

Developing PPIs on Architectural and Civil Engineering Services

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the Norwegian experience.

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Summary

The project of developing PPI on Architectural and Civil Engineering Services was initiated in 1997 by request of the National Account division. A questionnaire is sent to a stratified random sample of local-units within Architectural and Civil engineering Services. A set of variables is collected, including type of project, invoicing method, man-hours, hourly charged rates etc. Price indexes are developed using the hedonic method on the data from the questionnaire together with data from the Business register.

Using the price per square meter as the basis for the indexes we get volatile indexes, which vary more from quarter to quarter than it is reasonable to expect. Using hourly charged rates as the basis of the price indexes gives indexes that coincide more to other price (and cost) indexes covering the construction business. Hourly charged rates would be the basis of the indexes Statistics Norway plan to publish for the Architect and the Civil Engineering industries.

Introduction

In Norway as in other countries the importance of the Services industry in the economy is increasing. This makes it important to improve the basis for decision-making concerning the industry. Statistics Norway is already producing statistics on the business-structure and turnover in the industry, but lack the information to deflate the growth in the value-added, and to separate the growth in volume from the growth in price.

Improving the data on the Services industry is important both for macroeconomic purposes (Statistic Norway's Division for National Accounting, The Central Bank of Norway, The Ministry of Finance etc.) and for microeconomic purposes (the trade unions within the industry and their members).

The object of this project is to develop price indexes for the industries in the NACE section K: Real estate, renting and business activities. We started on four industry groups, that accounted for about 50 percent of the turnover in section K: NACE 72 Computer and related activities, NACE 74.201 Architectural activities, NACE 74.202, 74.203 and 74.209 Civil engineering activities, Geological surveying and related technical consultancy activities (Engineering activities) and NACE 74.4 Advertising.

The survey

The population for both architects and civil engineering consists of all active local-units in the Business register. From the population there is drawn a stratified random sample of local-units based on the local-units' NACE-code. The samples are stratified on size (number of employees) and the unit's age in addition to geographic location. All local-units exceeding a certain size are always included in the sample.

The Architect industry consists of few large enterprises and many small, The small units, especially those with only one employee, have an uneven distribution of work though out the year. And some of the small units have no activity at all. The Civil Engineering industry is very similar to the Architect industry, though with not quite as many small enterprises.

Interviews with representatives from the architects reveal that architects split their customers into three different groups:

- Public organisations
- Private enterprises
- Private households

The price expectations differ between the three groups. Architects find that private enterprises accept higher hourly charges than public bodies and private households. Private households are expected to turn to prefabricated houses if the price of a "unique" house becomes to high.

Pricing practices

Both architects and civil engineering enterprises base their fee on:

- Fixed price contracts
- Time based pricing
- A combination of the two above

How the fee is based differ between private and public principal. Looking at architects, if the contract has a private principal about 50 percent of the contracts had time based pricing. With public principals fixed priced contracts account for more than 50 percent. Contracts combining fixed and time based pricing account for approx. 20 percent in both cases.

Pricing methodology

A service with given features is rarely provided more than once. The next time the service is provided one or several of the characteristics are changed. This means that we cannot make a straightforward comparison of the prices of a service produced in two different periods. The observed difference in prices from one period to the next may reflect a genuine change in price or it reflects the differences in the characteristics of the service provided.

At the start of the project we had to choose a method that would ensured that the measured change reflected a change of the price on comparable services. Having used the hedonic method with success making price indexes for, among others, detached houses and for existing dwellings we decided to use the same approach for this survey.

The basics of the hedonic method are to identify the characteristics that influence the price of a service and through regression models estimate how and how much a change in these characteristics affects the price. Then comparing the price of a service in a given quarter with the estimated price of the exact same service provided at basis.

At the next stage in the project we identified characteristics believed to influence the price of the services they provided. In the 3. quarter of 1997 we issued pilot-questionnaires. After an evaluation the survey began in the 1. quarter of 1998. The questionnaires were sent to a sample of local-units within the industries in the survey.

Separate forms were prepared for each of the industries. The form asked for information about four different projects (services) which the local-unit had worked on in the quarter. Regarding each of the projects we asked about information on a variety of variables, both numeric- and classification-variables. The data from the questionnaires were combined with register based information about the local-units. The variables on the questionnaires were selected after consulting with representatives from the participating industries. Some of the variables were shared between the industries:

- The dates of start and estimated completion of the project
- Hourly charged rates on different classes of employees.
- Hours worked by different classes of employees.
- The value of the work completed in the quarter.
- Invoicing method (fixed, by the hour or a combination)
- Public or private principal.

