

Some challenges in Price Statistics

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The paper describes how various Dutch price statistics are embedded in an overall scheme of demand and supply of goods and services. Following this scheme the paper outlines several interrelations between demand and supply. By means of two examples the paper briefly explores the differences in price development of supply and demand and the role of transfer prices, i.e. the margins (such as trade and transport) in between the factory gate and the end consumers. A similar example is provided as regards the margins between the building costs and the final sale of the new residential building. The aim is to provide more insight to the users of the price statistics by combining existing statistics from the point of view of an end-product.

Key words: price indexes, CPI, PPI, housing prices, transfer prices, PPI-consumption index

1. Introduction

Price statistics are an important part of the short-term statistics area. Besides their role as deflator for National Account purposes and for calculating other volume statistics such as the industrial production index, they have a right on their own as well. Traditionally the most well-known are the consumer prices and the producer output prices of industry. In the framework of the European Short-Term Statistics Regulation (STS) other business areas are covered as well, for instance in construction, retail, services and for imports. Also in the area of agriculture, price indexes are compiled for the European member states, although not as part of the STS framework. Of more recent nature is the work in progress on housing prices as future extension of the HICP Regulation.

Along the years more and more price indexes have become available for a large number of economic areas. This growing availability of price data is firmly rooted in the strong need of the users. At an aggregated level these data serve as background information for financial-economic and monetary analysis. The majority of the users, however, need these data at the most detailed levels. Among these users are the NSI themselves (e.g. National Accounts) and a large number of businesses and federations who apply these prices in their long-term contracts (for mutually agreed adjustment of payments). In case of price increases payments are adjusted accordingly in order to reflect the current market situation.

But there is also a growing need for presenting prices in a more interrelated fashion. For how much are goods produced and for how much are they ultimately sold to the end consumer? Can something be said about the margins in between? To address these questions, the various fields of price statistics need to be connected. Connecting these, however, is not self-evident as price statistics are basically "organised" by type of actor (i.e. activity). Cross-cutting the different fields calls for a common denominator, i.e. the same nomenclature of goods, which is not the case. In the Netherlands the producer prices for industry are based on a mixed nomenclature of ProdCom/CPA and the Combined Nomenclature of International Trade. The consumer prices on the other hand are classified according to the COICOP. And for agricultural prices the API is the ruling classification. For connecting all of these nomenclatures, however, one can make use of the CPA which relates to both ProdCom and COICOP.

This article provides two examples of interconnecting prices. First a broad overview is given of the various price statistics available at Statistics Netherlands (section 2), together with a scheme which shows the overall connections in a simplified way. Section 3 describes an example of connecting industrial PPIs to their CPI equivalents. Section 4 provides an outline of the various input and output prices of new residential buildings, dealing with an issue which has been quite topical since the economic crises of 2008/2009. Section 4 concludes with a few suggestions and describes some of the work in this area currently undertaken by Statistics Netherlands.

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As shown in the next sections pursuing connectivity is mainly a matter of combining existing prices and/or presenting them in a combined fashion, rather than setting up new collections. It is also an attempt to partly bridge the absence in The Netherlands of short-term price information for the inland wholesale trading sector.

2. Various fields of price statistics

In The Netherlands prices are compiled for the following economic actors:

- **Agriculture:** quarterly input and output prices by type of product²
- **Industry (incl. Energy and Mining):** monthly output prices broken down by inland sales and exports, by type of product (basic level of calculation) and by activity (secondary derived level).
- **Construction:** monthly output price for residential buildings (based on building permits records) and for civil engineering (under development). Monthly input prices are available as well and based on re-weighting existing PPIs for materials, equipment and wages with the use of appropriate project schemes.
- **Retail trade:** monthly output prices by activity, fully based on the outcomes of the CPI
- **Wholesale Trade:** no price statistics available
- **Services** (transport, real estate, rentals, etc.): quarterly output prices (mainly B2B).
- **Imports and exports:** monthly price indexes for imports by type of product. For exports only a price index for the total is being calculated.
- **Households:** monthly consumer prices and house prices

In The Netherlands no prices are collected for wholesale, hotels and restaurants and financing. In general the input prices are not collected: they are constructed by means of already existing producer output prices.

