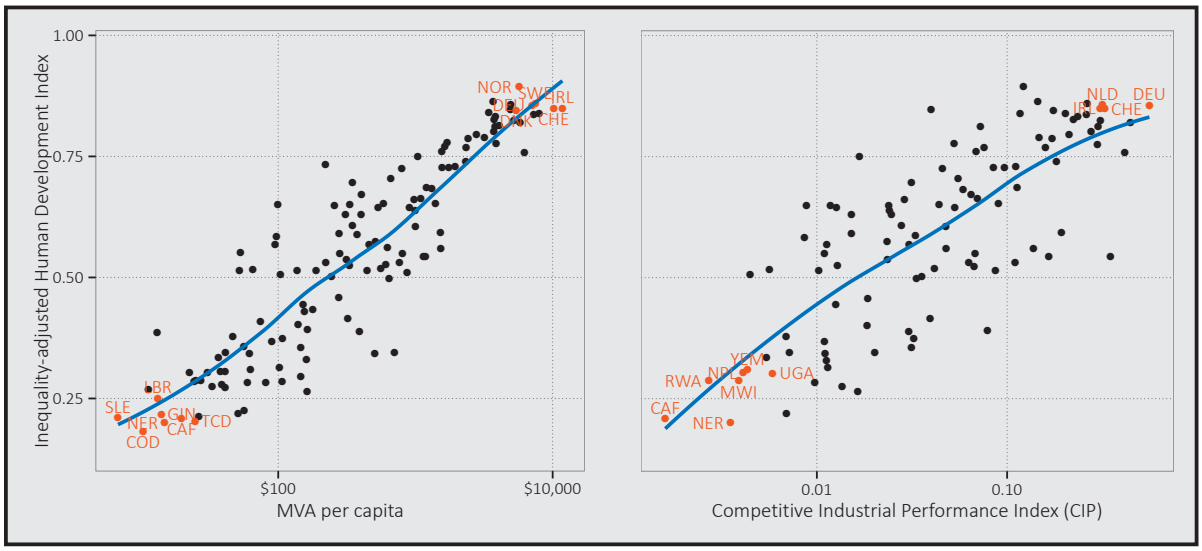

Fig. 7 | Development Index (IHDI) and MVA per capita for 2012 as well as the CIP index for 2010 Relation between the inequality-adjusted Human

To complete the analysis, the relation between industrialization and overall human development is investigated. The Human Development Index (HDI) for 2012, released by the United Nations Development Programme (UNDP) is a composite index measuring average achievement in three basic dimensions of human development: a long and healthy life, knowledge and a decent standard of living. It is designed to express the social and economic development of a country in a range of the value between 0 and 1, where a greater value means more developed. The inequality-adjusted HDI (IHDI) is similar in concept, but each of the three basic dimensions of the HDI is adjusted for inequality. "The IHDI is the actual level of human development (taking into account inequality), while the HDI can be viewed as an index of the potential human development that could be achieved if there is no inequality." In the two graphs of Figure 7, the IHDI is compared to MVA per capita (in constant 2005 US dollars) in 2012 and the CIP index in 2010. With both indicators of industrialization a very high correlation can be seen. The observed rank correlation coefficients between the IHDI and MVA per capita respectively between the IHDI and the CIP index of 0.9 and 0.77 are highly significant and underline the relations suggested by the graphs. Additionally, Germany, Ireland, Switzerland, Niger, and the Central African Republic are highlighted in both graphs.

Although economic inequality may widen at the early stage of industrialization, especially between richer urban and poorer rural communities, further industrial growth, as Kuznets curve suggests, is necessary to reduce inequality. Economic inequality today is much higher in low-income countries than in high-income industrialized countries.

Conclusion

Statistics presented herein show a clear and strong connection between industrialization and the three basic dimensions of human development: poverty, education and health. When MVA per capita rises by 1 percent, the poverty head count decreases by almost 2 percent. It is also evident from the data presented that poverty is most prevalent in least developed economies. At the same time, figures demonstrate that a higher level of industrial competitiveness - as measured by the CIP index - is accompanied by more children in secondary school. When the CIP value is above 0.1 school enrolment rates for secondary education exceed 75 percent. Finally, living a long and healthy life is much more likely for people in more industrialized countries, as seen by the significantly lower levels of child mortality and lifetime risk of maternal death experienced in countries with higher levels of industrialization.

On every important measure, adjust or not adjusted for inequality, human development is greater in industrialized countries.

MANUFACTURING INDUSTRY STATISTICS IN ETHIOPIA

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Introduction

The Central Statistical Agency (CSA) of Ethiopia was set up in 1961. It published its first yearly statistical abstract two years after its establishment. The statistical abstract brought together various annual statistics in one volume. The bulk of the information in the statistical abstract has been provided by the various household and establishment surveys and the remainder has been obtained from statistical/research units of individual ministries/institutions of past and currently existing governments. The statistics covered the entire country and many of the socio-economic sectors.

Statistical surveys have been conducted for the Ethiopian manufacturing industry since the inception of the CSA industry. The survey on the manufacturing industry has been covering factories using power driven machineries and employing 10 or more persons. The methodology of the survey is firmly based on the United Nations Statistics Division's concepts, definitions, and classifications of the subject with slight adjustments to the Ethiopian situation. The major items on which data are collected are: number of persons employed, value and volume of raw materials used, value and volume of production, wages and salaries, investment in the sector, value of fixed assets, and other expenditures and receipts etc.

The first survey on the manufacturing industry, which was conducted in 1962, covered about 200 factories spread across all of the 14 provinces of the country, and the data then elicited referred to the years 1955-1961. The survey was undertaken together with the data collection operation for the annual statistical abstract. The results presented statistics

on the number of establishments, persons employed, gross value of production, value added, and others, and were published in the statistical abstract.

With the lapse of time and, as the need and demand for more detailed data on the manufacturing industry increased, the survey instruments have been improved and extended. This action culminated in the launching of the separate and independent Survey on Manufacturing Industry and a statistical report containing the survey results titled Report on Manufacturing Industry Survey in 1968.

As the manufacturing industry in Ethiopia developed and the scope widened, so did the survey on the manufacturing industry. This necessitated the breakdown of the survey into further components:

- The Large and Medium Scale Manufacturing Industry Survey, which has been carried out annually since 1968 on the basis of a complete enumeration using list frames.
- The Cottage and Handicraft Manufacturing Industry Survey was planned to be carried out every five years on a sample basis using an area frame. The plan, however, was not implemented and instead only four surveys were conducted in 1972, 1978, 1997, and 2004.
- The Small Scale Manufacturing Industry Survey was planned to be carried out every second year using both area and list frames on a sample basis but only four surveys were conducted in 1997, 2003, 2006, and 2010.
- The Quarterly Manufacturing Business Survey has been conducted since 2005 on a limited number of variables, such as value of production, number of persons engaged, revenue of sales, new capital expenditure, and capacity utilization, based on a sample of 310 establishments using list frame. This survey is primarily intended to serve the purpose of national accounts compilation.
- The Quarterly Producers' Price Index Survey on Manufacturing Industry (PPI-M) has also been conducted since 2005 and focuses mainly on food products and beverages, textile, leather, chemical and chemical products, rubber and plastic products, non-metallic mineral products, basic iron and steel, etc. It is based on a sample of 250 selected establishments using list frames.

Large and Medium Scale Manufacturing Industry Statistics

1. Organization: One of the missions of the CSA is to produce quantitative and qualitative data on the manufacturing sector to meet the demand by policy makers, planners, researchers, and other data users. To achieve this goal the CSA has reorganized itself into eight Directorates at the Head Quarters and 25 Branch Statistical Offices across the country. The Directorates prepare the survey instruments, offer training, write, and release statistical reports while the Branch Statistical Offices recruit and hire the enumerators and perform the actual data collection in their respective areas of operation and dispatch the filled in questionnaires to the Head Quarters. Similarly, the Business Statistics Directorate deals with surveys on manufacturing industry. It is responsible for the preparation of the survey instruments, training, writing and analysis of statistical reports on the manufacturing industry.

2. Methodology: A structured questionnaire is used to elicit the data by interviewing the respondents of the surveyed factories. The interviewers (enumerators) are trained on an annual basis for at least ten days in interviewing techniques, in compilation of data from accounts records and other documents of the establishments surveyed, and in how to record them on to the questionnaires as per the instruction manual. After the training the enumerators go on field practice to do practical work to reinforce what they have learned in the classroom. All establishments/factories using power driven machinery and employing 10 or more persons are covered by the annual survey, which is virtually a census. A list frame is used to track the establishments that are to be surveyed. Each enumerator is assigned to eight establishments and given two months to complete the questionnaire. More than 300 enumerators, 60 supervisors (1 supervisor to 5 enumerators), and 30 statisticians are involved in the data collection operation all over the country. The survey is usually completed in two months. The filled in questionnaires are then sent to the Head Quarters.

3. Data Summarization: Editing and coding of the data is done at the Head Quarters based on the editing and coding instruction manual. About 40 editors and coders are involved in this operation and the operation takes one month to complete. Verification of the edited and coded questionnaires is also carried out on all the edited questionnaires. About 20 encoders perform data entry, and 8 data cleaners do the data cleaning. The programmers - in line with the tabulation plan- undertake data summarization. Then statisticians check the data reliability and consistency. The data is mainly aggregated at national level but it can also be disaggregated at regional level upon request.

4. Statistical Report Preparation: When the data after scrutiny are considered to be consistent and reliable, senior statisticians do the statistical report writing, including descriptive analysis, and the report is released to data users after being reviewed by the director general of the agency.

5. Dissemination: The results of the Large and Medium Scale Manufacturing Industry Survey are disseminated in print and on electronic media free of charge on www.csa.gov.et. All processed and official data are freely available to any data users without any restrictions.

6. Survey Results: The survey results offer a considerable number of data on various items of interest. Data on the number of establishments, number of persons employed, gross value of production, value added, value of fixed assets, investment in manufacturing, and expenditures of the sector are the major results of the survey.

Table 1 is intended to give a glimpse of a twenty-year time series on some selected variables of interest in the manufacturing sector in Ethiopia. The survey result, of course, convey much more than this.

The food products and beverages industry group and the non-metallic mineral products industry group are the major contributors to the Ethiopian manufacturing industry. About 32 percent of the manufacturing establishments are involved in the production of food and beverages and about 19 percent of the establishments are engaged in non-

Table 1 I Time series data on Large and Medium Scale Manufacturing Industry in Ethiopia for selected variables, 1993-2012

Year	Number of establishments	Number of persons employed	Gross value of production '000' Birr	Value added '000'Birr	Investment 000'Birr
1993	289	82,316	2,674,167	1,337,040	439,355
1994	499	88,862	4,010,703	1,859,390	206,596
1995	501	90,679	4,930,487	2,103,122	196,034
1996	642	91,199	5,799,104	2,445,024	229,267
1997	741	93,166	5,996,199	2,610,162	306,575
1998	762	94,023	6, 393,206	2,741,728	404,163
1999	779	94,412	7,272,328	2,886,474	367,059
2000	789	95,859	8,133,077	3,283,842	453,315
2001	798	94,532	8,439,658	3,415,524	542,911
2002	909	98,986	8,091,737	3,294,574	461,290
2003	966	102,347	9,024,225	3,758,495	517,011
2004	1,074	106,151	10,871,758	4,419,050	925,514
2005	1,207	110,160	12,316,416	4,716,474	894,996
2006	1,244	119,397	15,047,066	5,716,433	999,062
2007	1,443	136,043	18,574,230	7,448,390	1,525,334
2008	1,926	132,172	22,946,588	9,154,705	1,290,088
2009	2,198	149,672	28,787,689	11,434,869	1,949,177
2010	2,172	186,799	42,008,056	17,335,333	3,720,106
2011	2,168	175,641	52,325,424	22,442,001	3,657,733
2012	2,452	200,014	93,088,051	27,061,452	8,644,030

Notes I 1 US dollar is about 20 Birr.

metallic mineral products. More than 39 percent of the persons employed are in the food and beverages industry group and 10 percent are in the non-metallic products industry group. About 54 percent of the value added is still contributed by the same food products and beverages industry group and more than 14 percent by the non-metallic industry group. About 44 percent of the investment in the manufacturing sector was added by the food products and beverages industry group, and 17 percent by the non-metallic mineral products industry group.