The other variables differ among the industries. One or two questions were used to determine the type of service produced. The rest of the questions referred to how the contracts were obtained: the number of square meters, the number of competitors etc. From the Business-register we also obtained data on the age of the local-units, the number of employees and their geographical location.

Factors affecting the price

After interviews with the industries output in terms of price per square meter appeared to be the relevant measure. Most data are in terms with an area dimension. When constructing the indexes of both architectural and civil engineering activities we looked only at projects that had an area dimension.

Price per square meter

The regression models for both architectural services and civil engineering services based on the price per square meter had relatively good explanatory power (R^2): 0.50. The variables that affect the price are:

- The number of employees: When the number of employees increases so does the price. Large enterprises charge more than small enterprises. Also the kind of employee involved in the project affects the price. The more senior employee the higher rate per hour. For both architectural and civil engineering services fixed priced contracts had a higher price per square meter.

- The size of the project in square meter: As the size increases the price per square meter decreases. A part of the costs connected to architectural and civil engineering services are independent of the project's size.
- The geographic location of the local unit: As the industry expected that enterprises located in and around the capital charge more than other enterprises. Both because they face higher cost (renting costs) and that they to a larger extent have private enterprises as customers.
- Invoicing method: Fixed priced contracts proves more expensive than other contracts.

The price indexes based on the regression results proved more volatile than the industries and we expected. As of yet we have not been able to determine why the indexes are more volatile than reasonable expected.

Hourly charged rate

Using the same method as for price per square meter we also made price indexes based on hourly charged rates (including both fixed and time based contracts). The regression models had less explanatory power: $R^2 = 0.2$ for architectural services and $R^2 = 0.3$ for civil engineering services. But the price indexes proved more sound compared with other indexes (both costs and prices) regarding the construction business. The two indexes also follow each other, as we would expect.

The factors that explain the changes in the hourly charged rates are similar to those above:

- The number of employees: Large enterprises are more expensive.
- The size of the project: Large projects (in terms of square meters) cost more per hour. The decreasing price per square meter as the project size increase is due to increased marginal productivity.
- The geographical location of the local unit: The capital area is more expensive.
- The complexity of the projects: For Architectural services contracts that are regarded, as less complex than normal have lower prices than other contracts. Representatives for the architect industry stated that architects have long experience in rating project by complexity and taking that into account when negotiating fixed price contracts.
- Type of building: Projects that involve residential buildings costs less per hour than other projects. Project involving commercial buildings costs more per hour. This supports the architects' view that private enterprises are willing to accept a higher hourly rate than private households are.
- The type of employee: The hourly charged rate increases with the employee's role in the project. If the leader of the project (who usually is a senior employee) does the majority of hours on a project, it seems reasonable that the average rate per hour increases as well.

Challenges

A major problem in the survey was the decreasing rate of responses throughout the survey, with regards to local-units and in projects. Companies that in the first quarter of 1998 had given data on four projects gave data on only one project in the fourth quarter of 1998. This means that the numbers of observations that the regression models are based on decreases throughout 1998. The trend continued in 1999. At the fourth quarter of 1999 we threatened to fine local-units that did not reply. This strategy increased the number local-units that responded. But whether the local-units replies for four or less projects are left to see.

The local-units in the sample are not contacted prior to receiving the questionnaire. A guide follows the questionnaire. Respondents can get help on the phone filling out the questionnaire. Otherwise there are no contact between Statistics Norway and the respondents. Because we have no initial contact with the sample a proportion of the local-units in the sample should not have been included in the survey. Unless the local-units take contact, we can not identify the local-units that wrongly are included in the sample. The two main reasons why a local-unit should be excluded from the sample are:

- There is no activity in the local-unit: The population of small industries is unstable. Small local-units pop up and fade away quickly. Within Architectural services inactive small local-units also cause problems. Those local-units are kept as safekeeping for architects employed elsewhere. The cost of establishing and re-establishing enterprises makes it too costly to terminate enterprises when there temporarily is no activity.
- Incorrect NACE-code: Some of the local-units in the survey are not classified correctly.

Although not covered in this paper we have looked both at Computer services and Advertising services. There remains a lot of work on both industries. We also plan to expand the survey to other industries, such as car-rental where we have started the work.

Conclusions

Statistics Norway plans to publish price indexes based on the hedonic method with hourly charged rates as basis for both the Architect and the Civil Engineering industries. Initially we tried to use price per square meter as the basis of the index. This measure was the most favoured by the representatives for the industries. Indexes with this basis did not perform as expected. As a result we chose to use the "second best" solution: Price indexes based on hourly charged rates.