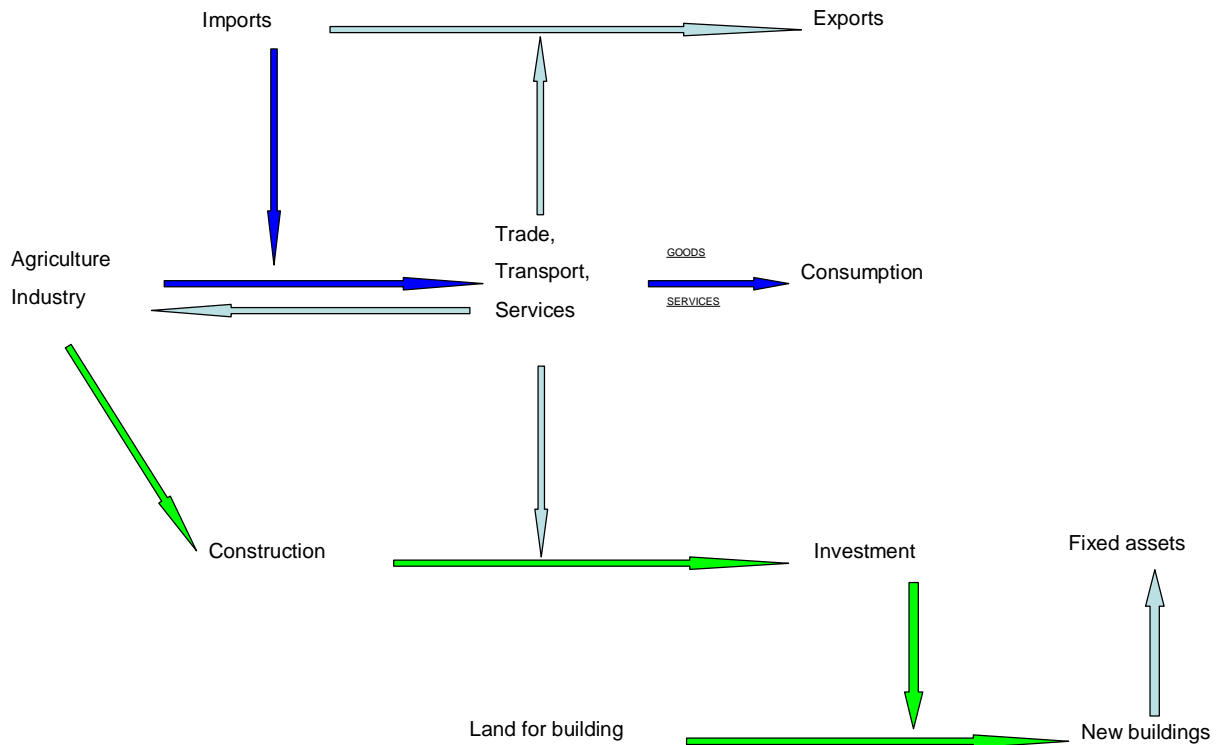
The Dutch price statistics are published as separate items, each having their own structure and classification. Due to this it is very difficult for users to get a clear overall picture of the various price stages of a specific product(group).

Besides price indexes there are also statistics/collections of absolute prices in place for specific (political) purposes, for instance in agriculture, energy and within the framework of Purchasing Power Parities. Statistics Netherlands furthermore publishes absolute world market prices of international raw materials (grain, oil, metal, etc.). These absolute prices, however, remain outside the scope of this paper. Furthermore, the paper will not address any issues related to the development and collection of absolute consumer prices for selected key products. The scope of the paper will be confined to the traditional price indexes.

In terms of tangible goods the coverage of price indexes is quite extensive across the various economic actors. One important link between producer prices and consumer prices is missing, however, notably the wholesale trade, at least for short-term statistics. In the examples shown in section 3 and 4 it will be demonstrated that the consumer prices do not always follow changes in the underlying production/import prices. It implies that the transfer between producers and end-consumers is affecting the end-price significantly. For understanding the origin of changes in the CPI this transfer margin is equally important as the PPI. From an economic point of view the transfer sector is an actor in-between the demand and supply of goods. It is for this reason that the sector of transfer (trade, transport and services). In the scheme below they are located at the center acting as key auctioneer of the market.

² Agricultural price indexes are compiled by the LEI (the Dutch Agricultural Economic Institute). Statistics Netherlands is currently integrating these prices into the PPI system, in conjunction with the extension of fishery-products in order to achieve a full coverage of tangible products.

Figure 1. Simplified scheme of prices



In a very simplified way, figure 1 shows the flow of goods/services from their supplying origin (import, agriculture and industry) to their final demanding destination (exports, consumption and investment). For reasons of simplicity the internal flows within each sector (for instance from mining to manufacturing industry) are not included. In the scheme Trade, Transport and Services are treated as one sector. In terms of goods the primary purpose of this sector is to handle the transfer from origin to destination. This could be a transfer in terms of transport, retail or a purely administrative transfer.

The examples provided in the next sections follow the upper scheme. The example of food consumption goods elaborated in section 3 is mirrored by the blue arrows of the scheme. The example on new residential building prices in section 4 follow the green arrows.

Construction of new residential buildings is a bit of a special case. The price paid for the ownership of the land of the building is not regarded as an investment. In economic terms the price paid for the land is an expenditure, but not an element of costs. Only the associated building costs of the new house are considered as an investment, regardless its buyer which could be a business or a household. In case of the latter, National Accounts treats them as-if they run a small housing business which they rent out to themselves. As such the 'Land for building' could be regarded as part of the transfer process; it is essentially an administrative transfer of ownership.