Challenges

Even though the CSA is an old national statistical office with a wealth of experience accumulated over the years, there are still challenges in producing and providing data to users. The various challenges require the focus and collaboration of both the data producers and data sources in this case the manufacturing industry sector. The major challenges that have a severe impact on the quality of the data are:

- Data gaps: There is a wide gap in the provision of data on the manufacturing industry, especially on small scale, cottage and/or handicraft manufacturing industry, because of poor coverage, unsustainable frequency of the surveys and absence of an appropriate frame;

- Absence of a business register: There is no consolidated single statistical business register even for the Large and Medium scale Manufacturing Industry. What is currently being used are the directories obtained from the Ministries of Trade and Industry which have duplications, omissions, inaccuracies, and are difficult to verify and update;

- Absence of National Standard Industrial Classification: There is a considerable demand for data other than those classified and grouped by the International Standard Industrial Classification (ISIC). This demand could not be met because there is no National Standard Industrial Classification for Ethiopia, which would provide data on items that are different from the ISIC grouping;

- Lack of statistical awareness on the part of respondents: Most of the respondents fail to appreciate the importance of the data they provide. They even do not know that the data in turn will be advantageous in running their business. Because of this many hesitate to respond/ delay the response or even refuse to give information;

- Respondent fatigue: Numerous refusals and delays have been severely affecting the survey and at times the CSA has to use the full force of the statistical act. The split of the Survey on Large and Medium Scale Manufacturing into two quarterly surveys and one annual has also aggravated the respondent fatigue;

- High turnover of experienced staff: This is a very recent phenomenon compared to the age of the CSA. In present day, the government is the least rewarding employer and this has manifested itself in the depletion of experienced staff in non-revenue generating government offices. The CSA has not been spared;

- Lack of initiative in the Business Statistics Directorate: There is little openness to change in the directorate. Many improvements could have been made on the survey instruments given the existing resources. There have not been as many improvements as there should have been for many years. Respondents, enumerators and supervisors are all weary of filling out the same tedious questionnaires for many years.

The overall effects of the above and other challenges are impacting seriously on the quality of data and necessitate timely action by the CSA. The CSA needs the collaborated efforts and help of all stakeholders including the manufacturing sector.

The way forward

- Efforts should be exerted to narrow the gap gradually. This entails the improvement of survey instruments and the production and provision of data, which have not been available before as well as increasing the coverage and scope to bridge the data gap;

- For better coverage, coordination, and harmonization of the manufacturing industry surveys good survey frames is required. Such survey frames are obtained from the construction and maintenance of a single statistical business register. A statistical business register is crucial in developing a comprehensive and integrated program of economic surveys and will support business surveys of the economy. The CSA has been working on the design of a statistical business register but has not yet completed it. The incomplete business register should be finalized and launched speedily. UNIDO's assistance in this regard would be beneficial;

- There idea of instituting a national committee on National Standard Industrial Classification has been conceived a long time ago. This concept should be realized as soon as possible to resolve the problems that await the committee and mitigate the challenges;

- Promotional work should be done using the electronic and the print media aggressively on a permanent basis to raise the statistical awareness of respondents. It should never be a one shot campaign;

- As the number of manufacturing establishments continues to increase, the census of manufacturing industry becomes more and more difficult, time consuming, and unmanageable. To avoid these challenges and alleviate respondent fatigue, the CSA should resort to a sample survey of the Large and Medium Scale Manufacturing Industry instead of a census;

- The CSA should devise means and ways of rewarding and retaining its experienced staff in order to keep them in their employ as long as possible;

- More change should take place sooner than later in the Business Statistics Directorate to keep up to date with the growing demand for data on the manufacturing industry.

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GENERAL INDUSTRIAL STATISTICS AND THE ECONOMIC CENSUS IN SRI LANKA

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Introduction

The Department of Census and Statistics (DCS) is the sole agency responsible for all statistics related to the socio-economic condition of Sri Lanka. The DCS conducts annual and quarterly surveys and decennial censuses to provide necessary data to the policy makers, planners and researchers in the country and to the international agencies. The DCS conducted its first Census of Industries and Agriculture in 1946. Since then the DCS has been conducting a census of Industries once in ten years except in the 90s. In addition to this, the DCS conducts annual and quarterly surveys to compile statistics on the industrial sector, viz.

- Annual Survey of Industries;
- Survey of Construction Industries once in two years;
- Quarterly Survey of Industrial Production.

The frame for these surveys is obtained from the censuses carried out once in ten years. The latest Census of Industries was conducted in 2003. The fast growing service and trade sectors have not been covered in the decennial censuses of agriculture and industries, which have been conducted by the DCS so far. Therefore, the necessity of an economic census has arisen in the country. In view of this background, the DCS has been directed by his Excellency the President to conduct a comprehensive economic census including the emerging sectors of trade and services due to the latter's importance in the economy.

Census 2013/2014

The Census operation is conducted in two phases: a listing phase and a detailed data collection phase. The listing phase that was carried out in October/November 2013 has been completed. It covered the listing all economic activities (both formal and informal) being operated in Sri Lanka, together with the data relevant to a few key variables, which are vital to determine the size and the shape of the Sri Lankan economy. At the listing stage of the economic census 1.04 million establishments in the industry, trade and services sectors were listed, covering the entire country. Listed

data were coded to identify their economic activities and they were computerized using a double entry system to ensure a high degree of accuracy. The accuracy of the data was further enhanced via computer based validation and verification checks and the errors found through those checks were manually corrected.

The detailed data collection phase, which has been planned to be conducted in September-October 2014, involves a complete enumeration from the entities that will be above the predefined threshold criteria and a sampling survey from the entities, falling below the threshold criteria. The listing operation listed over 1 million economic establishments according to the Sri Lanka Standard Industrial Classification Developed (SLSIC) developed by the DCS.

Scope and coverage of the listing stage

The Census was conducted throughout the country covering all economic activities, which were operative during the census period encompassing industry, trade, construction and the service sectors in line with the International Standard Industrial Classification (ISIC) revision IV. However, economic activities that were operated for the sole purpose of their own consumption were excluded at this exercise.

Considering the time constraint and the difficulties in enumeration, the following activities were also kept out of the purview of the listing operation:

- Agricultural activities considered under Section A of the ISIC Revision IV;
- Households that engage in operating or hiring three wheelers;
- Households that engage in transport services or renting vehicles deploying less than 3 light vehicles, such as vans, cars etc.;
- Teachers who engage in individual tutoring by visiting houses;
- Informal house-based tutoring classes which have less than 20 students;
- Those traders who do not have a permanent stall but change the place of selling from day to day throughout the week;
- Households that provide accommodation for less than 5 boarders;
- Those households that have rented less than 3 rooms, houses, annexes or other buildings like shops, boutiques etc. However, if the rented building has over 5000 sq. feet, then it would have been included;
- Households which have rented less than 5 acres of land for cultivation, 1 acre of land for fisheries or animal husbandry, or half an acre of land for non-agricultural economic activities;
- The activities of extraterritorial organizations classified under Section U of ISIC Revision IV, such as embassies, international organizations etc.;
- All entities that are temporarily as well as permanently closed down.

Field operation and staff recruitment

The listing officers went from household to household or entity to entity to identify the economic activities being operated in those units by questioning the relevant persons in those households and entities. The Grama Niladari (GN) officers, being the government officer in charge of the lowest administration boundaries of the country, were employed as enumerators to list the economic activities. In the instance where a GN division exceeds 1000 economic activities, extra officers were assigned depending on the number of economic activities in the area. Several census

blocks of the GN division were assigned to each additional enumerator thus appointed.

The economic activities operated at a permanent location, in a household or in an improvised post on a permanent basis (vendors and sellers operating for a long period at the same location on pavements, etc.) were enumerated at the location, where they regularly engage in the economic activity. However, the mobile vendors were listed at their respective household addresses.

The listing form gathered the following information from economic entities:

- Location;
- Nature of the industry;
- Legal Status;
- Name of proprietor/person in charge;
- Beginning year of commercial operation;
- Source of registration;
- Accounts keeping method
- Number of persons engaged;
- Annual turnover;
- Assets.

Administrative units

For administrative purposes, Sri Lanka is divided into 9 provinces and these provinces are further divided into 25 districts, districts into 331 divisional secretariats, and finally divisional secretariats into 14,022 Grama Niladari divisions. At the 14th Census of Population and Housing, which took place in Sri Lanka in 2011/12, the GN divisions were further subdivided into 65,012 census blocks, in such a way that each census block comprised around 150 housing or building units. This was done to facilitate the census taking process. The census blocks so devised were used in the Economic Census and also to guide the enumerators in their visits from unit (households, business entities etc.) to unit without missing or duplicating any unit in the country.

Classification of economic activities

The economic activities were classified using the latest version of the SLSIC developed by the DCS. This is the localized version of the ISIC Revision 4, which was developed by the United Nations Statistical Commission in 2008. ISIC Revision IV covers economic activities up to the 4-digit level, and in the SLSIC this was extended to the 5-digit level to accommodate vital economic activities prevalent in Sri Lanka (UNSD, 2008).

Informal sector

Informal entities are located in households, in small shops, workshops, or are operated outside a fixed location. Activities of households as employers of domestic personnel and households being producers for their own final use are outside the scope of the informal sector. Many informal enterprises are operated by an individual working alone - as a self-employed entrepreneur (own-account worker), or with the help of unpaid family members - while other informal, unincorporated enterprises may have paid workers. The activities cover the range from street vending, shoe repairing and other activities that require little or no capital and skills to activities that involve a certain amount of investment or level of expertise such as tailoring, car repair and professional services (Kundu, 1999).

Number of persons engaged

The total number of persons engaged in an economic activity, whether they are paid or not, are identified as “the number of persons engaged”. This includes permanent and temporary employees, hired workers listed on the payroll, own-account workers, unpaid family workers, active partners etc. If the

number of persons engaged had varied over the reference period (latest year), the average number of persons for the reference period was recorded.

As the data entry work is being done manually 17 districts out of 25 have been completed to date. Colombo is one of the districts, which compared to other districts, has the highest number of industries in the country. At the 2003 Census of Industries, 11.7 percent of the country's industries were found in the Colombo district. Table 1 shows the comparison of certain variables of industries in the Colombo district in 2003 and 2013.

This reveals that although the number of industries has increased during the period 2003 to 2013, with especially the large industries having decreased during this period. In 2003, 3.9 percent of the total industries were large, that is having more than 100 persons engaged. However, in 2013 only 1 percent was found to have more than 100 persons engaged. This might be the result of the government's policy, which is in favor of encouraging SMEs in the country. With the economic potential of the country, donors and lending agencies advise the country to encourage SMEs. The GSP+ withdrawal by the EU countries is also a fact behind the decrease in large industries (Cabraal, 2009).

Table 1 | Comparison of industrial activities: Economic Census 2013 and Census of industries 2003. Colombo district

Number of industries				
No. of persons engaged	**2003**	**%**	**2013**	**%**
1-5	10,787	42.6	25,316	46.9
6-20	2,201	15.2	2,342	8.2
21-50	613	4.2	536	1.9
51-100	359	2.5	220	0.8
Above 100	567	3.9	295	1.0
Total	**14,527**	**100.0**	**28,709**	**100.0**

OMAN EXPERIENCE WITH INDUSTRIAL STATISTICS AND UNIDO TECHNICAL COOPERATION

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Introduction

This paper presents the experience of the Ministry of Commerce and Industry (MCI) in industrial statistics from its establishment to the present. Oman is the only Gulf Country that is performing an industrial census on an annual basis.

Background

1. Starting point: It was the MCI's idea to establish a specialized unit to collect information and data on the industrial sector in the Sultanate. The purpose was to create an integrated database for the industrial sector to be used when developing future plans for the sector and to assess the performance on an ongoing basis. Based on this principle the MCI, in 1990, came to an agreement with the Japanese International Cooperation Agency (JICA) in order to benefit from its expertise in the field of industrial statistics and to create an integrated database and information system for the industrial sector in Oman.

2. Collaboration with JICA: Since 1990, the ongoing collaboration with JICA resulted in a number of preliminary studies and visits to explore and learn about the structure of Oman's industrial sector. On this base, a questionnaire for the collection of industrial statistics was designed.

3. The first industrial census year 1994: As a result of the JICA-MCI collaboration, the first industrial census as carried out in 1994. It included all existing industrial units in Oman in the categories of small and medium- and large-size, covering all regions and governorates of Oman. The result of this census was the annual Industrial Statistics book, which listed all collected statistical data on the

manufacturing sector, such as financial and employment indicators, geographical distribution and other data that help researchers and scholars as well as planners to prepare plans based on accurate and reliable data.

4. Continuation of the census and its scope: Since 1994, the MCI continued conducting industrial surveys on an annual basis in the same scope of coverage and continued to publish the annual industrial statistical book, which carries detailed results of surveys until 2000.

5. Adjustment range surveys: While performing surveys during the period 1994-2000, a declining number of industrial establishments of the small category (number of workers less than ten) year after year, and the lack of contribution to the manufacturing value added was noted. In the light of these findings the MCI decided to amend the scope of the surveys and to cover only establishments with an employment of ten and more workers. The MCI carried on the conducting of annual survey in the same format till the year 2011 and still maintains up to the present statistical data since 1993 until 2010 continuously without a time gap

6. Data collection methods: The MCI used to collect data from the industrial establishment by employing temporary enumerators, who conducted field visits. Their duties were to distribute the questionnaire and follow-up with the industrial establishment till the form is filled in completely by the establishments and then to bring it to the MCI. Since then the MCI has realized that there is a limitation in the methodology of industrial statistics and that there is a need to revise the methodology. Furthermore, industrial indicators need to be more efficient

Efforts to strengthen and improve industrial statistics

The idea of improving the industrial statistics came after the MCI realized the UN's 2008 International Recommendations for Industrial Statistics (IRIS2008) in 2009. Since then the MCI contacted one of the industrial consultants at the Gulf Organization for Industrial Consulting and asked them to visit to the MCI to assess the situation of the industrial statistics in Oman and to provide recommendations to the MCI related to the subject.

1. Phase one: In May 2011, a GOIC consultant visited the MCI and observed the survey conduction and dissemination of the statistic data.

