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Paths of Development: Compilation of a Component- based CPI for Bulgaria and Real Prices of Key Commodities for the Period 1750-2020

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A burlap sack is shown on the right side of the image, tilted and spilling a large pile of gold coins onto a white surface. The coins are 10 Bulgarian Lev (BGN) coins, featuring the number '10' and the word 'ЛЕВ' (Lev) on their obverse. The background is a gradient from dark grey on the left to white on the right.

Paths of Development: Compilation of a Component- based CPI for Bulgaria and Real Prices of Key Commodities for the Period 1750-2020

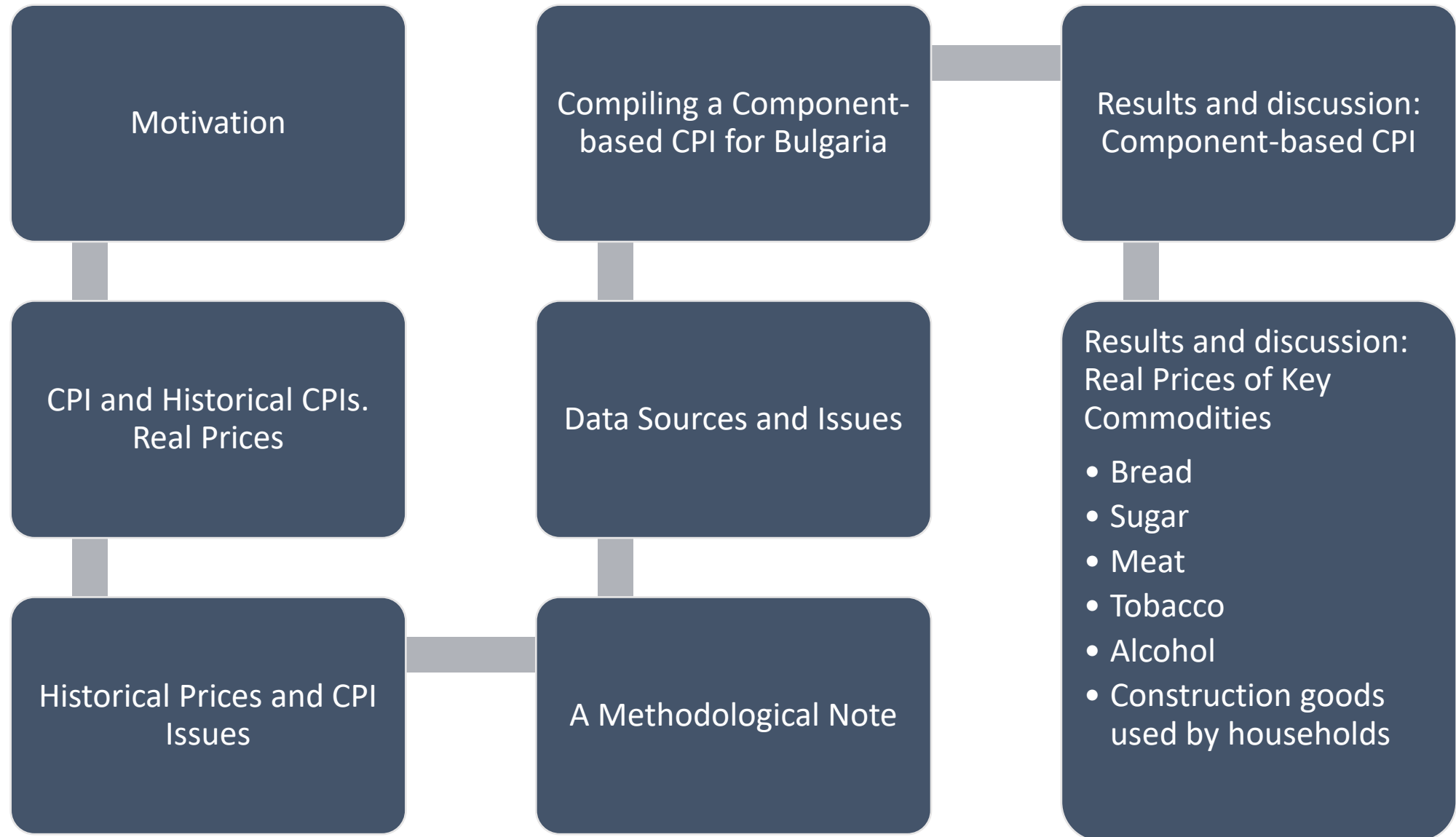
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Outline



Motivation

- This research was inspired by the many requests we have received over the years from colleagues and friends to “translate” certain prices (and amounts of money), mentioned in historical documents into present day values
- In the process of tackling this seemingly easy question (which took us a more than a year so far) we have encountered many data and methodological challenges:

The findings
presented here
follow our work
from another draft
paper

- In it we offer a detailed discussion on sources, methods and computations including:
 - An own-computed component-based CPI
 - A composite CPI based on official statistics on consumer prices
 - A combined CPI representing a single inflation series for subsequent economic analysis

CPI and Historical CPIs. Real Prices

- Consumer Price Index (CPI) is a measure of overall change in consumer prices based on representative basket of goods and services over time

CPI comprises
two elements:
prices and
weights

- Why then historical CPIs are so rare, available for only handful of countries (US, UK, France, the Nordics, Ottoman Empire etc.)?