3. Industrial products: from factory gate to end consumers

3.1 Producer prices (by type of product and by activity)

Traditionally the Producer Price Indexes (PPIs) start by collecting absolute prices for well-defined products which are specified in much detail and often unique. In The Netherlands the collection is based on a sample drawn from the ProdCom survey (for inland production) and External Trade (for imports). The response reaches over 90%.

After the process of collecting and editing, price indexes are calculated for each individual product. By using weights of the individual companies these indexes are subsequently aggregated into a producer price index for a specified class of products. These product classes are based on a combination of ProdCom, CPA and the Combined Nomenclature of External Trade. These price indexes by type of product are the key building blocks for the PPIs by type of activity.

Assuming price homogeneity for each product class across industries, the product based indexes can be aggregated into price indexes by type of activity by using an appropriate product-activity weighting scheme. For this purpose Statistics Netherlands uses weights derived from National Accounts in which the production values are broken down by type of product and by destination (inland or exports).

The sets of PPIs are targeted at goods which are supplied to the foreign market and to the inland market. Not everything which is sold by the industries to inland parties, however, finds its way to domestic final consumption. Some of the goods are exported by the wholesalers or re-directed to industries for intermediary use. This implies that the PPI of the consumption good industries does not fully match domestic final consumption.

3.2 Converting producer prices into a new PPI-consumption index

Beside the current set of producer prices, Statistics Netherlands is currently developing a new PPI based index which is a fully consumer oriented and therefore – from a theoretical point of view - closer related to the CPI.

As a first step the PPIs by type of product (import + production which goes inland) are re-classified from ProdCom to COICOP (classification of the CPI), thereby narrowing down at the most detailed level the products really used by end consumers³. As a second step these COICOP based PPIs are aggregated using the CPI weighing scheme instead of the PPI scheme⁴.

The resulting **PPI-consumption index** reflects the PPI price development of the 'product basket' of end consumers. Because it is PPI based, it is an 'ex factory' price excluding transfer costs such as transport and trade margins and value added tax which are typically included in the CPI. The CPI itself represents the **market price**, being the sum of two components, which are the **producer price** part (i.e. the PPI-consumption index) and the **transfer price** part (i.e. prices of transfer from factory/border to the end consumer).

There is a small difference in the timing between the PPI-consumption index and the CPI. Products which have been produced and bought by wholesalers are not immediately sold at the supermarket or retailers; there is a certain time-lag of transfer. As such the PPI based index is somewhat leading in time as compared to the CPI. Looking across a longer time of period this time-lag becomes less important. Comparing the trend of the market price (CPI) and the PPI-consumption index reveals not only the coherence between the two, but implicitly also the difference between them, i.e. the underlying trends of transport and trade margins. Moreover, these latter components can be approximated by (weighted) subtracting of the PPI component from the CPI.

³ At the lowest level of detail the ProdCom(s) price indexes are directly assigned to COICOP. As an alternative the CPA could have been used for this purpose.

⁴ Molding the PPI prices into the CPI framework is different than the more supply oriented construction of the PPI index of Consumption goods (one of the Main Industrial Groupings).

Disregarding the issue of leads/lags, an approximation of the transfer price can be derived from the former indexes by the following equation

$$TPI = (1/(1-W)) * (CPI - W*PPI)$$

Where TPI = Transfer price index (transport and trade margins plus tax)

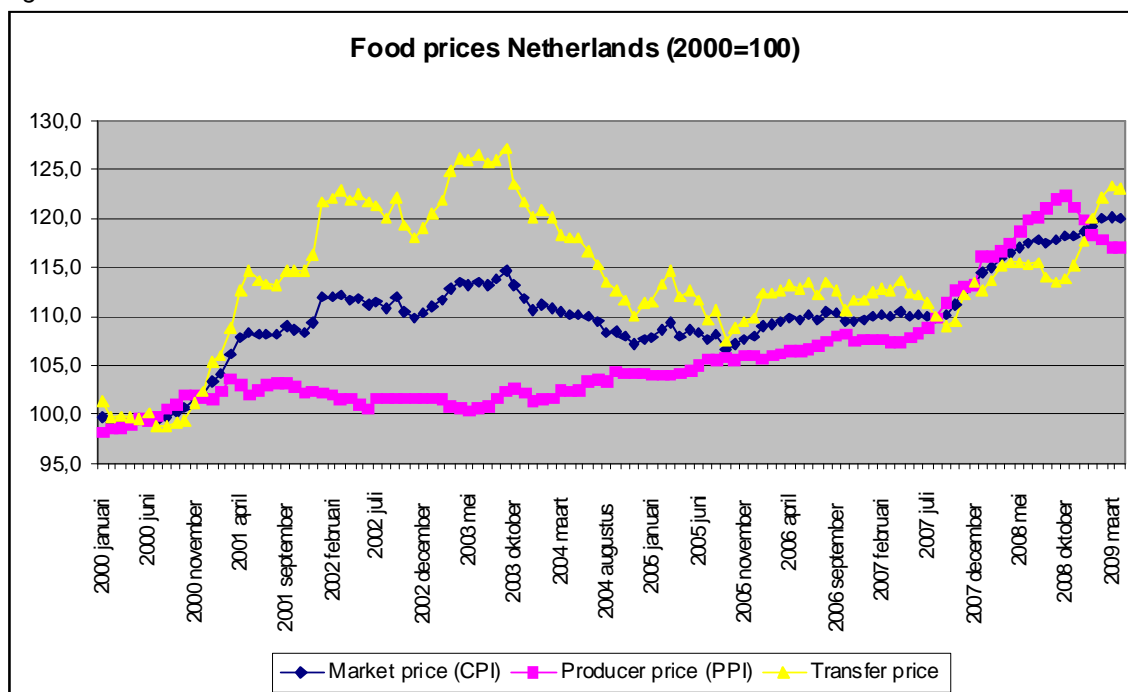
W = the ratio of the value of consumption at producer prices against consumption at market prices⁵

