

# Inflation, CPI, and Real Price Changes in Poland (specifically in Lubelskie Voivodship) in the Years 2002–2014

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## Abstract

*Inflation rate, Consumer Price Index, real price changes and the cost of living change perceived by people are sometimes reported to be significantly different. In this paper the analysis of these measures and goods and services price changes in Poland, in Lubelskie Voivodship in particular—in the years 2002–2014—is conducted. The study is based on data published by Central Statistical Office of Poland and Narodowy Bank Polski<sup>1</sup>. The results show a gap between officially published CPI and the inflation rate perceived by inhabitants who see inflation mainly from the angle of the prices of essential goods which they purchase every day.*

**Keywords:** inflation, CPI, Poland, lubelskie, consumer sentiment, ShadowStats, Chapwood Index

## Introduction

In recent years one can notice articles voicing the impressions of Polish consumers, or people connected with the financial sector of the economy, claiming that the cost of living increases faster than the official Consumer Price Index (CPI) indicates. For example Żak (2014) in his text “What Is the Truth about Inflation in Poland?” describes his own experience—purchasing power falls much faster than the inflation rate indicates. The author of the article “What is Real Inflation in Poland” (Trader21 2013) argues convincingly that inflation depends generally on the money supply. He shows M3 money supply in Poland since 2004 (and some price increases) and claims that CPI reported by Central Statistical Office of Poland (CSO) is intentionally considerably underestimated by applying some “statistical tricks.” Sztąberek elaborates, in his short 2013 text concerning the above-mentioned article in Trader21, entitled “Does Government Lie about Inflation?”<sup>2</sup>

In May 2014, an official statement—probably relevant to this kind of publications—about the method of Polish CPI calculation by the press spokesman of the Chairman of Central Statistical Office was made. He explained that CPI and inflation are not the same notions, although they are used interchangeably. Moreover, the Consumer Price Index is an average measure and cannot explain price changes for all individual households. Additionally, he noted that price increases (even for a small group of goods), is more perceived than price decreases (even for a large group of products) (Satora 2014).

Much the same opinion can be found about the official published inflation rate in the USA, but this time it is supported by serious statistical research and computations. Williams (2013) informs us that the Consumer Price Index—published by the U.S. Bureau of Labor Statistics (BLS)—has been seriously reconfigured since the early 1980s, and argues that:

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1. The name of the Polish central bank.

2. It is worth mentioning here that in 2012 *The Economist* published two short articles about Argentina’s government’s underhanded methods of calculating inflation rate: “Don’t Lie to Me, Argentina” and “The Price of Cooking the Books.”

- “CPI no longer measures the cost of maintaining a constant standard of living,
- CPI no longer measures full inflation for out-of-pocket expenditures,
- with the misused cover of academic theory, politicians forced significant underreporting of official inflation, so as to cut annual cost-of-living adjustments to Social Security, etc.,
- politicians look to expand further the concept of artificially-suppressed cost-of-living adjustments in current budget-deficit negotiations, through the use of the Chained-CPI . . . ,
- use of the CPI to adjust retirement benefits, private income or to set investment goals impairs the ability of retirees, income earners and investors to stay ahead of inflation,
- understated inflation used in estimating inflation-adjusted growth has created the illusion of recovery in reported GDP.”

He claims that real inflation is about 4 or even 7 (according to 1990 and 1980 based calculation method respectively) percentage point higher than officially reported.<sup>3</sup>

In 2008 Butowsky began calculating the Chapwood Index to debunk a belief that the CPI represents the increase in the cost of living. Like Williams, he maintains that “inaccuracy of the CPI began in 1983, during a time of rampant inflation, when the U.S. BLS began to cook the books on its calculation in order to curb the increase in Social Security and federal pension payments.” Butowsky claims that the Chapwood Index reflects the true cost-of-living increase in America. It is updated twice a year and reports the unadjusted actual cost and price fluctuation (without alterations and seasonal adjustments)<sup>4</sup> of the top 500 items on which Americans spend their after-tax dollars in the 50 largest cities. Values of that index are quite shocking — increase in cost of living fluctuate from 6,6% (Colorado Springs) to 13,7% (San Jose) in just one year in 2014 (*Welcome To Chapwood Index...* 2015), while the official published Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average for this year was 1,6% (Crawford, Church, and Akin 2015).<sup>5</sup>

As we see, there are some doubts about the officially published CPI and inflation rate, and sometimes the opinions are expressed quite clearly. These thoughts are derived both from everyday consumer experience, and alternate statistical computations. In the following part of our study we briefly review the definitions of inflation, consumer price index, the difference between them, and problems with estimation of CPI. In the last part of the work we analyze the price changes of selected goods and services in Poland (and in Lubelskie Voivodship) and contrast the results with the official CPI for Poland published by the Statistical Office, in the years 2002–2014. We are going to investigate if there are premises that real (perceived—at least) prices and cost of living in Poland, in the years 2002–2014, have been increasing faster than the official inflation rate. In the end of the work we show M3 money supply to real GDP ratio in Poland since the year 2002, as additionally proof that real inflation should be higher than officially reported.

## 1 Inflation rate and Consumer Price Index—definitions and estimation problems

At present<sup>6</sup> inflation is defined as a sustained increase in the general price level of goods and services over a period of time.<sup>7</sup> More precisely, we deal with inflation when sustained price increase of some goods (considering changes in the quality of the good) and services is not balanced by price decrease of other goods and services. In other words it is the weighted arithmetic average of all price changes (Kamerschen, McKenzie, and Nardinelli 1991, 126–127). The most common and widely accepted measure of price level is the Consumer Price Index, which is intended to show how the cost of a market basket has changed over time, where the market basket is constructed to represent the consumption of goods and services by a typical family. Hence the inflation rate is the annual percent change in a price index from year  $t-1$  to year  $t$  (consecutive years), it depends on prices of what goods and services are considered, and how weights are set (Krugman and Wells 2009, 605).

3. See details at [http://www.shadowstats.com/alternate\\_data/inflation-charts](http://www.shadowstats.com/alternate_data/inflation-charts).

4. Details about Chapwood Index methodology are available at <http://www.chapwoodindex.com/solution/>.

5. [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

6. For many years the common definition was a bit different. We will elaborate on this later.

7. See for example Chiang and Stone (2014, 5, 128, 130).

On the other hand the goal of the consumer price index is to measure changes in the cost of living—it tries to gauge how much incomes must rise in order to maintain a constant standard of living. The consumer price index, however, is not a perfect measure of the cost of living. Problems with calculating this index are widely acknowledged, but difficult to solve:

- substitution bias—when some prices rise by more than others, consumers respond to these differing price changes by buying less of the goods whose prices have risen by large amounts and by buying more of the goods whose prices have risen less or have fallen
- introduction of new goods—when a new good is introduced, consumers have more variety from which to choose, yet because the consumer price index is based on a fixed basket of goods and services, it does not reflect this change
- goods quality change—if the quality of a good deteriorates from one year to the next, the value of the money falls, even if the price of the good stays the same (similarly, if the quality rises—the value of the money rises) (Mankiw 2004, 227–229)
- outlet bias—a result of different product prices in different stores, and passes over distribution channels
- formula bias—results due to methods of aggregation and calculation (Hałka and Leszczyńska 2011, 55–56)