Historical Prices and CPI Issues

- Historical prices are not easily available: they tend to be scattered over thousands of archival documents and publications
- Hence, price data collection is a laborious process that often requires titanic efforts
- Yet, despite all the hard work, historical price time series often suffer from many gaps in information
- More importantly, historical household budgets are notoriously difficult to find for the period prior to 20th century
- That is why various shortcut techniques have been proposed to bridge these common problems in CPI reconstructions

A Methodological Note

- For historical CPI reconstructions scholars adopt two different approaches:
 - Link together existing official and non-official price indices into a single composite series (O'Donoghue et al., 2004 for the U.K. or Officer et al. for the U.S.), or
 - Build original component-based CPI, using a bundle of commodities and services (Edvnison and Söderberg, 2010; Klovland, 2014 and Grytten, 2004 for Norway; Radu, 2019 for Denmark)
- Here we present the results of our own compilation of a component-based CPI for the period 1750-2020

Consumption Basket

- Our bundle consists of 20 items that are largely representative of the consumption patterns of Bulgarians until the end of WWII
- **‘National’ (simple or weighted annual average) vs. town-specific prices**

Bread	Rice	Beans	Meat	Olive / Cooking Oil	Cheese & Butter
Onion	Apples / Grapes	Sugar	Salt	Wine & Rakiya	Tobacco / Cigarette
Aba / Shayak / Calico	Candles / Lamp Gas / Brown Coal	Lime / Cement	Cart / Railway Transport	Soap	Miscellanea: Barley

Data Issues: Prices and Weights

- In the process we had to tackle three major problems

Relatively wide range of **currencies** in which the prices were expressed in the original source

Wide range of pre-modern, **non-metric measures** used throughout the present-day Bulgarian territory before 1878

Missing price and weight observations for certain years/periods (not only for the 18th and the early 19th century but also for some communist and early transition years)

Data Issues: Prices in Various Currencies

- To tackle this issue, we constructed an auxiliary exchange rate database which comprised of nearly 6,200 observations
- This database allowed us to convert all prices, quoted in Ottoman *kuruş*, to Bulgarian lev using the *kuruş*/French franc (livre) exchange rate for the years before 1878, and the official *kuruş*/lev quotations from then onward
- **Alternatively: grams of silver**

Data Issues: Prices in Various Measures

- The problem with pre-modern measures was especially acute with lump commodities like grains
- Wheat, for example, was usually traded in *kile* which equalled 120 *oka* (154 kg) in Ruse and Svishtov; 80 *oka* (103 kg) in Varna and Dobrudja; and 100 *oka* (128 kg) in Vidin but quotations sometimes also appeared in *shinik*, *kutel* or bucket of varying weight (Karlovo: 52 *oka*; Plovdiv: 48 *oka*)
- We built a database with nearly 300 pre-modern measures which allowed us to tackle most of the measurement issues

Missing Data: Weights

- Weight imputations
 - The earliest household budget data is for 1848. We assume that the weights computed for that year extend back to 1750
 - The next observations come as late as 1925
 - We use linear interpolation for the period after 1848 to determine weights of different commodity group in the consumption basket

Missing Data: Price Imputation in 3-Steps

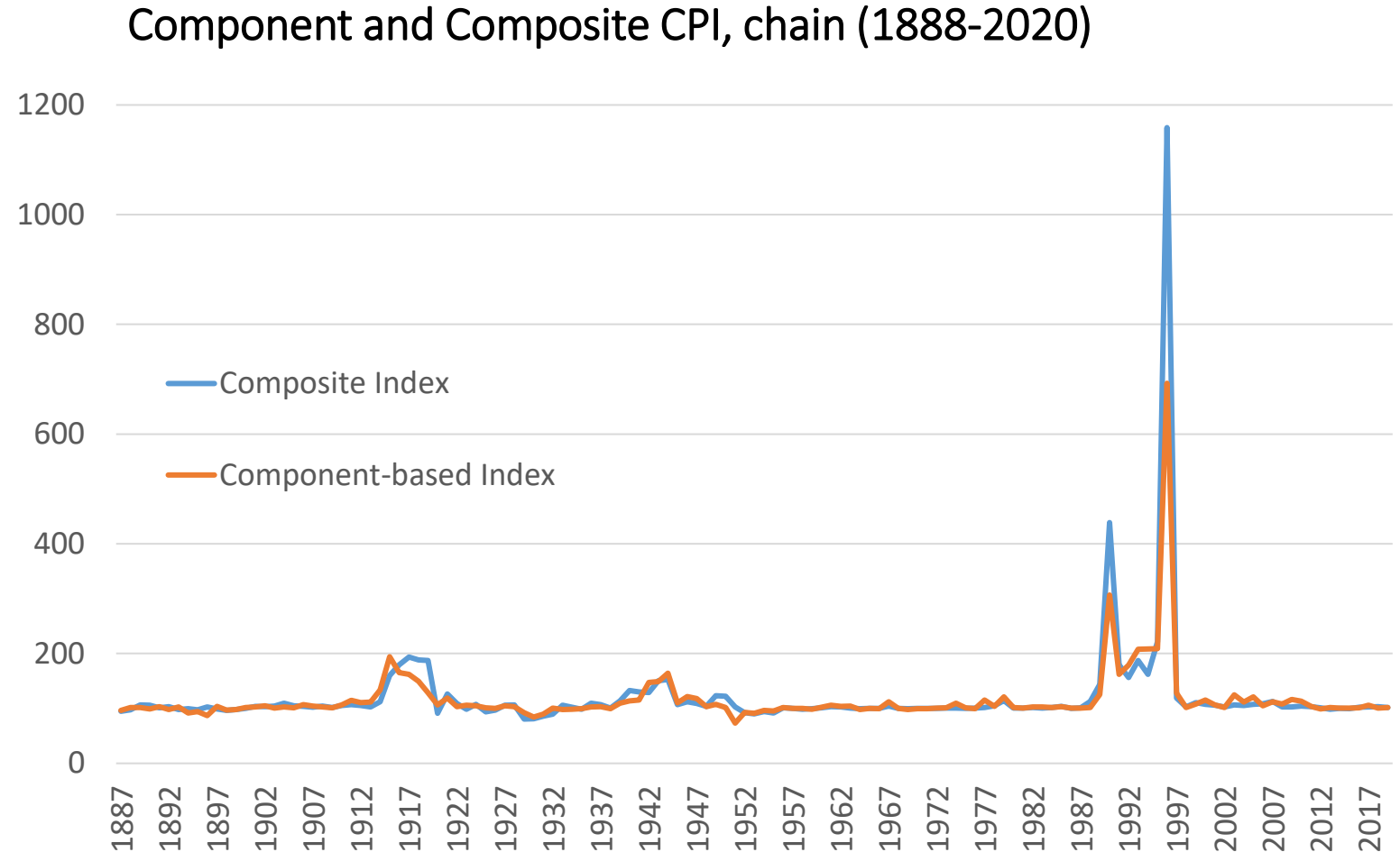
- Price imputations
 - First, we apply cubic splines for time series interpolation and extrapolation: Fritsch and Carlson (1980) method and algorithm through the stats package of the R software
 - This method has the advantage that it is very successful in keeping track of the monotonicity and convexity of the (price) data that it is applied to

