

A new long-run consumer price index for Austria (1800–2018)

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Indices of the development of consumer prices in Vienna or Austria date back to the year 1800. This article presents the first systematically documented and chained consumer price index for Austria spanning the period from 1800 to today. The selection of the series and the problems that arise in chaining them through wars, currency reforms and changes in index methodology are discussed in detail. We also propose adjustments to the constituent series which, compared to previously used series, yield significantly higher inflation rates during the Napoleonic Wars and a more pronounced deflation after their end, as well as a steeper price increase in 1948 and 1949. Finally, this article will examine the suitability of consumer price indices for the conversion of historical prices. This article includes a table containing annual index values. Monthly series are available online.

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Price indices are key indicators of national economic activity. Long-run price indices are also indispensable in deflating micro- and macroeconomic series to make them more comparable over time. And they make it possible to compute current equivalents of historical prices, which is a recurring issue. Price indices come in different shapes and forms, including wholesale price indices, retail or consumer price indices, export or import price indices as well as price deflators for GDP and its major components. This article deals with the prices paid by end users.

Background: The case for recalculating Austria's long-run consumer price index

In Austria, official surveys of prices were introduced in the 18th century, but the construction of indices measuring the change in the prices of selected goods did not commence until much later, and the systematic compilation of consumer price indices was not tackled until after the end of World War I (Mühlpeck et al., 1979a). The first consumer price indices were calculated back to 1914, the last year of peace before World War I, resulting in the continuous availability of index time series from 1914 onward, albeit combining different methodologies (ÖStZ, 1997).³ Mühlpeck et al. (1979a, 1979b) later broadened the picture by making a back-calculation of

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³ ÖStZ = Österreichisches Statistisches Zentralamt (Austrian Central Statistical Office), the precursor of today's Statistics Austria.

consumer price indices for the period from 1800 to 1914 for the territory of the Republic of Austria as it exists today.

These efforts made it possible to chain-link existing indices and track price changes in Austria from 1800 onward – a possibility that Mühlpeck et al. (1979a) highlighted by calculating the 1979 schilling value of the equestrian statues erected between 1858 and 1865 in Heldenplatz square in Vienna.⁴

While guidelines and examples for creating such chained indices have also been published by the Austrian Central Statistical Office (ÖStZ and WIFO, 1959; ÖStZ, 1998), the actual construction of continuous series has so far been left up to data users. Thus, there are still no official index series for the period covering the two world wars.

The only chained index for Austria ever published, to our knowledge, was developed by Butschek (1996, 2011). Yet, this index comes without a documentation and entails several methodological problems, which we outline below and to which we suggest possible solutions. The result of our exercise is a new long-run price index for Austria that chain-links indices for individual subperiods. It should be made clear at the outset, however, that we do not provide an official index; much rather, we offer a tool for conducting historical research and for illustrating the volatility of the currency's purchasing power as experienced by average households.

Compared with Butschek (1996, 2011), we left most annual inflation rates unaltered for the new index. We recalculated the index values for the periods from 1800 to 1820 and from 1945 to 1948. The ensuing adjustments are substantial, though, causing the price level to rise by as much as 20.15 million times (rather than 1.25 million times) during the 218 years from 1800 to 2018. As a consequence, the average annual increase in prices for this period rises from 6.65% to 8.02%. These averages essentially reflect the impact of three periods with steep price increases: the period during and after the Napoleonic Wars (until 1820), the First World War including the post-war period until 1925, and the period after the Second World War until 1952. The remaining 180 years – the periods between 1820 and 1914, between 1925 and 1945, and after 1952 – yield an average annual increase in prices of 1.49%, whereas the 38 high-inflation years come with an average annual increase of 45.16%. In other words, the considerable surge in prices since 1800 is predominantly attributable to turbulences that occurred in just one-sixth of the period under review. The median inflation rate of 2.02% for the years from 1801 to 2018 likewise shows that price changes were predominantly moderate.⁵ (See chart 1 in section 2 for an illustration of these developments.) The recalculation we undertook may also impact other economic indicators which use the consumer price index (CPI) for deflating, to the extent that such time series have been reconstructed or exist at all for the relevant time periods. Cases in point are time series

⁴ For more details on converting historical prices and other more suitable examples concerning the development of consumer prices (after all, average households rarely acquire equestrian statues), see section 4.

⁵ From 1800 to 1820, prices increased by a factor of 10.53 (an average annual price increase of 12.49%); from 1820 to 1914 by 1.67 (0.54%); from 1914 to 1925 by 15,043.03 (139.75%); from 1925 to 1945 by 1.12 (0.58%); from 1945 to 1952 by 8.93 (36.72%); from 1952 to 2018 by 7.62 (3.13%). From 1801 to 2018, the annual inflation rate was positive 166 times, negative 51 times, and there was one year with zero inflation (1937). In terms of ranges, the annual inflation rate exceeded 2% 110 times, 10% 28 times and 100% 7 times, whereas it dropped below –2% 29 times and below –10% 5 times (with all 5 incidents falling into the period from 1812 to 1823). (Average annual price increases based on geometric means.)

for nominal wages, nominal interest rates and economic output for the period from 1800 to 1820. Finally, the GDP figures for the period from 1945 to 1948 are not based on the CPI used by Butschek (1996, 2011) but on a dedicated GDP deflator; therefore these figures remain unaffected by the revision (Kausel et al., 1965).

This article is structured as follows. In section 1, we introduce the existing indices for the different subperiods. Section 2 explains how these indices can be chained together, addressing underlying considerations, and illustrates the differences between the new chained index we created and the chained index developed by Butschek (1996, 2011). Section 3 discusses to what extent indices covering only the city of Vienna and fewer goods and prices than today's CPI can reflect price developments for all of Austria. Section 4 examines the recurring issue of converting historical prices into current prices. In this respect it should be stressed that the index presented here does not lend itself for directly converting historical prices into current prices, because the period under review was characterized by seven different currencies in circulation and because all exchange rates between any two successive currencies need to be taken into consideration for the purpose of conversion.⁶ This technical

Table 1

Annual indices used and the price of silver (1800–1914)

Term used here	Term used in source	Data available for	Data used for	Base year	Note	Source	Circulating currency
All-items index ¹	Index der Verbraucherpreise 1800–1914	1800–1914	1820–1914	1914 = 100	Here we used the index labeled “Generalindex” by Mühlpeck et al., which is a Vienna-only index for reasons of data availability. (For more information, see main text.)	Mühlpeck et al. (1979a, 1979b)	Florins, crown
Silver price in paper florins	Silberkurs in fl Bankozettel	1800–1811	1800–1811	–	Price of 100 silver florins in the circulating florin currency; the currency reform of 1811 introduced new (Vienna standard) florins worth 5 paper florins	Pribam (1938)	Paper florins (Bancozettel)
Silver price in (Vienna standard) florins	Silberkurs in fl Wiener Währung	1811–beyond 1820	1812–1820	–	Price of 100 silver florins in the circulating florin currency; the currency reform of 1811 introduced new (Vienna standard) florins worth 5 paper florins	Pribam (1938)	(Vienna standard) florins (silver price drops to one-fifth <i>ceteris paribus</i>)
Index-based silver price	–	–	1800–1820	–	Calculated from silver prices published by Pribam (silver price of paper florins and (Vienna standard) florins)	Authors' calculations	Florins
New all-items index	–	–	1800–1914	–	For the period from 1800 to 1820, we adjusted the existing all-items index for the price of silver. The data for 1820 remained unchanged; 1820 is included for formal reasons (as the retrograde adjustment base year).	Authors' calculations (adjustment of existing index)	Florins, crown

Source: Authors' compilation.

¹ For the 1800–1820 period, Mühlpeck et al. used the changes in goods prices in silver rather than in the circulating currency. Hence, the all-items index failed to adequately reflect the volatility of the circulating currency, as the movements of the circulating currency were broadly masked by the exchange rate between the circulating currency and silver. To be able to use this series for the creation of a long-run index for Austria, we therefore had to factor in the exchange rate impact. The existing all-items index works fine from 1820 onward, by which time the relationship between silver florins and paper money had stabilized.

Note: “fl” = florin. All indices relate to Vienna and are assumed to be representative of modern-day Austria.

⁶ See table 7 for the currencies used in Austria since 1800, as well as “Selection of the currency for the base year 1938 in the 1948 retail price index” in section 2 for evidence of bias introduced by not taking into consideration individual exchange rates.

issue apart, there is the fundamental issue of limitations of CPI-based conversions. To address this issue, we compare CPI-based conversions with alternative methods based on nominal GDP and wages. The fifth and final section concludes.

1 Selection of constituent indices

For Austria, indices of consumer prices and living expenses have been regularly calculated and published since the 1920s. As consumer behavior changes with time, the basket of goods and services and underlying weightings have been adjusted periodically to ensure that the index continues to accurately reflect the trends in the general price level. In addition, price survey and index calculation methods have been developed further since the 1920s. The key changes in the indices constructed for Austria since the 1920s most notably include adjustments in the interval between basket changes in view of changing consumer behavior, changes in the number of items contained in the basket, and changes in the geographical coverage of price collection. Moreover, for some periods, we had to choose among alternative indices based on different methodologies. In other words, the creation of a long-run price index involved the selection and subsequent chaining of the most suitable indices. Tables 1 and 2 briefly illustrate the key characteristics of the constituent indices we used and the selection criteria we applied.⁷

Methodological considerations

Before delving into the description of specific indices, it is important to differentiate between the concepts of consumer price indices (CPI) and cost-of-living indices (COLI). While the CPI is a measure of changes, over time, in retail prices of one constant basket of goods and services, COLIs measure the changes in the price of maintaining a constant level of utility. This (constant) level of utility is based on a basket of goods and services regularly adjusted to reflect current consumption patterns. The idea is that households seek to minimize costs by replacing items that have become relatively more expensive with cheaper alternatives or switch to other goods or services as they become available if they provide the same level of utility at a lower cost. As the COLI approach is more complex and elaborate, CPI-based inflation rates – which primarily reflect changes in prices rather than changes in consumer behavior – have prevailed for practical purposes. Nevertheless, the composition and weighting of the CPI basket of goods and services are also subject to periodical adjustments. In other words, there are methodological overlaps between CPIs and COLIs.⁸

Yet, the CPI concept fails to work in times of rapidly changing consumption patterns, as is the case in periods of crisis during and after wars, since some goods included in the basket of goods might be temporarily unavailable. Consequently, indices for the years after World War I were geared toward amounts of calories, and the composition of the basket of goods was adjusted according to the availability of food items. Nonetheless, indices based on constant baskets of goods are preferable for a long-term study of price developments that includes periods of crisis, as discussed in this article. These indices permit the direct comparison of the costs of

⁷ For a more comprehensive illustration of the indices available for Austria, see Fluch (2016).

⁸ For a more detailed discussion of the characteristics of and differences between CPIs and COLIs, see Fluch (2016, p. 38). For a more comprehensive theoretical and practical consideration of CPIs, see the International Labour Organization (ILO) handbook (ILO, 2004).

pre-war and post-war baskets of goods (e.g. indices of the inter-war and post-war periods with the base years 1914 and 1938; see below), in a way skipping the methodologically problematic times of crisis. It should be stressed, however, that price developments and indices for times of crisis must always be interpreted with caution.