Another source of the CPI bias is also described in the literature—plutocratic gap (Ley 2005). Prais (1959) showed that the standard CPI computed by most statistical agencies can be interpreted as a weighted average of household price indexes, where the weight of each household is determined by its total expenditures. Therefore households of low expenditure are not represented properly in the index, and then CPI measures the change of market basket prices, whose structure is dominated by wealthier households. If prices of goods and services bought by less wealthy consumers increases faster than the basket price of richer consumers, CPI changes do not illustrate correctly the increase for poorer households in their cost of living. They experience a different rate of inflation! “Households which spend a larger proportion of their total expenditure on items experiencing the largest price increases . . . , such as food and fuel, would be expected to have a higher individual rate of inflation than those spending a higher proportion of their expenditure on [goods] . . . which have seen small price increases or price decreases. Households with the lowest level of total expenditure spend a higher proportion on food and “fuel and light” than those with the highest level of total expenditure . . . . This suggests that rising food and energy prices will have a greater influence over the personal inflation rate of households with the lowest level of expenditure.” (Pike, Marks, and Morgan 2008, 24)

The bias of the Consumer Price Index has been widely discussed. Most of the research showed that it was overestimated in some period of time. For example according to Filer and Hanousek (2003) in the Czech Republic CPI in the years 1990–1999 was overestimated about 4 percentage points per year. The Boskin Commission and works of Gordon showed that overestimation of CPI in the USA (years 1995–1996) was about 1 percentage point (Boskin et al. 1996; Gordon and vanGoethem 2005). However, bias evaluating methods based on personal experience inflation (Nordhaus 1998) indicate significant understating of CPI. Marini et al. showed that in the years 2002–2004 the inflation rate in Italy was underestimated by at least 6 percentage points (Marini, Piergallini, and Scaramozzino 2007). Ruiz-Castillo et al. pointed out slight underestimation of CPI in Spain (in the years 1992–1998) (Ruiz-Castillo, Ley, and Izquierdo 2002).<sup>8</sup>

Poland CPI bias, for the years 2005–2009, was calculated by Hałka and Leszczyńska (2011). The authors obtained a very small (0,0–0,4 percentage points) underestimation of CPI, but they admitted that the scope of their research was too narrow to support a significant conclusion. On the other hand, calculations revealed that the prices of consumer goods and services grew at a faster rate than the CPI index in the analyzed period, and essential goods prices increased faster than other goods prices, the authors said.

The results of a huge survey conducted in May 2003 – October 2005 on 400 000 observations in the EU seem to be very interesting for our consideration. It revealed (among other things), that:

8. More research examples one can find in (Hałka and Leszczyńska 2011).

- perceived inflation rate by the household was 11,6%—while the official rate was equal to 2,1%,<sup>9</sup>
- inflation perceptions and expectations fall as income or education increases,
- perceived inflation seems to increase with age,
- women perceive and expect higher inflation than men (Lindén 2006).

These results confirm Pike's (Pike, Marks, and Morgan 2008) observation about the relation between perceived inflation rate and household income level.

## 2 The analyzed data and statistical methods

Our analysis was based on data published by Central Statistical Office of Poland in the Local Data Bank Internet database.<sup>10</sup> Research was limited by the data available in June 2015. We analyzed changes of prices, from 2002 to 2014, in the following categories:

- average retail prices of consumer goods and services
  - food and non-alcoholic beverages (46 products analyzed)
  - alcoholic beverages, tobacco (5)
  - clothing and footwear (13)
  - dwellings (13)
  - health (3)
  - transport (7)
  - recreation and culture (3)
- average market-place prices received by farmers (17)
- average producer prices on the domestic market
  - bread and cereals (5)
  - prepared foodstuffs (4)
  - fats and dairy products (12)
  - meat, processed meat and other meat preparations (17)
  - miscellaneous goods (5)
- average retail prices of non-consumer goods (14)

for both Poland, and Lubelskie Voivodship, and showed the changes against the official Consumer Price Index. Additionally, all incomplete time series were removed, which considerably narrowed our data. In some cases the partial series were joined (when there were two records of the same product with two different names, but continued for the entire examined period).<sup>11</sup> Cumulative price changes for all individual items were calculated, next the 1st, 2nd and 3rd quartiles<sup>12</sup> were determined within each category and group for every year, from the base year 2002 to the year 2014. The generated charts (time series and histograms) with added official price index values allowed us to assess the gap between real prices of goods and services perceived by people versus CPI published by the Statistical Office.<sup>13</sup> Average yearly inflation rate (and price change of analyzed goods and services) in the years 2002–2014 was computed as a solution of standard compound interest equation for 12 periods.

## 3 Results

Central Statistical Office of Poland, aside from the “main” CPI index (total), publishes several CPI indices, for several categories of goods—that is for:

- food and non-alcoholic beverages,
- alcoholic beverages, tobacco,

9. One may wonder if such a significant gap was only a result of the euro currency entered into circulation on 1 January 2002 and market price conversion, or solid, intentional underestimation of CPI.

10. Database available at <http://stat.gov.pl/bdlen/>.

11. For example: “Vitaminum C” and “Vitamina C.”

12. We resigned from using an arithmetic mean, to avoid its shifting due to extreme observation sensitivity.

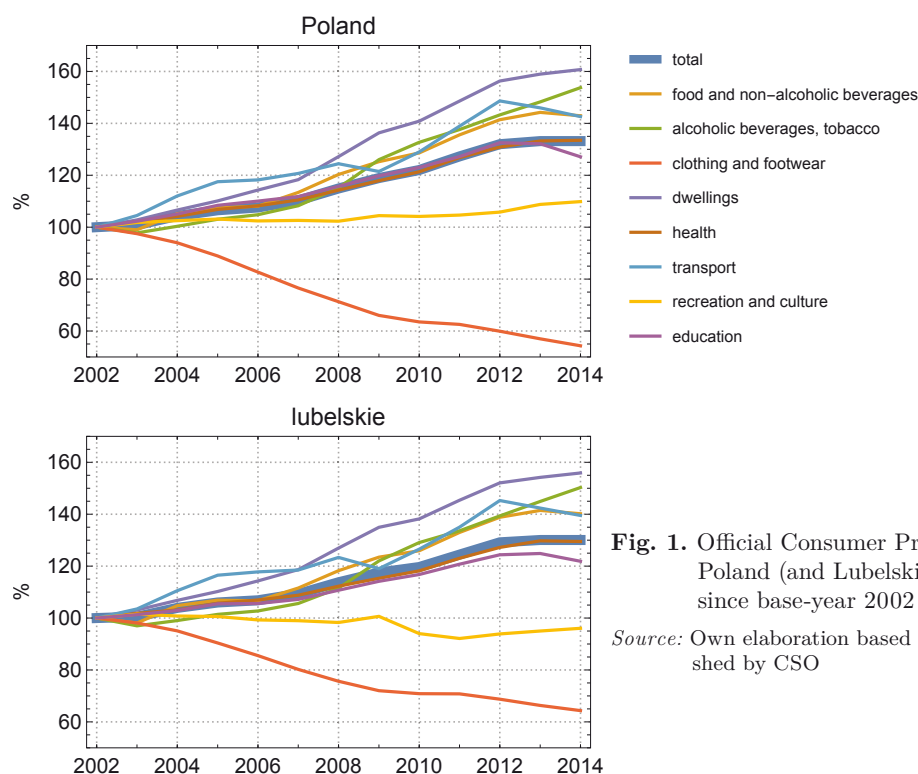
13. We were aware of the fact that the obtained difference cannot be considered as a value of CPI bias—the goal was to check if the household impressions of underestimated CPI could be justified.