   After the visit the consultant pointed out to the MCI that the current industrial statistics need to be improved and that there is a need to revise the methodology, which was adapted by the MCI to comply with international recommendations of industrial statistics. The consultant furthermore recommended to the MCI to contact UNIDO for this purpose.

   The MCI asked GOIC to start talks with UNIDO in order to obtain initial ideas on how the MCI can get help from UNIDO.

2. Phase two: The result of the talks was a visit of two experts from UNIDO to Oman, which took place during June 2012. The main aim of the visit was the preparation of a technical assistance project for conducting annual industrial censuses in Oman, which were originally created with support from JICA. The current system,

which was created by JICA, needs to be revised and brought to the level of best international practices. This preliminary visit of UNIDO was intended to review the capacity of the MCI and give a more accurate assessment of the needs in terms of training and consultancy time.

3. Phase three: Following the assessment done by this mission, MCI submitted a request to UNIDO for formulating and implementing a technical assistance (TA) project based on the fact-finding during the mission.

   A TA project was submitted to the MCI in July 2013 and the main objective of the TA project was the enhancement of the institutional capacity of the Omani Government for industrial development through improvement of the statistical infrastructure.

   In order to do so the current statistics system needed to be revised and upgraded to meet the international statistics practice. The following requirements should be met to fulfill the project aim:

   - Revise the questionnaire to bring it to the level of 2008 UN standards and customize the relevant parts to reflect the policy objectives in Oman;
   - Update the statistical database system, the software for data entry, data processing and report generation (which currently uses Oracle 6 in-house customized programs), revise the data dissemination plans;
   - Based on the collected data, develop indicators for monitoring and measuring both the overall performance of the industrial sector as a whole and the performance of its divisions. These performance indicators will be applicable for policy relevant analysis;
   - In order to achieve the above goals, review the internal process and qualified staffing currently in

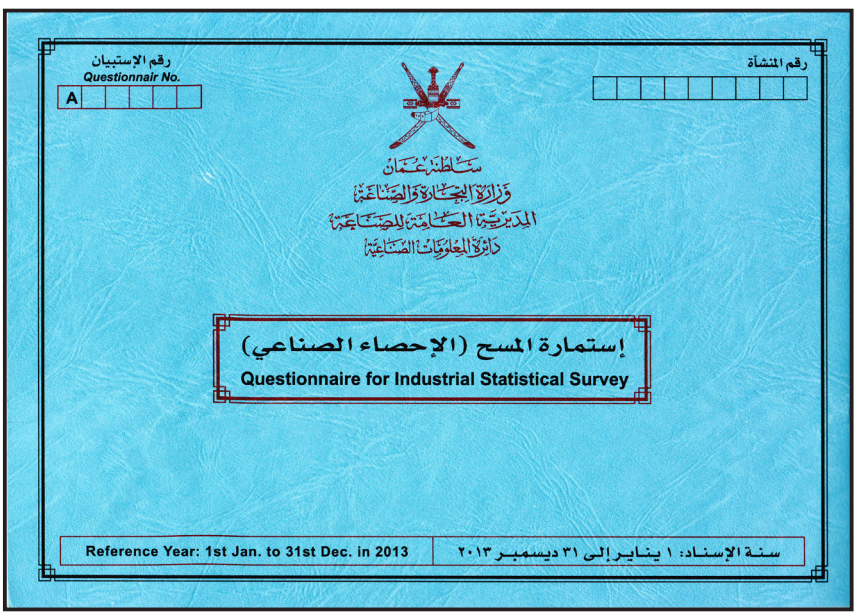

Fig. 1 | The new Questionnaire for Industrial Statistics

place in the Industrial Information Department and suggest alternatives to ensure effective implementation of the annual survey.

The MCI accepted the TA project and officially requested UNIDO to start the project in Oman.

4. **Adjustment range surveys:** An agreement was signed between the MCI and UNIDO on 22th April 2013 to implement the TA project based on a cost sharing agreement. It was agreed prior the signing of the agreement that the Oman government is going to fund this project to the extent of almost 72 percent of the total cost and the rest should be covered by UNIDO.

5. **Phase five**: On 29 May 2014, the MCI requested UNIDO to officially start implementing the project in Oman after the two parties signed the project documents.

6. **UNIDO First mission to Oman:** The first project mission was scheduled for 21 June to 4 July 2014 for two weeks and the output of the mission was as follows:

   - Revision of the questionnaire for the upcoming annual industrial survey and preparation of appropriate instructions for filling in the questionnaire correctly;
   - A brief training was held for current staff of the Industrial Information Department on IRIS 2008 and the draft questionnaire;
   - A plan of survey operation and project implementation was prepared;
   - Conversion of the establishments in the register from ISIC Revision 3.1 to ISIC Revision 4 was undertaken;
   - The tabulation plan for the improved survey was prepared.

7. **Approval of statistics industrial questionnaire form:** The revised questionnaire form was approved by the

Fig. 2 | The publication of the Central Product Classification (CPC 2) in Arabic

Ministry on 16th July 2013 and had to be translated into Arabic since it is the official language.

8. Staring annual survey in collaboration with UNIDO: The annual survey, in collaboration with UNIDO, was initiated on 11th December 2013 and its duration was planned for 3 months. It was conducted by four permanent enumerators and with the participation of one regional office staff in the each region. The total number of establishments listed in the survey frame was 943 units covering all regions of the country.

9. UNIDO's second mission to Oman: The second project mission was scheduled to 14-24 March 2014 and had the following objectives:

    - Discussion of problems encountered during launching of survey and advising on possible actions to be taken; deal with any operational difficulties
    - Training including data editing, coding and input;
    - Discussion and planning the development of analytical indicators;
    - Start data input and ensure that system is running as expected;
    - Final test of the system for data capture and processing;
    - Generate sample reports;
    - Prepare final tabulation plan; develop the tabulation software.

10. Current situation from April 2014 till present: The MCI has covered around 60 percent of those establishments listed in the survey frame and the 30th June is scheduled to be the last day of survey. By this time all distributed questionnaire forms are expected to be collected. At the same time data editing is carried out by the staff as well as data input is taking place once the editing and coding is done. This activity is still ongoing.

11. Planned UNIDO missions: The next UNIDO mission is planned after the finalization of data input and data editing. The expected objectives of the UNIDO mission are at this stage:

    - Final evaluation of data obtained - from census;
    - Final editing;
    - Processing of data and generation of tables;
    - Adjustment for non-response;
    - Back-casting of past data to ISIC Revision 4 (2005-2010)
    - Preparation of statistical report.

12. MCI's vision: In order to start the project as soon as possible several essential modules were left out: development of short term indicators, like Index of Industrial Production (IIP), online data acquisition, GIS system. These will be covered in a subsequent follow up project.

    On the other hand, GOIC is interested in replicating this project after its successful completion in other GCC member countries.

THE NATIONAL STATISTICAL DIRECTORY OF ECONOMIC UNITS

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Introduction

The National Directory of Economic Units (DENUE) is a directory of all active establishments in Mexico that is regulated and operated by the National Institute of Statistics and Geography (INEGI). It was created to meet the growing demand for information and was published for the first time in 2010. DENUE, which also presents the geo-referenced establishments in the cartography produced by the Institute (see Figure 1), can be consulted free of charge at INEGI´s web page.

DENUE is updated through different mechanisms and sources, such as the national Economic Surveys, studies on the mobility of economic units and specific operations, as well as directories provided by government agencies. Also, every five years a complete

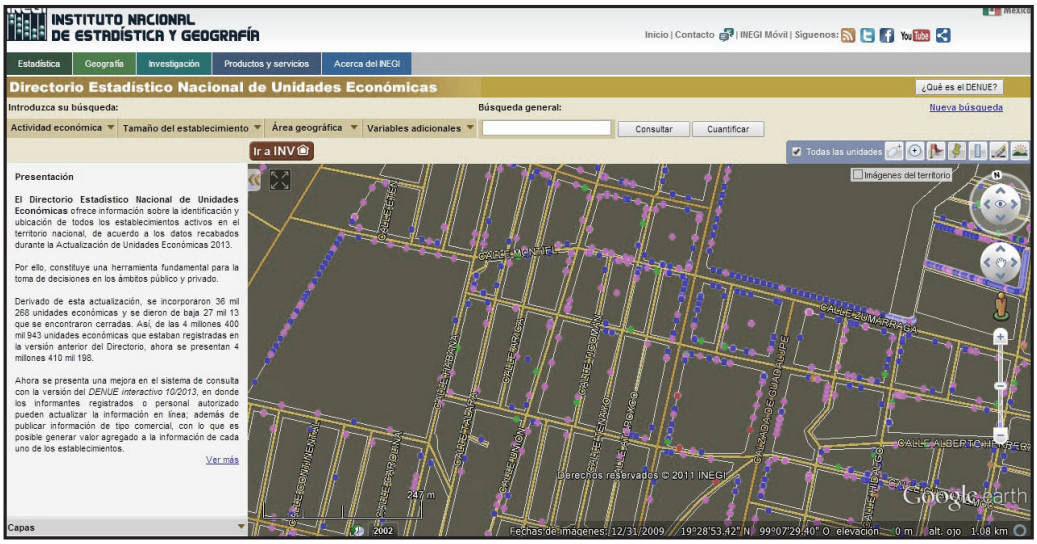


Fig. 1 | The National Directory of Economic Units (DENUE)

updating is accomplished based on the National Economic Censuses.

DENUE has been widely used by all sectors of society (public, private, academic and social sectors) for different purposes since its publication in 2010.

Background

On various occasions, INEGI made efforts to create a directory, however it did not have the adequate legal or technological conditions to achieve it. These conditions have changed favorably in recent years.

Currently, the National System of Statistical and Geographical Information Law (LSNIEG) stipulates that the National Economic Information Subsystem must be based on a National Directory of Economic Units. The use of this Directory is mandatory for the maintenance of administrative registers providing information of national interest[2] (Article 23, LSNIEG).

It also points out that "INEGI will establish, regulate and operate the National Directory of Economic Units" (Article 94, LSNIEG), and that "Individual persons and legal entities are required to register in it and the dependencies to deliver their directories to INEGI" (Article 95, LSNIEG).

On the other hand, the current technological development has enabled the development of powerful systems for the cleaning and confrontation of big volumes of databases, geographical information systems, as well as advanced geo-reference systems.

Furthermore, since INEGI relies on the National Geo-Statistical Framework, it has been possible to create a directory that allows for correct geo-referencing statistical information of every establishment in the national territory.

What is DENUE?

DENUE is DENUE is a directory that accounts for all economic units in Mexico; it contains information on the 4.4 million establishments that exist in the country. Originally, these data came from the 2009 Economic Censuses but they have been updated in the stratum of big establishments with information from other federal government institutions. Whenever a new big establishment is opened it is registered at various instances, hereby complementing the updating of DENUE.

DENUE allows viewing of the information on all the establishments or of the sub-universe of the establishment of a particular sector, branch or class of activity or of a certain geographical region or certain size of establishment. At the same time, it is possible to visualize the location of each of the establishments in the selected sub-universe on cartographic images and satellites. These features make DENUE a useful support tool for decision-making in the public, private and academic sectors, as well as in research and teaching.

Information in DENUE

Identification variables:

- Name of the economic unit;
- Business name;

[2] United Nations Economic and Social Council, 2009. Sources for the Identification of Enterprise Groups (Before Profiling). Project for the Elaboration of the National Directory of Economic Units in Mexico. Geneva.

- Activity type code;
- Name of the activity type;
- Employees (stratum);
- Type of economic unit;
- Date of incorporation into DENUE.

Location variables:

- Type of road;
- Name of road;
- Internal number or letter;
- External number or kilometer;
- Building, floor or level;
- Type and name of human settlement;
- Industrial corridor, mall or public market;
- Local number;
- Zip code;
- Basic geo-statistical area (AGEB) and block;
- Federative entity, municipality and locality;
- Geographical coordinates.

Contact variables:

- Telephone number;
- E-mail address;
- Website.

Usefulness:

- Permanently knowing the productive universe;
- Detecting and constructing the statistical units;
- Analyzing business population and their demography;
- Updated sampling frame for specific studies;
- Studying the spatial distribution of demand and supply;
- Input for Economic Censuses;
- Identifying the affected units in case of natural disasters;
- Identifying potential clients and suppliers;
- Identifying clusters and productive chains;
- Designing study plans and determining the demand for professionals;
- Perform market research.

Evolution of DENUE

In July 2010, DENUE, which was generated from on the information collected by the 2009 Economic Censuses, was made available to the public. It provides identification and location data of 4,331,202 economic units across all sectors of economic activities (excluding agriculture and forestry) in Mexico. Originally, the design of DENUE was based on the Geographical Information System, developed by INEGI. INEGI seeks to integrate any improvements in its platform into DENUE to meet users´ requirements. It adapts to technical innovations that increases the user-friendliness of the query system, making enquiries more intuitive. For this reason, the 06/2012 version of DENUE was migrated to the Google Earth Enterprise platform, which resulted in a better visualization of the information and improved system functionality.

DENUE´s new platform allowed users to obtain images of the territory in both 2D and 3D, to regulate the light intensity and to obtain a street view of the economic unit. In addition, it contains historical images of certain areas.

Currently, DENUE is undergoing further developments including the "Interactive DENUE", which is a tool that allows business owners to request the publication of information on their establishment in two new layers: trade information and additional information. These new layers will provide more information about, among others, the different activities developed in the establishment, the products or services it offers, its trade relations and links to other economic units.