On top of that, even terminological issues need to be taken into consideration. Some price indices referred to as consumer price indices or cost-of-living indices are not consistent with today's conceptual frameworks. For example, two so-called cost-of-living indices compiled by the Austrian Institute of Economic Research

Table 2

Monthly “retail price indices” used (1914 to date)

Term used here	Term used in source	Data available for	Data used for	Base month	Note	Source	Circulating currency
1926 RPI (crowns)	Preisindex-zahlen aufgrund der Kleinhandelspreise ¹	July 1914–Jan. 1925	July 1914–Jan. 1925	July 1914 = 1	Monthly data from 1920 onward; data for 1914 refer to July; data for 1915–1919 available for January, April, July and October.	ÖStZ (1950), section XV. 4. a) a), p. 145 ff.	Crowns
1926 RPI (old schillings)		Jan 1925–March 1938	Jan 1925–March 1938	January 1925 = 100			Schilling (old) (1 old schilling = 10,000 crowns)
1926 RPI (reichsmark)		March 1938–Dec. 1945	March 1938–Dec. 1945	March 1938 = 100			Reichsmark (1 reichsmark = 1.5 old schillings)
1926 RPI (new schillings)		Jan. 1945–Dec. 1949	Jan. 1945–July 1948	March 1938 = 100 (prices in reichsmark)	“1926 RPI” is a reference to the underlying consumption table, which relates to 1926.		Schilling (new) (1 reichsmark = 1 new schilling)
1948 RPI ²	Kleinhandelspreisindex (Basis: März 1938)	From July 1948	From July 1948	March 1938 = 100 (prices in old schillings)	This index continues to be chained with current indices (most recently the 2015 CPI). “1948 RPI” is a reference to the first year for which the index was published.	Statistics Austria	Schilling (new), euro
1948 RPI (new)	–	–	From July 1948	–	1948 RPI recalculated based on reichsmark prices from 1938. Measures multiplied by 1.5.	Authors' calculations (adjustment of existing index)	Schilling (new), euro
Stretched 1926 RPI	–	–	March 1938–July 1948	–	Stretching the “1926 RPI (reichsmark)” and “RPI 26 (new schillings)” enables us to align the July 1948 figure of the stretched index with the “1948 RPI (new)” measure. ³	Authors' calculations (adjustment of existing index)	Reichsmark, schilling (new)

Source: Authors' compilation.

¹ For the period from January 1947 to December 1949, the source publication also contains prices in old schillings with March 1938 as the base year, without providing any reasoning or explanation. Additional index figures (schilling prices for March 1938 = 100) are also provided for the period from January 1948 to December 1949 (section XV. 4. b), p. 148), citing “Statistische Nachrichten” as the source. From July 1948 onward, these additional index figures match the RPI figures (Kleinhandelspreisindex) with March 1938 as the base year – see below. Before July 1948, these figures do not match any of the other available index figures. Here, too, we were unable to find an explanation.

² The index is based on prices in old schillings for March 1938 = 100. In other words, the conversion from old schillings to reichsmark in March 1938 (1 reichsmark = 1.5 old schillings) was not taken into account. To be able to use this series for chain-linking, we therefore had to recalculate the index series (see below).

³ The “1926 RPI 26 (new schillings)” and the “RPI 48 (new)” overlap during the period from July 1948 to December 1949. However, the “RPI 48 (new)” measures are 3% higher on average, reflecting differences in the basket of goods. The “1926 RPI (reichsmark)” and “1926 RPI (new schillings)” use the same base (reichsmark prices for March 1938 = 100). The “1948 RPI 48 (new)” is methodologically more sophisticated, but not available before 1948. This leads us to the assumption that the “1926 RPI (reichsmark)” and the “1926 RPI (new schillings)” do not reflect the increase in prices from March 1938 to July 1948 in full. Our technical solution is to stretch the time series by distributing the difference evenly across the period of observation, to make up for the methodological differences. Formula: $\text{monthly_value_new} = (\text{final_index_new} - 100)/(\text{final_index_old} - 100) * (\text{monthly_value_old} - 100) + 100$, $\text{final_index_new} = \text{“1948 RPI (new)” figure for July 1948}$, $\text{final_index_old} = \text{“1926 RPI” figure for July 1948}$.

Note: Geographical note: All indices relate to modern-day Austria. Note on the data sources: “Statistische Nachrichten” published by the Austrian Central Statistical Office constitute an alternative historical source. Minor differences between figures taken from different publications may be due to revisions made in the historical sources and due to rounding. When computing the long-run index, we always selected the figures from the newest known publication. Note on retail prices published in “Statistische Nachrichten” from September 1946 in the sections on retail prices and general economic conditions: The reports published from December 1948 to March 1949 (volume IV/1949) provided the index data based on old schilling prices in the retail price index sections (see page 56 f and later) while also indicating reichsmark-based index figures in the sections on the general economic situation (see page 49 f and later).

(WIFO) – “Lebenshaltungskostenindex (LHKI) 1938” and “(LHKI) 1945” – actually constitute consumer price indices as they are based on a constant consumption table.⁹ It is therefore important to always be mindful of underlying descriptions when using historical indices. Similarly, as far as Austria is concerned, any reference to an index that translates as retail price index – “Kleinhandelspreisindex (KHPI)” – is actually a reference to a consumer price index; this particular index is calculated on the basis of a relatively constant end user consumption table and also comprises goods that do not qualify as retail goods, like housing and electricity.¹⁰

Index reconstruction for the 1800–1914 period by Mühlpeck et al.

The groundwork for studying price developments in the 19th century was laid with the time series published by Mühlpeck, Sandgruber and Woitek for the period between 1800 and 1914 in an anniversary publication on the history and work of centralized official statistics in Austria for the period 1829–1979.¹¹ They built upon the systematic collection and publication of prices, which had started in the 19th century, for instance with the production of Statistical Tables (“Statistische Tafeln”) for the Austrian Monarchy from 1828 onward. The benefits of consistent, comparable and long-term price series were highlighted by academic research, e.g. for projects in the context of the 1873 Vienna World Fair. The need for statistical information on prices became apparent also in light of the planned conversion to a gold currency in the early 1890s (k.k. Finanz-Ministerium, 1892). In an initial large-scale research project, select price and wage series had been extended back to the 14th century by Pribram (1938).¹² Yet, he had focused exclusively on compiling individual prices rather than on constructing a proper index. Mühlpeck et al. (1979) deserve credit for having developed a modern CPI from the variety of existing price data, taking 1914 as a starting point for back-calculations to 1800. They used data from Vienna, Linz, Graz and Innsbruck for the entire period,¹³ with their basket of goods comprising food items, rent data, textiles and other commodities. While they managed to establish food price indices for individual regions, the all-items index had to be calculated from the data for Vienna only due to data availability issues. Thus, the time series they created, and which we used for our chained index, de facto represents a CPI for Vienna (disregarding regional data for Linz, Graz and Innsbruck).

⁹ For further details, see ÖStZ and WIFO (1959, p. 23).

¹⁰ As opposed to indices aimed at measuring changes in the prices of end users’ constant baskets of goods or end users’ utility levels of consumption (CPI, COLI), wholesale price indices, producer price indices as well as import price indices relate to different levels of the economic process and are thus not covered in this article.

¹¹ Mühlpeck (1979a and 1979b) are part of this anniversary publication entitled “Festschrift ‘Geschichte und Ergebnisse der zentralen amtlichen Statistik in Österreich 1829–1979.’” In earlier publications, Hubbard (1973) calculated the CPI for Graz from 1861 to 1914 and Good (1976) did so for Vienna from 1874 to 1913. The calculations provided by Mühlpeck et al. (1979) cover the entire 19th century.

¹² The time series available for Vienna and Klosterneuburg were evaluated and new data for Salzburg were gathered in the context of an Austrian Science Fund project run from 2017 to 2020 at the Universities of Salzburg (Reinhold Reith) and Vienna (Thomas Ertl). This project served to develop and calculate adequate baskets of goods and real wages for the period from 1450 to 1850.

¹³ In the first half of the 19th century, missing prices for Innsbruck (Tirol) and Linz (Upper Austria) were complemented by data from Rattenberg (Tirol) and Wels (Upper Austria). For additional surveys of prices and wages for areas of the Austro-Hungarian Monarchy beyond today’s borders of the Republic of Austria, see Cvrcek (2013).

Basket of goods and component weightings

The composition of the basket of goods used by Mühlpeck et al. is based on a consumer survey among Viennese working-class households conducted between 1912 and 1914. Based on the relative proportions of average household expenditures as reflected by this survey, Mühlpeck et al. established the following weights: food (50.5%), housing expenses (13.7%), clothing and linens (8.5%), drinks and tobacco (6.5%) and lighting and heating (4.3%). All “other purposes” (cultural expenses, fees, recreation, vacation, services) amounted to 16.6% of the total expenses. The basket of goods was established with the base 1914 = 100 and used without adaptations for the period from 1800 onward. The all-items index was calculated as a Laspeyres index.

In doing so, Mühlpeck et al. assume that consumer behavior did not change significantly over the course of the 19th century, corroborating this hypothesis with data from various sources. In practice, Mühlpeck et al. selected only those goods and services from the 1912/1914 consumer survey that were known and available over the entire period from 1800 onward, skipping rarely consumed goods as well as taxes and insurance payments. While leaving unchanged the weighting of consumption categories, Mühlpeck et al. did adjust individual goods around the middle of the 19th century. Thus, the price series for candles and wood were replaced with series for petroleum and coal, respectively. In total, the basket comprises 37 goods in eight consumption categories.

Underlying data and calculation of index

In compiling price data, Mühlpeck et al. above all built on the work done by Pribram (1938), supplementing his findings with data from statistical yearbooks, market office records as well as records from chambers of commerce and trade. Observed prices and quantities were converted into uniform units of measure and all currencies in circulation at any one time were denoted in crowns and heller to improve comparability over time. These measures served to track changes in food prices in a fairly good manner, as food items accounted for 24 out of all 37 price series included. The bigger challenge was estimating expenditures for rent, textiles (represented by wool, loden and cotton) as well as body care products (soap). Here, the corresponding prices were either calculated as simple averages or extrapolated from other data. Missing prices were interpolated from trends of available prices. From the range of indices calculated by Mühlpeck et al. from the prices they compiled, we selected their “all items index” series (“Generalindex”; created using data for Vienna only, see above) as the chain-link covering the period up to 1914 in our long-run index for Austria.¹⁴

The beginning of systematic price index creation after World War I

Given rapidly rising inflation rates in the years during and after World War I, an official price index for Austria was launched in 1921 for the purposes of public administration and the courts by the Central Statistical Commission (Statistische Zentralkommission). Subsequently, the Federal Statistical Office (Bundesamt für

¹⁴ For the all-items index, Mühlpeck et al. (1979) disregard the positions “letter postage” and “newspaper,” as they do not consider the only continuously available series in this context to be representative of the expenditure items “public charges and fees” and “intellectual purposes,” respectively (p. 680). We adopt this approach as well.

