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THE USE OF TENDENCY SURVEYS IN EXTRAPOLATING NATIONAL ACCOUNTS

BY FRANK E. M. OUDDEKEN

AND

GERRIT M. ZIJLMANS

National Accounts Research Division, Central Bureau of Statistics, The Netherlands

A well-known way of using tendency survey data is the construction of Composite Leading Indicators (CLIs). It is rather peculiar that CLIs pretend to predict macroeconomic aggregates, while their construction is not consistent with the way actual macroeconomic statistics are compiled. This paper contains preliminary results of an attempt to integrate tendency survey indicators into the framework of the Dutch Quarterly Accounts. We conclude that tendency survey indicators can contribute to an explanation of trends in "real" economic variables. Many of these indicators lead the Quarterly Accounts indicators. They can, therefore, contribute to a timely estimation of National Accounts aggregates.

1. INTRODUCTION

Evaluations and anticipations of businessmen and consumers often show a remarkable lead on the business cycle. Therefore, tendency surveys can play an important role in an early description of the business cycle and its turning points. A well-known way of using tendency survey data is the construction of Composite Leading Indicators (CLIs). A CLI combines both quantitative statistical information and qualitative tendency survey data in one single indicator, which then serves to describe one aspect of the *macroeconomic* process. Sometimes this aspect is well defined (e.g. EC, 1982; OECD, 1987; Strigel, 1985; Klein and Nerb, 1985; Goldrian and Strigel, 1985), sometimes it is only described as "aggregate economic activity" (e.g. U.S. Department of Commerce, 1984). Also the purpose of this index is not always clear. It can vary from predicting the growth pattern of a time series to merely signaling its turning points.

There are two striking elements in the way business and consumer survey data are used in the construction of CLIs. First of all, early qualitative data are seldomly regarded as a coherent component within the entire system of economic statistics. Secondly, in the construction of a CLI scant reference is made to the methodology of the National Accounts, which is a generally accepted statistical framework for the description of macroeconomic processes. Consequently, it is peculiar that CLIs pretend to predict macroeconomic aggregates, while their

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construction is not consistent with the way the actual macroeconomic statistics are compiled.

This paper contains some preliminary results of an attempt to integrate business and consumer survey data into the framework of the Dutch Quarterly Accounts. Although the Quarterly Accounts are provisional National Accounts, they are based on the same concepts and accounting system. A prerequisite for incorporating early quantitative and business and consumer survey data in the Quarterly Accounts, is that both types of data can be directly linked at a rather low level of aggregation. Bearing this in mind, Section Two of this paper describes the organization of economic statistics in the Netherlands. Special attention will be paid to the incorporation of tendency surveys in the Dutch macroeconomic statistics. Section Three gives an example of the application of tendency surveys within the framework of the Quarterly Accounts: a methodology for compiling a flash estimate of the Quarterly Accounts. Some preliminary results of this incorporation process are presented in Section Four. Section Five contains a summary and some conclusions.

2. Tendency Surveys Within the Dutch System of Economic Statistics

One of the most prominent aspects of the organization of statistics in the Netherlands is its almost complete centralization in a Central Bureau of Statistics (CBS). This has stimulated the development of a coordinated and coherent system of statistics, including the tendency surveys. Consequently, there exists a clear relationship between the various annual, quarterly, monthly, and tendency statistics. This is illustrated in Table 1, which classifies various economic statistics according to their thoroughness as well as their degree of integration.

Thoroughness captures the phenomenon that statistics on a specific subject are adjusted at regular intervals, when new information becomes available. The earliest and least thorough information stems from data on expectations and other leading indicators. These are followed by monthly and quarterly short term indicators. Finally, annual statistics are compiled, which describe the economic process most thoroughly. However, it takes a long time before all data needed for their compilation are available.

Analogously, statistics can be grouped according to their degree of *integration.* Fully integrated statistics are the result of a process in which the reliability of data from various sources is evaluated before they are combined within a consistent statistical framework, such as the System of National Accounts. Since such a system imposes certain restrictions on the data (e.g. total income must be equal to total outlays), the original figures are subjected to some sort of external quality control. Partially integrated statistics are the result of combining (e.g. weighting and/or deflating) various unrelated statistics. No identity restrictions are applied in this case. An example of partially integrated statistics is the index of industrial production. Unintegrated or single statistics provide information on their own.

