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Pricing Large Equipment

A study for Producer Price Indices

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Abstract

The main problem with pricing Large Equipment is the fact that these products are custom-made and therefore cannot be compared across a period of time.

Part I of this paper is a pre-study[1] and presents the existing studies and research on the subject of pricing unique products such as Large Equipment and outlines the problems that arise from pricing these products. The international comparison made here shows that many countries do not account for Large Equipment and other countries have solutions for some particular areas. It is experienced that model pricing and output component pricing appear to be the most appropriate methods for pricing unique products such as Large Equipment.

Part II of this study provides concrete suggestions for implementing the findings in the work process regarding the Swedish PPI. A first essential step is to educate the PPI staff on the subject. There is also a need to classify such unique items in a clear and relevant way throughout the whole production process. This would assist in the detection of these unique products for improvement or validation reasons in the future work. Personal visits are preferred and experience shows that such contacts are more likely to be successful.

Throughout this study, there have been consultations with establishments producing/importing Large Equipment. When consulting establishments, that produce Large Equipment, the respondents often stressed the fact that there is no common ground for their products to be priced on in terms of customer type, market segment, the great variation of products depending on the market and the customer type and the time point, irregular production cycle etc. Consequently, cooperation is very resource-intensive and results often in non-response.

Key Words: Unique Products, Large Equipment, Producer Price Indices Model Pricing, Output Component Pricing.

[1] Done during 2005.

Contents

1 Introduction

There has long been a need to accurately determine the optimal method of measuring prices. Another issue of great importance is the construction of relevant and reliable price indices. Price indices are based on the comparison of prices for a distinct set of products across a specific period of time. These indices are important economic indicators and are widely used in the National Accounts for compiling constant price estimates.

Pricing products is a relatively well-known subject, especially for products and services characterized by constant production, i.e. if the same products (or basket of products) and services are produced over time. The pricing of products that are different over time (i.e. that do not appear in another time period) is not an equally well-known topic. Since these items cannot be compared over a period of time, these products are called *unique products* or *bespoke products*.

A large proportion of such unique products are found in the area of machinery and equipment[2]. These are referred to as *Large Equipment goods*. They can also be found in construction and tailored business services[3] where a typical transaction cannot be defined[4]. Unique goods such as Large Equipment are usually tailor-made and exist only as one single copy. These products are manufactured to meet specific requirements requested by the customer and would not be produced otherwise. It may take a long time to manufacture these and they may not be reproduced for a long time, if ever. Another situation that should be observed is that these products can, in themselves, cause new unique products. For example, the customer may order a component or even another product that complements or is complementary to an already existing one.

For the Producer and Import Price Index (PPI), a general problem is the formulation of a precise characterization of the goods or service to be priced. After selecting a product or output to be priced, the difficult problem is characterizing the goods in a way that not only facilitates re-pricing but also distinguishes between changes in quality and price. The latter is extremely important in order to obtain an accurate measure of price changes[5].

Because of the difficulties in pricing Large Equipment, many countries have ignored these products in their price indices. This is a problem especially for countries that are dependent on such products, since some of these products can, in themselves, have a significant impact on these economies[6]. It is therefore important to find adequate methods to deal with unique products.

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[2] E.g. ships, communication systems and special purpose machinery such as paper producing machinery, machinery for metal processing, moulds etc.
[3] A service is unique when sub-activities are, in a unique or costumed way, connected i.e. the uniqueness arises more from the way in which these sub-activities are combined, rather than the activities themselves. Handbook on price and volume measures in national accounts (2001).
[4] Handbook on price and volume measures in national accounts (2001).
[5] The PPI manual (2004).
[6] Price Indices for Capital Goods (2000).

Experiences from a number of countries support the fact that the choice of method can have a significant effect on price measurement. Large Equipment goods are present in many different areas. In all, Large Equipment is estimated to account for 10 to 15 percent[7] of the output of Swedish goods producing industries. A glance at the Swedish PPI sample shows that the main area in which Large Equipment is especially prevalent is in CPA 29[8].

This paper is divided into two parts. Where part one of this paper was done during 2005 (hence, the methods of measurements stated in part one of the paper concerns the situation in 2005) and part two during 2006.

1.1 Purpose

1. Part one of this paper aims to introduce the existing practices, studies and research on the subject of *pricing unique products such as Large Equipment*. The paper will present a discussion on the following:

- The extent to which explicit estimates of price change for products labeled Large Equipment are actually made.
- The techniques used.
- The problems or obstacles with the techniques used.

  Investigating the existing methods in this area will facilitate suggestions of improvements or methods for handling the problem of pricing Large Equipment.

2. Part two aims to provide suggestions or practical guidelines for dealing with Large Equipment. This in order to facilitate and to standardize the working process regarding the Swedish Producer and Import Price Index (PPI).