- clothing and footwear,
- dwellings,
- health,
- transport,
- recreation and culture,
- education,

and both for Poland, and separate voivodships (see indices for Lubelskie Voivodship in fig. 1).

As we see in figure 1, according to CSO, all prices increased 33% in Poland and 30% in Lubelskie Voivodship since base-year 2002. However, prices in the clothing and footwear categories have decreased considerably (about 45% and 35% in Poland and in Lubelskie Voivodship respectively). Furthermore, prices in recreation and culture have increased only by 10% in Poland and have decreased in Lubelskie by 4% since 2002. It is interesting that prices published by CSO along with the CPI show substantial increase in these two categories (see fig. 3 and tables in the Annex).

Charts presented in figure 2 show price changes of all analyzed goods (gray lines), median and quartiles along with official CPI for Poland published by CSO (we will refer to it as: CPI (GUS))<sup>14</sup> by four main categories. As we see in all these categories the median of price changes is higher than the CPI (GUS) for almost all years—except for producer prices on the domestic market which is higher since 2011. Of course generally CPI is not a measure of price changes others than consumer goods and services, but as a measure of inflation it may be collated with price changes of other products in fact, such as prices received by farmers, prices of producers, or prices of building materials, agricultural machines and fertilizers (non-consumer category).



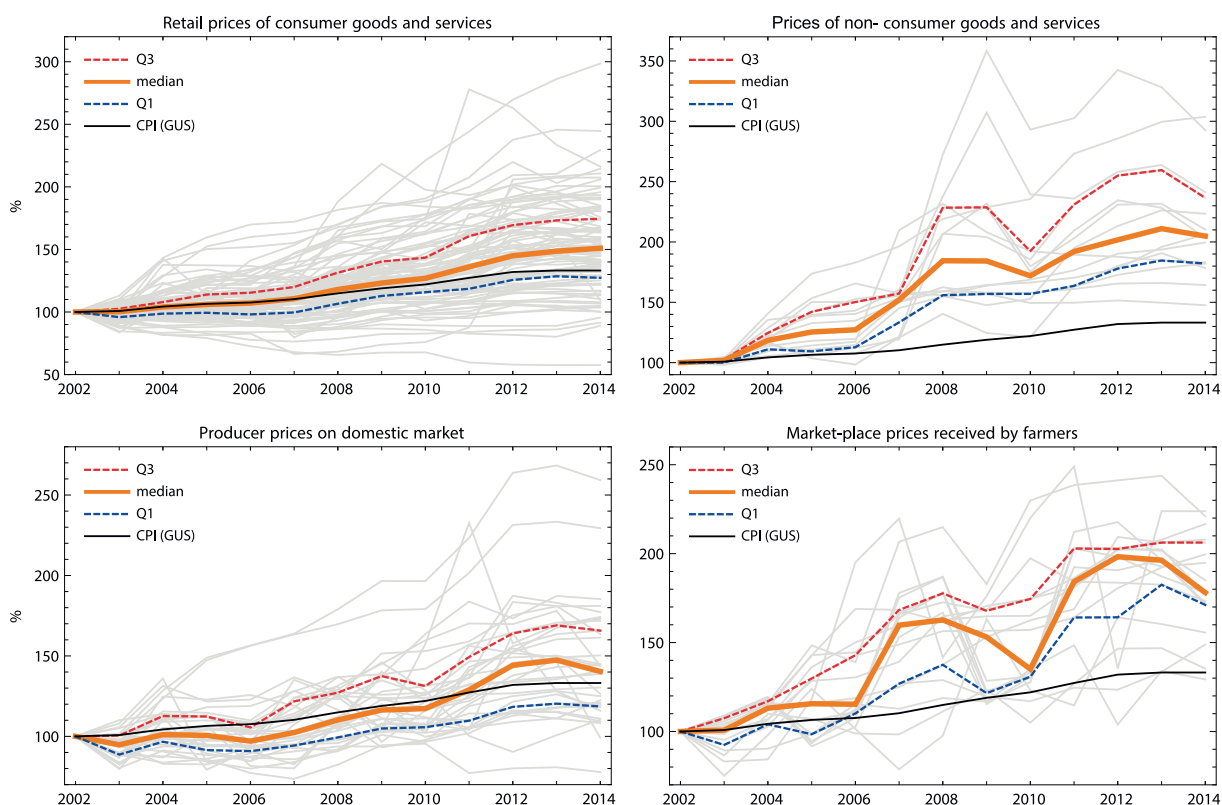
**Fig. 1.** Official Consumer Price Index in Poland (and Lubelskie Voivodship) since base-year 2002

*Source:* Own elaboration based on data published by CSO

There are some differences between Poland and Lubelskie Voivodship and they are presented in figure 3 charts. This time we divided goods into smaller groups, in accordance with CSO classification. In all presented categories except alcoholic beverages and tobacco, medians of price changes in 2014 are significantly higher than CPI (GUS) indicates (i.e., 33,2% increase form base-year 2002 to 2014). The biggest difference we obtained for non-consumer goods (about 105% retail price increase). For consumer goods and services (as a single category) the median of price increase was

14. We only use the CPI for Poland as it is the most frequently published measure for inflation, and people trying to keep up with inflation rate usually refer to this value only.