Missing Data: Price Imputation in 3-Steps

- Second, we explore the potentially significant correlations between Istanbul (*Tarihi istatistikler dizisi*, 2003) and ‘Bulgarian’ prices (1750-1863)
 - Statistically significant correlations are identified through estimating linear regressions in log-log form for five pairs of variables. The estimated equations are used to generate fitted values, i.e. in-sample forecasts of the missing observations concerning the left-hand-side variables
- Third, we average the cubic-spline-imputed values (step 1) and the in-sample forecasts (step 2) to obtain final price series for bread, rice, meat, olive oil, sugar

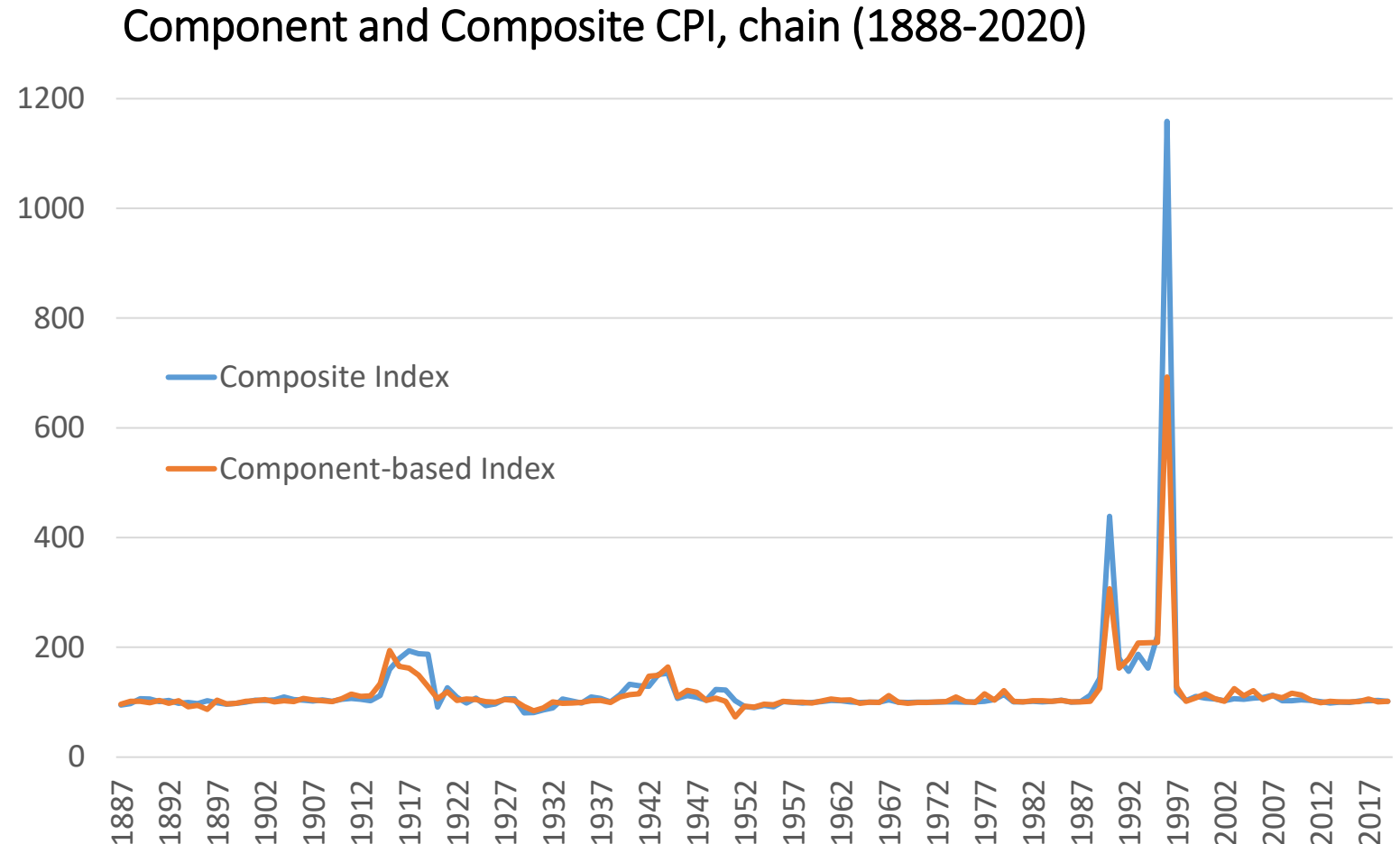
Validation of the Component-Based CPI

- We compare component-based CPI with the own-computed composite index for the overlapping period 1888-2020
- Our composite CPI is based on official price indices, published by the Bulgarian Statistical Office.