1.2 Methods

The information on existing research and models (and their potential), presented in part one of this paper, has been collected from the available studies and also via contacts with a number of countries[9] and several different companies. In addition to the information given in part one, the Swedish PPI database and further contacts with respondents/companies have also provided a basis for the implementation proposals presented in part two.

1.3 Limitations

Part one does not aim to present new pricing models or to develop existing ones. The main focus will be on giving a descriptive analysis of how to price Large Equipment. Part two presents a discussion on practical solutions for pricing Large Equipment with respect to the Swedish PPI and work process.

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[7] The estimated figure includes extensive parts of CPA (Classification of products by activity) 29, CPA 35 and less extensive parts of CPA 28 and CPA 32.
[8] Industry for machinery and equipment n.e.c.
[9] See section 3 and 4 for further information.

1.4 Disposition

Part one consists of five sections: section 2 contains a short presentation of existing models and a summary of previous recommendation made by Eurostat; section 3 presents applicable cases, for which the focus is on the models described in section 2; section 4 provides a summary on the case studies done; and section 5 concludes by summarizing and discussing the findings. Part two consists of four sections; section 6 contains a short background; section 7 presents further case studies and provides a short background on how the companies in the case studies were selected; section 8 provides a discussion on implementation of the findings in the Swedish work process and section 9 concludes this paper.

Part I - Pre-study for Producer Price Indices

2 Background

The existing pricing models concerning unique products are presented in this section. In the end of this section, the recommendations from Eurostat presented. The literature in this area is scarce, probably because of the recent attention pointing to the matter of pricing difficulties related to unique products such as Large Equipment.

2.1 Existing models

Model Pricing[10]

In this approach, a hypothetical transaction is priced every month by the surveyed company. A model product is specified in detail describing all the price-determining characteristics of the transaction. This specific combination of generic elements is then repriced in successive time periods.

When specifying a model product, there are two main methods of model selection that can be used. One is a hypothetical model that is representative for the types of products produced by the respondent. While this model never has been or may never be produced, it must represent those items that are actually being produced. It is essential for the model to be specified in sufficient detail to facilitate for the respondent when reporting prices for that exactly defined model. The second method is based on a real past product which is representative of the respondent's output. The respondent is asked to quote in each period what the price would be to produce this same product again if it were up for contract.

The use of this model requires the specification of a representative model, formulation of the model in terms of output, and not input, regular updating to ensure that the model is not out-of-date and taking account of the actual production cost and actual market condition which determines the current profit margin[11].

A variant of this model is the *repeated recent sale*[12]. The respondent is asked to supply the price of a recent sale. If a real transaction does not then occur during the period in question, the respondent is asked to provide a

[10] Handbook on price and volume measures in national accounts (2001) and the PPI manual (2004).
[11] Higher in boom periods and lower in recession periods.
[12] The PPI manual (2004).

hypothetical price for the exact same product of the recent sale. A replacement product is required, if the order for this specific model product is not repeated after some reasonable time[13]. It is assumed here that the production of the considered product will be on an ongoing basis. In other words, the same product is supposed to be produced again in the imminent future. It is not obvious therefore that this should be regarded as a method aimed to deal with unique products.

Output Component Pricing[14]

A real product or products are broken down into a number of key elements. The respondent is asked to examine individual projects, compare the specified key elements and then to supply the price for each individual part of the specified model, in each subsequent time period. These unit prices can either be based on a summation of current input costs and margins or actual transaction prices which can have been broken down into component unit prices.

The requirements are that the elements should be separately identifiable, and their qualities and impact on final performance of the product should be quantifiable. The prices should be available for different periods, i.e. the given key elements should appear regularly. Furthermore, the key elements should be measured in terms of outputs rather than inputs.

This model differs from the model pricing approach since no ultimate model is specified. However, the key elements in the specified output component model may become less and less relevant over time.

Input pricing[15]

The input pricing approach uses movements in the cost of the major direct inputs as a proxy for the change in output prices. For example, using a breakdown of the major materials and types of labour used in building a special purpose machine, the major inputs and their relative weighting can be determined.

This method requires regular updating of the direct input items to ensure that these particular inputs, which are used for calculating output price, are representative and updated. Another requirement is that the input items used should constitute a large proportion of the total inputs[16].

Ideally the current profit margins should be taken into account. As substitution between different inputs will not be taken into account the approach will have a positive bias as productivity increases.

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[13] According to the PPI manual, a reasonable time might be 6 to 8 months.
[14] Refers to Specification Pricing in the Handbook on price and volume measures in national accounts (2001).
[15] The PPI manual (2004).
[16] The PPI manual (2004).