3.3 PPI-consumption index versus consumer price index: examples in the food sector

First preliminary results from the conversion of PPI indexes into a PPI-consumption index are shown below for some product categories; for food as a whole and for some of its constituents such as bread&grain, milk and coffee.

Figure 2 displays the prices for total food consumption by households in The Netherlands. Taking into account the expected transfer time from the factory to the retail shops one would expect the PPI to be leading on the CPI. Between 2001 and 2005 this relation was not particularly evident due to the fact that the strong changes in transfer prices outweighed the development of the PPI. From mid of 2005 onwards, however, the impact of the PPI became significantly stronger. One of the reasons behind this may be found in the **price war of the supermarkets** in the Netherlands which started in the second half of 2003 lasting until the first half of 2005. Especially from mid of 2005 onwards the lead of the PPI on the CPI became more significant. The highest correlation (R=0,98) was found for a lead of 4 up to 5 months, with a regression slope of 0,7. Of course this lead should be considered as an average; some products (e.g. bread and milk) are consumed more immediately than others. The regression coefficient of 0,7 implies that a 1% PPI change results in a 0,7% in the CPI (ceteris paribus) which is more or less in line with the weight of the producer price in the total market price. From May 2007 onwards the PPI prices of food increased significantly until October 2008 due to strong rises in world market prices. CPI food prices picked up this increase in October 2007 reaching a peak in February 2009 after which it gradually slowed down.

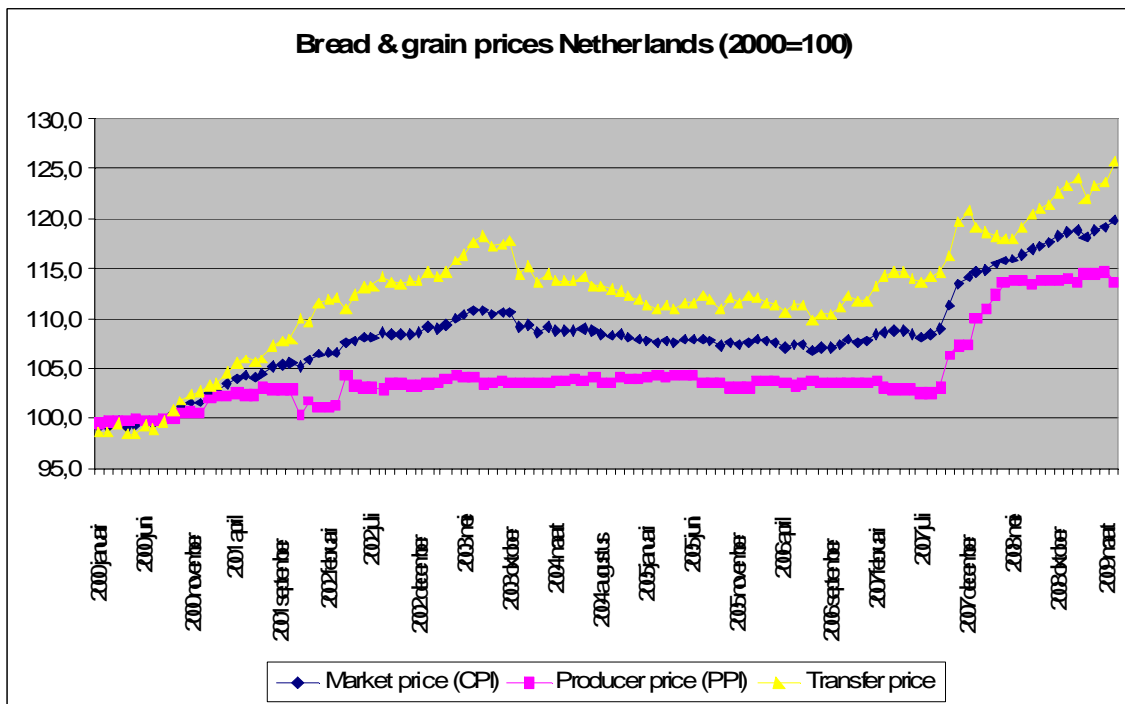
Figure 2.