Statistik), as the statistical authority was known from October 1921 onward, and the Parity Commission for wages and prices (Paritätische Kommission für Preis- und Lohnfragen) responsible for the provision of price data for collective wage bargaining experimented with the creation of different CPIs (Kamitz, 1949).¹⁵

Calculating price indices for war periods and immediate post-war periods, characterized by bottlenecks in supply, rationing and the existence of black markets, is challenging for several reasons.¹⁶ When the price of a basket of goods is assessed for changes over time, the resulting outcomes will allow for a meaningful analysis only if the composition of the typical consumption basket has remained broadly unchanged. This was of course not the case during and especially immediately after the war. A general scarcity of goods, rationing and profound changes in relative prices in conjunction with a decline in the level of consumption led to marked changes in the composition of consumption expenditures. Furthermore, many goods included in the consumption table became unavailable or were only available in comparably poor quality as the war progressed. This holds equally true for the post-war period (Kravis, 1948). Moreover, the constraints of price collection added to the challenge of creating meaningful indices. Especially right after the war, only a fraction of the basket of goods was available at official or officially tolerated prices, while households were compelled to satisfy basic needs through illicit trade on the so-called “gray” or black markets at rates substantially exceeding official prices (Klezl, 1925; Kravis, 1948; Suppanz, 1976).

Under such constraints, a price index can basically be calculated in two different ways, which were both pursued in the case at hand. First, the index may be limited to reflect spending on food items (which is easier to track) by calculating the costs of minimum food intake requirements rather than the costs of fixed basket of goods. Thus, this strategy consists in defining a minimum reference amount of calories and protein and fat, to be provided by different foodstuffs depending on availability and relative prices. This means that the consumption table may vary over time (Klezl, 1921b). The resulting index reflects the change in the cost of securing the required minimum food intake. In this vein, the Federal Statistical Office began publishing a required food intake index for Vienna (“vierwöchige Kosten des notwendigen Ernährungsaufwandes in Wien”) in January 1921 or, to be precise, the four-week costs of securing a daily intake of 3,000 calories for an adult male. The composition varied from month to month and was based on the available foodstuffs. Rationed quantities were calculated with official prices, while any additional quantities were calculated with open market prices.¹⁷

¹⁵ The Parity Commission was established by the Federal Act on the reduction of food subsidies of December 21, 1921, and remained active until May 1925.

¹⁶ This was an issue both after World War I (Klezl, 1921a) and World War II (WIFO, 1949; ÖStZ and WIFO, 1959).

¹⁷ 1914 was not used as the starting year for the 1921 index series as it was not possible to ascertain the market conditions prevailing in 1914. Still, the cost for July 1914 was calculated for comparative purposes, using the last consumption table. This index using 1921 as basis was last published in December 1925. See *Statistische Nachrichten* from December 1925, pp. 250–251. In parallel, a broader index of the “increase in total spending required to support a family in Vienna” (*Verteuerung des notwendigen Gesamtaufwandes einer Familie in Wien*) was calculated for a short period of time from March 1921 onwards. The intent was to show changes in the consumption expenditures of a family of four. The basket contained five consumption categories, with foodstuffs being taken from the required food intake index for Vienna. The four other groups were clothing, housing, lighting/heating and other. This index was only calculated for the months of January, March, June, October and December 1921. The index figure for July 1914 was set at 1.

While the required food intake index provides meaningful insights into the supply situation the population faced and can therefore be a useful tool for social policy, this approach quickly reaches its limits when it comes to a long-term assessment of price developments that also takes into account needs beyond nutrition. A second strategy therefore consists of assessing price changes with regard to a constant but broadly defined basket. Since this approach masks the widespread use of substitute items, the resulting index values may appear ahistoric in the short term. If, on the other hand, we assume that the improved supply situation, the end of rationing and the return to market prices were accompanied by a normalization of consumer behavior, the fixing of the basket allows price levels to be consistently compared over a longer period of time – with the exception of periods marked by deficiencies in supply and rationing. This second strategy was used for the cost-of-living index based on the weekly consumption of one person (“Index der Kosten der Lebenshaltung nach Maßgabe des Wochenverbrauchs einer Person”), published from January 1922 onward by the Parity Commission and the Federal Statistical Office. Using July 1914 as starting point, this method relied on a fixed basket of goods based on consumption estimates.¹⁸

The extent to which the price developments of fixed and variable baskets of goods can vary in times of acute distress, such as those during the years following World War I, is evidenced by Klezl (1921b). Starting with July 1914 = 1 as the base, Klezl calculated an 89-fold increase in the price of a fixed basket of goods by December 1920, but “only” a 67-fold increase in the price of a certain number of calories in a variable basket of goods. A further possible distortion stems from changes in quality. By assuming a consistent consumption table, the index underestimates the true increase in consumer prices during the war and post-war years as the quality of goods available at a given price worsened. During the gradual normalization following the war, then, the reverse occurred. Neither phenomenon is taken into account in the calculation of the indices.

Thus, a constant but widely defined basket of goods is clearly preferable for a long-term price index. Since it is safe to presume that consumption patterns did not change fundamentally between the last year of peace and the return to market prices after the war, the index correctly shows the change in prices between these two years. This means that it is also possible to assess long-term price developments over the wartime period. At the same time, the figures for the war period and its immediate aftermath need to be interpreted with caution.

1914–1958: The 1926 consumption table as the basis for long-term price comparisons

The need to compare price developments for the period covering the two world wars is best met using an index initially labeled “index of living cost changes” (Statistische Nachrichten, 1926(1), p. 13) and later referred to as “retail price index” (“Kleinhandelspreisindex” – KHPI) in Central Statistical Office publications

¹⁸ The methodological foundations of this index are given in No. 1 of Volume II of the Notices “Mitteilungen” of the Bundesamt für Statistik (Federal Statistical Office; see also Statistische Nachrichten, 1923, p. 14).

after 1945¹⁹ – or, to be precise, “1926 RPI,” because it is based on the consumption table of 1926.²⁰ To complicate things further, this retail price index is technically a consumer price index, as outlined above. The “index of living cost changes” was introduced to replace the required food intake index covering the needs of male adults and the cost-of-living index based on the weekly consumption of one person, which were terminated at the beginning of 1926, following the end of hyperinflation, the stabilization of the currency and the introduction of the schilling in 1925. It was published in the *Statistische Nachrichten* from January 1926 until December 1938.

However, the basket of goods on which the index of living cost changes also known as “1926 RPI” is based was also used for back-calculations to July 1914 and (with minor changes) formed the basis for index calculations for the period from 1938 to 1958. This means that the baskets of goods for 1914 and 1958 are comparable and that the RPI offers the desired stability for the period covering the two world wars. For the creation of our chained long-run index, we therefore do not use the aforementioned indices of the Federal Office and the Parity Commission (required food intake index and cost-of-living index) for the period from 1914 to 1925 calculated at the time, but rather the so-called retail price index subsequently calculated on the basis of the 1926 consumption table and published in *ÖStZ* (1950).²¹

The 1926 RPI introduced a range of changes compared to the indices which were published immediately following the war. The basket of goods was completely revised to consist of six categories (food, beverages and tobacco, clothing, heating/lighting, housing, other), which covered significantly more index items, including rental costs. Seasonal goods such as fresh vegetables and fruit were still excluded, however, in order to keep the basket consistent throughout the year.

When the new index was introduced, it was made clear that it did not tie in with the previous index series (*Statistische Nachrichten*, 1926(1), p. 13). Already in March 1926, however, the Federal Statistical Office decided to address the general need for long-term comparative series and to calculate and publish a parallel series starting in 1914 (1914 = 1) alongside the January 1926 = 100 series.²² For this purpose, the pre-war prices gleaned from the cost-of-living index based on the

¹⁹ See *ÖStZ* (1950) or *ÖStZ* (1998). The index of living cost changes published in the *Statistische Nachrichten* between 1926 and 1938 matches the retail price index in later publications of the Statistical Central Office. *ÖStZ* and *WIFO* (1959, p. 22) explicitly state that it is the same index under a different name. The name change may lead to confusion since the *Statistische Nachrichten* also contained monthly “retail prices of major consumer goods” (*Kleinhandelspreise wichtiger Bedarfsgegenstände*) since they first appeared in 1923. The information provided included absolute prices in kronen (and later schillings), index figures for individual goods as well as the unweighted arithmetic mean of all indices, a measure that was referred to as “Meßziffer.” However, this is clearly not the index later referred to as the RPI.

²⁰ *ÖStZ* and *WIFO* (1959) state that the label “retail price index” should not lead to the assumption that this is a real index of prices paid in retail. It is rather an index of those prices that are relevant to the standard of living. This is indicated by the inclusion of fees (prices for services) as well as by the title of the publication in which the index was first presented to the public: *The new index calculation of changes in living costs*.

²¹ *ÖStZ* (1950) does not expressly confirm that the so-called retail price index for the period from 1914 to 1925 was calculated on the basis of the 1926 consumption table. While this does seem probable, it would need to be verified using the price series for individual goods (*ÖStZ*, 1997) and the weighting pattern in the *Statistische Nachrichten* (1926, p. 13).

²² *Statistische Nachrichten*, 1926(3); p. 69. Publication based on July 1914 = 1 also allows for comparisons with the wholesale price index based on 1914 = 1.

weekly consumption of one person were reweighted using the 1926 consumption table. The two consumption expenditure totals from the two goods baskets were used to calculate the ratio between the two index levels. From then on, both index series were published monthly. The monthly articles published in the Federal Statistical Office's *Statistische Nachrichten* always provided the latest 1926 RPI figures (compared with the previous month), but index overview tables were published only sporadically (for example the indices for the period from January to December 1926 in *Statistische Nachrichten* 1926(12)). The July 1914=1 index series was published monthly in the *Statistische Nachrichten*. As of May 1938, the index was converted to reichsmark, based on the official conversion rate (1 reichsmark=1.5 schilling).²³ The basket of goods as such was left unchanged. Publication of the *Statistische Nachrichten* ceased in December 1938.

Following the end of World War II, regular publication of price indices resumed. As after World War I, the statistical offices were faced with the challenges of adequately reflecting the impact of rationing, goods only being available on the black market and reduced and/or noncomparable quality of the surveyed goods. The WIFO made a cost-of-living index available as early as April 1946,²⁴ while the *Statistische Nachrichten* provided only individual prices rather than a full-fledged index. Data on the so-called retail price index ("Kleinhandelspreisindex", see above) for major commodities in Vienna – which we used for the creation of the long-run consumer price index – were provided in the *Statistische Nachrichten* from July 1948 onward (which is why we refer to this index as the 1948 RPI in the following). The composition of the 1948 RPI was based on the 1926 RPI, subject to certain adjustments.²⁵ The 1948 RPI was calculated as a weighted arithmetic mean until February 1959 and regularly published in the *Statistische Nachrichten*. The missing years from 1939 to 1947 were later supplemented by the Central Statistical Office, and a continuous RPI for 1914–1949 was then published in the *Statistisches Handbuch* 1950 (ÖStZ and WIFO, 1959, p. 23).