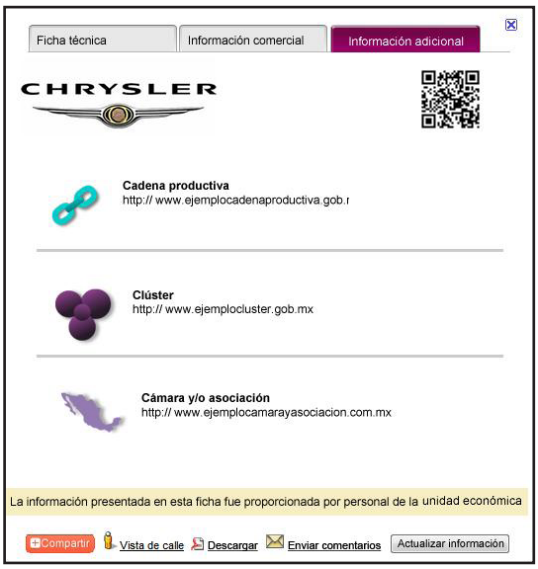
1. **Trade Information:** In this layer, the informant will be able to add the following information to the file query:

   - Logotype of economic unit;
   - Quick Response Code (QR);
   - Gallery of images (20 maximum);
   - Quality certifications;
   - International trade;
   - Business group;
   - Other.

2. **Additional Information:** This layer of information will be activated only for those economic units that are registered in the Secretariat of Economy and it will contain the following information:

   - Productive chain;
   - Cluster;
   - Chamber and/or association.

   In this layer, the user will only be able to add information from the Chamber and/or association he/she belongs to, or through his/hers register in the Secretariat of Economy.



How is DENUE used?

DENUE's query system migrates towards a worldwide-recognized platform, which allows navigating through the interface and perform consultations and research on economic units in a practical way based on the filters of:

- Economic activity: Every economic activity is classified according the North American Classification System (2007 SCIAN) (See Figure 3).
- Size of the establishment: Staff employed at the economic unit for producing its goods or for trading its services.
- Geographical area: As mentioned before, the cartography, on which the economic units are located in DENUE, is generated by INEGI; thereby the query on the establishments can be done on both national and local level.
- Additional variables: Users can search for the economic unit by name or corporate name, street, avenue, neighborhood or zip code.

Furthermore, DENUE has a panoramic vision of the query that is being done since the system generates visually and automatically,

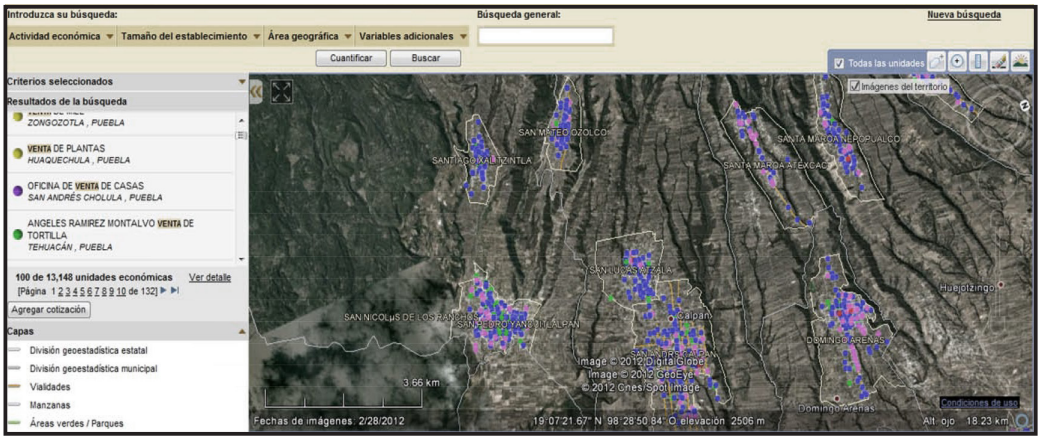
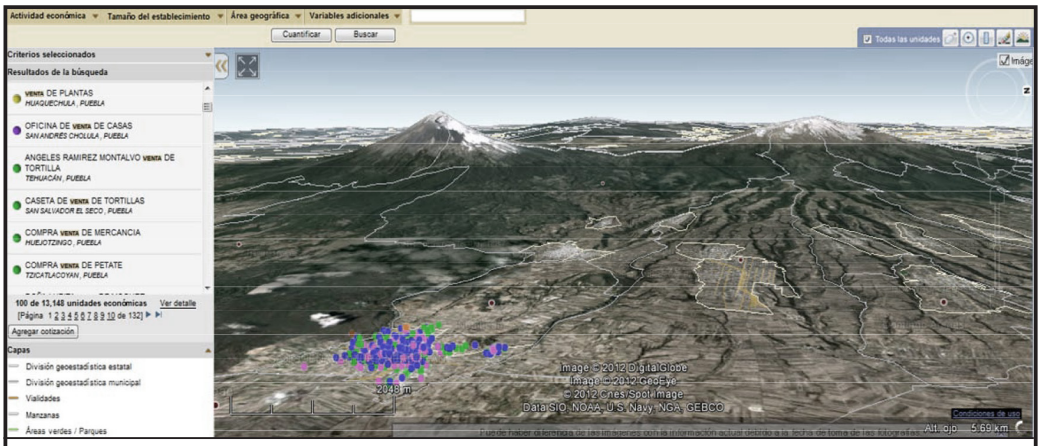


Fig. 2 | 2D Map



Notes I In this figure colored points represent economic activities following the SICAN 2007 classification.

Fig. 3 | 3D Map

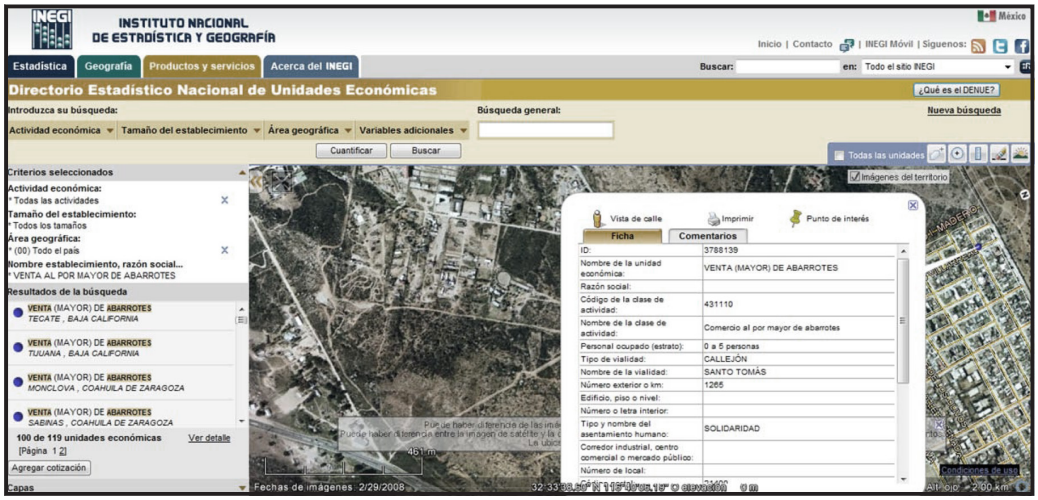


Fig. 4 | Identification and location information of an economic unit presented as a datasheet

Fig. 5 | Searching by economic activity (A) and geographic area (B)

through the high quality images and maps in 2D (see Figure 2) and 3D (see Figure 3), the physical location in the geographical area of the economic units under study, identified and differentiated according to their economic activity through a particular color
(see Figure 2).

The economic units can be selected individually to show the identification and location information through a datasheet (see Figure 4).

The statistical data are sorted according to economic activity and geographical area in response to the search criteria chosen by the user (see Figure 5).

It is worth noting that the cross-reference of one economic unit to another inside the same region or even in another state is quick, making DENUE an efficient tool for users.
Additionally, the datasheet has a tab for commenting (see Figure 6) through which INEGI seeks to obtain users' opinions about the information presented for economic units

in order to improve the information and the overall system.

Street view (see Figure 8) allows locating an economic unit as well as identification of its physical characteristics.

The point of interest marks the exact location where the search for an economic unit is made in order to keep it identified during other queries or when generating distribution routes or logistics. This tool is activated when selecting the icon from the economic unit´s datasheet.

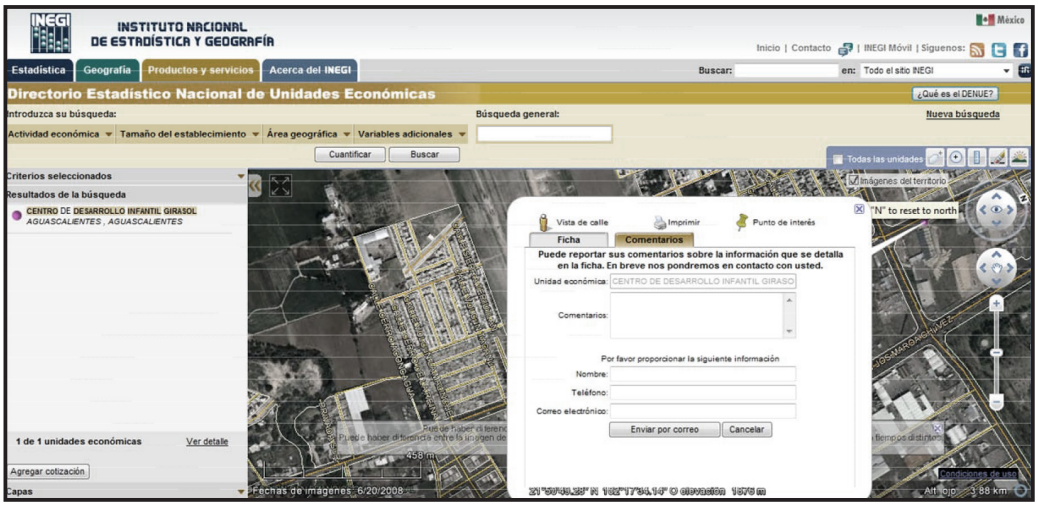
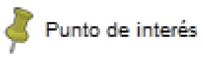


Fig. 6 | User comments



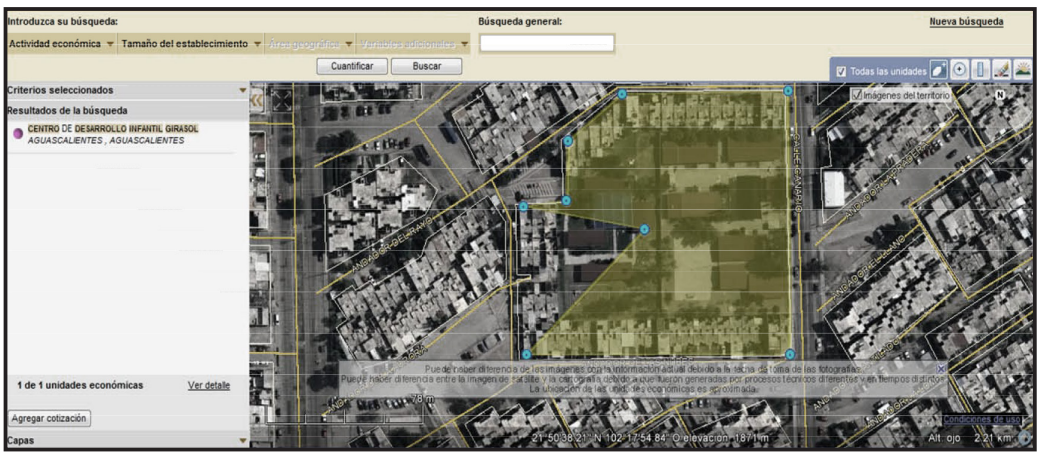


Fig. 7 | Searching by regular or irregular polygons

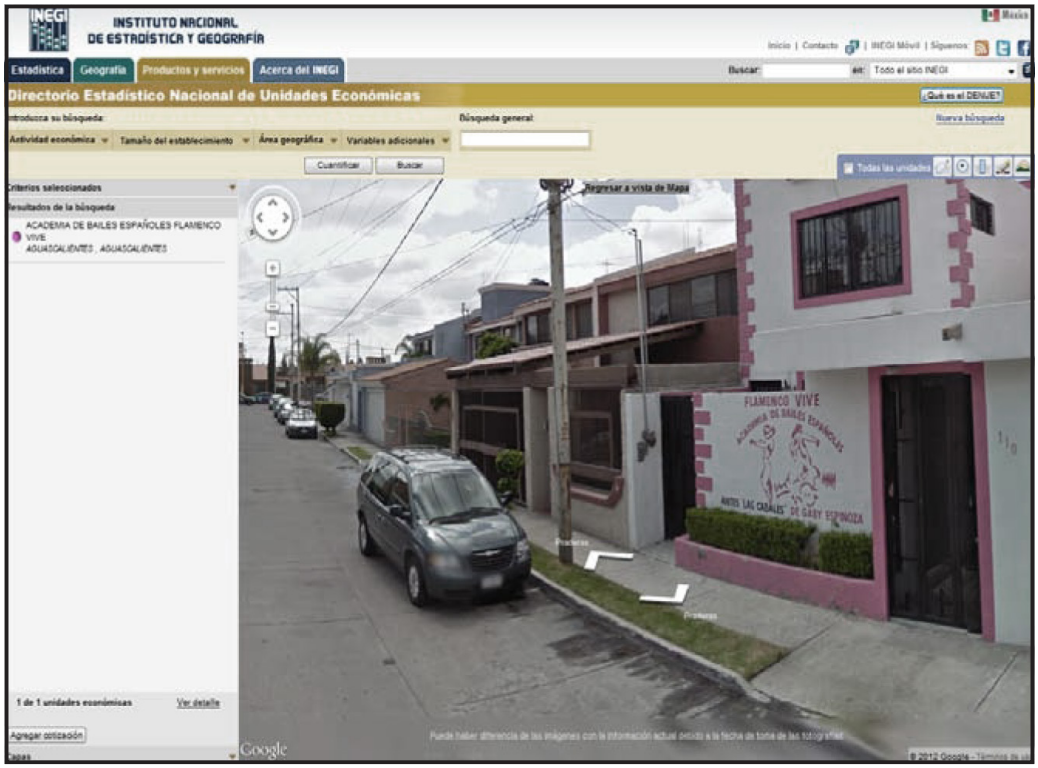


Fig. 8 | Street view

METHODOLOGY FOR EVALUATION OF STATISTICAL INFORMATION SYSTEMS

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Introduction

A vast literature on the evaluation of information systems (IS) exists and many studies take a formal-rational stand. Thus, the evaluation is seen as a largely quantitative process of calculating the likely cost/benefit on the basis of defined criteria (Walsham, 1993). Since these approaches are often developed from a management perspective, the different measures included in the evaluation are often of harder economical character. This approach is frequently criticized that the evaluation concentrates on technical and economical aspects rather than human and social aspects, which could have major negative consequences in terms of decreased user satisfaction.

