Understanding Industrial Change through new ways of representing Industrial Employment Statistics


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1. Abstract
In this paper a new way of using industrial employment statistics in order to understand major industrial changes will be shown. The case used in order to present this method will be the country of Sweden and a new way of representing official employment-data. In the case the whole (and not parts) of Sweden’s employment-changes will be analyzed in categories where NACE-codes (in Swedish terms: SNI-codes) will be divided at a five-figure-level and a new pattern of branches/sectors will be developed. The employment-development of these branches will be presented and analyzed with a graphical representation using Adobe Flash interactive software. The presentations shows a whole pattern where changes of specific branches can be analyzed together and compared to other branches in order to describe and understand why major changes occur. This representation makes it possible to analyze Sweden’s industrial transformation during the last 15 years – as a whole.

2. Introduction to a new way of representing industrial employment statistics
Official employment statistics is often used in order to describe industrial change. For example it is often used to show how certain branches evolve – or decrease. However when using public official employment statistics of today several problems occur i.e.:

- It is only often one branch analyzed and we seldom see a whole. This makes it difficult to see changes connected to changes ongoing in other branches. The phenomena outsourcing is i.e. therefore often hidden even though similar kind of change but, in the world of statistics, often occurring in another NACE-code. In worst case it can lead us to wrong conclusions about why a certain branch is changing in terms of employment.

- The timeframe for analyses is often very short, normally only a couple of years, and it makes it difficult to see the pattern of underlying structural changes - something that in the end can lead us to a misinterpretation of what is minor/major changes.

- The NACE-code system is old and not the best system to understand how industrial activities in well-developed countries have evolved in to “services”. The system as such indirectly is developed by UN in order to understand how nations develop industrially from former being an agricultural nation. We therefore need new classifications in order to be able to understand the development of a modern industrial society. This means that there are several NACE-codes existing to help us understand branches that steam from the early industrial period, but there are to few codes covering “services”. This can in worst case lead us to have a lot of statistics covering “the old times” but very little covering today’s knowledge-based society. In sum: The system as such is not the best suited to understand industrial changes in modern society.
3. Perspective
In this paper the following perspective will be used:

- A long time perspective will be used (statistics covering 15 years) in order to make it possible to see long waves of change.
- The whole employment within the country of Sweden (people in age of 15 – 64) will be covered.
- No major distinction will be done between private and public employment.
- Agriculture, industry and services will all be included in the statistics. However: the distinction between different branches here will be based on another division: companies that have similar strategic challenges, and are undergoing similar structural changes, will be part of the same branch/sector.

The branches used (and examples of companies included in each branch) is the following:

<table>
<thead>
<tr>
<th>Branch</th>
<th>Example Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material and Capital intense Industry</td>
<td>Arla Food, SCA, SSAB</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Ericsson, ABB, Volvo</td>
</tr>
<tr>
<td>Medicine/Life Science</td>
<td>AstraZeneca, Biovitrum</td>
</tr>
<tr>
<td>Construction</td>
<td>Skanska, Peab</td>
</tr>
<tr>
<td>Retailing</td>
<td>IKEA, HM</td>
</tr>
<tr>
<td>Infraservices</td>
<td>SAS, TeliaSonera, Vattenfall</td>
</tr>
<tr>
<td>Personal intense Services</td>
<td>ISS, McDonalds</td>
</tr>
<tr>
<td>Knowledge Transfer</td>
<td>Karolinska Institutet, EF Education</td>
</tr>
<tr>
<td>Health and Care</td>
<td>Capio, Danderyds Sjukhus</td>
</tr>
<tr>
<td>Consulting</td>
<td>TietoEnator, McKinsey, Logica</td>
</tr>
</tbody>
</table>

The branches used is also described below in terms of what kind of activities they include:

<table>
<thead>
<tr>
<th>Branch</th>
<th>Short description of “branch”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>Normally/formerly called “Mechanical industry” that is machinery, cars/trucks, electronic equipment etc.</td>
</tr>
<tr>
<td>Medicine/Life Science</td>
<td>Pharmaceuticals, Biotech, Medical technology.</td>
</tr>
<tr>
<td>Construction</td>
<td>Building industry (but not raw materials for construction).</td>
</tr>
<tr>
<td>Retailing</td>
<td>Shops, trading, retailing etc.</td>
</tr>
<tr>
<td>Infraservices</td>
<td>Former monopolies i.e. Banks, Airlines, Telecommunications and Energy operators – no matter juridical form (public as well as private)</td>
</tr>
<tr>
<td>Personal intense services</td>
<td>Housecleaning, restaurants, hotels, leisure parks etc.</td>
</tr>
<tr>
<td>Knowledge Transfer</td>
<td>Schools, Universities, Training Companies – no matter juridical form (public as well as private)</td>
</tr>
<tr>
<td>Health and Care</td>
<td>Hospitals, Day and Elderly care – no matter juridical form (public as well as private)</td>
</tr>
<tr>
<td>Consulting</td>
<td>IT/Management/Engineering/Juridical/Advertising/Economic Consulting</td>
</tr>
</tbody>
</table>
With this categorization in mind it can be noticed that several of the branches used here covers traditional official employment statistics way of adding different codes into more general/aggregated branche-titles - that goes i.e. for Retailing. However using SNI-codes at a five-figure level puts some new categories together. That goes i.e. for Infraservices and Consulting who are added together by taking different five-level codes that normally not so often is added together. These are examples of branches used here that the traditional NACE-system are not able to handle without this kind of representation.