1959–present: Consumer price index I and II and subsequent revisions

The 1954/55 consumer survey showed that the consumption table underpinning the retail price and cost-of-living indices no longer corresponded to consumer behavior in the post-war period. This led to a revision and expansion of the basket of goods and to the calculation of two new consumer price indices, labeled CPI I (representing

²³ *Statistische Nachrichten*, 1938, Volume 3/4; p. 74 and *Statistische Nachrichten*, 1938(6), p. 134.

²⁴ The cost-of-living index based on the post-war consumption table for a four-person working-class family was calculated by the Austrian Institute of Economic Research from April 1946 until February 1959 on the price basis of April 1938 = 100 and April 1945 = 100. The basket of goods consisted of nine consumption categories, designed to represent the consumption table for a four-person household.

²⁵ For example, unlike the 1921 RPI, the 1948 RPI did not include a "housing" consumption category. In November and December 1938 (final issue of *Statistische Nachrichten*/last time the consumption table was published), housing had accounted for a share of 5.6% of the living expenses / the index. Adjustments of this kind raise the question of how comparable and chainable structurally modified indices are. Yet, changes to the consumption tables are driven by the possible range of price collection, which was widening after World War II. For a more detailed discussion of the indices available during the post-war period (1948 RPI, WIFO cost-of-living index, CPI I and CPI II), see ÖStZ and WIFO (1959). We prefer the 1948 RPI to WIFO's cost-of-living index (the consumption table of which includes housing costs, for example) as the 1948 RPI is based on the 1926 RPI, and the 1948 RPI and the cost-of-living index moved broadly in synch from 1938 to 1958 (see ÖStZ and WIFO, p. 23 ff.). Any indices that were launched later use an improved methodology. Using/chaining them requires an explanation only when there are multiple indices among which to choose.

an average working-class household) and CPI II (representing a four-person working-class household). The survey areas were expanded significantly, including all seven provincial capitals existing at the time in addition to Vienna as well as St. Pölten and Wiener Neustadt (for Lower Austria). Among other things, fresh vegetables and fruit were added to the basket of goods (ÖStZ and WIFO, 1959). The two indices were calculated in parallel from March 1959 to December 1966 and moved virtually in synch. We chose the CPI II for the chained index – just like Statistics Austria did for the chaining of the continuously published RPI series (base: March 1938 = 100). The continuation of the RPI (chaining with current indices) by Statistics Austria thereby conveniently allowed us to use the RPI time series for monthly values from July 1948 onward when creating the new index (see also table 2). No special discussion of the subsequent indices is required.

Over the subsequent decades, the CPI was initially revised every ten years (1966, 1976, 1986, 1996) and later every five years (2000, 2005, 2010, 2015).²⁶ The composition of the baskets of goods remained in flux, and the expansion of product groups and goods in the collection of prices took changing consumer behaviors and the increasing level of prosperity into account. 1997 saw the launch of the Harmonised Index of Consumer Prices (HICP), which has since been published in parallel to the CPI. The two indices entail minor methodological differences in terms of the basket of goods and weighting. For the purpose of consistency, we used the CPI for our chained long-term index. Until the end of 2010, the CPI was calculated as a fixed-based index, but continues to be calculated as a Laspeyres index. Since the start of 2011, the CPI has been calculated as chained index. As the indices are chained in the December of each year, the baskets of goods can theoretically be adjusted every year.

2 The creation of a long-run index

The way to create a long-run price index for the past 200 years is to chain-link the indices available for the individual subperiods. With regard to chaining, a number of constraints are to be considered. These particularly concern the choice of currency for the period 1800–1820 and the linking of the indices during World War II. In both cases, the published index values must be revised and multiplied by adjustment factors in order to ensure an adequate reflection of price developments. While this issue has been repeatedly mentioned in the literature, it has not yet been explicitly discussed, and the required adjustments have not always been made (in full) in practice. For example, Statistics Austria addressed the issue by multiplying the conversion factors underlying its conversion chart (“Börsenkurier”) by 1.5, yet left the index values themselves unadjusted. Mühlpeck et al. (1979a, 1979b) also carried out a methodologically correct conversion of 1858 prices into 1979 prices. In both cases, however, no details are provided regarding the chaining of indices between 1938 and 1948. ÖStZ (1998) refers to the issue in the context of adjusting prices prior to 1820 but does not make any adjustments to the 1938–1948 chaining. It is therefore unsurprising that the chained index in Butschek (1996, 2011) does not take the two problems into account. Instead of subsequently applying adjustment

²⁶ See ÖStZ (1967) and the revision articles published in *Statistische Nachrichten* (04/1977 = volume 32); new series: 05/1987, 04/1997, 05/1997, 05/2001, 05/2006, 05/2011, 05/2017.

factors, we sought to explicitly address both issues during the creation of the new index. The following section presents this approach in detail.

Selection of the currency for the 1800–1820 period

Since 1800, nine different currencies have been used in Austria: paper florins (Bancozettel), three different florins (Vienna standard, Convention standard, Austrian standard), the crown, the schilling (old), the reichsmark, the schilling (new) and the euro (Jobst and Kernbauer, 2016; see also table 8). The adoption of a new currency name usually entailed a change in the nominal value of the currency units, as was the case, for example, when ATS 13.7603 became EUR 1 in 1999. Note that the changes in nominal prices associated with currency conversion do not constitute inflation (or deflation) and must therefore be excluded when calculating inflation.

One possible approach to dealing with multiple currencies is to convert all prices to a single currency unit. Mühlpeck et al. (1979a, 1979b) adopted this approach when collecting historical prices for the purpose of reconstructing a consumer price index for the 19th century. They converted all prices to crowns. For the period from 1800 to 1820, Mühlpeck et al. opted not to convert the prices into crowns directly from paper florins (or from Vienna standard florins after the 1811 currency reform) – as published by Pribram (1938) – according to the nominal exchange rate but rather into silver florins (Convention standard) first.²⁷ The reason for this decision was the significant devaluation of Austrian paper money during and immediately after the Napoleonic Wars (Jobst and Kernbauer, 2016). Until 1797, the relative value of silver florin coins and paper florins issued by the Municipal Bank of Vienna (Wiener Stadtbanco) had remained stable. However, repeated issuances of paper florins to finance the war with France fueled the devaluation of paper money, which was ultimately declared legal tender in 1797. Silver florins became a commodity, and the amount of paper money required to purchase silver florins on the market kept rising over the course of the war. The market price of silver florins in paper florins was used by Mühlpeck et al. (1979a, 1979b) to convert the paper money prices published by Pribram and other sources into silver florins.²⁸ In other words, the prices that entered into their CPI calculations are not expressed in the circulating currency (paper florins) but rather in silver florins. The result of this is that the index does not, at least not fully, show the high inflation during the Napoleonic Wars. Instead, it measures the development of the price of the basket of goods relative to another commodity (i.e. silver).²⁹

²⁷ The nominal exchange rates for the currencies used in Austria during the 19th century are: paper florins (until early 1811; 100 paper florins (Bancozettel) = 16.80 crowns), Vienna standard florins (from 1811 onward, officially removed from circulation in 1857; 100 florins (Vienna standard) = 84 crowns), Convention standard florins (from 1816 onward; 100 florins (Convention standard) = 210 crowns), Austrian standard florins (from 1857 onward; 100 florins (Austrian standard) = 200 crowns) and crowns (from 1900 onward). For the conversion rates, see also the table in Jobst and Kernbauer (2016), p. 273 f.

²⁸ The conversion to (Convention standard) florins is not discussed in detail in Mühlpeck et al. (1979a). The text merely contains a table showing changes in the market price of silver, calculated by Pribram (1938) based on the exchange rate between Vienna and Augsburg, where silver was actually used for payments. However, the comparison of prices for individual goods given in contemporary currencies (Pribram, 1938) and the relevant series in Mühlpeck et al. (1979b) shows that the conversion took place as described here.

²⁹ Applying the same approach to the period of hyperinflation in Austria following World War I would entail converting all prices from Austrian crowns into U.S. dollars prior to calculating the rate of inflation. Also in this case, the hyperinflation would be visible in the conversion rate to the U.S. dollar but not in the (dollar-based) price index.

This approach, which remained unaddressed by Mühlpeck et al. (1979a, 1979b), may reflect extensive international research efforts to collect data for prices and wages in grams of silver in order to allow international comparability of e.g. real wages or living standards. In terms of using the CPI to measure general price developments and the devaluation of money as well as the deflating of nominal amounts expressed in the circulating currency, however, the method chosen by Mühlpeck et al. is unsatisfactory. The fact that the depreciation of the Austrian currency vis-à-vis silver must be taken into consideration to obtain an adequate view of price developments is well known from the literature. Providing an example for the adjustment of historical amounts, ÖStZ (1998) explains that the meaningful use of the Mühlpeck et al. index requires amounts before 1857 to be converted into Austrian standard florins (valid from 1858) using a conversion factor which varies greatly prior to 1820.³⁰ In other words: The Mühlpeck et al. index alone does not show the price changes between 1800 and 1820 in their entirety.

In order to obtain a series that is easier to interpret and to avoid the intermediate step of using conversion factors, we recommend reversing the conversion of prices expressed in the circulating currencies by Pribram (1938) into silver. In other words, our approach is to use the circulating currencies to recalculate the index. We need to make these adjustments until 1820, because from 1820 onward, the privilegierte oesterreichische National-Bank (founded in 1816) managed to stabilize the relationship between silver florins and paper money at a steady rate of 2.5 to 1 by issuing banknotes redeemable for silver at the central bank on demand as well as by facilitating the gradual exchange of the previous inflationary state paper money into banknotes. Specifically, we take the index value of 1820 as the starting point and adjust it for changes in the rate of silver to the currencies circulating in the period from 1800 to 1819. Note that silver florins once again traded at a premium over paper money in the period from 1848 to 1878. The prices for this period, however, were not converted into silver florins by Mühlpeck et al. (1979a, 1979b), enabling us to use this series without any adjustments.³¹

Table 3 serves to compare Mühlpeck et al.'s index, silver florin prices and the new index presented here for the period from 1800 to 1820. As evidenced by the Mühlpeck all-items index, the Napoleonic Wars were a period during which Austria (and the rest of Europe) witnessed a surge in prices, as expressed in silver (or gold). In Austria, the prices measured in silver peaked in 1811 (up 54% from 1800) before falling back to their 1800 levels by 1819. Austria's use of the printing press to finance the wars also led to a massive devaluation of the national currency vis-à-vis silver, which – apart from the short rise in 1812–1813 – did not reverse sustainably until after 1815, and even then only partially.

³⁰ The conversion factors to be used before 1820 are not, however, given in ÖStZ (1998). We used the florin prices (paper florins and Vienna standard florins) stated in Pribram (1938).