⁵ For reasons of simplicity the share W is set at ½. For food wholesale and retail the margins (excluding value added tax) were approximately 20% respectively 33% in 2005. Some larger supermarkets, however, often buy directly from manufacturing industries, surpassing wholesale. Most of the taxes on food are 6%. This all adds up to a market price being in between 40% (without wholesale) to 70% (with wholesale) higher than the basic factory price.

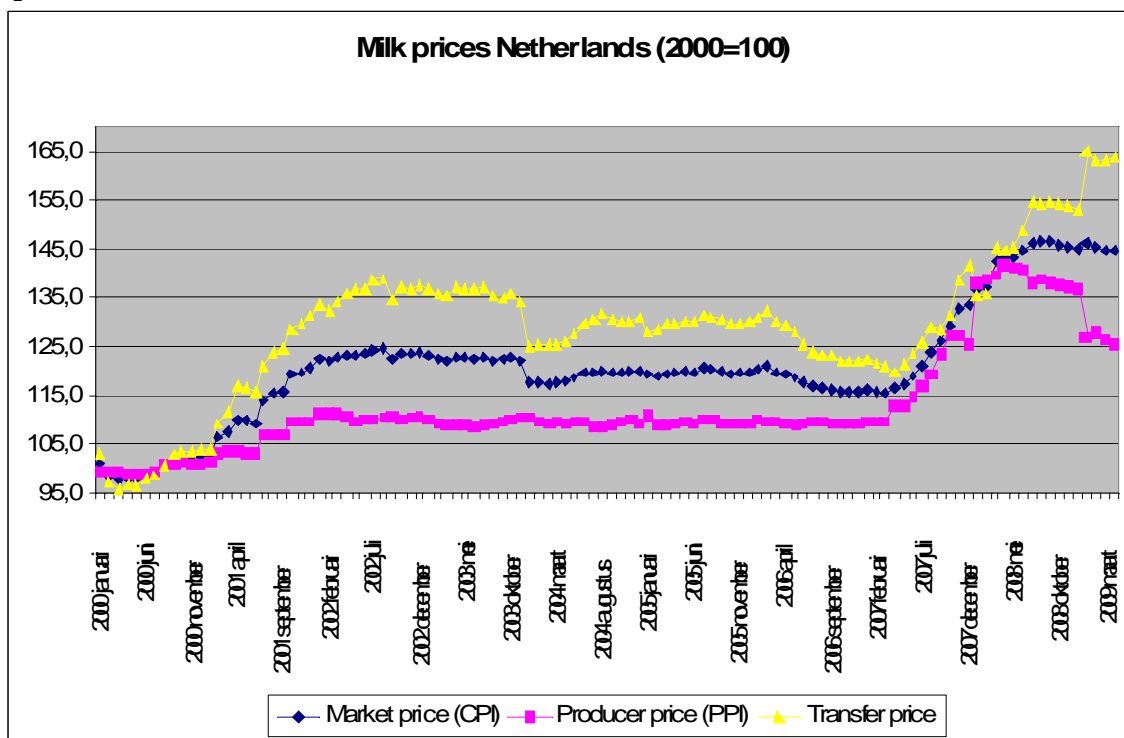
For some of the food products such as bread the delay in time between production and consumption will be significantly less. For bread & grain the highest correlation was found for a zero time lag. As shown by figure 3 both CPI and PPI of bread&grain began to increase sharply from September 2007 onwards.

Figure 3.