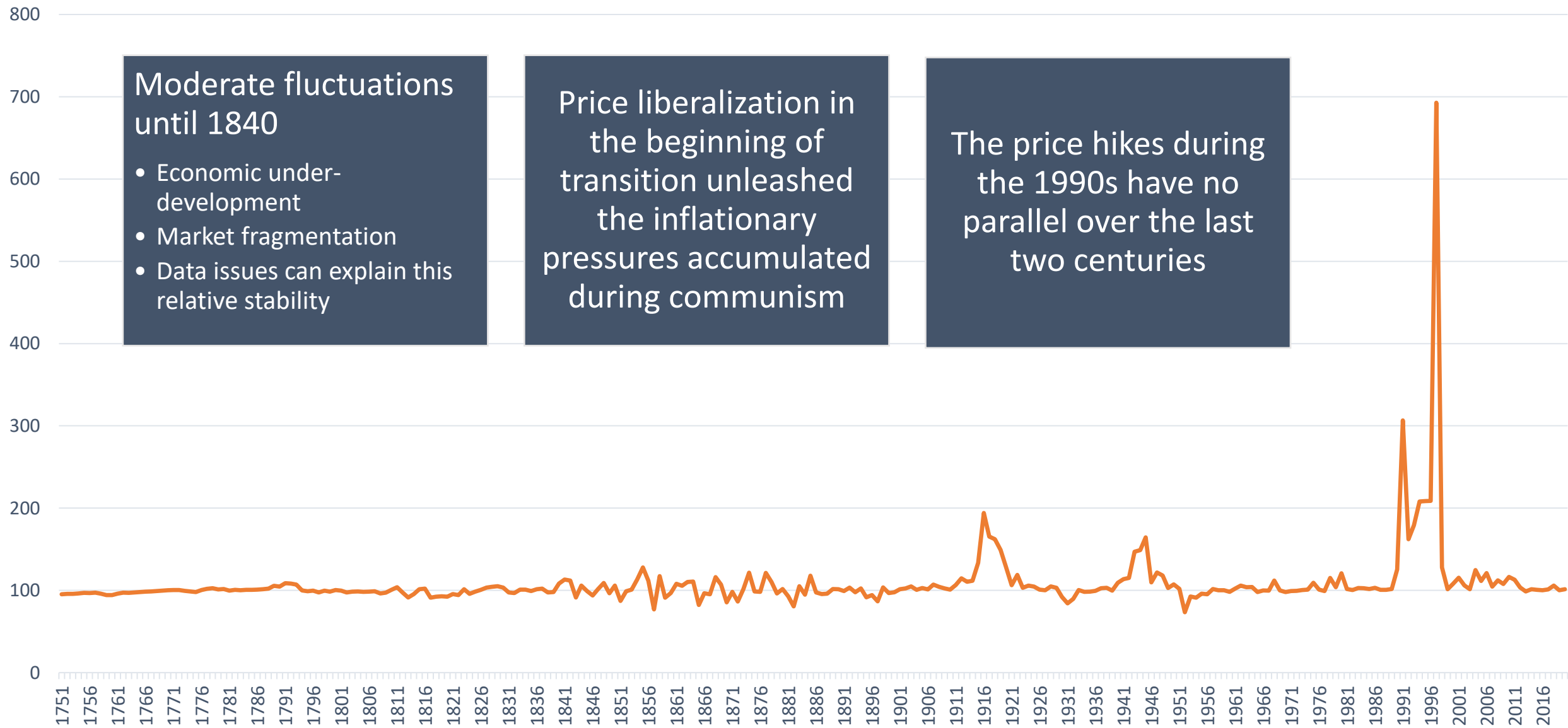


Validation of the Component-Based CPI

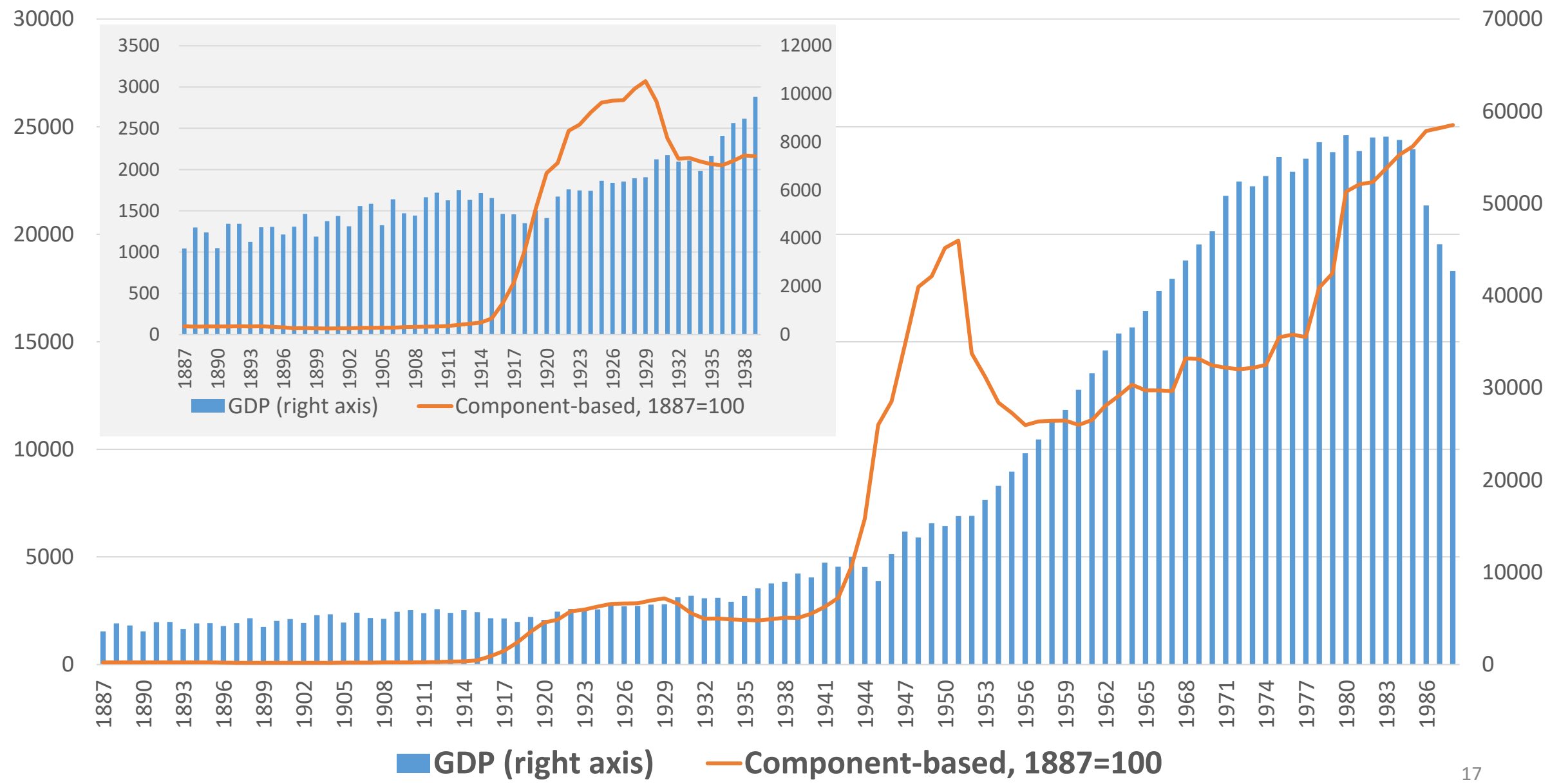
- Pearson correlation coefficient equals 0.97
- The component CPI captures the overall trend with more sizable deviations for the both World Wars, and the hyperinflation episodes during the 1990s
- Nevertheless, the component-based index captures astonishingly well the 1997 inflation record value