³¹ If necessary, the series can be converted into silver. No adjustment is needed from 1820 to 1847 because of the consistent convertibility of the florin into silver. The price of silver did, however, fluctuate significantly after this period and the annual figures required for converting the CPI into silver depend heavily on the selected calculation method (end-of-year figures or averages of end-of-month figures or of daily figures) or on whether and how the silver prices in Vienna missing for some periods are replaced by exchange rates against silver currencies or London silver prices. For corresponding data, see K.k. Finanz-Ministerium. For monthly and annual figures for the period from 1863 to 1879, see Jobst und Scheiber (2014) – publication and data available at: <https://www.oenb.at/Publikationen/Volkswirtschaft/south-east-european-monetary-history-network-data-volume/download.html>. On the subject of the rise and fall of the price of silver, see Jobst and Kernbauer (2016, p. 124 ff.).

Table 3

Comparison of historical price indices for the period from 1800 to 1820**Revision and chaining of existing indices explained; adjustments made for currency reform of 1811 and alignment with silver prices from 1800 to 1820**

	Mühlpeck all-items index, ¹ 1914 = 100	Silver price in paper florins ²	Silver price in (Vienna standard) florins ²	Index-based silver price, 1820 = 100	New all-items index, 1914 = 100	Mühlpeck all-items index	New all-items index
		Currency reform of 1811: 1 (Vienna standard) florin = 5 paper florins		Recalculated ³	Recalculated ⁴		
	Annual indices or annual prices				Annual inflation rates		
1800	62.0	114.9		9.2	5.7		
1801	61.6	115.8		9.3	5.7	-0.6	0.1
1802	62.0	121.7		9.7	6.0	0.6	5.8
1803	63.4	130.8		10.5	6.6	2.3	9.9
1804	80.4	134.3		10.7	8.6	26.8	30.2
1805	84.7	134.8		10.8	9.1	5.3	5.7
1806	81.3	173.0		13.8	11.3	-4.0	23.2
1807	76.2	209.4		16.8	12.8	-6.3	13.5
1808	97.6	228.2		18.3	17.8	28.1	39.5
1809	94.8	296.0		23.7	22.5	-2.9	26.0
1810	87.3	492.1		39.4	34.4	-7.9	53.1
1811	95.6	1093.8		87.5	83.7	9.5	143.4
1812	90.2		201.8	80.7	72.8	-5.6	-12.9
1813	82.2		159.2	63.7	52.3	-8.9	-28.1
1814	77.1		228.8	91.5	70.6	-6.2	34.8
1815	70.7		351.1	140.4	99.3	-8.3	40.7
1816	76.8		327.0	130.8	100.5	8.6	1.2
1817	71.6		332.8	133.1	95.3	-6.8	-5.1
1818	71.2		255.4	102.2	72.7	-0.6	-23.7
1819	59.6		249.2	99.7	59.4	-16.3	-18.3
1820	60.0		250.0	100.0	60.0	0.7	1.0

Source: See footnotes, authors' calculations.

¹Mühlpeck et al. (1979a, 1979b). We selected Mühlpeck et al.'s all-items index (Generalindex). Annual figures from 1800 to 1914 (1914 = 100). For the 1800–1820 period, Mühlpeck et al. used the changes in goods prices in silver rather than in the circulating currency. Hence, the all-items index failed to adequately reflect the volatility of the circulating currency, as the movements of the circulating currency were broadly masked by the exchange rate between the circulating currency and silver. To be able to use this series for the creation of a long-run index for Austria, we therefore had to factor in the exchange rate impact. The existing all-items index works fine from 1820 onward, by which time the relationship between silver florins and paper money had stabilized.

²Pribram (1938). Silver price of paper florins (1800 to 1811). Silver price of (Vienna standard) florins (from 1812, silver price drops to one-fifth ceteris paribus).

³Calculated based on the silver price of paper florins and, following the currency reform of 1811, (Vienna standard) florins.

⁴Mühlpeck et al.'s all-items index adjusted for silver prices for the 1800–1820 period. The data for the 1820 remained unchanged; 1820 is included for formal reasons (as the retrograde adjustment base year).

Note: Blank cells = no figures available; see article for further details on the indices; some index terms suggested by authors.

Table 3 also shows the price of silver florins expressed in the respective circulating currency – i.e. paper florins up to and including 1811 and (Vienna standard) florins (redemption and anticipation certificates – “Einlösungsscheine” and “Antizipations-scheine”) thereafter. Since redemption certificates were introduced at a ratio of 1:5 to paper florins in 1811, post-1811 prices have to be multiplied by a factor of five in order to adequately mirror the loss of value of the circulating currency in relation to silver. This evidences the dramatic devaluation of the Austrian currency and the pronounced fluctuations over this period (table 3, index-based silver price and new all-items index).

When we adjust the index of prices expressed in silver for changes in the price of silver to recalculate the index for prices in the circulating currency, we arrive at significantly higher rates of inflation and deflation for the period from 1800 to 1820 (table 3, annual inflation rates based on the “Mühlpeck all-items index” versus the “new all-items index”). Moreover, the peak price level shifts from 1811 (Mühlpeck et al. index) to 1816 (new index), representing an increase by a factor of almost 18 from the levels observed in 1800. Following several years of major deflation, characterized by decreasing prices in silver and the rising silver value of the circulating currency, the increase in prices compared with 1800 levels stabilized at a factor of approximately 10 in 1820.

Selection of the currency for the base year 1938 in the 1948 retail price index

Then there is the challenge of how to best capture price changes during the period of World War II. With the slow normalization of supply conditions after the war had ended in 1945, the Central Statistical Office resumed the publication of a retail price index for Vienna in December 1947 (*Statistische Nachrichten*, 1947(12), pp. 227–228).³² The calculation of the index figures was based on the prices for March 1938, i.e. the last year of peace with market-based price formation. The prices for March 1938 were stated in reichsmark. Given that the schilling was re-introduced at a ratio of 1:1 to the reichsmark in 1945, this approach is methodologically correct.

In March 1949, the Central Statistical Office started publishing a second set of price/index figures. Henceforth, the data obtained on (new) schilling prices³³ were compared not only with reichsmark prices but also with old (1938) schilling prices (*Statistische Nachrichten*, 1949(1–3), p. 56). This approach ignored the fact that the two currencies did not have a 1:1 exchange ratio, as 3 (old) schillings had been converted into 2 reichsmark in March 1938. As a result, the prices for the base year appeared 50% higher and index increases appeared one-third lower. Why this change was made in 1949 and why methodologically correct and methodologically incorrect indices were published in parallel for a while is not evident from the available documentation.³⁴ Much rather, information provided earlier in the *Statistische Nachrichten* underlined that the only way to capture the full scope of the price increases since 1938 was to compare current prices against reichsmark prices (*Statistische Nachrichten*, 1947(1) p. 3).³⁵ Ultimately, the *Statistische Nachrichten*

³² Information on price developments was published earlier, but publication of an all-items index was not resumed until 1947.

³³ The terms “old schilling” and “new schilling” are used here to differentiate between the schilling before and after World War II.

³⁴ On this, the *Statistische Nachrichten* note: The calculation of the index will henceforth no longer be based on the reichsmark prices, but rather on the schilling prices for March 1938. This change in the calculation basis is considered appropriate as, in general, current income levels are not compared with incomes in reichsmark during the war, but rather with incomes in schilling during the pre-war period. (*Statistische Nachrichten*, 1949(3), p. 56). This explanation is not compelling. The April 1938 = 100 price basis in reichsmark was not changed in 1949 in the cost-of-living index published in parallel by the WIFO. For the period from 1946 to 1949, WIFO’s cost-of-living index (WIFO, 1949) shows a progression similar to the new chained index published here.

³⁵ Published in the *Statistische Nachrichten* section on wholesale prices and indicators. In general, readers are advised to also study the sections on the general economic situation.

stopped the parallel publication of both index figures in 1951, after which it released only the index based on the old schilling.³⁶

In subsequent years, this methodological decision appears to have been at least temporarily forgotten. A publication from 1959 (ÖStZ and WIFO, 1959, p. 22 and footnote 1 on p. 22) informed readers that, following the war, the Austrian Central Statistical Office began to regularly publish the retail price index again from July 1948 (base: March 1938 = 100).³⁷ Moreover, readers were informed that the 1938 reichsmark prices were compared to current schilling prices at a ratio of 1:1. This is incorrect, as the base was actually underpinned by the old schilling prices.

In contrast, many works that sought to establish comparisons of purchasing power over the 1938–1948 period did correct for the change in the price basis. This is in particular true for the *Börsenkurier*'s conversion chart, the calculation formula of which multiplies the index values after 1948 by a factor of 1.5 and therefore correctly displays the converted amounts. The currency converter provided by the OeNB³⁸ is based on the *Börsenkurier* tables and therefore also provides correct conversions. Mühlpeck et al. (1979a) also correctly converted 1858 prices to 1979 prices for their sample calculation for equestrian statues (see above), albeit without providing details for the calculation or the chaining of indices between 1938 and 1948. While these calculations based on the (consecutive) price indices take the 1948 change in the price basis into account, this is not true for the chained index in Butschek (1996, 2011). Depending on the source, the index values may therefore need to be adjusted accordingly for the creation of chained indices.

Change from the 1926 RPI to the 1948 RPI and the index value for 1948

The 1948 RPI was first published in July 1948. The 1926 RPI used previously (on a reichsmark basis from March 1938) continued to be published monthly until December 1949 (ÖStZ, 1950). Butschek (1996) used the 1926 RPI for 1946 and 1947 and then switched to the schilling-based 1948 RPI from the *Statistische Nachrichten* for 1948. Apart from the fact that, as explained above, the reichsmark-based index should be used here, this raises two further issues.

First, while the 1926 RPI and the 1948 RPI follow the same trend during the months for which both indices are available, the 1948 RPI figures are, with slight fluctuations, 3% higher on average than the 1926 RPI figures. The differences in levels and monthly changes may be attributed to the different baskets of goods, as outlined above. At the same time, the difference in levels raises the question of how best to link the two indices. One possibility would be to link up the indices using a chaining coefficient of approximately 0.97. This would not, however, take into account the fact that both indices use 1938 as base year, meaning that both index figures for 1948 show the price increase since 1938. As the 1948 RPI is

³⁶ *The Statistisches Handbuch für 1950, which provides an overview of price changes since 1914, also lists two price index series from 1947 onward (ÖStZ, 1950, pp. 145–146). A comparison of the two series makes it clear that the calculation of the changes in purchasing power since 1914 must use the series based on the reichsmark, as the index value would otherwise fall from 161 to 111 from December 1946 to January 1947 rather than increase to 166 (on a consistent price basis).*

³⁷ *In fact, publication was resumed in December 1947. Regular monthly information on the all-items index was initially only included in the sections on the general economic situation, while regular monthly publication of detailed information in the sections on prices began in July 1948.*

³⁸ See <https://www.eurologisch.at/docroot/waehrungsrechner/#/>.