Combining the horizontal and vertical relations, Table 1 reveals a dual sequence of confrontations in the sense of both using more thorough data and

TABLE 1

A VIEW ON THE STRUCTURE OF THE DUTCH SYSTEM OF ECONOMIC STATISTICS

Integration / Thoroughness	Not Integrated Statistics	Partially Integrated Statistics	Fully Integrated Statistics
Expectations and leading indicators	Business and consumer surveys	Composite leading indicators[1]	—
Monthly indicators	Statistics on • products • prices • foreign trade • consumption	Index of industrial production	—
Quarterly indicators	Quarterly statistics on manufacturing industries (sales and employment)	Deflated quarterly statistics on manufacturing industries (sales and employment)	Quarterly accounts
Annual statistics	Production statistics	p.m.[2]	National accounts

[1]Composite Leading Indicators are not compiled by the CBS, but see e.g. De Nederlandsche Bank (1988) and OECD (1987).

[2]Partially integrated annual statistics are of a very specific nature; an example in this table would require too much explanation.

integrating statistical information. The various confrontations, however, are only fruitful if coordination with respect to both *concepts* and statistical *units* is guaranteed within the system of economic statistics. This may be said to be the case in the Netherlands. Consequently, the business and consumer surveys can directly be linked to the Quarterly Accounts, thereby serving as one of the inputs of the process of statistical integration. In this respect, the input-output method of statistical integration is of great help: all Dutch National Accounts figures with respect to the production and expenditure process (including the quarterly ones) are based on fully balanced input-output tables. The construction of input-output tables is not an end in itself, but merely a means to improve the statistics' quality through various consistency checks.

It may be noted that the existence of an integrating framework for tendency survey results and monthly data also has feed-back effects on those statistics. First, the integration process has beneficial effects on the *quality* of the basic statistical information. Confrontation of data from various sources leads to a better understanding of the weaknesses in each of them. This, of course, offers a good opportunity for quality improvement. Secondly, the existence of an integration process sets deadlines on the availability of basic statistics. In the Dutch case, the *compilation time* of some basic statistics has been decreasing since the first release of the Quarterly Accounts. Both observations lead to the conclusion that it is desirable for all basic data to be, in one way or another, input into an integration process. As indicated in Table 1, the thoroughness of source data determines the thoroughness of the integrated statistics. The most thorough statistics, the annual National Accounts, are a framework for the integration of annual data, while the Quarterly Accounts can be regarded as the

framework for the integration of monthly and quarterly short-term data. Therefore, almost all statistical information, be it monthly, quarterly, or annual, is used in one or another integration framework. To date, only expectations and leading indicators remain unintegrated. Therefore the top right cells of Table 1 are empty.

At the moment the Dutch CBS is doing research in the field of incorporating expectations and leading indicators in the compilation of the Quarterly Accounts. The objectives of this research project are twofold: improvement of the Quarterly Accounts' quality and accelerating their date of release. If it is possible to substitute the regular Quarterly Accounts indicators by a complete set of more timely indicators, a *Quarterly Flash* becomes feasible. This Quarterly Flash will then be a framework for integrating expectations and leading indicators as well as timely *ex post* quantitative and qualitative data, so it could be placed in the empty space of Table 1. To establish the Quarterly Flash, a new methodology is needed.

3. The Quarterly Flash: Methodology

The methodology of the Quarterly Flash has been developed as an extension of the methodology of the Quarterly Accounts. In this way the Quarterly Flash is a logical step forward in the process of supplying increasingly more timely, integrated statistics.

In comparison to the final estimates of the annual National Accounts, provisional accounts (annual and quarterly) have to cope with a lack of data. The sooner the accounts are to be published, the more serious this lack of data is. Various techniques have been developed for the compilation of provisional National Accounts in order to solve this information problem. Figure 1 represents the compilation process of the Quarterly Accounts in the Netherlands. The essential element of this compilation process is the *balancing* of the input-output table by adjusting the indicators and/or the hypotheses. We refer to Janssen and Algera (1988) for a detailed description.