Escalated contract pricing[17]

A contract for the sale of Large Equipment may specify a base price that is subject to escalation over time according to movements in costs such as labour and material costs. Hence, the use of escalated input costs provides a proxy of the output price in each time period for the life of the contract and for the base-period item.

This method requires a relevant technique for escalating the input costs. For index escalation settlement contracts, this may require the use of other proxy indices (for labour and material inputs), which must match those used in the actual contract for the pricing method to be representative.

Problems arise when the contract ends and is replaced by a new contract for a completely different product. Appropriate techniques, which are not always easy to use and do not apply in all situations, should then be adopted for linking these contracts. The new contract has to be comparable and as representative as the old one. The price comparisons should be based on equally representative sample concerning both the reference period and the comparison period. Of course, this is difficult since all contracts are unique in themselves and depend on the customized product, the buyer-seller relationship etc. Furthermore, if wage indices are used for escalation it is likely that the model would show an upward bias.

Quality adjustment[18]

Quality adjustment is already used in many areas and is adopted for measuring price changes over time when specifications are replaced by new ones and it can be explained as follows:

An item in the price index for a certain product group disappears from the market. A new item is then chosen to replace it. Most of the quality adjustment models will then try to answer how much of the price change is due to changes in specification and how much is due to changes in the price. Quality adjustment can be done in many ways, such as calculating the marginal costs of additional features[19].

This method is resource-intensive (and maybe even unsuitable) for unique products, as the products change on an ongoing basis and are often of a very complex nature.

Use of international price indices[20]

A country with a small amount of imports of a particular product can use either the Export or Producer Price Indices for such products from producer

[17] The PPI manual (2004).
[18] Handbook on price and volume measures in national accounts (2001) and the PPI manual (2004).
[19] See the PPI manual for further information on quality adjustment techniques.
[20] Handbook on price and volume measures in national accounts (2001) and Price Indices for Capital Goods (2000).

countries or Import Price Index information from import countries importing them. In this case, international pricing data for import flows are used. For the figures to be meaningful, it is of great importance that the countries (both the country adopting the figures and the source country) do not differentiate too much, with regards to the composition of domestic production and/or cross-border trade flows.

The method may be particularly relevant for imports transactions, not only for Large Equipment goods, where the imports are irregular. For example, Sweden uses American indices to estimate the Swedish imports for airplanes.

2.2 Recommendations by Eurostat[21]

According to Eurostat's recommendations, both the model pricing and output component pricing methods are appropriate (A method). Eurostat points out that these methods are resource-intensive and require careful specifications.

The use of international prices can be a B method (a method which can be used if an A method cannot be applied), if the prices can be considered representative of the country's domestic production and cross-border trade flows.

The use of specific and robust quality adjustment methods could be an A or B method, depending on the suitability of the industry (for example, trains and special purpose machinery could be suitable industries for this method).

The major product items discussed in the paper by Eurostat are ships, aircraft, trains, oil rigs and machinery for special purpose machinery (such as paper machinery). For each area, Eurostat states method recommendations, (see Appendix).

The conclusions and the recommendations are however inconclusive since there is a lack of references to any documented evidence.

[21] Handbook on price and volume measures in national accounts (2001).

3 Applicable cases

Although there are some examples of relevant pricing, Sweden does not currently have a comprehensive strategy for pricing Large Equipment. One current solution is that only a part (frame part) of the actual product is used to price the whole product (paper producing machines). Another example of a current solution is that spare parts are priced instead of the complete product. These approaches are clearly insufficient.

Several countries (Australia, Canada, Finland, France, Netherlands, Norway, New Zealand, Switzerland, United Kingdom and USA) were asked to provide information about if and how they price customized products such as Large Equipment. They should also state problems or obstacles they have encountered with the techniques used. Some of the above countries do not account for Large Equipment (Canada, Netherlands, Norway and Switzerland). Canada, for example, has tried to estimate prices for Large Equipment through model pricing but without any success. Statistics Canada has met with great resistance from respondents because of the workload that the model pricing approach imposes on them. Currently, Canada has not found a solution to the problem. The USA uses output component pricing for military airplanes[22]. Other countries (Australia, Finland, France, New Zealand and United Kingdom) have solutions in some particular areas. These cases are discussed individually below.

3.1 Australia[23]

The following approaches for measuring price changes are used by the Australian Bureau of Statistics (ABS): *model pricing, escalated contract prices, input prices and use of provided price index.*

Model pricing is the solution most widely adopted for handling the problem of unique products such as ships. As already mentioned, this approach requires the respondent to state a price in each period for a standard product with specifications that are held constant. For example, a shipbuilder is asked to select a representative ship that was constructed in the past and to quote for each period what the price would be to undertake that project if it were up for contract. The problems with this approach are the heavy workload on the respondent, getting the respondent to take the pricing procedure seriously and to reflect market conditions. To accurately re-price a ship on an ongoing basis is a major task. Most respondents will be reluctant to do so.