Comparison of historical price indices for the period from 1946 to 1949

Revision and chaining of existing indices explained; selection of currency for base year 1938; index stretched for the period from March 1938 to July 1948

	1926 RPI (new schillings) ¹	Stretched 1926 RPI	1948 RPI ²	1948 RPI (new)	New CPI	1926 RPI (new schillings) ¹ or 1948 RPI ²	New CPI	
	Price base RM	Price base RM	Price base OS	Price base RM	Price base RM	Price base OS	Price base RM	
		Recalculated ³		Recalculated ⁴	Recalculated ⁵		Recalculated ⁵	
	Monthly figures					Annual figures [annual inflation rates]		
1946	Jan.	122	123,3			123,3	141	143,2
	Feb.	122	123,3			123,3		
	March	122	123,3			123,3	[26.0%]	[27.5%]
	April	136	138,2			138,2		
	May	136	138,2			138,2		
	June	138	140,3			140,3		
	July	147	149,9			149,9		
	Aug.	147	149,9			149,9		
	Sept.	148	150,9			150,9		
	Oct.	152	155,2			155,2		
	Nov.	158	161,5			161,5		
	Dec.	161	164,7			164,7		
1947	Jan.	166	170,0			170,0	277	287,5
	Feb.	175	179,6			179,6		
	March	177	181,7			181,7	[96.6%]	[100.7%]
	April	178	182,7			182,7		
	May	202	208,2			208,2		
	June	202	208,2			208,2		
	July	276	286,7			286,7		
	Aug.	326	339,7			339,7		
	Sept.	393	410,8			410,8		
	Oct.	393	410,8			410,8		
	Nov.	416	435,2			435,2		
	Dec.	417	436,3			436,3		
1948	Jan.	417	436,3			436,3	329	469,6
	Feb.	416	435,2			435,2	(calculated from July–December figures only)	[63.3%]
	March	416	435,2			435,2		
	April	435	455,4			455,4		
	May	434	454,3			454,3		
	June	434	454,3			454,3		
	July	437	457,5	305	457,5	457,5	[19.0%]	
	Aug.	436		305	457,5	457,5		
	Sept.	434		303	454,5	454,5		
	Oct.	507		349	523,5	523,5		
	Nov.	510		350	525,0	525,0		
	Dec.	528		364	546,0	546,0		
1949	Jan.	527		363	544,5	544,5	402	603,4
	Feb.	527		362	543,0	543,0		
	March	525		361	541,5	541,5	[22.1%]	[28.5%]
	April	527		362	543,0	543,0		
	May	532		362	543,0	543,0		
	June	607		416	624,0	624,0		
	July	606		415	622,5	622,5		
	Aug.	604		414	621,0	621,0		
	Sept.	611		419	628,5	628,5		
	Oct.	628		419	628,5	628,5		
	Nov.	673		463	694,5	694,5		
	Dec.	684		471	706,5	706,5		

Source: Statistics Austria, see footnotes, authors' calculations.

¹ ÖStZ (1950), section XV. 4. a) a), p. 145 f.

² Retail price index (Kleinhandelspreisindex) published by Statistics Austria (base: March 1938; monthly figures from July 1948, annual figures from 1948), annual figures for the period shown here and beyond also available in: Butschek (2011), p. 569 ff. Based on these sources, the annual figure for 1948 is derived only from the monthly figures for July to December 1948, which gives rise to an upward bias in the annual figure owing to the sharp price increase in the second half of the year.

³ 1926 RPI stretched for the period from March 1938 to July 1948.

⁴ 1948 RPI revised (correct currency selected for base year 1938).

⁵ Chaining of the recalculated or revised indices. Annual indices calculated as arithmetic means of the respective monthly figures.

Note: Base month for all indices: March 1938 = 100; prices expressed in new schillings, prices based on reichsmark (RM) or old schillings (OS), blank cells = no figures available. Minor differences between figures may be due to revisions made in the historical sources and due to rounding; see article for further details on the indices; some index terms suggested by authors.

methodologically superior, it would be unsatisfactory to change its index value through chaining. In order to avoid a break following the change from the 1926 RPI to the 1948 RPI between June and July 1948, we decided to stretch the 1926 RPI, starting with March 1938 = 100, so as to make it correspond to the index level of the 1948 RPI in July 1948.

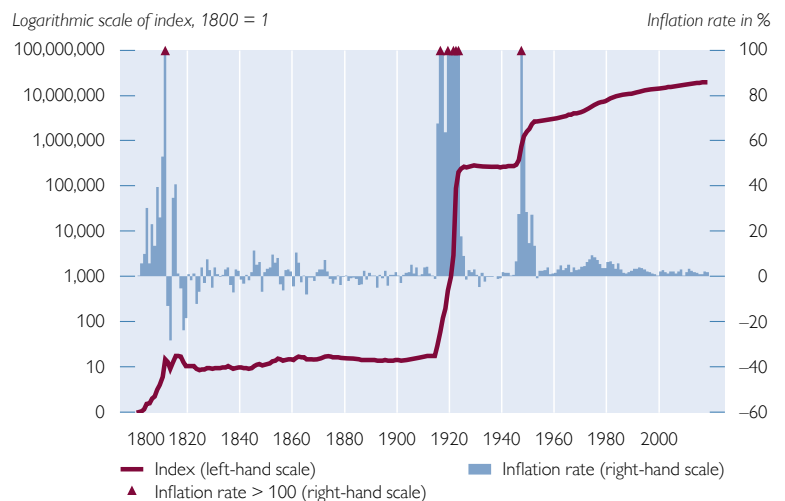
The second issue relates to the calculation of the annual value for 1948, given that publication of the 1948 RPI started in July. Butschek (1996, 2011) calculates the annual value for 1948 as the arithmetic mean of the monthly figures from July to December, neglecting the months from January to June.³⁹ Owing to the significant inflationary pressure prevailing in 1948, the annual figure of the reichsmark-based series therefore appears too high for 1948 and, therefore, too low for 1949. However, the 1926 RPI and the 1948 RPI are comparable in principle and match each other when the 1926 RPI is adjusted by 3% as suggested. Therefore, we can calculate the annual figure by taking the January to June figures from the 1926 RPI and the July to December figures from the 1948 RPI. Table 4 shows the resulting changes to index values and inflation rates.

The use of the reichsmark/new schilling-based 1948 RPI and the consideration of all monthly figures when calculating the annual value for 1948 results in corrections to the inflation rates for 1948 and 1949. We thus arrive at inflation rates of 63.3% for 1948 (instead of 19.0%) and 28.5% for 1949 (instead of 22.1%). The inflation rates for subsequent years remain unchanged.⁴⁰

The new index

The following section provides an overview of the new chained index and annual inflation (chart 1) as well as the chaining structure (table 5). Moreover, table 6 lists annual index figures for the new CPI from 1800 onward, and table 7 the corresponding annual inflation rates. Table 8 contains an overview of the currencies used in Austria starting in 1800 and the exchange rates of consecutive currencies.

Chart 1
The new CPI from 1800



Source: OeNB, calculated on the basis of existing time series from numerous sources (see article).

³⁹ Butschek (1996, 2011) lists only annual values but no monthly values. Those annual values do, however, correspond to the average of the monthly values from the 1948 RPI as shown in table 4.

⁴⁰ The annual inflation rates listed here are calculated on the basis of the annual index values. The annual index values are the arithmetic means of the monthly index values. The stretching of the 1926 RPI leads to minor changes to the pre-1948 inflation rates.

Table 5

Creation of the new CPI through chain-linking (annual figures from 1800, monthly figures from 1914)

Period used		Existing index		Recalculated/chained index	
from	to				
1800	1811	Silver price in paper florins	→ Index-based silver price	→ New all-items index (annual figures from 1800 to 1914)	→ New CPI (years from 1800)
1812	1820	Silver price in (Vienna standard) florins			
1820	1914	All-items index	→ ..		
July 1914	January 1925	1926 RPI (crowns)	→ ..	→ New CPI (monthly figures from 1914)	
January 1925	March 1938	1926 RPI (old schillings)	→ ..		
March 1938	December 1945	1926 RPI (reichsmark)	→ Stretched 1926 RPI		
January 1946	July 1948	1926 RPI (new schillings)			
July 1948	To date	1948 RPI	→ 1948 RPI (new)		

Source: Authors' compilation.

Note: Overlaps of one month or one year between consecutive time series are a technical requirement for chaining. Note on the composition of the annual figures: For the years from 1800 to 1914, we can compile an index with annual index values based on existing annual indices. For the years from 1914, we calculate the annual index values from the new monthly CPI figures (monthly figures from 1914) (annual index values = arithmetic mean of all available monthly values).

Table 6

The new CPI from 1800

1914=100		1831	54.6	1863	92.4	1895	80.5	1925	15,043.0	1955	1,045.3	1987	3,997.9
1800	5.7	1832	54.5	1864	92.6	1896	77.2	1925=100		1956	1,075.7	1988	4,074.4
1801	5.7	1833	54.9	1865	85.2	1897	77.8	1925	100.0	1957	1,117.9	1989	4,178.9
1802	6.0	1834	56.6	1866	84.8	1898	78.4	1926	98.8	1958	1,130.6	1990	4,315.2
1803	6.6	1835	58.8	1867	84.4	1899	80.0	1927	101.5	1959	1,146.3	1991	4,459.4
1804	8.6	1836	56.6	1868	82.7	1900	80.4	1928	103.4	1960	1,165.7	1992	4,638.8
1805	9.1	1837	52.6	1869	84.3	1901	78.0	1929	106.7	1961	1,202.8	1993	4,807.0
1806	11.3	1838	54.2	1870	87.0	1902	78.6	1930	107.3	1962	1,261.2	1994	4,949.2
1807	12.8	1839	55.5	1871	89.7	1903	79.9	1931	102.3	1963	1,297.1	1995	5,060.3
1808	17.8	1840	54.8	1872	96.2	1904	81.4	1932	103.8	1964	1,346.8	1996	5,154.2
1809	22.5	1841	53.1	1873	98.3	1905	85.6	1933	101.6	1965	1,418.4	1997	5,221.7
1810	34.4	1842	53.5	1874	97.1	1906	86.8	1934	101.2	1966	1,445.1	1998	5,269.8
1811	83.7	1843	52.6	1875	94.1	1907	90.3	1935	101.0	1967	1,502.6	1999	5,299.4
1812	72.8	1844	53.6	1876	92.7	1908	90.8	1936	100.9	1968	1,544.2	2000	5,424.0
1813	52.3	1845	59.7	1877	93.0	1909	91.8	1937	100.9	1969	1,591.8	2001	5,568.1
1814	70.6	1846	62.8	1878	89.4	1910	95.4	1938	99.7	1970	1,661.4	2002	5,668.5
1815	99.3	1847	66.8	1879	89.3	1911	99.5	1939	99.0	1971	1,739.6	2003	5,745.3
1816	100.5	1848	62.3	1880	89.8	1912	100.8	1940	101.0	1972	1,850.1	2004	5,863.8
1817	95.3	1849	63.5	1881	88.0	1913	101.2	1941	102.5	1973	1,989.4	2005	5,998.9
1818	72.7	1850	65.6	1882	87.3	1914	100.0	1942	104.0	1974	2,178.9	2006	6,085.8
1819	59.4	1851	68.3	1883	87.0	1914 = 1		1943	104.3	1975	2,362.8	2007	6,217.8
1820	60.0	1852	75.0	1884	86.0	1914	1.0	1944	105.2	1976	2,535.8	2008	6,417.8
1821	59.0	1853	79.6	1885	82.8	1915	1.7	1945	112.2	1977	2,674.6	2009	6,450.3
1822	59.8	1854	86.2	1886	80.0	1916	3.4	1946	143.0	1978	2,770.3	2010	6,567.3
1823	52.6	1855	83.1	1887	82.0	1917	6.8	1947	287.0	1979	2,873.0	2011	6,781.3
1824	49.1	1856	78.1	1888	80.8	1918	11.2	1948	468.8	1980	3,054.7	2012	6,949.9
1825	51.0	1857	80.2	1889	82.1	1919	27.9	1949	602.4	1981	3,262.6	2013	7,088.9
1826	49.5	1858	82.8	1890	82.2	1920	55.5	1950	692.1	1982	3,440.1	2014	7,202.7
1827	53.2	1859	84.6	1891	82.6	1921	169.0	1951	881.4	1983	3,554.9	2015	7,267.8
1828	54.7	1860	80.9	1892	78.6	1922	5,032.2	1952	1,001.6	1984	3,756.3	2016	7,333.3
1829	52.0	1861	89.5	1893	79.1	1923	11,712.8	1953	993.7	1985	3,876.1	2017	7,485.9
1830	54.1	1862	94.9	1894	78.6	1924	13,788.9	1954	1,019.4	1986	3,942.0	2018	7,635.5