Results and Discussion: Component-based CPI (chain)



Results and Discussion: CPI (1887=100) and GDP



CPI Implications: Real Price: Bread

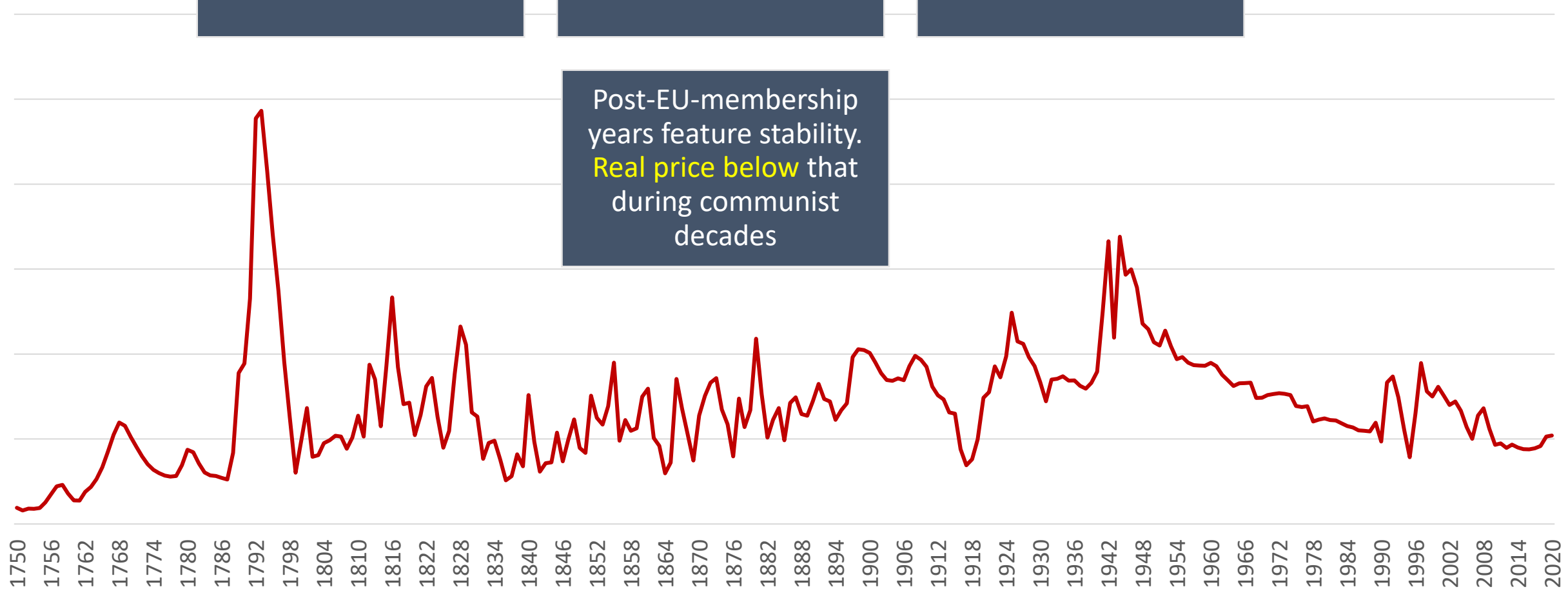
Relatively stable real price over the long run