The objective of this study is to develop a methodology for analyzing the content and the statistical business process implemented in a statistical information system (SIS), and to perform assessment of the system under consideration, which should cover (in different level of detail) the following main topics:

1. Quality of the statistical data according to the quality dimensions: relevance, accuracy, timeliness, accessibility, completeness, comparability and coherence;
2. Technical characteristics: system availability, performance, maintainability and user support;
3. Usability analysis of the data portal;
4. In order to achieve the above goals, review of the internal process of data collection, entry, validation and dissemination and suggestion of alternatives, if necessary, to ensure effective functioning of the system. Of essential importance is the analysis of the workload necessary for maintenance of the data and to what extent the available staffing can cover it.

This study was initiated by a request by the Gulf Organization for Industrial Consulting (GOIC) in Doha/Qatar and later the developed methodology was successfully applied to other statistical information systems, like

the Directory of Industry in Gabon (Fichier Industriel Gabonaies). There are two methodology approaches, which will be used in this study in order to review the statistical information system under consideration. The first aspect concerns the description of the statistical business process applied. We propose for this purpose to apply the Generic Statistical Business Model (GSBPM) introduced by the Joint UNECE/Eurostat/ OECD Work Sessions on Statistical Metadata (METIS). The second approach used in this report is the DeLone and McLean model for evaluation of information systems. In order to make it applicable to a statistical information system, particular adaptations were necessary.

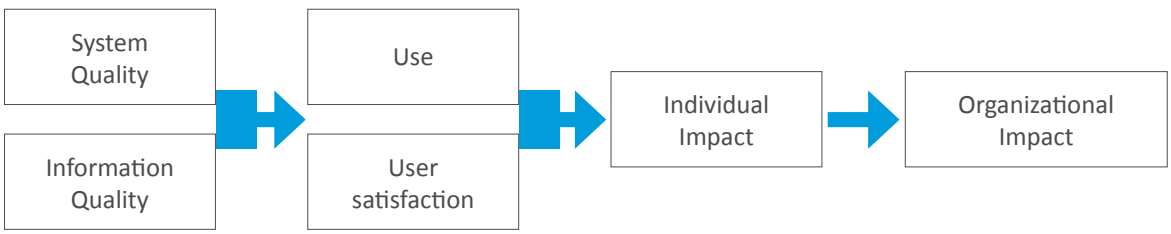
The structure of the rest of the paper is as follows. Section II introduces the DeLone and McLean model and its adaptations for the case of statistical information systems. Section III explains the application of the GSBPM in the context of evaluating and benchmarking statistical information system. In Section IV the developed methodology is illustrated by applying it for analysis of the GOIC industrial statistics database - Gulf Industries Database (GID) and its Industrial Market Intelligence portal (IMI). Section V concludes.

The study is a work in progress and further details and experiences will be added.

The DeLone and McLean model and its adaptation for Management Statistical Information Systems

DeLone and McLean (1992) developed a framework for classifying the multitude of effectiveness measures of an information system into six categories. They called this framework the DeLone and McLean (D&M) IS success model. The initial model, which provided a comprehensive framework for measuring the performance of information systems is presented in Figure 1. The research of DeLone and McLean (1992) brought about some structure to IS effectiveness research (Seddon and Kiew, 1996). Others have begun developing standardized measures that can be used to evaluate the various dimensions of IS success as specified by the DeLone and McLean model (e.g. Sedera and Gable, 2004).

Ten years after the publication of their original IS Success Model, DeLone and McLean (2003) reviewed more than 100 journal articles dealing with IS success measurement, which led to a revision of the 1992 model and the production of the Updated DeLone and McLean IS Success Model.



Source | DeLone and McLean (1992).

Fig. 1 | DeLone and McLean IS Success Model (1992)

The new and updated model was based on the empirical and theoretical contributions of researchers who have tested or discussed the original model. The updated model is presented in Figure 2. It consists of six interrelated dimensions of information systems success, which is described below.

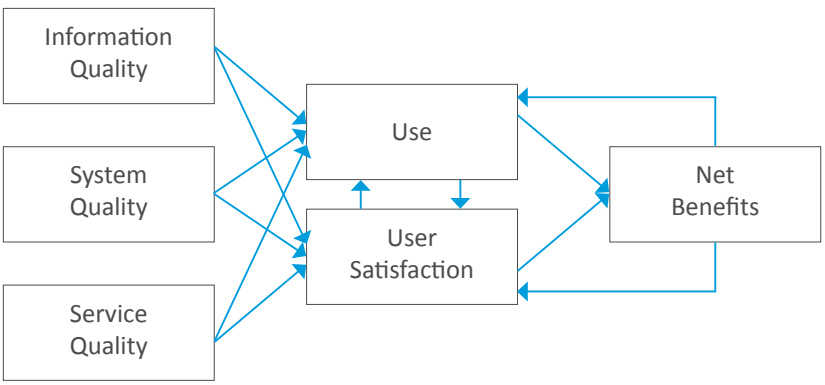
Some of the revisions to the original model were based on suggestions and re-specifications from other researchers in the field. This updated IS success model accepted the Pitt, Watson and Kavan (1995) recommendation to include service quality as a construct. Another update to the model addressed the criticism that an information system can affect levels other than individual and organizational levels. Because the success of an information system affects work groups, industries, and so on the variables, individual impact and organizational impact were replaced by net benefits. Thus, accounting for benefits at multiple levels of analysis is achieved. This revision allowed the model to be applied to whatever level of analysis a researcher considers most relevant.

The DeLone and McLean model has also been found to be a useful framework for organizing information systems success measurements. The model has been widely used by IS researchers for understanding and measuring the dimensions of IS success. Furthermore, each of the variables describing success of an information system was consistent with one or more of the six major success dimensions of the updated model.

The six dimensions include: system quality, information quality, service quality, system use, user satisfaction and net benefits. Each of the dimensions will be considered in the subsequent sections.

System Quality

This dimension defines the desirable characteristics of an information system. For example: ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times. Perceived ease of use is the most common measure of system quality. However, perceived ease of use does not capture the system



Source | DeLone and McLean (2003).

Fig. 2 | Updated DeLone and McLean (2003) IS success model

quality construct as a whole. Other authors have developed instruments, which use a number of attributes to capture the system quality, namely: reliability, portability, user friendliness, understandability, effectiveness, maintainability, economy, and verifiability. Petter, DeLone and McLean (2008), and Sedera and Gable (2004) recommend the following measures: ease of use, ease of learning, user requirements, system features, system accuracy, flexibility, sophistication, integration, customization. Some of them are, in our opinion, more relevant for the measurement of service quality, while others are difficult or even impossible to measure. Therefore, we will adopt (and adapt) the list provided by DeLone and McLean (2003):Ease of use:

- Ease of learning;
- Adaptability;
- Reliability;
- Response time;
- Usability.

Information Quality

This dimension describes the desirable characteristics of the system outputs, that is, management reports and websites. Such characteristics include: relevance, understandability, accuracy, conciseness, completeness, currency, timeliness, and usability. Since we are considering statistical information system we will adapt these requirements to represent the quality of statistical data. In general, researches are strongly encouraged to include information quality measures as a critical dimension in their measurement construct (DeLone and McLean, 2003). This is of particular importance for statistical information system, where the information (or data) is also the sales product.

Based on the nature of statistical activities carried out, a set of quality dimensions has been identified. This set is targeted to ensure that the statistical activities of an (international) organization are relevant, and that data compiled and disseminated are accurate, complete within the defined scope and coverage, timely, comparable in terms of internationally recommended methods and classification standards, and internally coherent with variables included in the datasets. Quality dimensions defined here should apply to the statistical activities of an international organization. While each national statistical institution may define its own quality assurance framework, an international organization should make maximum effort to ensure that data produced from the statistical operation are accurate, internationally comparable and coherent. A theoretical discussion of the quality topics can be found in Fröschl and Grossmann (2001).

- Relevance: refers to the statistical subject topics and concepts used;
- Accuracy: generally, in statistics accuracy is defined for estimates, concerning the closeness between estimated values and unknown population values;
- Completeness: stating that, for domains with data available, statistical offerings indeed reflect user-expressed needs and priorities;
- Accessibility (often related to clarity of information offering): considers requirements of easy data access and flexibility in data usage. Accessibility refers to the availability of statistical information to the user. It includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which the information can be accessed. The cost of the information may also be an

aspect of accessibility for some users (see for example Statistics Canada (2011), 4th edition);

- Timeliness: represents the punctuality and regularity of dissemination, reporting on the time elapsed between observation/data collection and data/output availability;
- Comparability: aiming at reliable comparisons of accessible statistics across space, between subject domains, and over time;
- Coherence: implying clear and tractable relationships between different data bodies or statistics conveyed. In the case of an international statistical database like the GOIC industrial database, the coherence dimension is extremely important. This implies internal consistency of data in different aspects. First of all, it is necessary that the terms and concepts used in one data set have exactly the same meaning in another data set, unless the difference is explicitly mentioned. The terms used throughout the database must have the same meaning for all countries and for years included in the database, unless any deviation is reported.

Service Quality

This is the quality of the support that system users receive from the IS department and IT support personnel. In the original formulation of the model, the dual dimensions of system and information quality seemed sufficient to capture the essential characteristics of information systems being delivered to users. Later, however, it became apparent that a third dimension was needed, representing the service quality. This need has become even more apparent with the advent of e-commerce and the demand of customers for support from their web providers. In the era of Internet, the users have also become customers, so that a bad user support will result directly into a loss of customers. Service quality characteristics include: responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff.

The SERVQUAL model, adapted from the field of marketing, is a popular instrument for measuring IS service quality (Pitt, Watson and Kavan, 1995). It is an attitude measure and represents the service quality as the discrepancy between a customer's expectations of service offering and a customer's perception of the service received. It has five generic dimensions (factors) stated as follows:

- Tangible: the hardware and software, on which the information system is running, are up-to-date;
- Reliability: the users are able to perform the operations promised for the service dependably and accurately;
- Responsiveness: the IS employees give prompt response to users/customers;
- Assurance: the IS employees know how to do their job well;
- Empathy: caring and individualized attention that the firm provides to its customers.

System Use

This dimension represents the degree and manner in which staff and customers utilize the capabilities of an information system. System Use characteristics include: amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use. For the purpose of the evaluation of statistical information systems we will adapt the measures provided by DeLone and McLean (2003) and include the following:

- Number of users (staff, maintenance of the data base);
- Number of (registered) internal users;
- Number of (paying) subscribers;
- Number of inquiries;
- Nature of use;
- Navigation patterns;
- Number of site visits;
- Number of transactions executed (searches, reports, etc.).

User Satisfaction

The User Satisfaction dimension represents the level of users' satisfaction with reports, websites, and support services. For example, the most widely used multi-attribute instrument for measuring user information satisfaction can be found in Ives et al. (1983). This dimension is one of the most difficult to measure, particularly in the case of statistical information system, where the users are mainly external. At the same time this metric is extremely important, because the user becomes a customer, and poor user support can result in the loss of customers. We will consider the following metrics (only partially covered in the present study, further research and evaluation are necessary). The most useful measurement information can be obtained from user surveys. These can be done first with test users (internal, staff members, colleagues, friends, etc.) but after that must be extended to real users (subscribers):

- Repeat subscriptions;
- Repeat visits;
- User surveys.