**Fig. 2.** Price changes in categories of goods and services since base-year 2002 in Poland

*Source:* Own elaboration based on data published by CSO

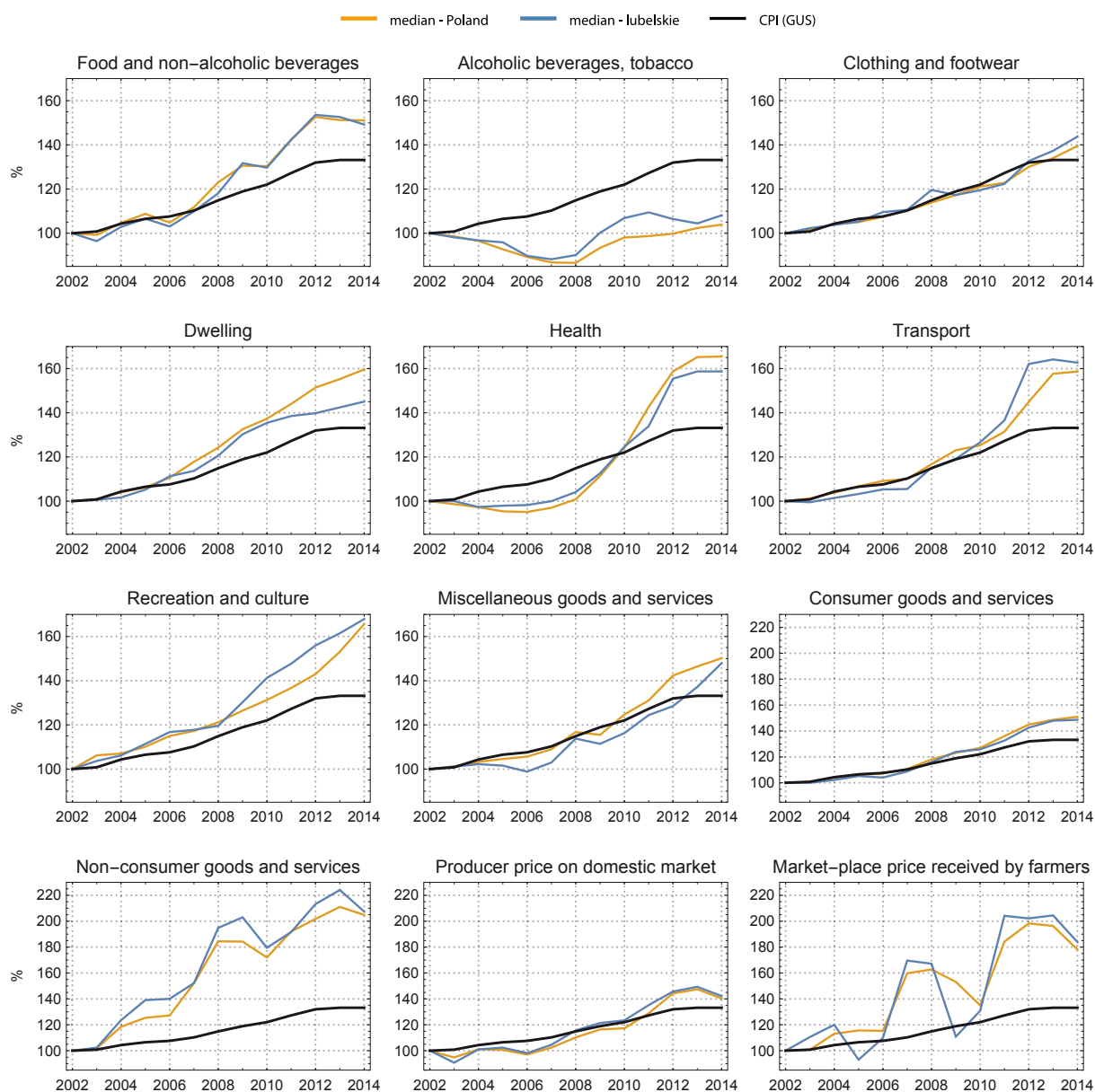
about 50% in 2014. Detailed information is presented in table 1. In two groups of goods, in the years 2013–2014, prices stopped rising (health, transport), prices of food decreased slightly, and prices in the categories of farmers' market-place, producers, non-consumer goods in the year 2014 decreased noticeably. Nevertheless the gaps between official price change since 2002 and analyzed product prices were still very serious. As we mention above, an exception was the alcoholic beverages and tobacco group, but unfortunately the computations was based on 4 products only, hence the result could be misleading.

Distributions of price changes from 2002 to 2014 along with CPI (GUS) of four considered categories of goods is presented in figure 4 for Poland and figure 5 for Lubelskie Voivodship. Histo-

**Tab. 1.** Medians of goods and services price increase in separate categories since base-year 2002 to 2014 (in %)

Group/Category	Poland	Lubelskie Voivodship
Food and non-alcoholic beverages	51,1	49,2
Alcoholic beverages, tobacco	3,9	8,1
Clothing and footwear	39,5	43,8
Dwellings	59,6	45,0
Health	65,5	58,7
Transport	58,7	62,7
Recreation and culture	65,7	67,9
Miscellaneous goods and services	50,2	47,9
Retail prices of consumer goods and services (whole category)	50,9	48,6
Average market-place prices received by farmers	78,1	83,9
Producer prices on domestic market	40,3	42,2
Prices of non-consumer goods and services	104,9	107,4

*Source:* Own elaboration based on data published by CSO

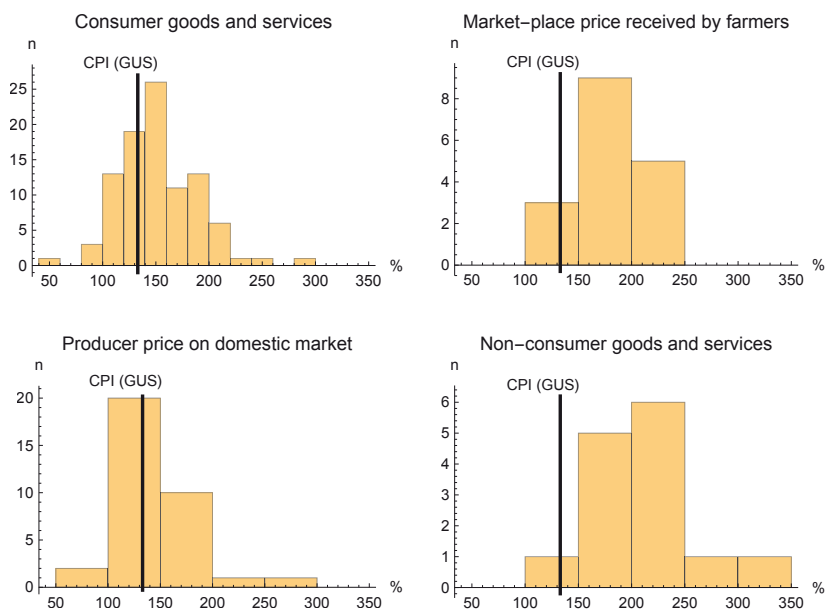


**Fig. 3.** Medians of price changes in groups of goods and services and CPI (GUS) since base-year 2002 in Poland and Lubelskie Voivodship

*Source:* Own elaboration based on data published by CSO

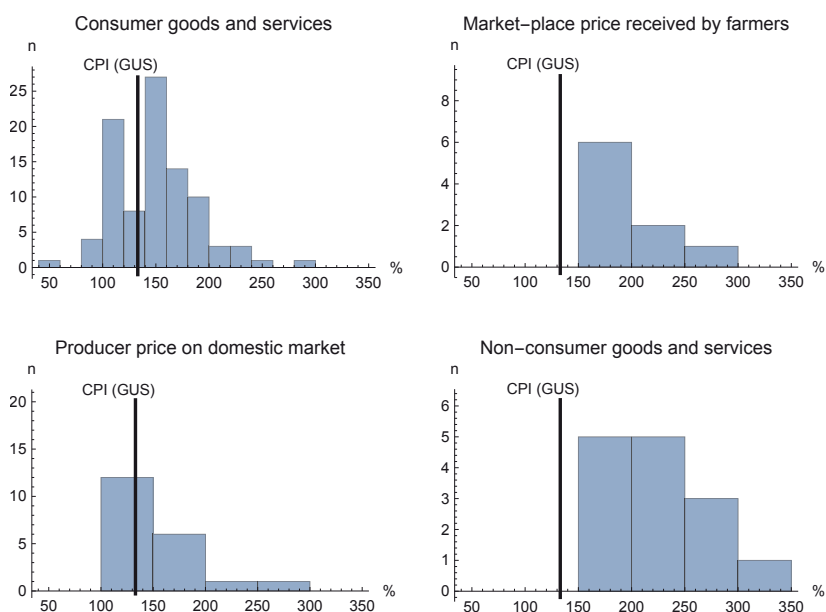
grams confirmed our previous computations, that prices of most analyzed products since the year 2002 increased much more than official CPI indicates. For Poland in category non-consumer goods, and for Lubelskie Voivodship in categories of farmers' market-place prices and non-consumer goods all considered products increased in price more than 33,2%. Distribution of price changes for both Poland and Lubelskie Voivodship is shown on figure 6. Detailed numerical values are presented in table 2 and the Annex.

