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(Male) Wages in Switzerland, 1750-1860

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(Male) Wages in Switzerland, 1750-1860*

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23rd February 2026

Abstract

We estimate daily wage rates for skilled and unskilled construction workers and agricultural laborers in Switzerland from 1750 to 1860, a period of profound political and economic transformations. Our analysis is based on 17,700 newly collected wage quotes from primary sources and 23,300 price quotes from primary and secondary sources. We find that wages and prices were remarkably similar among different Swiss regions. We therefore construct price and wage series for the entire territory. Nominal wages remained largely unchanged during the second half of the eighteenth century, rose markedly around 1800 and then held at that level until 1850. Real wages stagnated as a result of rising price levels. Contrary to earlier claims of low Swiss wages, wages in the construction sector were similar to those in neighboring European regions, in particular France and Germany. We quantify the uncertainty in our wage estimates that arises from sampling uncertainty and potentially undocumented in-kind benefits.

JEL classifications: J3, J4, I31, N33.

Keywords: Real wages, Consumer price index; Standards of living; Switzerland; 18th century; 19th century.

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1 Introduction

The trajectory of real wages in eighteenth-century Europe remains central to debates on the Little Divergence and the origins of modern economic growth. While the wage structures of major European economies such as Britain, France and Italy have been extensively documented, Switzerland remains largely absent from the comparative literature, despite its central position in continental trade networks and its early industrialization (Bairoch 1982; Veyrassat 2018). Allen (2001, 2009) shows that northern Europe experienced rising wages relative to the south during the early modern period, and links these high relative labor costs to the early adoption of labor-saving technologies in England. Yet for Switzerland, systematic evidence on wage levels and their evolution before 1850 is scarce. Existing studies focus primarily on the post-1850 era, leaving the eighteenth century largely undocumented (e.g. Chatelanat 1878; Siegenthaler 1965; Studer 2008). As a result, we lack a clear understanding of how Swiss real wages evolved and how Switzerland is situated within the European Little Divergence.

This paper addresses this gap by making three contributions. First, we reconstruct the evolution of nominal and real daily wages in Switzerland using 17,700 hand-collected wage quotes and 24,000 price quotes from 14 cantons.¹ This produces the first nationally representative pre-1850 wage series for both agricultural and construction male workers. Second, we harmonize the underlying archival material by constructing conversion tables for currencies and units of measurement and by generating a new Swiss consumer price index for the period. Third, we quantify two sources of uncertainty that affect historical wage estimates. We evaluate the impact of incomplete documentation of in-kind benefits and we implement a block bootstrap that measures the sampling uncertainty inherent in archival sources. These contributions expand the empirical basis for studying living standards and the position of Switzerland in the European Little Divergence.

We identify three key patterns. First, real wages remained stable between 1750 and 1800, rose by 35–50 percent during the early nineteenth century and remained stable again until 1850. This pattern holds consistently across occupation groups, despite differences in wage levels. Agricultural laborers (who represented the majority of the male workforce) earned less than unskilled construction workers, who in turn earned less than skilled construction workers such as masons and carpenters. The substantial real wage increase reflects nominal wages rising to offset increased living costs in the 1790s, then remaining constant as prices declined again after 1800. Second, our regional series reveal remarkably small differences in both wages and prices across cantons, suggesting integrated labor and commodity markets decades before the establishment of the federal state in 1848. Third, unskilled laborers earned the equivalent of 3.1 daily consumption baskets per day worked in 1750 (a welfare ratio of 2.1) and 3.8 baskets in 1860 (a welfare ratio of 2.6), placing Switzerland on par with Strasbourg and

¹ We make all code and data publicly available, including harmonized micro-data, conversion tables for pre-1850 currencies and units, a new Swiss CPI, and new series of nominal and real daily wages for male agricultural and construction workers (1750–1860). The replication package containing all code and data will be made available upon publication.

southern Germany (Allen 2001; Pfister 2017).²

We address an important challenge in the historical wage literature by quantifying the uncertainty surrounding our wage estimates, focusing on two distinct sources. First, we consider the uncertainty arising from the fact that our data represent only a sample of all potentially recoverable archival documents. To quantify this sampling uncertainty, we apply a block bootstrap procedure. Specifically, we generate a distribution of wage series estimates by resampling wage and price observations at the source-document level. The range of these estimates illustrate the sensitivity of our wage estimates to the sampling process. We find that sampling uncertainty is substantial. Around our baseline estimate of 3.1 consumption baskets (unskilled construction workers' real wage in 1750), the 95 percent confidence interval ranges between 2.6 and 4.

We also assess estimation uncertainty due to incomplete information on in-kind benefits. In many instances, our source documents do not indicate whether wage recipients also received in-kind compensation such as bread or wine. In order to bound the range of potential wage estimates, we construct two extreme wage series in which all or none of the ambiguous cases include in-kind benefits. Our results show that this range is smaller than the confidence intervals due to sampling uncertainty. For construction workers, our point estimates lie close to the lower bounds of that range, suggesting that it is unlikely that the level of our wages series is overestimated due to the way we deal with in-kind payment.