Net Benefits

The dimension Net Benefits, added to the updated model of DeLone and Mclean, represents the extent to which IS' are contributing to the success of individuals, groups, organizations, industries, and nations. For example improved decision-making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development. The new Net Benefits construct appeared in the updated model and replaced the previous term impact. It immediately raises three issues that must be addressed:

- What qualifies as a "benefit"?
- For whom?
- At what level of analysis?

The previous term impact may be positive or negative, thus possibly leading to confusion as to whether the results are good or bad. The Net Benefits is the most important success measure, since it measures the positive and negative impact of the system as a whole on the organization, the customers, markets and industries. Did the benefits achieved through the obtained from the system statistical information save the particular user and his organization time and money? Have the benefits, such as larger markets, supply chain efficiencies and customer responsiveness, yielded positive net benefits for the organization in question? Was there a contribution to the growth of the gross domestic product of a nation? Did the infrastructure development contribute to the reduction of poverty? It is important to note that the analysis of the net benefits cannot be analyzed without the measurements in "System Quality" and "Data Quality" dimensions. The following list present the most popular measurements for net benefits, which we will adopt for the evaluation of statistical information systems:

- Cost savings;
- New and expended markets;
- Increased sales;

- Cost reductions;
- Creation of jobs;
- Reduced search costs;
- Time savings.

In order to apply the DeLone and McLean model for practical evaluation of statistical information systems such as the GOIC industrial database, it is necessary to adapt it in two aspects:

1. We are considering statistical information systems that maintain and provide statistical data for which well-defined quality dimensions exist. Further, statistical metadata is essential for the proper presentation and enrichment of the statistical data;
2. The second aspect is related to the role, which Internet plays in the dissemination of statistical data and metadata nowadays. For this purpose we will use the adaptations done by the authors in DeLone and McLean (2004).

The Generic Statistical Business Process Model (GSBPM)

A first step to the evaluation of a statistical information system is to describe the implemented statistical business process. As already mentioned in the introduction for this purpose, we will use the GSBPM. Since this model is well known, instead of giving details about the model, we will present the mapping to the statistical businesses process of GOIC.

Following many separated initiatives by international bodies on statistical process definition in the past years, an international standard has been defined by the Joint UNECE/Eurostat/OECDWork Sessions on Statistical Metadata (METIS): Generic Statistical Business Process Model (GSBPM). The GSBPM should be seen as a flexible tool to describe and define the set of business processes needed to produce official statistics. The use of this model can also be envisaged in other separate but often related contexts such as harmonizing statistical computing infrastructures, facilitating the sharing of software components and providing a framework for process quality assessment. The GSBPM comprises four levels and further levels of detail may be appropriate for certain statistical business processes or in certain organizations, but these are unlikely to be sufficiently generic to be included in the generic model.

The GSBPM model was adopted in many national and international statistical agencies (Australia, Canada, Denmark, Spain, Ireland, Turkey, UNIDO) after adapting the different phases to their own needs. For practical GSBPM implementation inside other statistical organizations one could refer to www1.unece.org/stat/platform/display/metis/Papers+about+the+GSBPM, where many papers describing the practical implementation of the model are presented.

GOIC Statistical business process

In the following, the statistical business process of GOIC will be mapped according to the GSBPM. Depending on the GOIC statistical activities, not all phases of GSBPM are relevant. The first three phases, Analyze Needs, Design and Build can be applied only in cases of surveys, which are performed by GOIC, but are not part of the organization's core activities. There is no standardized procedure for performing the surveys, but for the time being this is unnecessary and we will skip these first three phases. Similarly, the last two phases, Archive and Evaluate are relevant only in connection with surveys, and will therefore not be considered either. Thus, we remain with three phases (similarly to the statistical business process

of the United Nations Industrial Development Organization):

- Data collection;
- Data transformation;
- Data dissemination.

Example: Evaluation of the GOIC industrial database

The GOIC Information Department maintains several databases and provides integrated information services to the GOIC's staff and other recipients by responding to inquiries and providing required data and information. It also provides users with accurate, updated and certified industrial, economic and social data about member countries of the Gulf Cooperation Council (GCC) through the Industrial Market Intelligence (IMI Plus) Portal. GOIC considers the Gulf Industries Database (GDI) one of the main pillars for market studies, project feasibility and investment-related decision-making. The database includes almost 15,000 industrial units operating in the GCC countries. The classification used in the database is the International Standard Industrial Classification (ISIC) of all economic activities. The products produced by these economics units are classified according to Industrial products are classified in accordance with the Harmonized System (HS). The database includes the following main data items: factory name and address, website, industrial products, design capacities, actual production quantities, raw material used, energy, fuel and size of investment and workforce. The database also contains data about industrial licenses of firms that are yet to start the production process.

In the following, we will present the evaluation of the GOIC industrial database according to the DeLone and McLean (1992) framework for classifying the multitude of effectiveness measures of an IS that uses six categories. In many cases, the evaluation is subjective, based only on the experience of the authors, as no real measurements could be taken. This holds particularly for the Use, User Satisfaction and Net Benefits categories. Many of these criteria could be measured more precisely in the future, based on the audit functions of the system, which were still under development, when the study took place, and on user satisfaction surveys that could be undertaken.

- System Quality: The quality of the GOIC industrial database system is overall very good. The complete development and maintenance is "outsourced" to the responsible IT department, which takes care of the operation, maintenance and further development of the system. The requested changes from the information department are submitted formally to the IT department and handled accordingly. The usability of the system has to be considered in three different aspects:
  - Tools for maintenance of the database: the tools are relatively easy to use for performing any changes to the database. More on-the-fly validations will improve the usability and will reduce the possibility of mistakes by entering data. Other improvement could be the implementation of some of the maintenance functions, which currently are performed in Excel. These improvements will reduce the requirements to data processing skills of the maintenance users (for example new employees will be more easily trained for working with the tools);
  - The old IMI portal: the old portal seems to be less intuitive for new users, but it is very easy to use for experienced

users and also easy to learn. The responsiveness and reliability are high;
    - The new (at the time of the study, December 2012) IMI Plus portal: it is expected that the new portal is much more intuitive than the old one and thus easier to use and easier to learn how to handle. However, it is the authors' opinion that the old IMI portal was much more usable and that its responsiveness was better. In order to validate these concerns, more experience with IMI Plus is necessary.

- Data Quality: the data quality is evaluated according to the seven quality dimensions, generally accepted in most of the national and international statistical organizations;
- Service Quality: this is basically the quality of the support that the users of the GOIC industrial database receive from the information department and the IT support personnel;
- System Use: in general the use of the system, based on the number of (paying) subscribers needs improvement. The current number of registered is not sufficient for the system of this type and dimension. The following measures can be recommended in order to improve the system visibility and use: (i) advertising, (ii) conference presentations, (iii) Internet/ search engine promotion, (iv) more flexible subscription model.
- User Satisfaction: this dimension has to be considered from three different perspectives, depending of the type of user: (i) GOIC staff members, performing the maintenance of the system; (ii) Internal GOIC users; and (iii) External users/subscribers. The analysis of the usability of the new IMI Plus portal is extremely important, since- at the time of this survey- it was not yet operational and there was no actual user experience. This could be started by a user survey with test users (internal, etc.). Currently, the only measurement available is the number of renewed subscriptions, which is more than 50 percent.

- Net Benefits: at the current stage of the evaluation it is not possible to estimate the net benefits.

An example of evaluation results are presented in Table 1 below. The table lists all the criteria in three columns: Current, Benchmark and Target. The first column contains the results for the observations taken now. As already mentioned in this document, to our knowledge, no similar evaluation is done on a statistical information system. Furthermore, due to the uniqueness of the system (its content and its functions), there is no other system to compare with, i.e. no "benchmark". Although there are similarities with the OECD data warehouse and the UNIDO statistical database, there is insufficient information to perform qualitative benchmarking. This column is therefore left empty and will in a future evaluation be filled with the results of the Current column in this document. In such a way, the benchmarking will be performed against a historical status of the same system and we will be able to see what improvements are made. The Target column should be considered theoretical, desirable targets. Since the criteria are evaluated in the scale 1 to 10, we could expect only 10s in the Target column, but this is not necessary, since, in many cases, a mark lower than the theoretical maximum can be sufficient. For example, we cannot expect to achieve 100 percent coverage and this is not possible given the specific of the data collection. Similarly, the System Quality results should not be all 10s either, since, even with lower marks on these

criteria, it is possible to achieve all 10s in the Service Quality criteria.

Summary

This paper focuses on designing and developing an evaluation methodology for statistical information systems. The main objective of the methodology is to evaluate an information system in terms of system and service quality as well as quality of the statistical data according to the following quality dimensions: relevance, accuracy, timeliness, accessibility, completeness, comparability and coherence. Two approaches are used to review the statistical information system under consideration. The first aspect is the way to describe the statistical business process applied- for this purpose we propose to apply the GSBPM. The second approach is the DeLone and McLean model for evaluation of Information Systems. In order to make it applicable to statistical information system, particular adaptations are necessary.

The proposed methodology is applied for evaluation of the GOIC industrial database. First, the statistical business process of GOIC is considered and is mapped against the GSBPM. This process is then measured against the adapted DeLone and McLean model for evaluation of management statistical information systems.

Table 1 | Evaluation of the GOIC industrial database

Dimension	Measurement	Current	Benchmark	Target	Comment
System Quality		**7.7**	**0**	**9**	
	Ease of use	8	0	8	
	Ease of learning	8	0	8	
	Adaptability	7	0	8	
	Reliability	8	0	8	
	Response time	7	0	9	
	Usability	8	0	10	
Data Quality		**7.1**	**0**	**9.5**	
	Relevance	8	0	10	
	Accuracy	8	0	10	
	Accessibility	6	0	10	The cost of the information reduces the accessibility. A measure to improve accessibility would be to give some portion of data for free.
	Completeness	6	0	8	
	Timeliness	8	0	10	
	Comparability	6	0	8	
	Coherence	8	0	10	
…	…	…			…
Total		**7.1**	**0**	**9**	

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STATISTICS OF GENDER GAP IN EMPLOYMENT AND WAGE RATES IN THE MANUFACTURING INDUSTRIES OF INDIA

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Gender issue, in particularly, bringing equality between men and women, has been declared a common goal for the international community since it was set out in the preamble to the Charter of the United Nations (UN) in 1945. Gender describes socially constructed differences between men and women, boys and girls, etc. It is defined on the basis of social norms, behaviors, activities, relationship and responsibilities, which are assigned by the society as appropriate for male and female (WHO, 2010). Gender discrimination is the consequence of persistent inequality between men and women in all spheres of life. The dimension and degree of discrimination against women manifests itself differently ways across cultures, politics, races, regions, countries and economies. Such discrimination in economic activities is a matter of concern for any welfare, democratic and developing state. Equal opportunities and compensation to the female workforce are required elements in the governmental policies of such states. For this reason, there are campaigns across the globe focusing on the empowerment and rights of women in all aspects including education, employment and economic participation with the objective to reduce gender inequality. Keeping development as a broader goal in mind and focusing on women participation in all economic activities, many international movements have been established to promote gender equality and women empowerment.

Moreover, the eight Millennium Development Goals (MDGs), which were adopted at the United Nations 2000 Millennium Summit and endorsed by 189 Member States, also emphasize the gender issue. The vision of the Millennium Declaration is to create a more just and equal world, where equal access for women and men to resources and opportunities is essential to the achievement of all MDGs. Specifically, the third MDG goal is to "Promote gender equality and empower women" and puts emphasis on increasing gender equality in education and on the labour market. To monitor the development in the female participation rate in the non-agricultural sector, an indicator is defined as the share of female workers in the non-agricultural sector expressed as a percentage of total employment in the sector. This indicator measures the degree of openness of labour markets to women in the industry and service sectors. An indicator such as this, direct policymakers not only towards equal employment opportunities for women

and men but also towards greater economic efficiency through increasing flexibility of the labour market. It also focuses on raising the status of women and ensuring their full participation and integration in the development at all levels. Moreover, it draws attention to problems specific to women such as the steadily declining trend of their participation in the workforce.

There are studies, which focused on female participation in the economy as a whole with reference to their socio-economic background (Ghosh, 2004; Karan and Selvaraj, 2008; Khanna, 2012). However, studies on female participation in specific sectors in the economy are very few.

Even though there is an upward trend in female participation in Indian economy, their participation in the manufacturing sector requires deeper analysis: What is the level of female participation in the manufacturing sector? Are there any differences in female participation across industry divisions in the manufacturing sector? What is the gap in the wage pattern of female workers vis-à-vis male workers in the manufacturing sector? This paper tries to answer some of these questions through statistical analysis of gender gaps in the Indian manufacturing sector.

The manufacturing sector is often considered a mostly male dominated sector. Over the last two decades, India has emerged as one of the fastest growing economies in the world. Manufacturing played an important role in this achievement. The sector contributes to approximately 15 percent of GDP and provides almost 50 million jobs, equivalent to nine percent of India's total work force. In this study, effort has been made to assess the extent of gender bias thorough two parameters viz. female participation rate and wage gap, or wage differentials, in the manufacturing sector. Due to data constraints, the female participation rate was estimated for the entire manufacturing sector comprising both the organized and unorganized manufacturing sectors over three time periods, i.e. year 2000-2001, 2005-2006 and 2010-2011. The wage gap has been estimated for the organized manufacturing sector only for the year 2005-2006 and 2010-2011. Based on major data sources, India's manufacturing sector has been stratified into two mutually exclusive and collectively exhaustive strata viz. small and large sectors. The small sector comprises manufacturing units employing up to nine persons, and large sector units employ 10 persons or more and use electricity as motive power. Data for these sectors is compiled through two separate data collection programs of the Indian Government, namely, the Annual Survey of Industries (ASI), covering the registered manufacturing sector, and the National Sample Survey (NSS) quinquennial survey on the unorganized manufacturing sector (UMS). .The surveys are published in two separate reports.