As mentioned before in the case of *escalated contract prices*, the contract specifies a base price, which is subject to escalation over time according to movements in costs. This may be a common industry practice for very large contracts, such as naval contracts for a number of ships of the same design (for example, a class of destroyers) where the contract may have a long life. The major problem with this pricing method is that it provides only a basis for measuring prices for the life of the contract.

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[22] Handbook on price and volume measures in national accounts (2001).
[23] Matt Berger (2005) and the PPI manual (2004).

The input price approach is commonly used because of its relative ease. Using this approach, a ship is viewed as a group of standardized components (main engine, gearboxes, navigation equipment, hull and so on) which are combined together using various amounts and types of labour. Actual specifications (for example, specific make and model of engine, aluminum plates) can then be selected and priced over time. The model adopted in Australia neglects the profit margins and the substitutions toward more productive inputs.

Another method involves the *use of a price index* provided by the respondent, where the respondent derives the index. The method is used for monitoring price movements for construction of the new class of ships for the Australian Navy. An index structure was developed together with the respondent that meant, in effect, that the respondent was producing a price index using model pricing. The price index is supplied to the ABS each quarter. The initial problem encountered by the ABS with this approach was the fact that the respondent was reluctant to cooperate with ABS in supplying price data due to confidentiality and concerns over security. After further discussions, the respondent agreed to provide an indicator of price change each quarter. However the ABS is currently encountering some other difficulties with this approach and therefore considers this method to be unsatisfactory for the following reasons:

- In this particular case, the respondent has experienced high staff turnover and the person responsible for providing the index number has now left the organisation. The remaining staff has not sufficiently documented the process to enable the new replacement contact to undertake the exercise.
- Reliance on the respondent to fully document the structure of the index and the methodology used for producing the index.
- Inabilities to monitor individual components to ensure if the price increases or decreases are reasonable, if the supplied figures are in line with current conditions on the market and constant quality.
- Inability to evaluate the ongoing representativeness of the specifications used to construct the index.

3.2 Finland[24]

Statistics Finland has a few solutions in the area of pricing Large Equipment. The statistical office in Finland uses a *cost-based method* and a variant of *output component pricing*.

The *cost-based method* is used for estimating prices for paper machinery and shipbuilding. In the case of the paper machinery, the prices of the parts of paper machinery are collected. These prices include the profits but the profits are missing from the assembly of the machinery. This method is considered as unsuitable by the Handbook on price and volume measures in national accounts from Eurostat.

[24] Jari Harjunpää (2005).

A variant of *output component pricing* is used for some unique goods. The method is similar to the above-stated cost method. An example is if a product has a frame part or parts that form the basis of the product and the customer then selects the additional "features" or parts to form the actual product. The price of the main part (although not the whole product as such) is used to estimate the price development of the product. One example here is a wheel loader, where the observed price is the price of the basic machine, cabin and basic dipper.

3.4 France[25]

The National Institute for Social and Economical Statistics in France (INSEE) currently uses the following methods:

Imaginary quotation (devise fictive) is used in sectors for control systems, tanks, reservoirs, metal containers and moulds. The field officer and the respondent both determine a set of characteristics (raw material, wage, services etc.) which will be subject for pricing over successive time periods. The price is compiled as if the company was to build these particular products in the prevailing market conditions at that particular time point. Margins are included in the price in order to reflect market conditions. Although this method works very well in some sectors, it is avoided for two main reasons. Firstly because this approach is not considered to give price estimates close to the market prices and secondly because, despite the effort to minimize the workload posed on the respondent made by the French field officers, who are well trained and specialized in the particular field they investigate, the workload remains a major obstacle.

The prices for some components (such as door, axle etc.) and some indices (that are used for escalating the payments) are used for the train industry. For instance, the company takes the mean of three indices (steel, wages, and plastics) to update the prices of a contract in each subsequent month. Information about wages, raw materials, etc. is also used.

3.5 New Zealand[26]

New Zealand does not really have an industry that produces unique products such as large ships, planes, military equipment, mining equipment etc. Therefore there have not been any efforts worth mentioning to price these products for the PPI. For the *Import Price Index*, Statistics New Zealand identifies the countries where these unique goods are manufactured and uses the Export Price series (adjusted for changes in the exchange rates) from that country as a proxy for the price changes that importers will face. For this purpose, indices from Australia, the United States, the UK and Japan are used.

[25] Frederic Minodier (2005).
[26] Philip Anderson (2005).