Since the base-year 2002 to 2014, as far as officially published CPI is considered, the average inflation rate was 2,42% per year (i.e., 33,2% since 2002 to 2014). But computed average changes of product prices median for all four categories of goods and services separately were (as expected) significantly higher (see fig. 6). It is worth noting that prices in the consumer goods and services category in Lubelskie Voivodship have been increasing a bit faster (3,56%) than in Poland (3,49%). Whereas average yearly price increase for all analyzed prices together were 3,64% for both Poland, and Lubelskie Voivodship—about 1,2 percentage points higher than official CPI indicates. Distributions of average price increase computed for all products separately (fig. 7) confirm that



**Fig. 4.** Distribution of price changes, since base-year 2002, in four categories of goods and services in Poland

*Source:* Own elaboration based on data published by CSO



**Fig. 5.** Distribution of price changes, since base-year 2002, in four categories of goods and services in Lubelskie Voivodship

*Source:* Own elaboration based on data published by CSO

**Tab. 2.** Percentage of products which increased in price more than 33,2% since base-year 2002

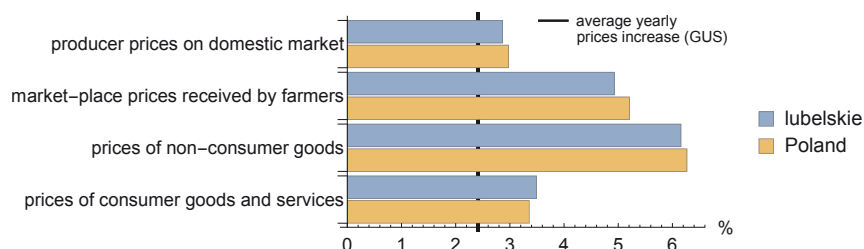
Group/Category	Poland	Lubelskie Voivodship
Retail prices of consumer goods and services	69,5	67,7
Average market-place prices received by farmers	94,1	100,0
Producer prices on domestic market	55,9	65,0
Prices of non-consumer goods and services	100,0	100,0

*Source:* Own elaboration based on data published by CSO.



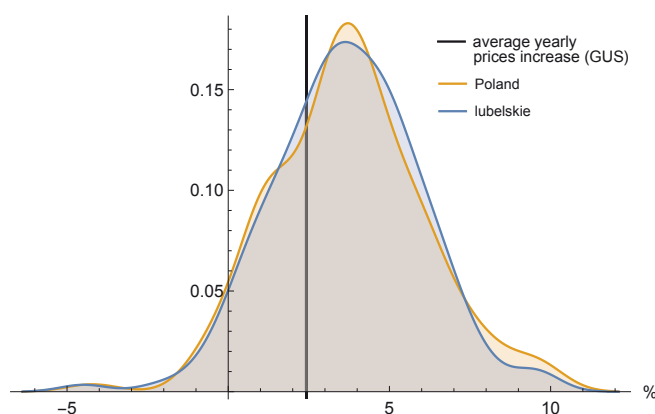
generally price changes in Poland and Lubelskie Voivodship were generally quite similar, although there were differences between categories (see fig. 6).

It should be mentioned here that due to progressing deterioration of food quality,<sup>15</sup> the real price increase in that group of products is probably higher than registered prices indicate, and just food price changes are the most perceived by households, especially those with relatively low income.



**Fig. 6.** Average inflation rate per year in four categories of goods and services since base-year 2002 to 2014

Source: Own elaboration based on data published by CSO



**Fig. 7.** All analyzed yearly average price changes of goods and services distribution since base-year 2002 to 2014

Source: Own elaboration based on data published by CSO

#### 4 Quantity of money as a reason for price increase

“The economy’s overall price level can be viewed in two ways. So far, we have viewed the price level as the price of a basket of goods and services. When the price level rises, people have to pay more for the goods and services they buy. Alternatively, we can view the price level as a measure of the value of money. A rise in the price level means a lower value of money because each [zloty] in a [consumer] wallet buys a smaller quantity of goods and services” (Mankiw 2004, 342). So in addition to our price analysis, we would like to consider “the other side” of inflation or the reason of price change. The term “inflation” originally referred to increase in the amount of money in circulation,<sup>16</sup> and some scientists still use the word in this way. Although economists generally agree that in the long run inflation is caused by increase in the money supply,<sup>17</sup> most modern economists—as we mentioned above—use the term “inflation” thinking of a rise in the price level only. Milton Friedman and other University of Chicago economists in the 1950s and 1960s “concluded that the money supply, while not a reliable instrument for controlling short-term movements in the economy, can be effective in controlling longer term movements of the price level and that the prescription for stable prices is to increase the money supply regularly at a rate equal to

15. We cannot prove it here, but we think that any attentive consumer could confirm that phenomenon.

16. See: (Chisholm 1922). In *Webster’s New World Dictionary of the American Language* (edition from 1960) the definition of inflation reads as follows: “. . . an increase in the amount of currency in circulation, resulting in a relatively sharp and sudden fall in its value and rise in prices: it may be caused by an increase in the volume of paper money . . .”, so the increase of prices is rather an effect of inflation than inflation itself.

17. See for example (Mankiw 2004).

that at which the economy is estimated to be expanding.”<sup>18</sup> Hence, inflation arises when quantity of money increases faster than global production.

Let us analyze the present situation in Poland. The left chart in figure 8 shows clearly that in Poland M3 money supply increased much more faster than real GDP in the years 2002–2014. Since the ratio of money supply to real GDP may be a good measure of inflation,<sup>19</sup> we obtained in this way values of inflation rate—they are substantially higher than official CPI, and in 2014 (compared to base-year 2002) exceed 200% (see fig. 8). Average inflation rate determined from this ratio values, in the years 2002–2014, was 6,1% (sic) per year. We will not develop this result further.<sup>20</sup> Our conclusion here is only that inflation defined by increase in the amount of money causing the prices increase is substantially higher (3,7 percentage points per year) than the officially published measure of inflation in Poland, CPI.<sup>21</sup> In other words, the value of money decreases much faster than the official CPI indicates, and—we think—people feel that fact.