4. Data and statistical representation
With the perspective emphasized in the previous section in mind some examples of the following statistics on employment data in Sweden that could be developed is:

- The whole countries employed divided in different branches - shown as the modern industrial country as Sweden actually is
- Employment change in every branch as well as the country as whole between the years 1989 to 2003 - both in terms of % and amount

When also using the Adobe interactive Flash software in order to present the data several interesting patterns of how Sweden has transformed industrially during the last 15 years can be shown. Some examples from the material developed will be presented and discussed below.

4.1. Sweden Employment % (4.3 million employed divided in branches) 2003

![Pie chart showing employment distribution in Sweden in 2003](image)

Figure 1. Sweden employment divided in branches (In the Flash-presentation each slice can be “clicked” and, through a new window that will be shown, deeper knowledge on that certain branch is presented).

In the figure above several interesting observations can be made i.e.:
- The NACE-code-system that in general put great emphasize in categories/branches concerning agriculture and industry do have problems. The main occupation within Sweden is services and that is not what NACE is good at representing.
• At the same time the category “services” is too broad, actually nearly covering everything, to be used in order to understand Sweden’s modern industrial change.
• The suggestion of using the branches described earlier in this presentation do seem to work. It gives us a fairly clear picture of what different kind of activities that services mean in a modern society.
• It can also be observed that in the picture an instinctive comparison between the sizes of different branches can be made. As an example it can be noted that there are nearly as many people in Sweden working as consultants than people working in construction. This is an observation that neither do match the public “assumption” nor the public debate on “important employment sectors” in the country. However of course that is not to say that consultants do not work with construction. Of course there are consultants working with the construction industry. But: consultants work with other sectors to. The point is that consulting have become such a huge sector for employment that it is needed do be observed “as such”.
• It is far easier to understand/study/analyze employment statistics in this way – than in reading excel-tables. Comparisons can i.e. be made instinctively.

4.2. Sweden Employment (amount) 1989 – 2003, divided in branches

In the figure above several interesting observations can be made i.e.:
• With the exception of one major reclassification (roughly 100 000 people that was working in Day Care but “moved statistically” to the public school sector during the
1990s – and therefore reclassified from "Health care" into “Knowledge transfer) it can be observed that nearly every sector in Sweden have either decreased or increased with about 50 000 - 100 000 employees during the last 15 years. That is a lot. In other words: the industrial transformation of Sweden is huge, and it is ongoing al over. The figure shows that every branch have changed severely.

- Major traditional industrial sectors like Raw material and Manufacturing is loosing jobs, and that trend has been ongoing for a long time. One might assume that this change i.e. will be connected to “outsourcing”, i.e. former R&D-offices being transferred into Consulting. However: the rise of the consulting sector can not only be explained with the decrease of traditional industry-jobs being lost and outsourcing. Consulting is a sector that also works with i.e. Retailing and Infra services and has grown for several more purposes. The figure helps us see this.

- Former monopolies, mainly in this classification included in the sector for Infra services (i.e. railways, airlines, banks, energy operators and telecom operators) are often assumed to have decreased in terms of employment due to deregulation. However this sector as whole have not decreased as much as often assumed. This is probably best understood in terms of a big amount of entrepreneurial activities in this sector. That is: at the same time as former monopolies decrease in terms of employment there are new companies, and new jobs, created in this sector. This the figure also help us to see.

- Comparing sizes of different sectors are also interesting to do. For instance it is of interest to se that the sector for Medicine and Life science is not bigger than roughly 50 000 employees – even though it has grown heavily during the last 15 years. That indirectly (if comparing size to other sectors) tells that if a country like Sweden assumes that this sector will compensate for jobs lost in other sectors it is not likely to happen. However that is not to say that this sector is not important when it i.e. comes to economic value. Of course this sector is important to the country as whole since it is an important exporter. But it is not such a big “employment-motor” that often is assumed in the public debate of job creation.