This study is based on the two major data sources, the ASI and the NSS. There are limitations to the coverage of ASI as some factories are still not registered due to various administrative reasons. In this study, we consider the organized manufacturing sector, covered by the ASI, as large units. Moreover, factories with 10 or more employees, which are not registered and thus not covered in the ASI, are also categorized as large. These factories are available in the NSS. On the other hands, field surveys reveal that there are cases of factories in the ASI for which employment has dropped to less than 10 employees since their initial registration. For practical purposes these units are kept within the ASI frame.

In this study, we define 'small' factories as those units with 9 or less employees. The term 'small' should not be confused with the Micro, Small and Medium Scale Industries classification of industries in India, which is based on the capital originally invested in plant and machinery. Though the ASI provides annual data, there is no annual source of data for the UMS survey. Every five years, the NSS conducts a survey of all types of enterprises including manufacturing enterprises.

The survey on UMS has been conducted in the 56th (year: 2000-2001), 62nd (year: 2005-2006) and 67th (year: 2010-2011) NSS rounds. In the present study, those three periods will be considered as a three referral time-period for obtaining statistical data. Unit level data in the NSS and the ASI are used for the study. Data on UMS have been culled out from the NSS unit level data in which manufacturing is a major activity and estimates are generated for small and large sectors.

Table 1 | Organization of industrial survey programs in India

	Annual Survey of Industries	Unorganized manufacturing sector
Domain	All units/factories registered on lists maintained by the Chief Inspector of Factories (CIF) under sections 2m of the Factories Act, 1948 or under Bidi & Cigar Workers (Conditions of Employment) Act, 1966, viz. units employing 10 or more workers with the aid of power or 20 or more workers without the aid of power. The list of such units is called the ASI frame.	Entire manufacturing sector not covered in the ASI
Coverage	Factories/units statistically selected from the ASI frame for surveys.	Manufacturing enterprises including own account enterprises selected statistically from the area frame
Large units	ASI units	Manufacturing enterprises with 10 or more employment size but not covered in the ASI as reported during the NSS field surveys [X]
Small units	Nil [field surveys reveal that there are cases of factories in the ASI for which employment has dropped to less than 10 employees since their initial registration. For practical purposes these units are kept within the ASI frame]	Units with less than 10 employment size [Y]
Broad sectors definitions	**Large** (ASI+) = ASI + X, **Small** (UMS-) Y	

The female workforce participation rate is defined as the proportion of female employees in total employment who are involved in manufacturing activities.

$$\text{Female workforce participation rate} = \frac{\text{Total female workers}}{\text{Total workers}} \times 100$$

It is to be noted that the available information on female workers in the ASI is restricted to those workers directly employed in the industry.

Figures 1 and 2 present the percentage share of female participation in the manufacturing sector in India in the years 2001 and 2011

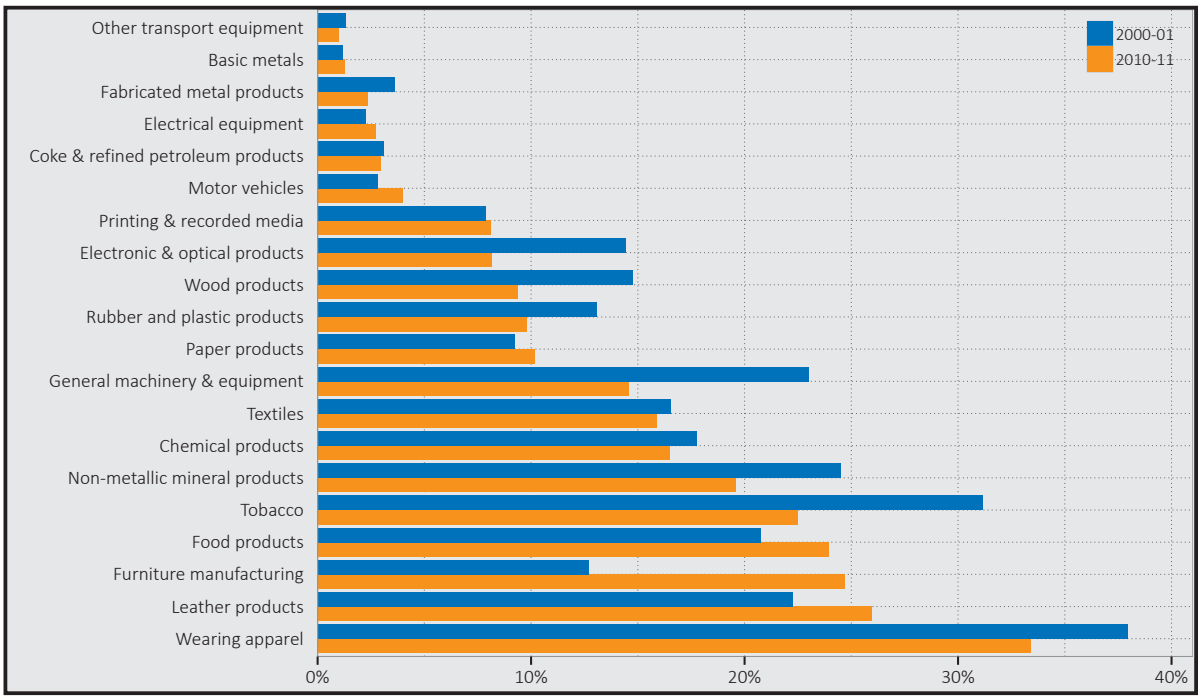

Fig. 1 | Pattern of female participation rate (in percent) in large manufacturing industries

for large and small manufacturing sectors, respectively. The figures indicate a higher proportion of female participation in the small manufacturing sector. In the large manufacturing sector, female participation has decreased significantly since 2001 in almost all industries except in the leather, furniture, food products and paper industries. The technological advancement and reduced demand for low or semi-skilled workers in large industries may be a reason for this general decline in the share of female workers in total employment across industries.

In small manufacturing industries, the share of female workforce has increased over time except in the chemicals, paper, other non-metallic products, food product and cotton ginning industries. The share of female workers in the unorganized sector has always been sizeable owing to the dominance of low cost and semi-skilled workers.

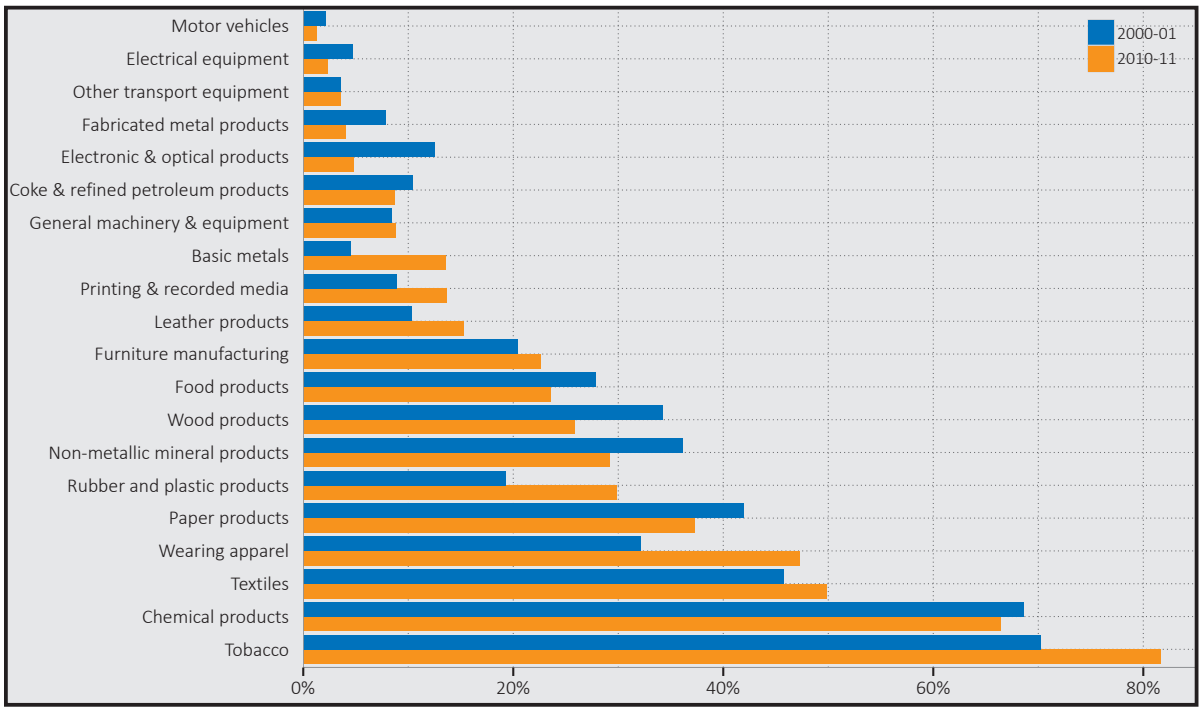

Fig. 2 | Pattern of female participation rate in small manufacturing industries

The size structure of the female workforce shows that the concentration of female workers in the small manufacturing sector is much higher than in large sectors in almost all industries (see Appendix). Interestingly, in the small sector, female participation has increased in the workforce from 2000-2001 to 2005-2006 but subsequently decreased in 2010-2011. However, in the large sector, while there has been an overall absolute increase, industry-specific developments vary. For example, female participation has decreased in the large sector tobacco industry but it has increased in the small sector. Similar trends are found in the food processing industry.

Figure 3 illustrates that female workers largely dominate the small manufacturing

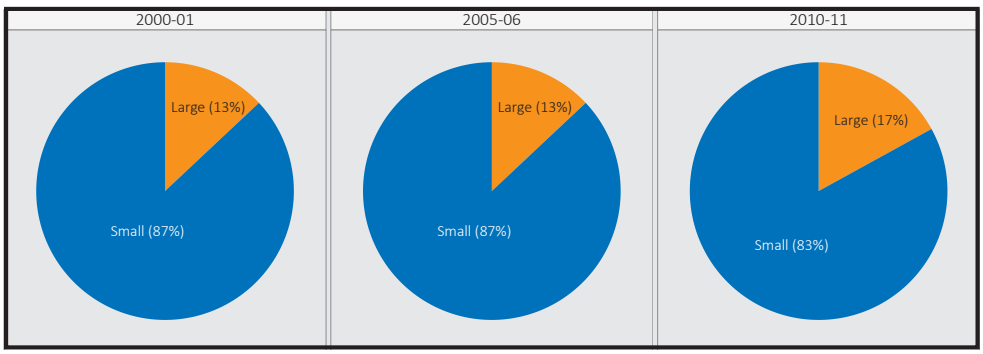

Fig. 3 | Changes in share of female workers in the large and small manufacturing sectors

sector. Many of these workers are likely to be own-account workers. The share of female participation in large industries has increased from 13 percent to 17 percent between 2001 and 2011, which is step towards the elimination of gender gap in the large manufacturing sector.

Wage differentials

In addition to studying gender differentials in the work participation rates in the Indian manufacturing sector, this paper also attempts to explain wage differentials in the registered manufacturing sector.

Because the distribution is skewed, the average wage is measured as the median and not the mean.

Thus, the Wage Gap or Wage Differential Ratio is defined as:

$$\text{Wage Differential Ratio} = \frac{\text{Female workers median wage}}{\text{Male workers median wage}}$$

The daily median wage for each sex has been calculated for each industry based on unit level ASI data on the daily wage rate and SPSS version 21 software. Hence, the daily median wage of female workers has been calculated on the basis of daily wage rate of female workers within a particular industry; and similarly for men.

Table 2 | Wage gap in organized manufacturing industries

Manufacturing activity	2005-2006			2010-2011		
	Median wage per day			Median wage per day		
	Female workers (F)	Male workers (M)	Wage Differential Ratio (F/M)	Female workers (F)	Male workers (M)	Wage Differential Ratio (F/M)
Cotton ginning, cleaning and bailing [considered as manufacturing activity as per definition]	68	84	0.81	128	157	0.82
Food products and beverages	64	84	0.77	115	145	0.80
Tobacco products	62	64	0.97	95	100	0.95
Textiles	73	102	0.72	126	172	0.74
Wearing apparel	95	117	0.82	159	182	0.87
Leather and related products	70	96	0.73	117	152	0.77
Wood and of products of wood and cork, except furniture; articles of straw and plating	57	82	0.69	101	144	0.70
Paper and paper products	63	93	0.67	125	157	0.80
Printing and reproduction of recorded media	82	121	0.68	156	188	0.83
Coke, refined petroleum products	102	97	1.05	139	167	0.83
Chemicals and chemical products	70	104	0.67	125	179	0.70
Rubber and plastic products	79	99	0.80	130	166	0.78
Other non-metallic mineral products	73	87	0.85	126	153	0.82
Basic metals	85	96	0.89	148	161	0.92
Fabricated metal products, except machinery and equipment	87	102	0.85	150	175	0.86
Machinery and equipment N.E.C	118	132	0.90	200	211	0.95
Computer, electronic & optical products	103	113	0.91	161	183	0.88
Electrical equipment	97	115	0.84	179	198	0.90
Motor vehicles, trailers and semi-trailers	102	119	0.86	185	211	0.88
Other transport equipment	109	111	0.98	171	172	0.99
Furniture; manufacturing N.E.C	112	120	0.93	160	188	0.85
Recycling	56	92	0.61	154	166	0.92
All industry	**73**	**97**	**0.76**	**131**	**166**	**0.79**

From Table 2, it is evident that female workers are getting smaller wages than male workers on an aggregate level across all industries in the periods 2005-2006 and 2010-2011. The gap appears to have been reduced slightly in favor of female workers in most industries over time. It is especially high in the tobacco, other transport and basic metal industries. The reason for these gaps may not be due to gender discrimination but rather the level of

skilled work. Female workers are likely to do less skilled work in all organized manufacturing industries, which is a possible explanation for the lower wages.