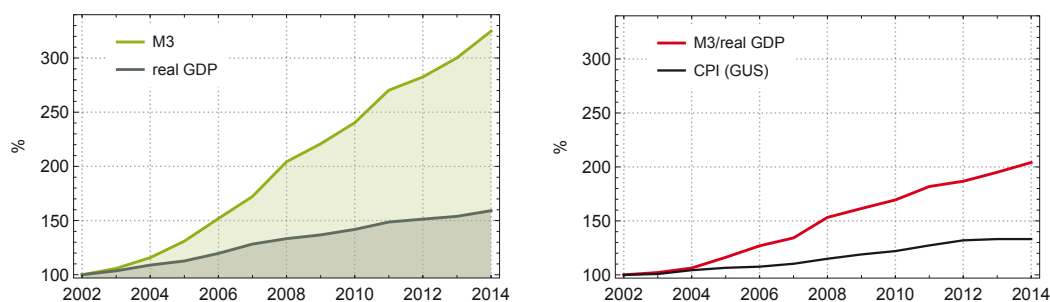


Fig. 8. M3 money supply, real GDP (left) and M3/real GDP ratio (right) in Poland since base-year 2002 to 2014

Source: Own elaboration based on data published by NBP and CSO

## Conclusions

According to the presented analysis of price changes we can state that most of the considered goods since 2002 have increased in price more than the official CPI indicates (i.e., 33,2%). Moreover, many of the necessary or essential goods and services in 2014 are about twice as expensive than in 2002—for example: fresh butter (95% increase in price), whole-meal rye bread (93%), rice (85%), black tea (82%), potatoes (124%), milk (117%),<sup>22</sup> eggs (106%), natural net-gas (114%), cold water (84%), hard coal (80%), electricity (68%), 95 octane petrol (66%), consultation of a specialist doctor (82%), driving lessons (92%), and theater tickets (106%)—see more in Annex.

Pietrzak (2015) showed that information about CPI is for households too general and much less relevant than prices of products in their consumer baskets. So if we look at the consumer basket of Polish households (fig. 9), about 21% of expenditures consist of food, and circa 20%—housing, water, electricity, gas and other fuels (in 2014). As we showed above, many products in these categories have almost doubled their prices since 2002, and perceived inflation rate depends just on these goods and services, especially if a household has quite a low income.

18. Encyclopædia Britannica 2015. Encyclopædia Britannica Ultimate Reference Suite. Chicago: Encyclopædia Britannica, s.v. “inflation.”

19. “If the quantity of goods and services available for purchase—output, for short—were to increase as rapidly as the quantity of money, prices would tend to be stable. Prices might even fall gradually as higher incomes led people to want to hold a larger fraction of their wealth in the form of money. Inflation occurs when the quantity of money rises appreciably more rapidly than output, and the more rapid the rise in the quantity of money per unit of output, the greater the rate of inflation. There is probably no other proposition in economics that is as well established as this one.” (Friedman and Friedman 1980, 254)

20. It is probably material for another more detailed study.

21. Sargent (1982) showed that in the 1920s in Austria, Hungary, Germany and Poland the quantity of money and the price level moved closely together. The strong association between these two variables was consistent with the quantity theory of money, which states that growth in the money supply is the primary cause of inflation. In the years 2002–2014 in Poland this relation seems to not have occurred—so either the economy rules now work differently or the CPI is significantly understated.

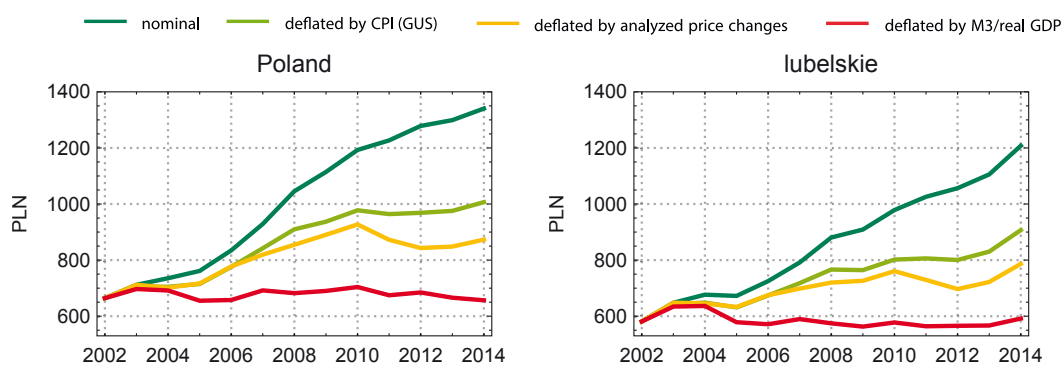
22. Fresh milk at market-place from farmers; cows’ milk, fat content 3–3,5%, sterilized available in the store—44%.



**Fig. 9.** Structure of the market basket in Poland (weights applied to calculation CPI)

*Source:* Own elaboration based on data published by CSO

In figure 10 average monthly available income per capita in Poland and in Lubelskie Voivodship is shown. The nominal average income increased about 100% since 2002, as did many of the essential good prices. Hence people's experience is that prices regularly increase and their wallet purchasing power only just keeps up. On the other hand, deflating nominal income by official CPI gives only about a 50% real increase since 2002. But if the true average inflation rate in Poland was about 6% per year (as we determined considering money supply), the real available income generally has not changed for 12 years (sic). In that situation it may be a very uncomfortable feeling for people, when the media continuously announces that Polish GDP grows, and average salary increases from month to month.



**Fig. 10.** Average monthly available income per capita, nominal and deflated, in Poland (left) and Lubelskie Voivodship (right), since base-year 2002

*Source:* Own elaboration based on data published by NBP and CSO

As economists generally agree (and hope), the Consumer Price Index should be a good measure of inflation. CPI value is very important both for politicians and ordinary people. Its rate is regularly used by government, bankers, economists, businessmen and ordinary consumers to make decision about monetary policy, interest rates, investments, level of savings, selling or buying real estates, taking out a loan, etc. respectively. Regardless of inflation definition (and meaning)—rise in the price level or increase in the amount of money in circulation—considered, it seems that our brief research revealed faster price increase or higher inflation rate than the published CPI indicates. Relying on price changes we showed that average yearly inflation rate in the years 2002–2014 was about 1,2 percentage points higher than the published rate of 2,42% per year, but for products in the categories of market-place prices received by farmers and non-consumer goods and services—yearly increase in prices exceed 5%. Furthermore, the presented observations concerning the macroeconomic relation of total money supply to real GDP seems to indicate that the real inflation rate in Poland in the analyzed period was about 6% per year.

We appreciate the fact that this study (the main part of it) is strongly limited only to prices of goods and services published by the Central Statistical Office, and that analysis of price changes

did not reflect the method of CPI estimation.<sup>23</sup> Nonetheless, in our humble opinion, the conducted computations and presented information are sufficient enough to lead us to the conclusion that real inflation in Poland is higher than the official CPI published by the Central Statistical Office, and consumer sentiment about that fact is fully justified.