- Fluctuates around 0.2 – 0.4 constant leva

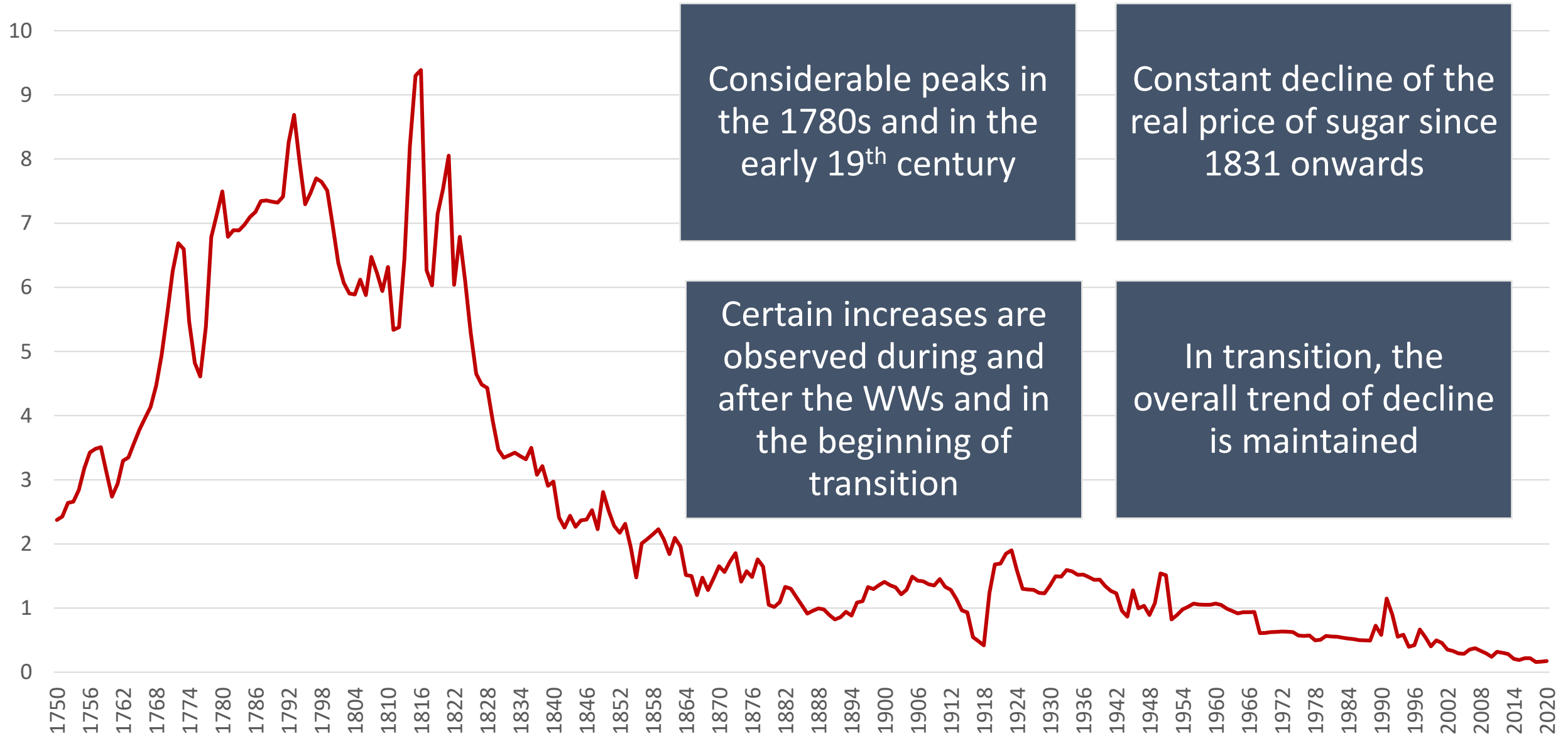
Considerable peaks in the end of the 18th century and during WWII

Constant decline of the real price during the communist period

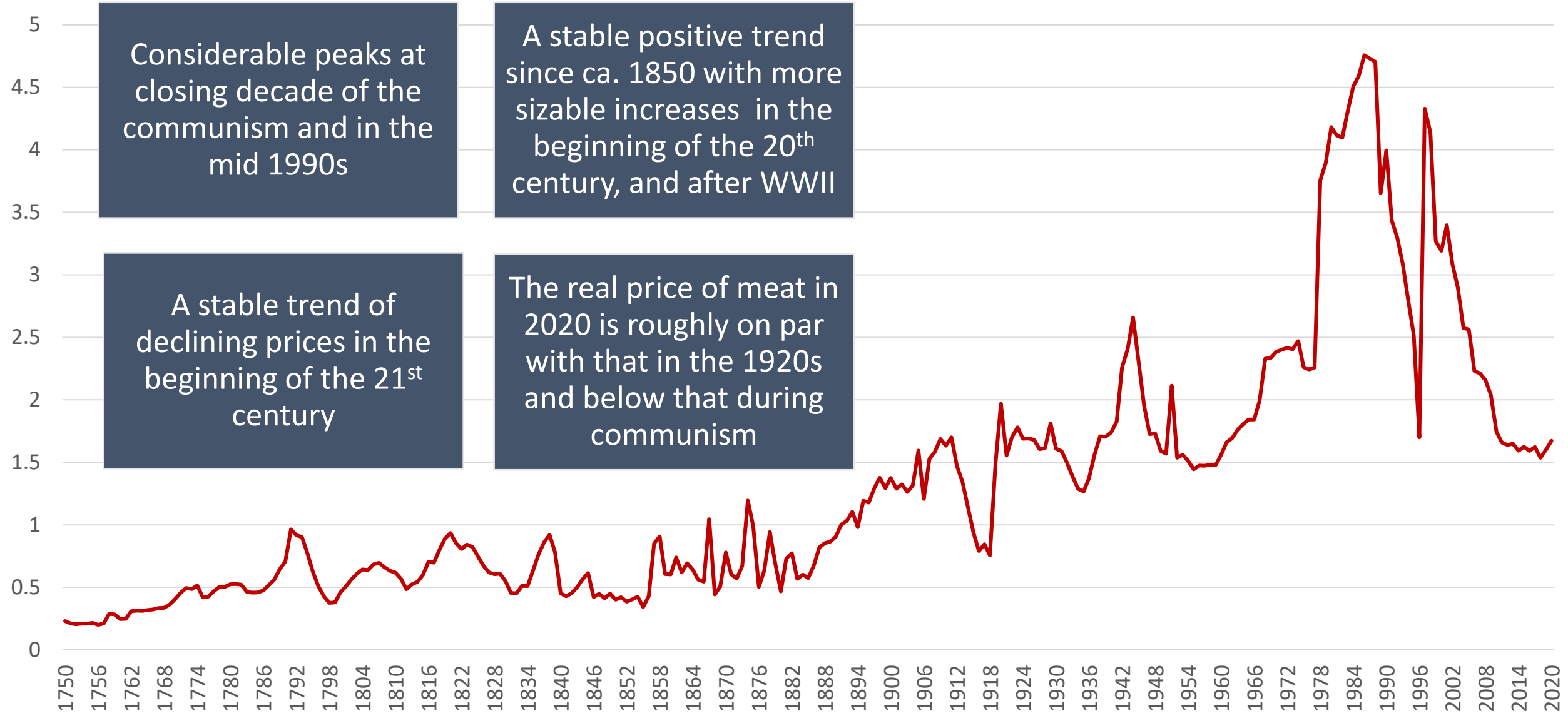
Post-EU-membership years feature stability. Real price below that during communist decades