3.6 United Kingdom[27]

To some extent, the National Statistics Office (ONS) in the UK uses *escalating contract pricing* and *model pricing* for pricing Large Equipment.

Escalating contract pricing is used for products such as ships and planes which have a long manufacturing period (greater than 2 years).

In exceptional cases, the ONS has undertaken *model pricing*. In these cases the respondent is asked for an imaginary product price for a product close to the unique product, for which the respondent can estimate a price for each month.

The data collectors are trained in the above-mentioned methods and negotiate with respondents who are not keen to supply price information if they make bespoke products because of the work involved in estimating price changes.

To keep the estimations as accurate as possible, efforts are made to update or change the unique product at least every 6 months to a new product where the actual price at the time is known.

3.7 USA[28]

Most of the prices sampled in the PPI are based on actual transactions. Indirect or model pricing is acceptable, though rare, for industries that have outputs that cannot be exactly reproduced/sold on a monthly basis. A determination of the exact methodology to be used is custom tailored to suit the unique product and the characteristics of the sampled industry.

In the USA, representatives of newly sampled industries are normally visited by Washington staff (from the headquarters) to review industry characteristics, which greatly contributes in a collaborative way to select the most appropriate and realistic pricing methodology. Once the review and feedback from industry representatives are complete, an industry background report and collection instructions are developed and sent to regional office staff in preparation for actual data collection of the sample through personal visits.

[27] Dean Flecher (2005).
[28] Roselyn Swick & Holdway Michael (2006).

4 Case studies

According to special ordinances, Swedish agencies are obliged to consult the Board of Swedish Industry and Commerce for Better Regulation (NNR) before requiring information from enterprises[29]. Consultation has taken place with the NNR30.

4.1 Background

In order to better understand the pricing problem associated with unique products, several companies were contacted for consultation. A summary of these consultations will be presented in this section. Due to confidentiality, the names of the companies as well as a number of details have been left out.

The twelve companies chosen for consultation produce Large Equipment goods. At the present, there are problems with pricing products from these companies. Some of them are ranked as very important for the Swedish PPI sampling and it is therefore very important to solve the pricing problem concerning these particular companies. Consultations were carried out on an ongoing basis via e-mail and telephone and, in some cases the companies were visited (if the company accepted such a visit).

In all cases, the companies were very reluctant to discuss the subject and even more to receive a personal visit. Further contact resulted in consultation visits in four cases and telephone consultations in four other cases. In four cases, consultation did not take place due to the company's reluctance. The reluctance was mostly because consultations by telephone or a personal visit demanded resources, such as time and well-informed personnel.

Subjects that were discussed during the contact with the companies were:

- The companies' overall production i.e. products produced and how these are produced.
- The nature of the products: in what sense are the products considered unique? What are the common features between products produced from one time to another?
- The company's own methods for estimating the cost of producing the product in order to see if the companies' own price calculations could be used. For example, in the model pricing approach.
- Model pricing and output component pricing were discussed in particular. The companies were asked if they could (hypothetically) think of using one of these approaches. If so, how? If not, why?
- One of the final questions was if the company could consider participating in a pilot study.

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[29] The business sector has established the NNR to represent them in matters such as making Regulatory Impact Analysis when proposing new regulations. The NNR study and comment on the analyses with the focus that regulations should not create unnecessary obstacles to start-ups, competition, innovation and growth. For more information please see www.nnr.se

[30] Anders Hultkvist (2005).

4.2 Summary of the case studies

Almost all of the companies mentioned that the problem with pricing these products were not only due to the uniqueness of the products but also to irregular production cycles. In other words, the products take a long time to produce and there may be no sales in a particular period. All of the contacted firms also stressed that the customer type, market segment or market are of great importance and have a significant effect on the price level. There may therefore be differenced in the price for different customers, not only reflecting the production of the unique product but also the customer's financial status or the competitive situation of the market in question. Furthermore, there could also be completely different products sold in different market segments since the preference for the product mixture is varied.

Two companies claimed that there is no common ground on which their products can be priced. All of the products are unique and therefore hard to compare from one time to another. The customers want and demand new and better products than the most recently produced products. Each settlement is significantly different from another, i.e. different products, different subcontractors, widely varying technological and manufacturing features, varying portion of research and development, etc. None of these companies were willing to participate in a pilot study. The reason is that they can not find any model at all that would give a correct or even nearly correct price estimate for these products. They also claim that attempting to find a model would require a lot of resources and time, and the model would not be useful for one time period to another, since the products could not be compared from one time period to another. The companies also argued that the statistical office would not be able to know the exact grounds for the price estimation because of confidentiality. The production cycle for the products concerned could vary from between 10 to 20 years and the production is also irregular which makes pricing difficult.