## Annex

### Price changes of analyzed goods and services in Poland from 2002 to 2014

Prices of food and non-alcoholic beverages in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Beef meat, bone-in (roast-beef)—per 1 kg. . . . .	10,71	26,20	145
Natural cocoa, domestic milling—per 100 g. . . . .	1,83	4,20	130
Roasted buckwheat groats, whole 0,5 kg . . . . .	2,03	4,39	116
Pearl-barley groats—per 0,5 kg . . . . .	1,08	2,24	107
Multi-fruit juice—per 175 ml . . . . .	1,64	3,27	99
Fresh butter, fat content about 82,5%—per 200 g . . . . .	2,35	4,60	96
Whole-meal rye bread, standard—per 0,5 kg. . . . .	1,51	2,92	93
Black pudding—per 1 kg. . . . .	5,04	10,28	90
Deep-frozen strawberries—per 0,5 kg . . . . .	4,37	8,3	90
Rice—per 1 kg . . . . .	2,12	3,92	85
Headcheese—per 1 kg . . . . .	8,44	15,5	84
Black tea, leaf—per 100 g . . . . .	2,14	3,90	82
Pork fat—per 1 kg . . . . .	3,67	6,45	76
Hen eggs, fresh—per 1 piece . . . . .	0,30	0,52	73
Natural honey—per 400 g . . . . .	6,66	11,01	65
Wheat-rye bread—per 0,5 kg. . . . .	1,34	2,20	64
Salted herring, headless—per 1 kg . . . . .	7,97	12,73	60
Smoked mackerel headless—per 1 kg . . . . .	10,63	16,72	57
Wheat flour—per 1 kg. . . . .	1,57	2,45	56
Sour cream, fat content 18%—per 200 ml. . . . .	1,22	1,89	55
Lard—per 250 g . . . . .	1,21	1,86	54
Semi-fat cottage cheese—per 1 kg . . . . .	8,78	13,46	53
Rape-oil, domestic Goods and services—per 1 l. . . . .	4,13	6,33	53
Deep-frozen mix of carrots and green peas—per 0,5 kg . . . . .	2,82	4,20	49
Disembowelled chicken—per 1 kg. . . . .	4,93	7,34	49
Fillets of hake, frozen—per 1 kg. . . . .	14,85	21,76	47
Wheat roll—per 50 g . . . . .	0,29	0,42	45
Jam—per 360 g . . . . .	3,51	4,98	42
Natural coffee, ground—per 250 g . . . . .	4,75	6,69	41
Smoked bacon—per 1 kg. . . . .	14,31	20,15	41
Fresh carp—per 1 kg . . . . .	10,04	14,11	41
Milk chocolate—per 100 g. . . . .	2,54	3,55	40
Raw bacon—per 1 kg . . . . .	10,44	14,51	39
Dry sausage—per 1 kg . . . . .	23,19	29,96	29
Cows' milk, fat content 3–3,5%, sterilized—per 1 l . . . . .	2,32	2,99	29
Smoked sausage—per 1 kg. . . . .	12,44	15,82	27
Pork ham, boiled—per 1 kg. . . . .	19,85	24,39	23
Apple juice—per 1 l . . . . .	3,11	3,79	22

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23. But our computations, based on median, allowed us not to take into consideration the most varying prices.

Prices of food and non-alcoholic beverages... (continued)

Goods and services	2002	2014	Increase in price
Poultry filet—per 1 kg . . . . .	16,1	18,85	17
Cereal muesli with fruits—per 350 g. . . . .	5,06	5,88	16
Baleron (cervical pork, boiled)—per 1 kg . . . . .	17,79	20,19	13
Pork meat, bone-in (centre loin)—per 1 kg . . . . .	13,48	14,87	10
White sugar, crystallized—per 1 kg . . . . .	2,28	2,5	10
Egg pasta—per 400 g . . . . .	3,59	3,87	8
Can of pork meat—per 300 g. . . . .	3,92	3,93	0
Pork meat, boneless (shoulder)—per 1 kg . . . . .	13,37	13,38	0

Source: Own elaboration based on data published by CSO

Prices of alcoholic beverages, tobacco in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Cigarettes—per 20 pcs . . . . .	4,18	12,48	199
Beer, light full—per 0,5 l. . . . .	2,68	2,86	7
White grape wine, dry—per 0,75 l . . . . .	9,24	9,6	4
Flavoured vodka 40%—per 0,5 l . . . . .	23,69	22,64	-4
Pure vodka 40%—per 0,5 l . . . . .	23,68	21,67	-8

Source: Own elaboration based on data published by CSO

Prices of clothing and footwear in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Women's tights, plain, 15 den . . . . .	3,24	6,83	111
Resoling men's shoes—per 1 pair . . . . .	24,12	40,37	67
Children's low leather shoes with non-leather sole—per 1 pair. . . . .	95,15	150,07	58
Men's boots shoes with non-leather sole—per 1 pair. . . . .	148,62	227,91	53
Jacket (aged 2–6), fabric, warmish . . . . .	86,37	127,44	48
Trousers (aged 6–11), jeans-type . . . . .	47,05	68,09	45
Women's leather knee-boots with non-leather sole—per 1 pair . . . . .	243,91	340,24	39
Women's low leather shoes with non-leather sole—per 1 pair . . . . .	130,24	180,19	38
Men's low leather shoes with non-leather sole—per 1 pair. . . . .	138,99	189,63	36
Men's suit dry-cleaning—per set . . . . .	24,61	33,21	35
Tights (aged 2–6), cotton and other fibers . . . . .	11,78	15,54	32
Men's shirt, polyester staple fibres and cotton, long sleeve. . . . .	74,9	95,36	27
Women's overcoat, wool . . . . .	604,23	626,62	4

Source: Own elaboration based on data published by CSO

Prices in dwellings category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Natural net-gas, high-methanated for households (W-1.1 tariff)—per 1 m <sup>3</sup>	1,31	2,81	115
Sink fixture. . . . .	75,33	151,01	100
Cold water by municipal water-system—per 1 m <sup>3</sup> . . . . .	1,97	3,64	85
Hard coal—per 1 t . . . . .	444,27	802,37	81
Electricity for households (G-11 tariff)—per 1 kwh . . . . .	0,38	0,64	68
Double bowl stainless steel sink . . . . .	125,81	205,58	63
Enamel frying pan with Teflon coating, diameter 24 cm . . . . .	37,26	59,47	60
Heating of dwellings—per 1 m <sup>2</sup> of usable floor space . . . . .	2,89	3,97	37

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Prices in dwellings (continued)

Goods and services	2002	2014	Increase in price
Enamel pot, capacity about 3 l . . . . .	30,85	39,7	29
Iron with dusch system . . . . .	158,22	193,16	22
Vacuum-cleaner . . . . .	331,17	347,39	5
Automatic washing machine (dry-linen capacity not exceeding 5–7 kg) . . .	1353,18	1204,59	–11
Fridge-freezer, capacity about 300 l . . . . .	1834,36	1057,11	–42

Source: Own elaboration based on data published by CSO

Prices in health category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Consultation of a specialist doctor . . . . .	47,57	86,51	82
Cotton wool—per 200 g . . . . .	3,68	6,09	65
Vitaminum C, coated tablets 0,1 g—per 50 pcs . . . . .	3,25	4,94	52