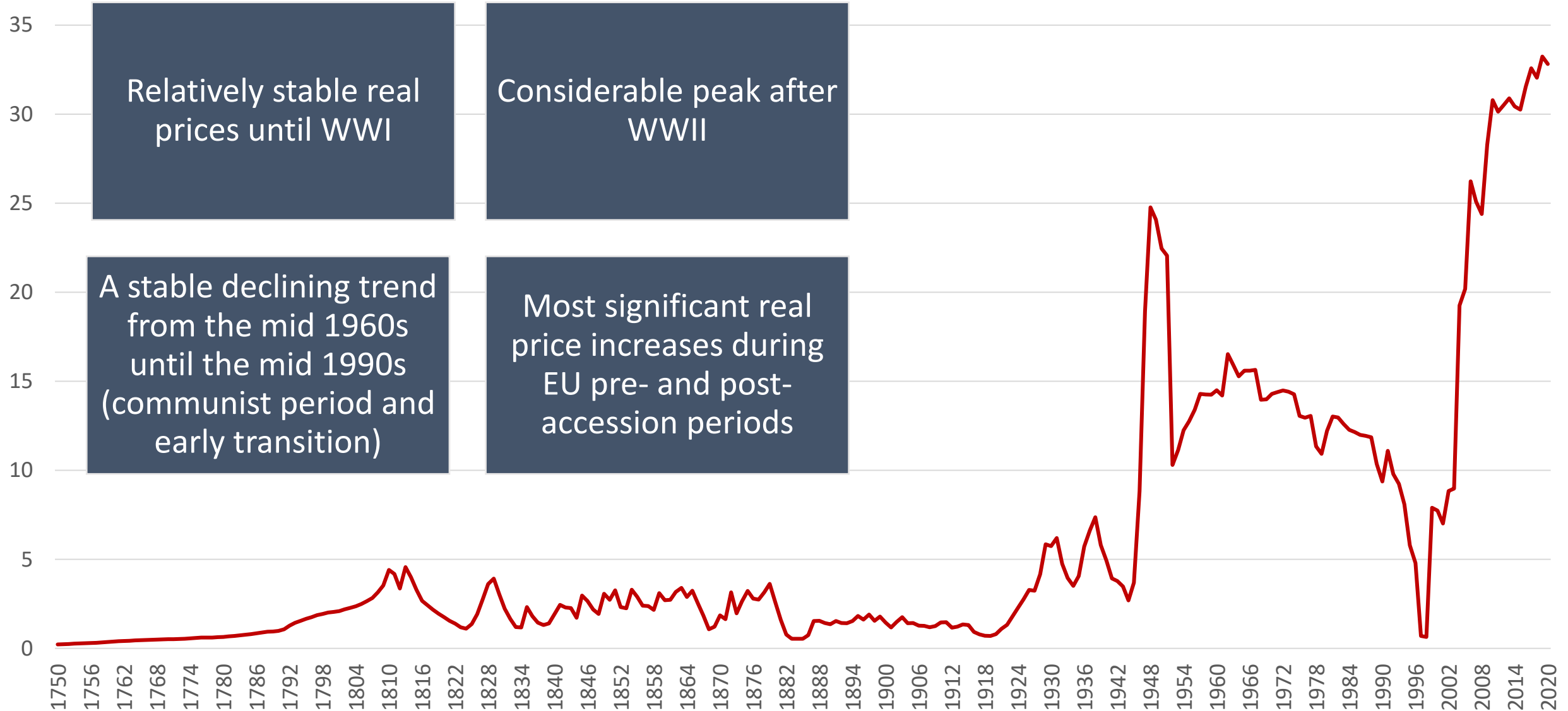
CPI Implications: Real Price: **Sugar**



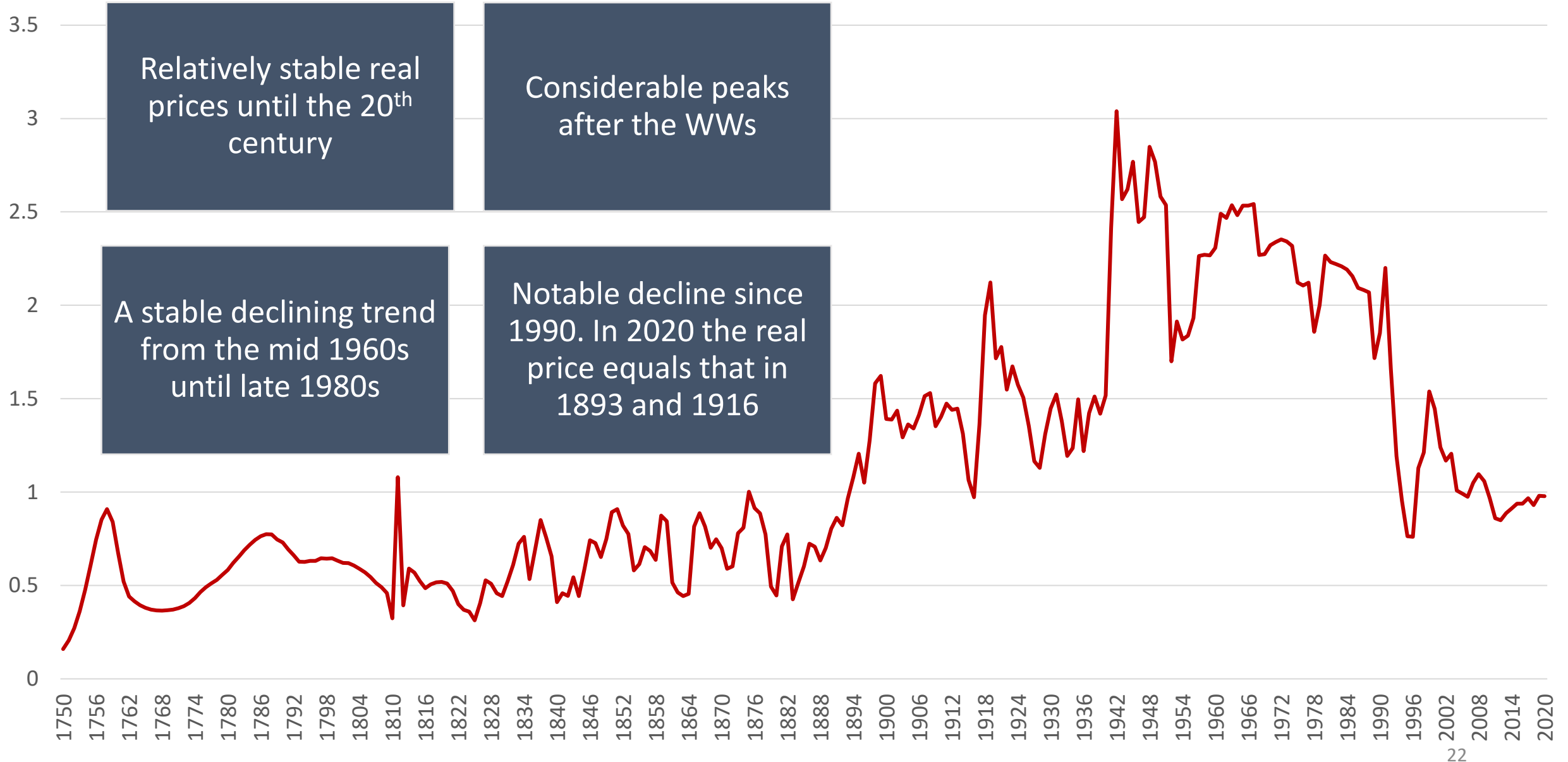
CPI Implications: Real Price: Meat



CPI Implications: Real Price: Tobacco



CPI Implications: Real Price: Alcohol



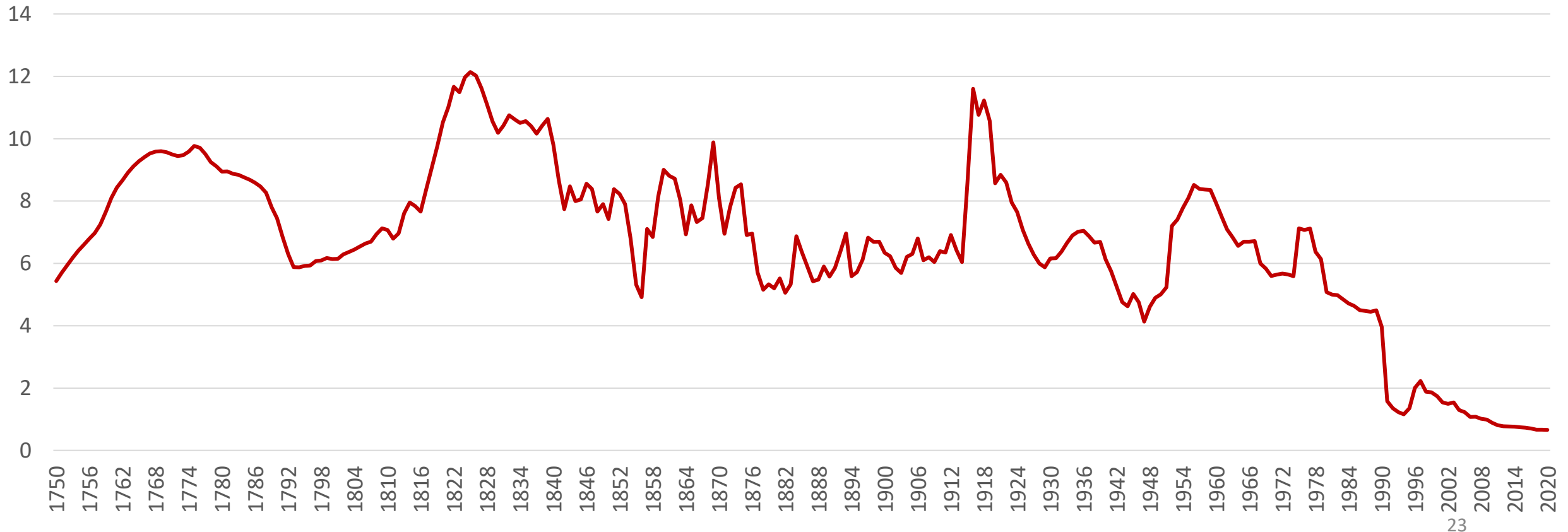
CPI Implications: Real Price: **Construction**

First peak of the real prices of construction goods in the 1760-70s. Then, in the 1820s.

Moderate fluctuation from the mid 19th century until WWI

A sizable peak after WWI and less pronounced after WWII.

A stable declining trend from the mid 1950s. More sizable real price drop during transition.



CPI Implications: Main Conclusions

Annual inflation during the 1990s seems to be incomparably higher than any other crisis period of the past, including the years of the WWs

- Extremely high negative impact of price liberalization

Under market economy, the real prices of bread, sugar, meat, alcohol and construction goods decrease

- Despite catching-up with EU levels and negative perception of nominal price increases, the development of markets and competition has led to increased affordability of key commodities

The price of tobacco has been increasing after the EU integration periods

- Due to the alignment of excise rates to minimum EU levels and the abolishment of tobacco growing subsidies

Real price fluctuations reflect political decisions, market developments, and exogenous influences; they shape consumers' and producers' choices

A Curious Implication



What is the present value of Evlogi Georgiev's donation for Sofia University?

- The Court estimated its value to **13 million 1911 leva**
- Based on the calculated CPI, the 2020 donation's value equals **602 million BGN**



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Thank you for your attention!

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