Table 3 shows that the within-industry variation of daily wages for female workers also exists wherever the mean exceeds the median. The data suggest discriminatory wage rates on Indian factories in the periods 2005-2006 and 2010-2011.

Table 3 | Female workers average wages per man-day by activity type in India (in Rs.)

Manufacturing activity	2005-2006			2010-2011		
	Female workers average wages per day			Female workers average wages per day		
	Mean	Median	Mean>Median	Mean	Median	Mean>Median
Cotton ginning, cleaning and bailing	74	68	Yes	131	128	Yes
Food products and beverages	72	64	Yes	131	115	Yes
Tobacco products	65	62	Yes	104	95	Yes
Textiles	83	73	Yes	141	126	Yes
Wearing apparel	105	95	Yes	171	159	Yes
Leather and related products	80	70	Yes	134	117	Yes
Wood and of products of wood and cork, except furniture; articles of straw and plating	63	57	Yes	109	101	Yes
Paper and paper products	73	63	Yes	143	125	Yes
Printing and reproduction of recorded media	111	82	Yes	182	156	Yes
Coke, refined petroleum products	256	102	Yes	465	139	Yes
Chemicals and chemical products	98	70	Yes	164	125	Yes
Rubber and plastic products	88	79	Yes	142	130	Yes
Other non-metallic mineral products	78	73	Yes	140	126	Yes
Basic metals	120	85	Yes	206	148	Yes
Fabricated metal products, except machinery and equipment	104	87	Yes	182	150	Yes
Machinery and equipment N.E.C	154	118	Yes	258	200	Yes
Computer, electronic & optical products	127	103	Yes	195	161	Yes
Electrical equipment	133	97	Yes	230	179	Yes
Motor vehicles, trailers and semi-trailers	140	102	Yes	221	185	Yes
Other transport equipment	166	109	Yes	201	171	Yes
Furniture; manufacturing N.E.C	131	112	Yes	194	160	Yes
Recycling	65	56	Yes	139	154	No
All industry	**89**	**73**	**Yes**	**156**	**131**	**Yes**

Table 4 | Skewness of daily wage rates of female workers, 2005-2006 and 2010-2011

Manufacturing activity	2005-2006	2010-2011
Cotton ginning, cleaning and bailing	0.33	0.18
Food products and beverages	0.52	0.52
Tobacco products	0.24	0.48
Textiles	0.48	0.43
Wearing apparel	0.62	0.48
Leather and related products	0.74	0.76
Wood and of products of wood and cork, except furniture; articles of straw and plating	0.59	0.49
Paper and paper products	0.60	0.42
Printing and reproduction of recorded media	0.92	0.62
Coke, refined petroleum products	1.51	1.22
Chemicals and chemical products	0.75	0.63
Rubber and plastic products	0.51	0.48
Other non-metallic mineral products	0.41	0.45
Basic metals	0.84	0.59
Fabricated metal products, except machinery and equipment	0.45	0.66
Machinery and equipment N.E.C	0.73	0.76
Computer, electronic & optical products	0.72	0.57
Electrical equipment	0.81	0.35
Motor vehicles, trailers and semi-trailers	1.02	0.67
Other transport equipment	1.12	0.80
Furniture; manufacturing N.E.C	0.63	0.54
Recycling	1.31	-1.38
Total	**0.61**	**0.49**

Absence of proper collective bargaining power and unstructured labour market may be the reasons for the within-industry variation. In many cases, the scale of operation is also a contributing factor to wage determination. From Table 4, we see how the degree of variation within each industry is evident of the skewness of daily wage rates of female workers.

From the degree of skewness, it is clear that the daily wage rates of female workers are positively skewed within each industry in both 2005-2006 and 2010-2011; but to a decreasing extent for almost every industry. This indicates that wage discrimination in factories has declined across industries over time. Increased bargaining power, improved flow of information and better governance may be attributable to such change.

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APPENDIX: STATISTICAL TABLES

Table A.1 | Pattern of female participation rate, large and small manufacturing sector (percent)

Manufacturing activities	2000-2001			2005-2006			2010-2011		
	Large	Small	Total	Large	Small	Total	Large	Small	Total
Cotton ginning, cleaning and bailing [considered as manufacturing activity as per definition]	32.14	23.94	31.39	23.69	38.34	25.73	15.27	10.76	14.83
Food products and beverages	20.77	27.85	26.54	27.58	28.52	28.26	23.95	23.61	23.71
Tobacco products	31.16	70.25	63.80	19.59	75.91	70.28	22.49	81.68	73.87
Textiles	16.57	45.75	38.10	18.12	51.94	42.26	15.88	49.83	40.53
Wearing apparel	37.95	32.13	32.78	39.70	42.58	42.21	33.42	47.33	44.97
Leather and related products	22.27	10.33	14.12	18.57	11.22	14.26	25.96	15.24	20.92
Wood and of products of wood and cork, except furniture; articles of straw and plating	14.76	34.19	33.85	21.49	36.69	36.33	9.40	25.85	25.18
Paper and paper products	9.25	41.93	27.40	10.47	64.91	47.11	10.17	37.32	22.90
Printing and reproduction of recorded media	7.89	8.86	8.62	8.42	15.63	12.71	8.11	13.65	11.82
Coke, refined petroleum products	3.09	10.45	5.37	3.38	7.31	4.10	2.96	8.72	3.44
Chemicals and chemical products	17.76	68.65	35.08	19.30	79.27	47.83	16.50	66.46	33.04
Rubber and plastic products	13.09	19.25	16.13	11.08	22.16	15.74	9.79	29.89	17.54
Other non-metallic mineral products	24.49	36.12	31.46	14.28	32.11	24.57	19.61	29.18	23.37
Basic metals	1.16	4.50	1.77	1.09	5.59	1.75	1.28	13.55	2.77
Fabricated metal products, except machinery and equipment	3.61	7.87	7.10	3.18	5.94	5.23	2.35	4.06	3.41
Machinery and equipment N.E.C	23.01	8.44	19.11	17.37	6.58	15.09	14.59	8.79	13.66
Computer, electronic & optical products	14.44	12.55	13.50	9.41	9.01	9.21	8.16	4.84	7.58
Electrical equipment	2.27	4.67	3.62	3.46	3.68	3.57	2.71	2.30	2.60
Motor vehicles, trailers and semi-trailers	2.84	2.12	2.65	2.76	1.87	2.62	3.98	1.31	3.73
Other transport equipment	1.32	3.53	1.89	2.58	2.26	2.47	1.00	3.57	1.35
Furniture; manufacturing N.E.C	12.70	20.47	19.37	7.31	16.89	14.47	24.72	22.60	23.09
Recycling	5.02	14.55	14.00	41.39	17.55	30.14	1.38	NA	1.38
Total	**17.92**	**34.87**	**30.96**	**16.69**	**40.42**	**34.08**	**16.00**	**38.08**	**30.72**

Table A.2 | Total female workers, large and small manufacturing sector, by activity type

	2000-2001			2005-2006			2010-2011		
Manufacturing activities	**Large**	**Small**	**Total**	**Large**	**Small**	**Total**	**Large**	**Small**	**Total**
Cotton ginning, cleaning and bailing [considered as manufacturing activity as per definition]	33,623	2,506	36,129	22,404	5,888	28,292	15,211	1,152	16,362
Food products and beverages	303,154	1,783,351	2,086,505	555,237	1,547,157	2,102,394	435,908	1,008,789	1,444,697
Tobacco products	198,489	2,266,178	2,464,668	90,948	3,174,075	3,265,023	103,225	2,465,167	2,568,392
Textiles	316,129	2,456,456	2,772,585	388,246	2,774,516	3,162,762	308,603	2,569,220	2,877,823
Wearing apparel	204,465	1,386,952	1,591,417	27,3818	2,004,875	2,278,693	412,730	2,861,328	3,274,058
Leather and related products	36,309	36,190	72,499	47,671	40,805	88,476	79,316	41,258	120,574
Wood and of products of wood and cork, except furniture; articles of straw and plating	13,754	1,766,428	1,780,182	20,899	1,469,209	1,490,108	11,066	717,730	728,796
Paper and paper products	16,103	91,209	107,312	16,866	215,341	232,207	29,083	94,148	123,231
Printing and reproduction of recorded media	10,656	37,123	47,780	16,941	46,187	63,128	15,876	53,915	69,791
Coke, refined petroleum products	1,474	2,232	3,705	2,421	1,170	3,591	2,587	695	3,282
Chemicals and chemical products	130,256	259,589	389,845	144,224	537,275	681,499	138,873	277,001	415,874
Rubber and plastic products	34,493	49,541	84,034	33,443	48,458	81,901	57,652	110,484	168,136
Other non-metallic mineral products	333,240	735,670	1,068,910	169,617	520,225	689,842	427,151	410,771	837,922
Basic metals	5,249	4,530	9,779	5,574	4,969	10,543	10,074	14,775	24,849
Fabricated metal products, except machinery and equipment	11,756	116,465	128,220	16,017	85,837	101,854	20,831	59,315	80,147
Machinery and equipment N.E.C	33,771	4,534	38,304	28,452	2,877	31,329	27,647	3,178	30,825
Computer, electronic & optical products	30,166	25,645	55,811	22,093	21095	43,188	34,118	4,276	38,394
Electrical equipment	7,640	20,244	27,885	14,489	17,539	32,028	14,950	4,904	19,854
Motor vehicles, trailers and semi-trailers	6,130	1,651	7,781	8,567	1,090	9,657	23,631	790	24,421
Other transport equipment	1,965	1,829	3,794	4,411	2,129	6,540	2,176	1,210	3,386
Furniture; manufacturing N.E.C	55,209	541,190	5,963,99	56,216	385,481	441,696	213,673	654,342	868,015
Recycling	109	5,137	5,246	3,497	1,324	4,820	90	0	90
Total	**1,785,630**		**13,380,282**		**12,907,520**		**2,389,522**		**13,759,840**
		1,159,4651		**1,944,501**		**14,852,021**		**11,370,318**	

Table A.3 | Wage differential ratio based on mean and media, by activity type

Manufacturing activities	2005-2006			2010-2011		
	Wage differential ratio		Difference	Wage differential ratio		Difference
	Based on mean	Based on median		Based on mean	Based on median	
Cotton ginning, cleaning and bailing [considered as manufacturing activity as per definition]	0.84	0.81	0.03	0.75	0.82	-0.07
Food products and beverages	0.75	0.77	-0.02	0.77	0.80	-0.03
Tobacco products	0.82	0.97	-0.14	0.76	0.95	-0.19
Textiles	0.69	0.72	-0.03	0.62	0.74	-0.11
Wearing apparel	0.80	0.82	-0.01	0.82	0.87	-0.06
Leather and related products	0.75	0.73	0.02	0.79	0.77	0.01
Wood and of products of wood and cork, except furniture; articles of straw and plating	0.68	0.69	-0.01	0.69	0.70	-0.01
Paper and paper products	0.69	0.67	0.02	0.81	0.80	0.01
Printing and reproduction of recorded media	0.76	0.68	0.08	0.71	0.83	-0.12
Coke, refined petroleum products	1.30	1.05	0.25	1.27	0.83	0.43
Chemicals and chemical products	0.71	0.67	0.04	0.71	0.70	0.02
Rubber and plastic products	0.78	0.80	-0.02	0.71	0.78	-0.08
Other non-metallic mineral products	0.71	0.85	-0.13	0.79	0.82	-0.03
Basic metals	1.05	0.89	0.17	1.08	0.92	0.16
Fabricated metal products, except machinery and equipment	0.87	0.85	0.02	0.69	0.86	-0.17
Machinery and equipment N.E.C	0.94	0.90	0.05	0.95	0.95	0.01
Computer, electronic & optical products	0.90	0.91	-0.01	0.86	0.88	-0.02
Electrical equipment	0.92	0.84	0.08	0.93	0.90	0.02
Motor vehicles, trailers and semi-trailers	0.93	0.86	0.07	0.80	0.88	-0.08
Other transport equipment	1.15	0.98	0.18	0.94	0.99	-0.05
Furniture; manufacturing N.E.C	0.88	0.93	-0.05	0.83	0.85	-0.01
Recycling	0.65	0.61	0.05	0.78	0.92	-0.14
Total	**0.75**	**0.76**	**-0.01**	**0.74**	**0.79**	**-0.04**

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