Two of the visited companies agreed to participate in a pilot study (if one would take place in the future). Both of these companies use a base model that may be representative and could be a subject for pricing. One of the companies has already developed a test model (model pricing), in cooperation with the statistical office. The other company agreed to participate only if the statistical office agrees to offer technical support. This is to minimize the amount of resources demanded as the company would need to reprogram its own systems to be able to deliver the requested prices. The latter company's demands were not unique. There was a discussion in all cases about lack of resources and the pressure such models would put on the companies. According to them, there is no extra time they could spare for projects such as this. In two cases, the companies were already familiar with model pricing since the approach was partly used for calculating prices.

5 Conclusions

A few countries[31] are currently using methods which involve output component pricing or model pricing. These approaches appear to be the most appropriate methods for pricing unique products such as Large Equipment.

The case studies presented above also support that model pricing and output component pricing may be the current best models for solving the pricing problem of unique products. As mentioned earlier, and also rather apparent in the above-stated cases, these approaches require a large amount of resources. There are also some obstacles to overcome before companies can or will report prices. One of the main obstacles is to get the companies into such a discussion. Another obstacle is how to facilitate for the companies to find a model or components appropriate for pricing. A personal visit made the contacts more positive, shorter and more meaningful than contacts via e-mail and telephone. Personal visits are therefore recommended. Furthermore, the companies' willingness to cooperate could increase if the statistical office is able to support the construction and updating of an appropriate model. To obtain a correct or appropriate model there needs to be a dialogue, initially on an ongoing basis, between staff from the statistical office and someone with expert knowledge (in production and sales) from the responding firm.

In all of the case studies presented in the latter section, none has monthly sales. Price reports on a monthly basis would therefore be unnecessary. Quarterly, bi-annually or maybe even annually would be recommended in these cases. Also, the workload calls for less frequent quotations.

The other models presented above may also contribute to solving the pricing problem. This is particularly true for input pricing, especially if the profit margins are taken into account. Escalating contract prices might work as a complementary or intermediary approach but does not give a long-term solution to the problem. Hence, there is no unique solution to the problem.

[31] At least Australia, France, UK and the USA

Part II - Implementation in Producer Price Indices

6 Background

Part I dealt with finding adequate methods by which unique products could be priced. It was primarily an introduction to existing practice, studies and research on the subject of *pricing unique products such as Large Equipment*. Part I also discussed some relevant cases where the following questions needed to be answered: to what extent are explicit estimates of price change for products labeled Large Equipment actually made? Which techniques are used and what are the problems or obstacles with these?

In the pre-study twelve establishments were contacted for a discussion about Large Equipment. The discussions were carried out on an ongoing basis via e-mail and telephone and, in some cases, the companies were visited (if the company accepted a visit). The findings from the early stage contacts (in Part I) with the different countries and companies founded the basis for the continuing work in Part II.

More establishments were contacted in the second stage, in order to focus on solving the problems concerning pricing unique products/systems and to establish price measurements. This part of the study aims to provide guidelines for implementing the findings into the working processes for PPI in Sweden.

7 Case studies Part II

The introduction of a new classification code concerning the Swedish sample selection 2006 for PPI aims to make it easy to keep track on those establishments that produce or import Large Equipment. In the Swedish PPI sample, recently a certain code is assigned to a product when it is characterized as unique. This classification has facilitated the continuous work regarding the pricing problems for these products. This classification also helps to map out the areas where the problems with Large Equipment are more common. When solutions are found for some products in one area, the possibility of applying the "same" solution to other products in that same area could be considered.

The PPI sample for 2006 contains approximately 4000 products. Of these products, 46 products are currently classified as Large Equipment. However the classification work has just begun and is far from finalized.

The main focus for selecting the companies and the specifications has been for the Producer Price Index rather than Import Price Index. This is for two reasons. Firstly, the companies often have a better knowledge about the production cost, the quality and the nature of the product if they produce it themselves which makes it easer when discussing for example approaches such as Model pricing. Imported goods can vary (in characteristics or as totally different items) and are more difficult to overview. The second reason is that the weights, in many cases, for the Large Equipment goods produced in the producer market are higher (in the PPI sample 2006) and it is therefore more important to obtain price observations for these items.

7.1 Summary of the case studies Part II

Of the 46 companies in the 2006 sample that produces products classified as being unique, 30 companies have been contacted.[32] The contacts were made by e-mail and telephone but the aim was to visit the companies (if the company accepted a visit). As mentioned previously in Part I, the companies were very reluctant to discuss the subject and even more to receive a personal visit. Some kind of contact was established in 16 cases. Only five cases resulted in a meeting between Statistics Sweden and the company representatives. In addition, telephone meetings were arranged in five cases. The remaining cases resulted in a few e-mail exchanges. In 14 cases, there was no response and no discussion could therefore take place.