To put it simply, the techniques used in the compilation process of the Quarterly Accounts amount to the extrapolation of a one-year old quarterly input-output table by means of price and volume indicators. The extrapolation makes use of the hypotheses of the static input-output model with fixed technical coefficients and a simplified demand structure (Leontief input-output model). The function of the model is to fix part of the *structure of the economic process*, primarily the structure of both production and final demand. Data which cannot be obtained in time are derived from information available by means of the model coefficients. The more data are lacking, the more structural information on the economic process is needed.

The Quarterly Flash is to be compiled very shortly after the reference period. At that time, even the regular price and volume indicators are lacking to a large extent. Part of the lacking indicators can be substituted by earlier available data. However, this does not solve the whole problem. Therefore, the Quarterly Accounts methodology must be *supplemented* with a Quarterly Flash model, describing the relations between expectations and leading indicators on the one hand and the price and volume indicators to be used as input in the input-output

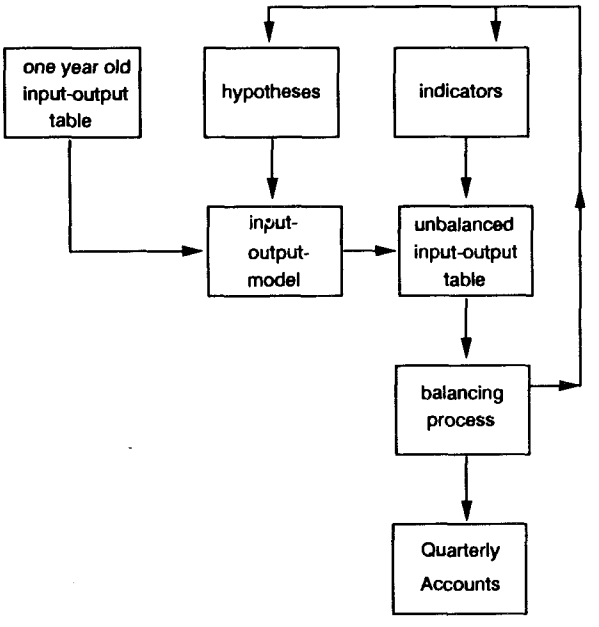

Figure 1. Compilation Process of the Dutch Quarterly Accounts

model on the other hand. However, the structural information needed for the Quarterly Flash model differs from that for the input-output model. There are differences in character, origin and techniques used.

With regard to the difference in *character*, the methodology of the Quarterly Accounts appears to be dominated by definition equations (total input = total output) and static technical relations. For instance, the production structure laid down in a one-year old input-output table and the assumption of constant returns to scale, implicitly specify a production function for each branch of industry. The additional hypotheses needed for the Quarterly Flash model mainly concern behavioural relations. Future economic behaviour may be revealed by expectations and leading indicators. To give an example, changes in input costs are usually ahead of changes in output prices and the production of some (upstream) branches of industry leads the production of others (downstream). Consequently, the Quarterly Flash needs dynamic behavioural relations instead of definitions and technical relations. The differences in *origin* of the structural information are closely related to the differences between static and dynamic relations. As the Quarterly Flash model must have a dynamic character, its coefficients cannot be derived from the observations of a single quarter. The estimation of the Quarterly Flash model will therefore be based on a set of time series.

As a result, the *techniques* used in order to obtain the structural information are different. The input-output model hardly needs any special techniques. The model is primarily based on hypotheses, which are, to some extent, "tested" in the balancing process. To the contrary, the Quarterly Flash model will be based on regression and time series analysis.