- It might also be noticed that if al sectors are calculated together the total amounts of jobs existing in Sweden nearly is as many year 2003 as it was 1989 – in other words “the net effect of job-creation” have not been big during last 15 years.

### 4.3. Sweden Employment (% change of branches) 1989 – 2003

If using the same kind of branches, but looking on change in terms of % instead of amount of jobs, a deeper understanding of the industrial transformation of Sweden can be shown, like in the figure below.

In the figure several complementing interesting observations can be made i.e.:

- There was, as assumed if the industrial history of Sweden is known (there was a really big down-turn during the first half of 1990s), several branches that lost jobs in the early 1990s. However, even under that period some branches grew. Examples of branches that have had a stable growth during the last 15 years are i.e. Consulting, Knowledge Transfer, Personal intense services and Life Sciences. Several other sectors have a decreasing situation – and also have had so for a long time period.

- What kind of branch that is “big” and what is “small” and the conclusion on which branch that is growing/decreasing heavily or less can only be understood well if the earlier figure that shows “amounts of jobs” is compared with this curve. It must be
understood that this kind of analysis is a matter of “what you compare data with”. And: these curves make different kind of comparisons possible, at the same time. It gives us a deeper understanding of the industrial transformation of Sweden.

Figure 3. Sweden Employment change in % (Figure in Swedish). In the Flash-presentation each category of branch can be chosen individually – see right corner. Then each chosen selection can be “clicked” and the employment-curves will develop gradually starting at 1989 and ending at 2003 (same order of sector that is used in figure 2 but from top to bottom i.e. Raw material sector is on top).

5. Analysis of this representation as such
The curves above are examples of curves that mainly have been developed and used in order to understand the industrial transformation of Sweden. The neither was developed in order to claim what is needed in terms of politics to create more jobs nor in order to claim which branch in Sweden that is of biggest value for the country as whole. These examples of questions, that employment-figures however often are used for, are in this context considered counterproductive. And if the curves here would be used in such kind of a context, they actually only tell that every branch is needed and must develop if the country as whole shall develop (mainly because a whole, and not parts of the country employment, is represented).

Branches in real life are connected to each other i.e. in terms of business relations (Manufacturing buying services i.e. from Personal intense services and Consulting) and this representation constantly, when adding different questions to the curves, bring that fact forward.

There can also be shown in the curves that no branch is big enough to dominate the employment statistics of Sweden - and therefore also is not likely to be able to grow in the future so extremely much more compared to other branches. Indirectly therefore the curves shown here tell that on one hand industrial transformation do really happen, and a
lot of patterns in that transformation can also be analyzed since the changes described over a long time period is fairly clear and consistent, but at the same time transformation does not happen over night. So the representation of statistics shown here give us a useful distance to industrial employment transformation.

The curves shown here have also been used in order to do interviews with about 100 important industrial leaders (CEOs) as well as about 800 experts covering al sectors (see the reference list). Questions like “what is your explanation to these changes that the curves show?” have been deeply analyzed.

There are three major conclusions that can bee drawn from these interviews. Each individual curve, as well as the pattern as whole, is very often explained by emphasizing the last 15 years effect of: Productivity development (i.e. ICT-effects, work-employment efficiency programs, new products where not as much labor as before is needed, investments in new equipment), Reorganization of companies (i.e. mergers, downsizing due to market change, outsourcing, buy-outs, vertical integration, specialization) and internationalization (offshoring, expansions abroad instead of within Sweden, foreign take-overs and then down-sizing etc) and how these three variables of explanations are connected to each other.

5. Conclusion, and moving the method further
Using modern ways of categorizing industry employment statistics is useful when trying to understand industrial transformation of a whole country. The categories used here (where i.e. no distinction has been made between private and public) based on a new pattern developed by five-figure-level NACE-codes put together with modern representation of data - in this case using Adobe interactive Flash software - give us new advantages of analyzing and spreading the knowledge of public official employment statistics.

At this moment the representation/method presented here is also being developed in order to shed light on how the industrial transformation of Europe, as whole, have been during the last decades. It would be of great interest to continue that development in close collaboration with i.e. OECD.

6. References
Most material shown in this presentation was developed when I was working as main project leader for the Swedish national project “The future of Swedish Industry” – a joint project between “The Swedish Agency for Economic and Regional Growth” (NUTEK) and “The Royal Swedish Academy of Engineering Sciences” (IVA) during 2005 – 2007. Al basic statistics was available with the help from “Statistics Sweden” (SCB). Material from the project is public available for download at either www.nutek.se or www.iva.se. Some reports from the project is:


The project developed/presented/included much more material than here is used.