All the five visits done during 2006 were successful and resulted in solutions for pricing of the unique products. However, no solution was found for the remaining cases.

Where a solution have been found the approach agreed with the businesses is best described as Model pricing. Typically a representative historic transaction has been chosen as the basis for the specification that is to be re-

[32] The aim is to contact all of the establishments producing/importing items that are classified as unique in the PPI sample.

priced. Often in the specification, the actual product characteristics are changed slightly by removing features that are regarded as especially distinctive. This is to make it easier to relate the specification to current actual transactions, and thus to the current price level in such transactions. The larger the value of those distinctive features that are removed from the original transaction in order to arrive at the final model specification, the larger is the risk for non-representativity. However, it does facilitate comparison over time and such practical advantages may often out-weight theoretical disadvantages.

We could also relate this simplified Model pricing approach to output component pricing. In that case we would ask the respondent to provide "output prices" for the key elements of the product. In the simplified Model pricing approach instead we ask the respondent to remove from the actual price the "output prices" of those distinctive features not included in the specification.

Another application of the simplified model pricing approach is when the respondent actually does calculate a current price for the simplified model by adding up the cost of each component/characteristic and applying the current profit margin to arrive at the current output price. In this case the simplified model just serves the purpose of simplifying the calculation. Comparability over time would have been achieved also if the model would include some distinctive features.

All the companies in question will report prices quarterly since the production cycle in these companies, as suspected, are irregular and there may be no sales in a particular period. Quarterly price reports help to ease the workload for the respondents and have been welcomed by the companies when suggested.

It is experienced by Statistic Sweden that it is harder to convince establishments to cooperate in providing relevant price measurements in areas where the unique products are for military purposes. This is because they often claim that there is no common ground for their products/imports and therefore pricing the item in question would be impossible. For no reason at all, the company can sell a product for different prices to different customers. The difference can only be explained by the characteristics of the customers. There have been in total four contacts[33] with such companies and two of them were visited. However, only in one case has a solution been possible. In this case a model product based on a previous contract with a certain type of customer was selected for future pricing. The services (for example, training of the costumers) provided in association with actual transactions of the item are excluded from the specification in order to obtain some comparability and make the price quotations more comprehensible to the respondent. I.e. the respondent prices the product thinking what if it is that same model product with no services included, fixed costumer-type and engineering cost. It is possible that this company could cooperate because the company produces an item line with similar items. Other companies may not even produce/import items that are at all similar, which questions the comparability.

[33] In total, that is including the contacts made during the pre-study.

It is important to underline the fact that in all cases where solutions were reached, the companies produce items that have some kind of basic design i.e. the produced items are not completely different (such as in cases of companies producing products for military purposes). Though the principles of model pricing do not require the existence of similarities between the products actually produced it has, until now, been impossible to find solutions that involve large hypothetical elements in calculating the price estimates.

8 Implementation

It is very important to spread the knowledge of pricing Large Equipment amongst the staff at the statistical office and to integrate the ideas in the monthly production of the Producer and Import Price indices.

The process of contacting the respondents is very time-consuming. It may take months from the first initial contact until some kind of solution has been reached. One advantage of involving all the staff working with PPI at the Prices Unit is that the workload regarding solving pricing problems such as this would be divided. Hence, incorporating this work in the monthly PPI process would be preferable.

A first step is therefore to educate the co-workers at the Prices Unit on the subject, i.e. the definition of Large Equipment and the problems that arise with such products. It could be useful to hold a workshop on this matter and perhaps provide some guidelines to help remind the Prices Unit staff of the various steps in the process.

The next step would be to correctly classify the products in the sample selection and PPI production system in such way that assists in the detection of these unique products for improvement or validation reasons in the future work. This work already begun but it is far from completed.

In the continuing work, someone from the statistical office, preferably someone who is responsible for a particular industry, should contact the companies in question regarding the pricing problem. If possible the representative from the statistical office should make a personal visit to the company. Personal visits have proved to have a good outcome both in terms of solving the current measurement problem and in terms of gaining an understanding of the company and also the uniqueness of the product in question. Personal visits may not guarantee a solution to a particular pricing problem but it gives a much better understanding of the area (which could be useful in the future).

Considering the workload that the problem with pricing unique products impose, it would be preferred that the person responsible for the particular line of business contacts the establishment concerned. This person should have extensive knowledge of the business area and could therefore carry on possible discussions at a higher level. However, it is important that the personal visit is preceded by a thorough study of the company in question and the business area to which the company belongs. The knowledge possessed and the arguments used by the statistical office representative play an important role in motivating the company to cooperate and making an effort to solve the pricing problem with the unique product.