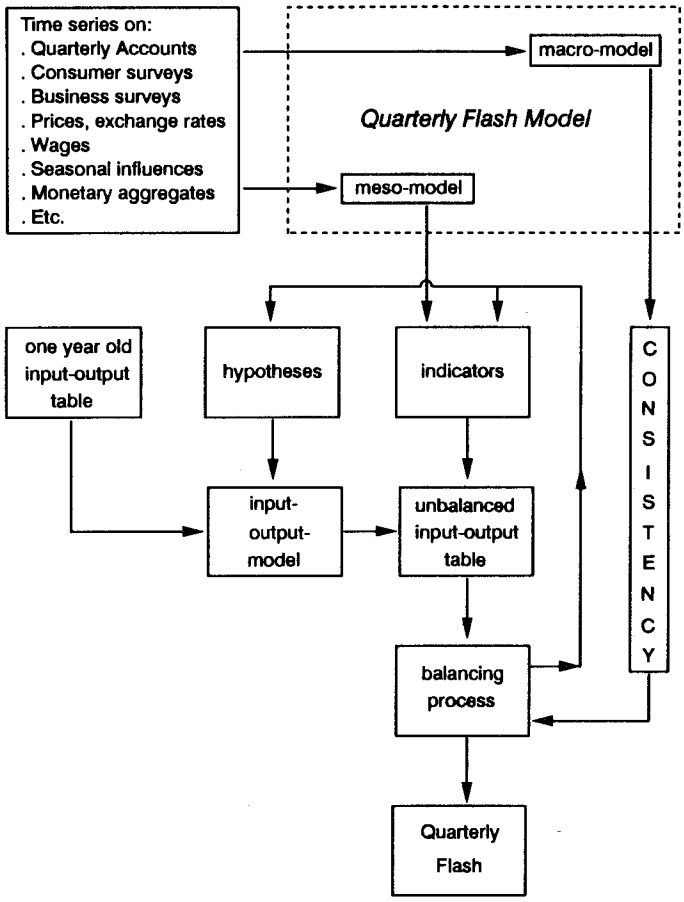

Figure 2. Structure of the Quarterly Flash Model

The Quarterly Flash model we envisage will ideally be composed of two separate sub-models: a mesoeconomic and a macroeconomic one. Figure 2 shows how these models supplement the Quarterly Accounts methodology. The meso-model and the macro-model serve different purposes, which is revealed in the character of the model equations. Since the Quarterly Flash model will have to yield early estimates of the Quarterly Accounts indicators, the meso-model will consist of *time series analysis* relations. After these estimated indicators have been balanced within the input-output model, a *descriptive* macro-model will provide a consistency check at the macro level. An advantage of this descriptive macro-model is that it can also be used in the compilation process of the regular Quarterly Accounts as a check on consistency and coherence. In practice, the construction of the macro-model has a low priority. The reasons for this are quite obvious. The meso-model only estimates part of the indicators needed. The greater part of the indicators consist of timely *ex post* data. Moreover, the macro-model offers just an extra consistency check: the input-output framework already is a robust tool in this respect.

4. Early Estimates of the Quarterly Accounts Volume and Price Indicators: Some Preliminary Results

In a pilot study we investigated the feasibility of estimating the Quarterly Accounts price and volume indicators using only expectations and other leading indicators for three closely related branches of industry, namely paper and boardmills, paper products manufacturing, and publishing and printing. This selection of interconnected branches of industry was motivated by our wish to investigate the possibility of dynamic relations between them, e.g. a sort of production chain or cost-price effects.

Box and Jenkins' method (Box and Jenkins, 1976) was applied, estimating only transfer functions with one input series, as our main interest was whether relations could be estimated or not. The estimation period runs from 78-I to 87-IV.

The time series used in the pilot-study were not smoothed. The reason for this is that the Quarterly Accounts and the Quarterly Flash are statistics which possess a stochastic character that should not be suppressed, for it cannot be assessed *a priori* whether erratic data fluctuations are in accordance with "reality" or an inevitable by-product of the statistical process (e.g. sample errors). However, not smoothing also has its price: the random component in the early indicators may be relatively large. Two elements of the Quarterly Flash methodology take care of reducing these random components: the input-output framework at the meso level and the macro-model at the macro level.

The pilot study yielded satisfactory results. A transfer function could be found for each price and volume indicator. In fact, many transfer functions were considered acceptable, so we had to develop a selection procedure. In this selection, economic plausibility played a dominant role next to statistical acceptability. Below, the selected transfer functions for the production indicators of the three aforementioned manufacturing industries are presented. We start with the volume indicators. The capital B represents the back-shift operator: $BX_t = X_{t-1}$.