Source: OeNB, calculated on the basis of existing time series from numerous sources (see article).

Note: For ease of reference and clarity, we show the index in three sections: for the period from 1800 to 1914 with the base 1914 = 100; for the period from 1914 to 1925 with the base 1914 = 1 (hyperinflation in the years up to 1925); from 1925 with the base 1925 = 100. Overlaps (1914 and 1925) are a technical requirement for chaining. Furthermore, we use the arithmetic mean of the available monthly figures to calculate the annual figures underlying the index values from 1914 for the new CPI.

Table 7

New CPI – annual inflation rates

1800–1914		1831	0.9	1863	–2.6	1895	2.4	1925	9.1	1955	2.5	1987	1.4
1800	x	1832	–0.2	1864	0.2	1896	–4.1	1925–2018		1956	2.9	1988	1.9
1801	0.1	1833	0.7	1865	–8.0	1897	0.8	1925	9.1	1957	3.9	1989	2.6
1802	5.8	1834	3.1	1866	–0.5	1898	0.8	1926	–1.2	1958	1.1	1990	3.3
1803	9.9	1835	3.9	1867	–0.5	1899	2.0	1927	2.8	1959	1.4	1991	3.3
1804	30.2	1836	–3.7	1868	–2.0	1900	0.5	1928	1.9	1960	1.7	1992	4.0
1805	5.7	1837	–7.1	1869	1.9	1901	–3.0	1929	3.1	1961	3.2	1993	3.6
1806	23.2	1838	3.0	1870	3.2	1902	0.8	1930	0.6	1962	4.9	1994	3.0
1807	13.5	1839	2.4	1871	3.1	1903	1.7	1931	–4.7	1963	2.8	1995	2.2
1808	39.5	1840	–1.3	1872	7.2	1904	1.9	1932	1.5	1964	3.8	1996	1.9
1809	26.0	1841	–3.1	1873	2.2	1905	5.2	1933	–2.2	1965	5.3	1997	1.3
1810	53.1	1842	0.8	1874	–1.2	1906	1.4	1934	–0.3	1966	1.9	1998	0.9
1811	143.4	1843	–1.7	1875	–3.1	1907	4.0	1935	–0.2	1967	4.0	1999	0.6
1812	–12.9	1844	1.9	1876	–1.5	1908	0.6	1936	–0.1	1968	2.8	2000	2.4
1813	–28.1	1845	11.4	1877	0.3	1909	1.1	1937	0.0	1969	3.1	2001	2.7
1814	34.8	1846	5.2	1878	–3.9	1910	3.9	1938	–1.2	1970	4.4	2002	1.8
1815	40.7	1847	6.4	1879	–0.1	1911	4.3	1939	–0.7	1971	4.7	2003	1.4
1816	1.2	1848	–6.7	1880	0.6	1912	1.3	1940	2.0	1972	6.4	2004	2.1
1817	–5.1	1849	1.9	1881	–2.0	1913	0.4	1941	1.5	1973	7.5	2005	2.3
1818	–23.7	1850	3.3	1882	–0.8	1914	–1.2	1942	1.5	1974	9.5	2006	1.4
1819	–18.3	1851	4.1	1883	–0.3	1914–1925		1943	0.3	1975	8.4	2007	2.2
1820	1.0	1852	9.8	1884	–1.1	1914	–1.2	1944	0.8	1976	7.3	2008	3.2
1821	–1.7	1853	6.1	1885	–3.7	1915	67.8	1945	6.6	1977	5.5	2009	0.5
1822	1.4	1854	8.3	1886	–3.4	1916	104.8	1946	27.5	1978	3.6	2010	1.8
1823	–12.0	1855	–3.6	1887	2.5	1917	99.0	1947	100.7	1979	3.7	2011	3.3
1824	–6.7	1856	–6.0	1888	–1.5	1918	63.8	1948	63.3	1980	6.3	2012	2.5
1825	3.9	1857	2.7	1889	1.6	1919	149.3	1949	28.5	1981	6.8	2013	2.0
1826	–2.9	1858	3.2	1890	0.1	1920	98.7	1950	14.9	1982	5.4	2014	1.6
1827	7.5	1859	2.2	1891	0.5	1921	204.9	1951	27.4	1983	3.3	2015	0.9
1828	2.8	1860	–4.4	1892	–4.8	1922	2876.8	1952	13.6	1984	5.7	2016	0.9
1829	–4.9	1861	10.6	1893	0.6	1923	132.8	1953	–0.8	1985	3.2	2017	2.1
1830	4.0	1862	6.0	1894	–0.6	1924	17.7	1954	2.6	1986	1.7	2018	2.0

Source: OeNB, calculated on the basis of existing time series from numerous sources (see article).

Note: The annual inflation rates correspond to the percentage change of the index value for a given year from the index value of the preceding year. Refer to table 6 for the index values. For ease of reference, table 7 mirrors the structure of table 6.

Table 8

Currencies in Austria from 1800

	Currency	Subunit	Conversion
Before 1811	Paper florin	60 kreutzer	
1811	Florin (Vienna standard)	60 kreutzer	1 Vienna standard florin = 5 paper florins
1816/1820 ¹	Florin (Convention standard)	60 kreutzer	1 Convention standard florin = 2.5 Vienna standard florins
1857	Florin (Austrian standard)	100 (new) kreutzer	1.05 Austrian standard florins = 1 Convention standard florin
1900	Crowns	100 heller	2 crowns = 1 Austrian standard florin
1925	Schilling (old)	100 groschen	1 schilling (old) = 10,000 crowns
1938	Reichsmark	100 pfennige	2 reichsmark = 3 schillings (old)
1945	Schilling (new)	100 groschen	1 schilling (new) = 1 reichsmark
1999/2002 ²	Euro	100 cent	1 euro = 13.7603 schillings (new)

Source: Jobst and Kernbauer (2016), p. 274 f; includes further explanations.

¹ From 1816, florin-denominated banknotes issued by the privilegierte oesterreichische National-Bank (Convention standard florins) and florin-denominated redemption and anticipation certificates (Vienna standard florins) were circulating in parallel – initially at fluctuating market prices and from 1820 at a stable rate of 1:2.5.

² First introduced as an accounting currency in 1999; euro coins and banknotes followed in 2002.

The CPI changes are discussed in detail in Beer et al. (2016).⁴¹ Following high levels of inflation during the Napoleonic Wars and the subsequent rather significant deflation, the period until 1848 saw rather volatile rates of inflation but generally stable prices. The years up to 1873 are primarily marked by inflation, and those from 1873 to 1900 by falling and stable prices. Prices rose again during the decade leading up to 1914. The inflation and hyperinflation during and after World War I were again followed by a period of stable prices during the second half of the 1920s and throughout the 1930s. World War II also led to a major surge of prices, yet without causing another round of hyperinflation. Since then, price developments have been marked by a measured and continuous upward trend, including a period of accelerated inflation in the 1970s.

3 How representative is the new index for price developments in Austria?

Today's standards of consumer price index measurement raise the question of how reliable consumer price indices calculated for a more distant past are and what purposes the chained index may serve.

As shown in Fluch (2016), early indices include a significantly smaller amount of goods and services than current indices. To some extent, the smaller amount is of course a data availability issue, but it can also be argued that the simpler consumption patterns associated with significantly lower standards of living imply that a relatively small number of goods suffice to capture the key price drivers. At the same time, the issue arises how large a bias is introduced by the undercoverage of quality changes – which need not necessarily be quality improvements, as often implied in the current literature (e.g. Hausman, 2003). As mentioned above, the quality of foodstuffs deteriorated sharply above all in war times. However, it is indeed fair to presume that the quality of the goods contained in the basket of goods will have improved on balance over time. Quantifying this effect may therefore be a promising avenue for future research.

Furthermore, there is the issue of how accurate the index values are for periods of rationing, shortages and the absence of prices determined by the free market. As shown above, the index must be interpreted with care in these cases. Yet, the index is a good choice for long-term comparisons between two periods of free market prices, so long as it is reasonable to assume that consumption patterns have not changed too much between those periods.

Another issue is that of geographic coverage. Until 1958, the index only covered prices for Vienna. This leads to the question to what extent the Viennese index can be used to assess trends throughout the area of the Austro-Hungarian Monarchy and later the Republic of Austria. In 1869, the population of Vienna accounted for some 20% of the population of the area of modern-day Austria, but for just 2.5% of the total population of the Austro-Hungarian Empire. Until 1910, this share rose from 2.5% to some 4.5%. Following the dismantling of the Monarchy, the share of Vienna surged to 29% in 1934; and it was still as large as 23% in 1951.⁴²

⁴¹ Beer et al. worked with a preliminary version of the index published here (pending further reviews but already addressing fundamental issues, without documenting the respective issues in detail). The preliminary and the final version differ above all in the pre-1820 period and in the period from 1946 to 1949, with some of the differences being substantial for both the index figures and the inflation rates.

⁴² On the population of Austria and Vienna based on today's borders, see Butschek (1996), on the Monarchy, see Helczmanovszki (1979).