Source: Own elaboration based on data published by CSO

Prices in transport category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Driving lessons, “B” category . . . . .	683,73	1309,58	92
Tourist bicycle . . . . .	578,24	1049,48	81
Unleaded 95 octane motor petrol—per 1 l . . . . .	3,2	5,3	66
Single ticket for travelling by tram . . . . .	2,08	3,3	59
Single ticket for intra-urban bus . . . . .	1,78	2,73	53
Taxi daily fare—for 5 km distance . . . . .	12,23	16,15	32
Mechanical car body wash . . . . .	13,6	17,04	25

Source: Own elaboration based on data published by CSO

Prices in recreation and culture category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Theatre ticket . . . . .	21,19	43,63	106
Local daily newspaper . . . . .	1,28	2,12	66
Cinema ticket . . . . .	11,48	17,65	54

Source: Own elaboration based on data published by CSO

Prices in miscellaneous goods and services category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Men's quartz watch . . . . .	66,46	115,96	74
Men's hair-cut . . . . .	11,15	16,83	51
Women's cold wave . . . . .	48,46	72,78	50
Toilet soap—per 100 g . . . . .	1,58	2,01	27
Tooth-paste—per 100 ml . . . . .	7,04	8,04	14

Source: Own elaboration based on data published by CSO

Prices in non-consumer goods and services category in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Tractor mounted grain seeder . . . . .	7212,07	21903,7	204
Sulphate of potash, nutritive content about 60% K2O—per 25 kg . . . . .	14,73	43,11	193

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Prices in non-consumer goods and services (continued)

Goods and services	2002	2014	Increase in price
Granulated superphosphate, nutritive content about 20% P <sub>2</sub> O <sub>5</sub> —per 25 kg	10,00	24,14	141
Urea, nutritive content 46% N—per 25 kg . . . . .	17,16	40,6	137
Compound feed for cattle—per 1 dt . . . . .	76,66	171,23	123
Polifoska, nutritive content 8% N, 24% P <sub>2</sub> O <sub>5</sub> , 24% K <sub>2</sub> O—per 25 kg . . .	24,10	50,68	110
Steamer on solid fuel, capacity 100 l . . . . .	348,44	718,69	106
Ammonium phosphate, nutritive content 18% N, 46% P <sub>2</sub> O <sub>5</sub> —per 25 kg .	25,88	52,67	103
Tractor rotary mower . . . . .	3576,11	7137,94	100
Building burnt brick, full, class 15—per 1 piece . . . . .	0,63	1,17	83
Hydrate lime—per 1 t . . . . .	311,40	567,13	82
Compound feed for pigs—per 1 dt . . . . .	79,72	142,22	78
Roofing paper, 15 m <sup>2</sup> in roll—per 1 roll . . . . .	44,70	73,44	64
Portland cement—per 25 kg . . . . .	7,56	11,17	48

Source: Own elaboration based on data published by CSO

Market-place prices received by farmers in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Edible potatoes (excluding early kinds) 1 dt . . . . .	44,76	100,19	124
Straw of winter cereals 1 dt . . . . .	12,45	27,52	121
Cows' milk 1 l . . . . .	1,02	2,21	117
One-year heifer 1 head . . . . .	953	1981,29	108
Hen eggs 1 piece . . . . .	0,32	0,66	106
Dairy cow 1 head . . . . .	1588	3169,01	100
Calves for slaughter 1 kg . . . . .	4,99	9,72	95
Barley 1 dt . . . . .	43,42	80,34	85
Oats 1 dt . . . . .	37,6	66,97	78
Triticale 1 dt . . . . .	41,45	73,46	77
Meadow hay 1 dt . . . . .	20,77	36	73
Rye 1 dt . . . . .	37,13	63,91	72
Wheat 1 dt . . . . .	49,64	84,97	71
Piglet for breeding 1 head . . . . .	105,7	164,52	56
Farm horse 1 head . . . . .	3141	4678,85	49
Pigs for slaughter 1 kg . . . . .	3,65	4,94	35
Fodder potatoes 1 dt . . . . .	26,96	34,86	29

Source: Own elaboration based on data published by CSO

Producer prices on domestic market in 2002 and 2014 (in PLN), and price changes since 2002 (in %)

Goods and services	2002	2014	Increase in price
Raw beef with bone, rump cut 1 kg . . . . .	9,67	25,07	159
Raw leg of beef, boneless, 1 kg . . . . .	12,55	28,79	129
Fresh butter, fat content about 82,5%—per 1 kg . . . . .	9,2	17,05	85
Black pudding 1 kg . . . . .	4,17	7,55	81
Pork lard in cubes (250 g) 1 kg . . . . .	3,47	6,15	77
Roasted buckwheat groats, whole 1 kg . . . . .	2,87	5	74
Pearl barley mazurska 1 kg . . . . .	1,23	2,13	73
Wheat-rye bread 1 kg . . . . .	2,28	3,92	72

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## Producer prices on domestic market (continued)

Goods and services	2002	2014	Increase in price
Headcheese “włoski” 1 kg . . . . .	6,36	10,54	66
Pork fat—per 1 kg . . . . .	3,16	5,17	64
Salted herring, without head, not gutted, 1 kg . . . . .	6,03	9,73	61
Cows' milk 3–3,5% fat, extended shelf life, in a box, 1 l . . . . .	1,43	2,15	50
Gutted chickens 1 kg . . . . .	4,36	6,32	45
Smoked bacon with ribs 1 kg . . . . .	10,77	15,55	44
Tomato concentrate 30% 1 kg . . . . .	7,21	10,38	44
Raw pork bacon 1 kg . . . . .	8,68	12,48	44
Semi-fat cottage cheese—per 1 kg . . . . .	6,81	9,58	41
Ripening “gouda” cheese—per 1 kg . . . . .	10,57	14,8	40
Deep frozen filets of hake, 1 kg . . . . .	10,34	14,35	39
Cream, non-returnable packaging, 18% fat, 1 l . . . . .	4,41	5,75	30
Wheat flour poznańska in bags 1 kg . . . . .	0,87	1,1	26
White evaporated salt in bags 1 kg . . . . .	0,32	0,4	25
Fresh-packed pickles, whole 0,9 l, 1 pcs . . . . .	2,68	3,28	22
Pork, cooked ham, 1 kg . . . . .	16,73	20,21	21
Daisy ham 1 kg . . . . .	15	17,98	20
Sausage “mysliwska sucha” 1 kg . . . . .	18,72	22,2	19
Apple juice, box 1 . . . . .	1,76	2,08	18
Fresh hen eggs, whole, 1 pc . . . . .	0,25	0,29	16
Raw pork with bone, shoulder 1 kg . . . . .	9,56	10,61	11
Natural chocolate, full, without additives 1 kg . . . . .	15,12	16,69	10
Raw pork centre cut loin roast 1 kg . . . . .	12,16	13,3	9
Deep-frozen mix of carrots and green beans, 1 kg . . . . .	3,16	3,42	8
White granulated sugar in bags 1 kg . . . . .	2,1	2,08	−1
Pork spam turystyczna 300 g . . . . .	3,07	2,39	−22

Source: Own elaboration based on data published by CSO

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