Volume Indicators

All variables are presented as deviations from their means. The values in parentheses are t-values.

$$V1 = \underset{(2.1)}{(1+0.36B)}\,a - \underset{(4.4)}{0.045X1_{-2}} \qquad R^2 = 0.49$$

$$V2 = \frac{\underset{(3.1)}{(1-0.55B^4)}}{\underset{(2.6)}{(1-0.45B)}}\,a + \underset{(2.2)\quad(3.1)}{(0.015+0.020B)X2_{-2}} \qquad R^2 = 0.64$$

$$V3 = \frac{1}{\underset{(6.0)}{(1-0.70B)}}\,a + \underset{(2.6)}{0.017V1_{-2}} \qquad R^2 = 0.58$$

$V1$ = paper and boardmills volume indicator

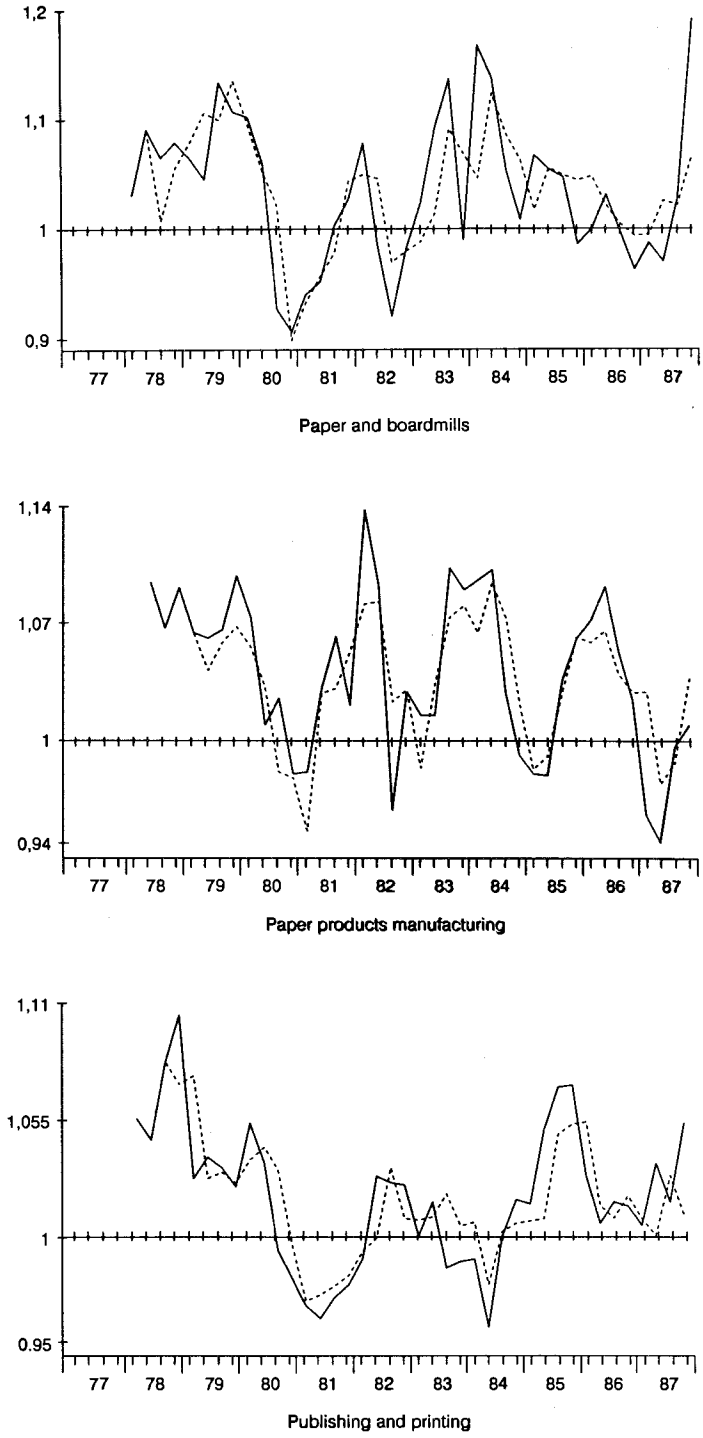

Figure 3. Production Volume Indicators, Actual Versus Fitted (- - -) Values. (Indices of four-quarter rates of change)