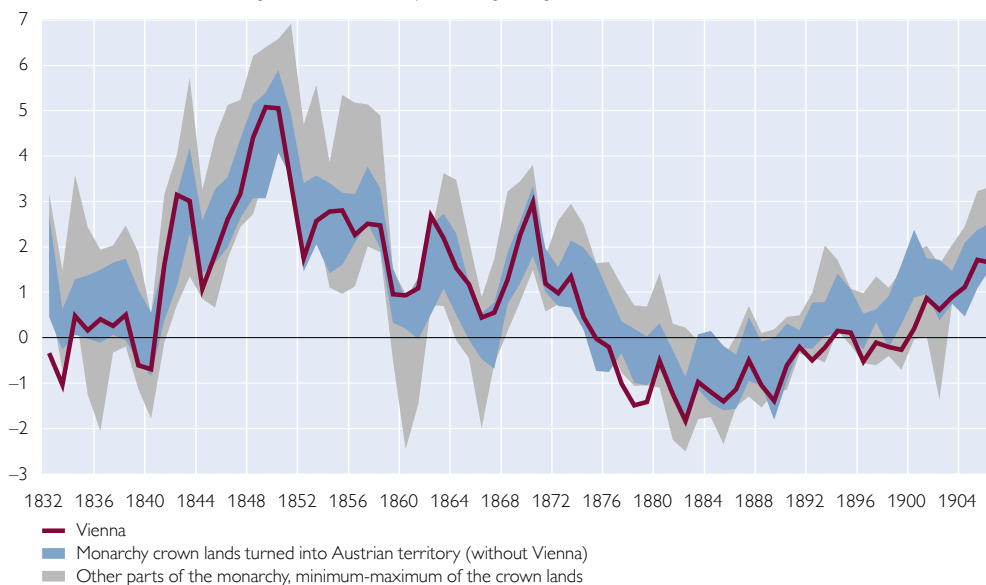
While no regional price data were published for the period of the Austrian Republic, the Vienna series can be cross-checked with regional information for the period before 1914. Mühlpeck et al. (1979a, p. 682) calculated food price series for Graz, Linz and Innsbruck. They were not able to add this series to the all-items index because data on other components of the goods basket were not available. For food, however, the four cities show similar trends throughout the 19th century.

Unsurprisingly, the differences between price levels (and between inflation rates) are greater if other areas of the Monarchy are included in the comparison. Cvrcek (2013) uses the data available for the Monarchy's crown lands to create regional price indices for the period from 1827 to 1910. These regional price indices do, however, run into the difficulties known from Mühlpeck et al. (1979a). While regional prices are available for food, wood and coal, the data situation regarding textiles, soap and rents is much more difficult. Because of the lack of systematic information on regional differences in consumption patterns Cvrcek (2013) therefore applied the weighting used for Vienna to all crown lands. These results must hence also be interpreted with caution. Judging from the median of the price changes observed in the Monarchy's crown lands, price increases were generally lower in Vienna. While inflation in Vienna was comparatively high in the period from the 1840s to the 1860s, Vienna was consistently at the lower end of the distribution after 1870 and until 1913 (see chart 2).⁴³ This convergence of regional price levels corresponds to the generally accepted notion of increasing integration throughout the Monarchy during the period (Good, 1986; Schulze and Wolf, 2012). For users of the price index published here, this means that the index presented in

Chart 2

Regional differences in inflation from 1832 to 1906

% , inflation rate and fluctuation range of inflation rate, 10-year moving average



Source: OeNB, calculated on the basis of data published by Cvrcek (2013).

⁴³ The Vienna index in Cvrcek (2013), which is used in chart 2, is not the one we used for the creation of the new long-run CPI.

this article tends to somewhat underestimate the general price increase for the entire Monarchy in the final decades of the 19th century.

A similar analysis is not possible for the period from 1914 to 1958 because the available local price data have not been reviewed systematically so far. As the Republic of Austria is significantly smaller and more homogeneous than the Austro-Hungarian Empire, regional differences ought to be less pronounced, though.

4 Conversion of historical prices – CPI and alternatives

Users typically expect long-run price indices to facilitate the conversion of historical prices into current prices. However, as shown here, the creation of price indices is a complex task. Depending on data availability (with regard to an adequate level of granularity and geographic coverage) and the underlying objectives (what is to be measured and compared, and for what reason?), individual indices or index time series will differ more or less from each other. While all indices serve to measure price levels and price developments, they differ significantly in their details and, upon close examination, may be more or less suitable to answer specific questions. An index of consumer prices does not necessarily provide information about the development of real estate prices or wage-based incomes (i.e. the price of labor), even though these may be highly correlated. Other indices are better suited to that purpose.

At the same time, a suitable index or a suitable comparison method should be used for specific questions relating to price developments or price comparisons. We specifically use the term “comparison method” as price comparisons need not necessarily rely on indices. Table 9 compares a range of methods for converting historical prices and values⁴⁴ (see also Officer and Williamson, 2006).

The table is intended to show that different indices or methods will be called for depending on the value to be compared (price of a good, wage, asset, etc.) and the issue at hand. Historical construction costs, for example, will be more meaningful for an Austrian living in the 21st century if they are examined in relation to both the historical and current economic output. To give an example: It took eight years (from 1972 to 1979) and approximately ATS 8.8 billion at the time to build the Vienna International Center, one of the UN’s four major office sites. In 1979, ATS 8.8 billion accounted for around 0.9% of Austria’s GDP, which corresponds to around EUR 3.5 billion in 2018 figures. In other words, the construction effort made in the 1970s would amount to a EUR 3.5 billion construction effort in today’s money.⁴⁵ If we use the CPI rather than corresponding GDP ratios to convert the 1979 construction costs, the equivalent for 2018 is only EUR 1.7 billion.⁴⁶ In other words, different methods will produce significantly different outcomes. This demonstrates the need to always go for the most adequate comparison method, as discussed in detail in Officer and Williamson (2006). In the case at hand, the CPI

⁴⁴ Note that the terms “value” and “price” are not synonymous. The difference in their meanings is not, however, a topic for discussion here.

⁴⁵ According to the United Nations Office Vienna, construction costs totaled EUR 640 million (https://www.unov.org/unov/en/vic_history.html). This equals approximately ATS 8.8 billion. Nominal GDP for 1979 (EUR 71,315.4 million = ATS 981,321.3 million) taken from Butschek (2011, p. 568); nominal GDP for 2018 (EUR 386 million) taken from Statistics Austria.

⁴⁶ Construction costs were multiplied by 2.66, which is the factor by which the CPI (as presented in this article) for 2018 exceeds the CPI for 1979.

Table 9

Sample conversions of historical amounts

Amounts spent in the identified base years converted into 2018 figures

Example	Brown bread, price per kilo	Annual salary of a young civil servant	Building costs of the United Nations' Vienna International Center
Base year	1830	1900	1979 (built from 1972 to 1979)
Historical amount	4.3 kreutzer (Convention standard florins) ¹	2,000 crowns ¹	ATS 8.8 billion
CPI ²	How much would a 1 kilo loaf of bread bought in 1830 cost today, adjusted for the average rate of inflation? Did the price of bread rise at a slower or at a faster rate than the basket of goods on average? EUR 1.55	How much would the goods and services that the civil servant was able to buy in 1900 cost in today's money? How much purchasing power did he have? EUR 13,800	If the government had used the money it paid for building the Vienna International Center to buy goods and services, how much would these goods and services cost today? EUR 1.7 billion
Wage index and wage comparisons	How expensive was a loaf of bread for a day laborer in 1830? With a day laborer earning 24 kreutzer (Convention standard florins), how many loafs of bread did his daily wage buy in 1830? 5 ½ kilo of bread ³	How big a salary would the young civil servant earn today if his salary had risen at an average rate (in other words: "Did young civil servants earn a fairly decent income in 1900, or not?") Remains unanswered ⁴	How much would building the Vienna International Center cost today, assuming that building costs have risen broadly in line with wages? EUR 2.4 billion ⁵
Nominal GDP ⁶	How much did it cost to make 1 kilo of bread relative to the production of other goods? EUR 82	Compared with national income, how large is the share of resources available to a civil servant? For top salaries, we might ask: Compared with national income, how large is the share of total resources available to top earners? EUR 191,000 EUR	How big a share of annual value added did Austria spend in building the Vienna International Center? How big would this share be in today's money? 0.9% of GDP = EUR 3.5 billion

Source: See footnotes; authors' calculations.

¹ Source for historical prices and wages: Mülpeck et al. (1979b). Price for 1 kilo of brown bread (p. 148): 4.3 kreutzer = approx. 0.07 florins (1 florin = 60 kreutzer; all figures refer to Convention standard florins). No round numbers due to the conversion of prices and weights. Annual salary of a young civil servant (p. 129): 2,000 crowns.

² Here we use the new CPI presented in this article.

³ This example shows that comparing historical prices with the costs of other goods available at the same time may suffice to get a feel for historical prices. Source for day-laborer wages (expressed in crowns there): Cvrcek (2013).

⁴ Wage indices are available only for post-World War II periods. While wage indices exist for earlier periods, comparisons over time and between indices for different wages are limited. This is why we opted not to calculate wage indices for the period covering the two World Wars.

⁵ In the period from 1979 to 2018, the index of agreed minimum wages rose by a factor of 3.68 (source: WIFO database; 1966 index of agreed minimum wages – total economy, all employees).

⁶ Source for historical GDP data: Butschek (2011), p. 565 ff; source of GDP for 2018: Statistics Austria. 1830: 709 million crowns, 1900: 4,051 million crowns, 1979: EUR 71,315.4 million, 2018: EUR 386,094 million, historical GDP figures in source publications not always expressed in the currency circulating in the relevant year.)

is not the method of choice as it was created for other purposes (to reflect changes in consumer prices) and is specifically geared to capturing price developments (changes in the purchasing power of money) while failing to directly take into account other economic developments (e.g. wages, technology, economic performance and capability). This means that it is not suited for assessing economically relevant projects from the past in a modern context.

Consumer price indices are generally seen as the archetypal indicator of price development. In actual fact, they constitute only one kind of price indicator and are therefore far from suitable for every purpose. Doing a CPI-based conversion of prices or incomes usually provides euro values that seem rather low. This is because major productivity gains over time mean that the same basket of goods (or a basket

of goods yielding the same utility) can be purchased for less money today than was the case 100 or 200 years ago. GDP equivalents are actually a more meaningful gauge for the status or power connected with a certain level of wealth or income, or for the cost of major infrastructure projects, such as the construction of the Semmering Railway or the Vienna International Center. After all, the GDP equivalents show how big a share of the aggregate resources was held by individuals or governments, or how large a share of economic output had to be mobilized to realize a particular project.

5 Conclusion

This article introduces a new chained index documenting how consumer prices have changed in Austria since 1800 – the first such index to have been exhaustively documented and to span two-plus centuries of history. Close examination of existing indices which we linked up raised a number of issues that we addressed in the chaining process. This exercise led to significant adjustments to the inflation rates published earlier for certain years.

We also created a monthly index beginning in 1914, which is another first.⁴⁷ The long-run consumer price index should be useful for converting historical price and value data into current amounts, which is a recurring issue. Whether the consumer price index will provide more meaningful insights than other measures depends on the issue at hand. At any rate, conversions of historical prices should generally be interpreted with caution.

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⁴⁷ July 1914 as the basis for a monthly index; data at three-month intervals from January 1915; monthly data from January 1920.

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