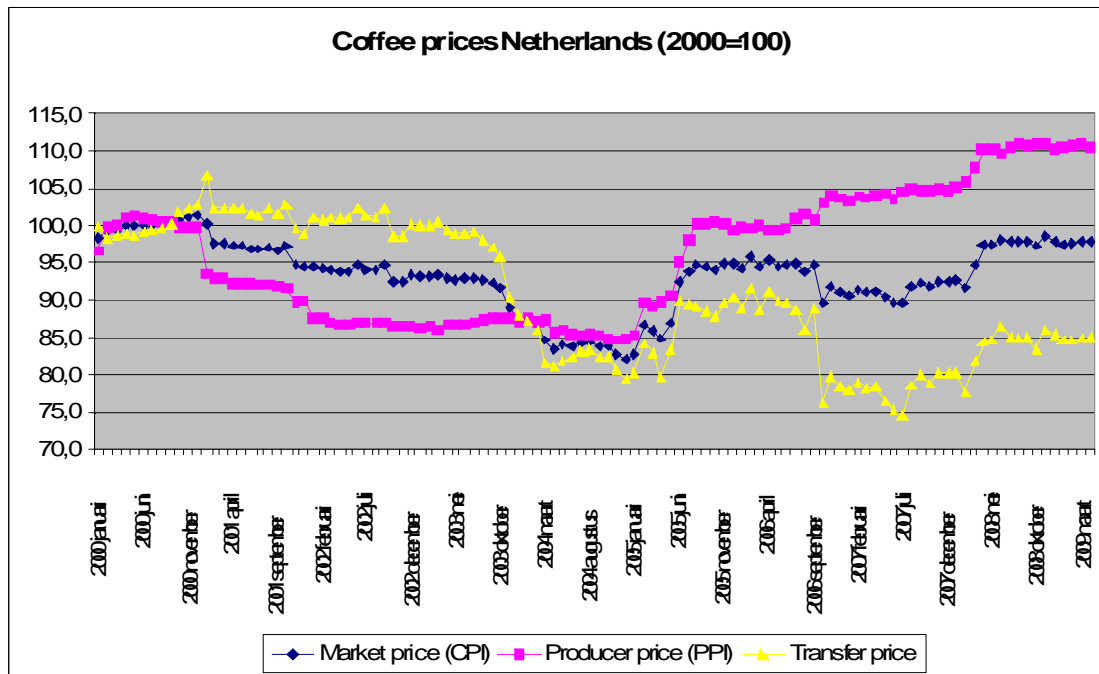
In the case of milk the decrease of the PPI which started around May 2008 has not been followed by a decrease in the CPI of milk. As a consequence the transfer price rises quite significantly to a level which is more than 60% higher than in 2000 (see figure 4).

Figure 4.



In the coffee market the downward trend between 2000-2004 of the PPI and CPI changed into a pattern with stepwise increases. Because the PPI increases faster than the CPI the transfer margin did on average not improve as compared to 2004 being 15% below the transfer price of 2000.

Figure 5.



3.4 PPI-consumption index: work in progress

The development of the new PPI-consumption index at Statistics Netherlands is expected to be implemented in the second half of 2009. Further studies will be carried out to determine more precisely its value as an early indicator for the CPI.

At detailed product levels of the COICOP the quality of the coherence between the CPI and the PPI will be examined in order to assess the accuracy and meaningfulness of the implicit transfer price.

Some of the goods are at this moment insufficiently covered by the PPI, such as agriculture and fish. In 2009 work has started to cover these PPI areas as well and the aim is to integrate the existing collection of agricultural (and fishery) prices into the industrial PPI, thereby extending the coverage to the full scope of tangible goods.

Depending on the success of the good based PPI-consumption index and its use in daily practice, Statistics Netherlands envisages to extend its coverage with services by re-using the B2C Service PPIs in the same manner.

4. Construction products: from bricks to houses

4.1 Introduction

In the field of construction several price statistics are compiled and some are still under development. Among these are the input and the output prices for civil engineering and new houses. This section focuses on the prices of new residential buildings (hereafter named new houses) and their costs and addresses the issue of the transfer margin in between. Contrary to the purchase of goods which is considered as final consumption, the acquisition of new houses is regarded by National Accounts as an investment.

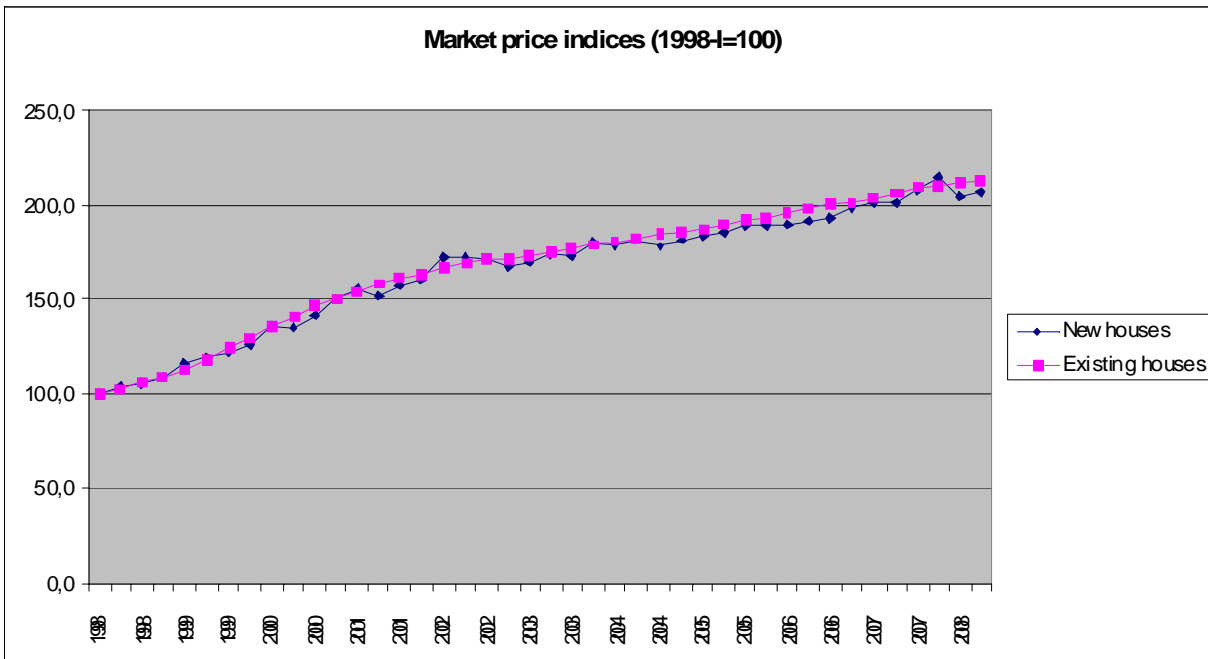
4.2 Compilation of price indexes for new houses