$V2$ = paper products manufacturing volume indicator
$V3$ = printing and publishing volume indicator
$X1$ = judgement on stocks of finished products in the intermediate goods industry (three month average)
$X2$ = inflow of new orders in the intermediate goods industry (three month average)

The coefficients of the input series in all transfer functions are significant and the input series have a two quarter lead. The values of the multiple correlation coefficients are almost twice as high as those of the ARIMA-models. The input series of both paper and boardmills ($X1$) and paper products manufacturing ($X2$) originate from the business surveys of the intermediate goods industry. Both paper and paper products are primarily intermediate goods. The paper and boardmills production volume indicator ($V1$) appeared to be the best input series for the printing and publishing transfer function. Evidently a dynamic relationship between these two branches of industry exists. As the graphs show, there is a satisfactory correspondence between the fitted values and the actual values of the volume indicators.

Price Indicators

In most cases, time series on price changes are strongly autoregressive. In our research this phenomenon was confirmed for all three price indicators. The most suitable input series for the price indicator transfer functions are the price indices of intermediate consumption by the branches of industry themselves. These indices are better known as price indices of purchased raw materials, semi-manufactures and auxiliaries. For printing and publishing this price index was not available. In this case the price index of the intermediate consumption of paper and boardmills was used.

The paper products raw material price index ($Y2$) has a somewhat shorter lead than the input series for paper and boardmills ($Y1$). We could not explain why the fit of the transfer function for printing and publishing is so much worse than that of the other two price indicator transfer functions. Again, the graphs of the actual versus the fitted values are satisfactory.

$$P1 = \frac{1}{(1-1.09B+0.52B^2)}a + (0.24+0.16B)Y1_{-1} \qquad R^2 = 0.95$$
$$\qquad\quad (6.6) \quad (3.1) \qquad\quad (4.4) \quad (3.0)$$

$$P_2 = \frac{1}{(1-1.17B+0.41B^2)}a + (0.43+0.21B)Y2 \qquad R^2 = 0.97$$
$$\qquad\quad (7.2) \quad (2.5) \qquad\quad (4.6) \quad (2.3)$$

$$P3 = \frac{1}{(1-0.55B)}a + 0.13\,Y1_{-1} \qquad R^2 = 0.62$$
$$\qquad\quad (4.0) \qquad\quad (3.8)$$

$P1$ = paper and boardmills outprice price indicator
$P2$ = paper products manufacturing outprice price indicator