The classification of the unique products also helps to minimize the workload. By looking at a certain area where there are documented cases of unique products, one could perhaps draw similar conclusions on other unique products in that specific area or even in completely different areas.

The purpose of the guidelines is to standardize the work process to some extent and in this way ease the workload for both the national statistical office and the respondents. Below follows some suggestions for the future work.

1. Classifying the unique products by assigning a code in the sample selection sheet as soon as the information about the product is known.

2. Follow-up the products that are coded as unique by contacting the companies in question. A personal visit, by someone in charge of the business area in question, is recommended.

3. Solve the problem together with the company and carefully document the results by using standardized methods. Documentation is essential also for the purpose of presenting good examples to respondents that feel dubious to the possibilities of providing useful price estimates.

4. Once the observation is in the production system, it should be classified in some way to help keep track of the item and the particular solution. Assigning a code that indicates that the product has a unique solution will simplify future work and validation.

5. It is very important to make the companies aware of the criteria for the pricing models used. For example, in cases where model pricing is used, the company must update the model from time to time to make sure that the product and the model are still representative (see page 8). How often the updating should occur is not defined but can depend on the business area or the product.

Since the work with solving pricing problems for unique products is very time-consuming it is necessary to prioritise. The priority should therefore be in the most important items with respect to the market (the producer market for reasons mentioned above, see page 20).

It is important to be flexible when discussing solutions to the pricing problems concerning Large Equipment. Often practical advantages could out weight theoretical deficiencies.

9 Conclusions

International experiences and contacts with establishments have played a central role in order to find pricing solutions for Large Equipment in the Swedish PPI. However, the international experience in this area is scarce but point out that the most appropriate approaches are output component pricing or model pricing. The contacts established with the companies have been very resource demanding but still very informative. In total, including the pre-study, have 42 companies been contacted.

Seven cases, which were all based on personal contact with the respondent resulted in successful price measurements. In these cases is the approach agreed upon with the businesses best described as model pricing. Typically a representative historic transaction has been chosen as the basis for the specification that is to be re-priced. Often in the specification, the actual product characteristics are changed slightly in order to facilitate comparison over time and such practical advantages may often out-weight theoretical disadvantages. To ease the work load posed on the respondents the price reports are often provided quarterly. It is important to underline the fact that where solutions were reached only companies produce items that have some kind of basic design i.e. the produced items are not completely different. However, all solutions reached are more or less unique.

Many of the discussions with the companies did not result in solving the pricing problem since it was hard to convince the respondents to co-operate. Therefore, it is very important to develop better routines in order to establish contacts with the companies and to find ways to motivate the respondents better.

There was no response in 18 cases, or approximately half of the contacted establishments. The problems with non-response are believed to be due to the fact that cooperation is very resource-intensive.

Concrete suggestions for implementing the findings in the work process regarding the Swedish PPI are given in part II of this paper. A first essential step is to educate the PPI staff on the subject. A workshop on this matter could also be useful and guidelines to assist the Prices Unit staff. There is also a need to classify such unique items in a clear and relevant way throughout the whole production process. This would assist in the detection of these unique products for improvement or validation reasons in the future work. The classification work has already begun but is in need of further improvements. It is also suggested that someone from that statistical office, preferably someone who is responsible for that particular industry, contact the company in question regarding the pricing problem. Personal visits are preferred and experience[34] shows that such contacts are more likely to be successful. Good examples should be used to help convincing the respondents to provide price estimates.

[34] Experienced also in the USA.

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Appendix

Methods recommended by Eurostat

The major product items discussed in the paper by Eurostat are ships, aircraft, trains, oil rigs and machinery for special purpose machinery (such as paper machinery).

For ships, the A method would be "model pricing" if the characteristics mentioned above are satisfied.

For oil rigs, the A method is an "output component pricing" approach to identify the modular elements of the rig, as long as adjustments for quality are applied to the elements. Pricing of the components with an adjustment for company margins and labour productivity would be considered a B method, as would the use of an international index for certain types of ships – of large size and modular construction - which share the characteristics of oil rigs.

For airplanes, the A method here are model pricing and the output component pricing approaches.

Model pricing and quality adjustment methods are both A methods for trains, provided that stratification at least extends to wagons/coaches/locomotives and to the different forms of propulsion technology.

For special purpose machinery (for example paper machinery), the A methods are model pricing and the output component pricing approaches, but appropriate quality adjustment methods can be used directly where the machinery is not suited for a decomposition method.

For defence goods, it is possible to apply similar methods to those described above (indeed it may be that military and civilian product prices move in a very similar way). The defence ministries' own price indices (if they compile one) can be considered as an A method if their price indices are quality adjusted and based on actual evolution of output prices.