As general approach the **input price indexes** of new houses are calculated by means of other statistical sources such as industrial producer prices of building materials (e.g. bricks) and wages and salaries in construction. The input prices only reflect the costs of the variable inputs and exclude other costs incurred during the building process (e.g. overhead, capital costs). The type of materials and labour input and the weights used for aggregation are based upon a well-defined set of housing characteristics. The information of these characteristics is provided by external construction experts; this ensures that the index closely follows common practice and building legislation.

Besides an input price for new houses, a **producer price index** is also calculated. The PPI for new houses is based on the Dutch registry of building permits. Quality changes, such as in square metres, are filtered out by applying a hedonic regression approach.

Currently Statistics Netherlands is developing a **market price index** of new houses, i.e. the value for which newly built houses are sold. This development project is part of a larger European HICP project for setting up price indexes of existing and new houses and cost indexes related to the acquisition of houses. The market price index for new houses has the status of work in progress and first results are expected to be disseminated at a regular basis end of 2009. For the moment the market price index of new houses is not adjusted for quality changes, an issue which will be investigated more deeply in 2010. Strictly speaking it is therefore an average value index and not a pure price index which is corrected for quality changes. Figure 6, however, shows that the price trends of new houses and existing houses are moving in a very similar fashion, suggesting a relative limited impact of quality changes of new houses.