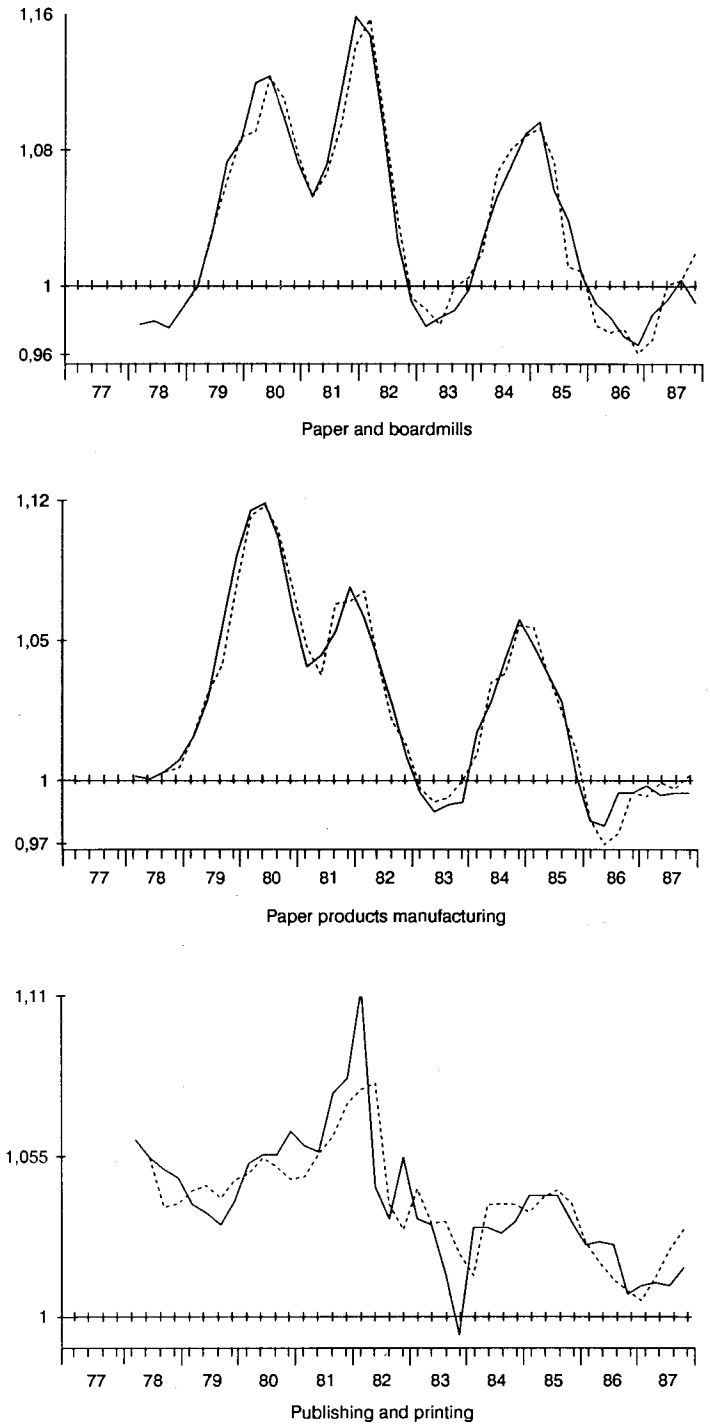

Figure 4. Production Price Indicators, Actual Versus Fitted (- - -) Values. (Indices of four-quarter rates of change)

$P3$ = printing and publishing output price indicator
$Y1$ = price index of raw materials, semi-manufactures and auxiliaries purchased by paper and boardmills (three month average)
$Y2$ = price index of raw materials, semi-manufactures and auxiliaries purchased by paper products manufacturing (first month of quarter only)

5. Summary and Conclusions

Tendency surveys are often used for a description of the *economic* process at the *macro* level. However, scant reference is made to the methodology of National Accounts, which is the pre-eminent framework for the description of macroeconomic processes.

This paper reports on an attempt to integrate both tendency survey indicators and early quantitative data into the framework of the Dutch Quarterly Accounts. This integration is possible because the Dutch tendency surveys belong to a coordinated and coherent system of economic statistics. As a result, tendency surveys can be linked with other statistics in two ways. First, they can be regarded as a preliminary "prediction" of more thorough statistics that are compiled subsequently. Secondly, tendency surveys might be used as source data in a process of statistical integration which serves to produce *timely and reliable* information on macroeconomic activity.

In short, this research project aims at producing Quarterly Accounts of improved quality while shortening their compilation time. In addition, the feasibility of substituting all regular Quarterly Accounts indicators by tendency survey indicators and earlier available quantitative data is studied. This would mean, eventually, that a flash estimate of the Quarterly Accounts becomes available. By way of experiment, a methodology for this Quarterly Flash has been developed: the Quarterly Accounts methodology is supplemented by a meso-model for timely estimations of the price and volume indicators to be used as input in the input-output model on the one hand and a macro-model for a consistency check on aggregate data on the other hand.

In a pilot study, we have tried to estimate relations for a few price and volume indicators of the regular Quarterly Accounts. Transfer functions were found for all of them. In the case of price indicators no tendency survey data were used, because price changes could be predicted quite well by changes in production costs. Cost-push price changes seem to be important. With regard to the volume indicator transfer funtions, tendency survey data performed reasonably well as input series. Moreover, a dynamic relation between the production volume of two closely connected branches of industry was found. Notwithstanding these results, the economic plausibility of the input series might be a matter of discussion. Future research may be focused on increasing the number of input series in the transfer functions, in order to attain more complete specifications.

Despite the limitations of our pilot study, we may conclude that tendency survey indicators can contribute to an explanation of trends in "real" economic variables. Many of these indicators lead the regular Quarterly Accounts indicators. They can, therefore, contribute to an extrapolation of National Accounts.

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