Figure 6. Price indexes of sales of new and existing houses Netherlands



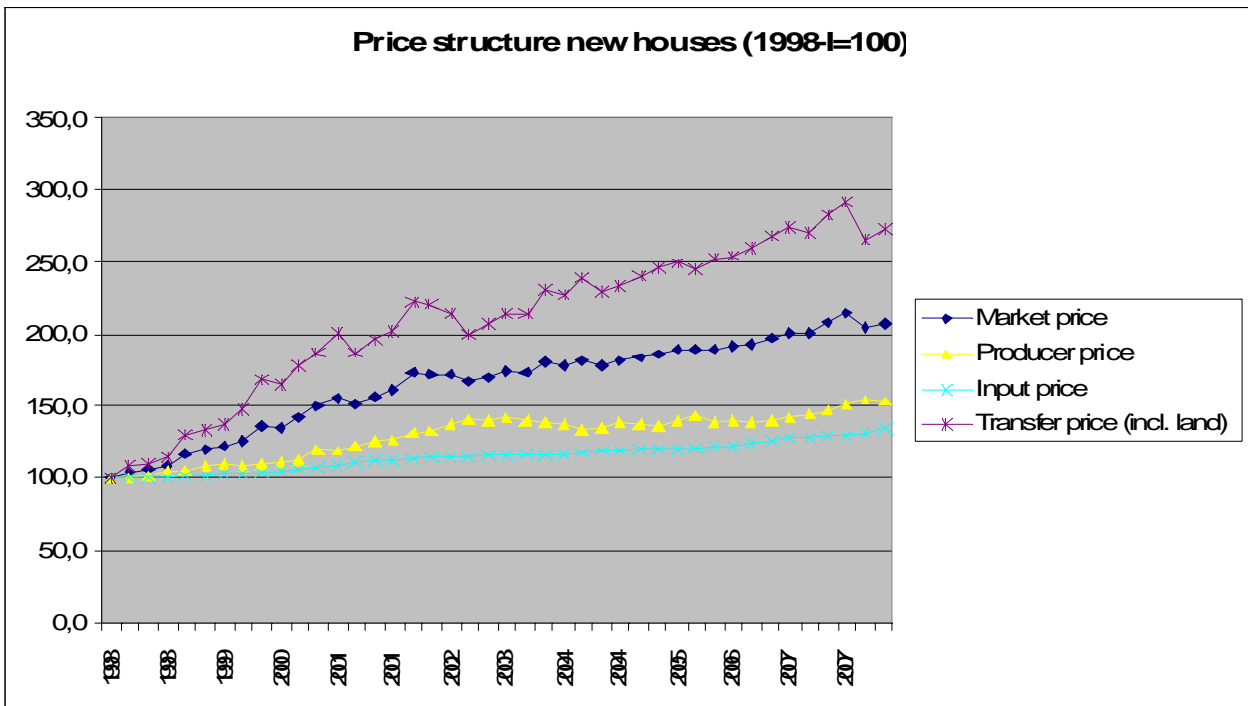
4.3 Comparison of prices of new houses

Figure 7 (below) combines input and output prices of new houses. It shows that in the last decade (1998-2008) the input prices (material costs and labour) for building new homes moderately increased by approximately 35%, not very much higher than the rise in the general price level of consumption (i.e. inflation) which was 27%. The producer price of new home (total building costs including overhead and construction margin) grew over the 10 years approximately 50%, only slightly faster than the input price.

Between 1998 and 2008 the real market prices of new houses, however, more than doubled. Obviously this can only in part be explained by the increase in the production price. As stated in section 4.2, the increase of new house prices strongly follows the overall market price development of existing houses (see figure 6). One of the reasons of this can be found in the pricing policy of municipalities where the land price was determined as difference between existing market prices and the construction costs.

It means that the transfer price (including land) - which can be calculated from the market price and the producer price - almost tripled. This remarkable result has been broadly confirmed by an internal research report (Danzer et al) in which it was estimated that the price of land of the full housing stock rose by a factor of around 3,5 over the period 1997-2007. That their estimate for land exceeds the one of the transfer price can to some extent be explained by the fact that the transfer price is also affected by other acquisition costs which did not increase that much, meaning that the price increase of land more than tripled.

Figure 7. Input and output prices of new houses



Recently the market prices for new homes have been under severe pressure due to the financial crises. More restrictive mortgage policies and the general economic downturn made households more cautious and led to a very strong fall in the number of houses sold and led ultimately also to a decrease in the price which started in the beginning of 2009.

5. Conclusion

Producer prices of industry and of consumption have a long-standing tradition. In general they are treated as two distinct statistical areas, not connected to one another. The paper explores a few examples of bringing the PPI and CPI closer together.

Between the factory gates (PPI) and the final consumption by households (CPI) the products are transferred through a chain of wholesalers, retailers and other service providers. As such the CPI can basically be divided in a price component reflecting the transformation of raw materials into consumer products (the PPI part) and a price component reflecting the transfer of the finished product from the factory gate to the end consumer.

By re-arranging slightly the PPI on the basis of the CPI classification (COICOP) and its weights, a new PPI price index can be compiled targeted at the specific basket of consumption goods of the CPI. From a theoretical point of view this new index has some interesting properties:

1. it slightly leads the CPI insofar that its influence is not compensated by an opposite change in the transfer margins;
2. It enables a rough approximation of the transfer margins in between manufacturing/import and households.

First results for food consumption price indexes seem to corroborate with these properties. Work is currently in progress for setting up a complete **PPI-consumption index** which covers all tangible consumption goods, including fresh food from agriculture and fisheries. In conjunction with the latter, the Dutch PPI system will be extended with Agriculture and Fisheries.

The new index essentially represents the production costs of the consumption good. Describing the chain from PPI to CPI in this way is potentially interesting for various purposes, for the economic actors themselves, but also at the political level. Statistics Netherlands intends to implement the new index in the second half of 2009 and will carry out further studies to consolidate its quality and its meaning as an early indicator. Depending on its success and usage further studies can be carried out for enriching the PPI-consumption index with services by re-using the existing Service PPIs. As such the PPI-consumption index acts as a medium for interlinking the PPIs of industry and services with the CPI.

Subtracting the PPI-consumption index from the CPI results in an approximation of the **transfer price index**. This approximation will, however, not be published by Statistics Netherlands due to timing differences between PPI and CPI (i.e. the goods are consumed at a later stage than production). Getting the proper weights is also an issue which needs further studies. For the purpose of analysis, however, the paper shows that the derived transfer price can support our understanding and interpretation of market price developments.

Besides regular capital goods (machineries) the acquisition of new houses – by both households and enterprises – is also classified as an investment. Also in this case the confrontation of the prices at various stages offers additional insight in the underlying components of the market price. For the housing market the huge rise in market prices over the past decade does not seem to be justified by production costs which were relatively moderate, more or less in line with inflation. Moreover, the asset price of the housing stock is dominated by the development of land prices which itself is ruled by the prevailing sale prices of existing houses. Besides further development of housing prices, Statistics Netherlands will start also with the compilation of the price index of the land underlying residential buildings.