A large literature has used wage and price data to reconstruct historical living standards and study long-run economic divergence. In his seminal work, Allen (2001) emphasizes the daily wages of construction workers as a consistent and comparable measure of labor income, given the standardization of their work and the predominance of cash payments. Subsequent studies have expanded this approach by adding new regions, occupational groups, annual workers and suggesting methodological improvements (e.g., Chambru and Maneuvrier-Hervieu 2023; García-Zúñiga and López Losa 2021; Humphries and Weisdorf 2019; Rota and Weisdorf 2021; Stephenson 2018). We contribute to this line of research by providing the first long-run wage series for Switzerland covering both the eighteenth and early nineteenth centuries. Our findings show that Swiss wages were similar to those of Strasbourg and southern Germany, consistent with Switzerland's geographic position and early industrialization.

Our work also relates to the long tradition of studies of historical wages and living standards in Switzerland (e.g. Chatelanat 1878; Gruner 1968; Siegenthaler 1965)³. Among the earliest systematic attempts to quantify Swiss wages and prices, Chatelanat (1878) uses data from the Bernese cantonal statistics office and household account books, finding stagnating or declining real wages between 1840 and 1870. Studer (2008) puts Swiss real wages in international perspective by following the methodology of Allen (2001) to estimate wage series for skilled

² We rely on Allen's wage series for Strasbourg, as Geloso (2018) do not report an updated wage series for that city that takes into account his criticisms regarding in-kind payments.

³ In online appendix Section A.1, we provide a detailed overview of this literature. We emphasize the different methodologies used by contemporaries and historians to measure living standards and how they influenced their findings.

and unskilled construction workers in Zurich between 1800 and 1913. Comparing these series to Allen’s estimates for a collection of European cities, he finds that in 1800 real wages were lower in Zurich than in any of the other cities, including Strasbourg. He concludes that real wages in Zurich were lagging behind the rest of Europe and only caught up with places like Strasbourg after the 1820s.

We build on and extend Studer’s work by covering different regions within Switzerland, adding agricultural wages, and extending the series back to the mid-eighteenth century. We find that in 1750, real wages of construction laborers were on the same level as Strasbourg and southern Germany. Studer’s conclusion of Zurich lagging behind the rest of Europe in 1800 is not supported by our estimates. However, our estimates confirm his view that real wages in Switzerland were similar to those in other European places by 1850.

A growing body of research has highlighted methodological challenges that can bias historical wage estimates as indicators of living standards. These include the imputation of missing data (Paker et al. 2025), the treatment of non-monetary payments (Humphries and Weisdorf 2019), the incorporation of the costs of household services required to transform commodities into consumable goods (Humphries 2025), and the fact that male real wages do not provide accurate measures of the standard of living (Burnette 2025).⁴ Such issues are particularly acute in pre-industrial contexts, where fragmentary sources, in-kind compensation, and unobserved labor inputs can distort comparisons across time and space. We contribute to this literature in two ways. First, we develop a formal model of sampling uncertainty and utilize our 90 distinct archival sources to assess how unobserved sample-source selection may bias historical wage estimates. Second, we systematically evaluate the impact of in-kind payments by testing alternative imputation strategies. Our results shows that accounting for sampling uncertainty has a greater effect on the precision of wage estimates than varying procedures to account for in-kind compensation. We think that this approach is relevant not only for our wage estimates but also provides a general framework for future work in historical settings with heterogeneous sources and incomplete payment data.⁵

The rest of the paper is organized as follows. Section 2 provides background on the main economic and social transformations of Switzerland between 1750 and 1850. Section 3 describes the data collection and harmonization process and the methodology used to construct the wage and price series. In Section 4, we first present the new series of wage estimates for male workers in Switzerland between 1750 and 1860, before quantifying the uncertainty around these estimates, stemming from sampling uncertainty and the unclear documentation of payment in kind. Section 5 concludes.

⁴ For an overview of these challenges and biases, see Carvalhal et al. (2025).

⁵ Although we acknowledge the importance of Paker et al. (2025) and Humphries (2025) to estimate reliable measures of living standards, incorporating their proposed adjustments is beyond the scope of our paper.

2 Historical Background

During the Congress of Vienna (1814/1815) the borders of the “système Helvétique” received international recognition.⁶ These boundaries have remained largely stable to the present day and delimit the geographical scope that we denote as “Switzerland”.⁷ Between 1750 and 1850, Switzerland experienced repeated and profound political and institutional transformations. Prior to 1798, the Swiss Confederacy (*Alte Eidgenossenschaft*) was a loose confederation of quasi-sovereign cantons, characterized by fragmented authority, multiple currencies and hundreds of units of measurement, and pervasive labour markets and internal trade barriers. The French invasion and the establishment of the Helvetic Republic marked a decisive rupture, introducing centralized governance and monetary unification through the Swiss franc, as well as the liberalization of internal trade. However, these reforms were short-lived. The Act of Mediation in 1803 and the subsequent Restoration period (1815–1830) reinstated cantonal autonomy, dissolved the monetary union and reintroduced institutional and economic fragmentation. Political conflict during the Regeneration period (1830–1848) culminated in the Sonderbund War of 1847. The liberal victory paved the way for the establishment of the federal state in 1848. The new constitution balanced centralization with cantonal autonomy while enforcing liberal economic principles such as the abolition of internal trade barriers, setting the foundations for modern Switzerland.

These changes both shaped and resulted from the rapid economic development. At the end of the eighteenth century, average per-capita industrialization levels were higher than in the neighboring countries (Bairoch 1982, pp. 280-2). Mechanization began slowly around 1800, both pressuring the traditional putting-out system and providing job opportunities for the already sizable population dependent on industrial work.⁸ This development is reflected in the increase of occupational shares in the secondary sector from 25% in 1798 to 33% in 1850 (Table 1). Until the nineteenth century, the agrarian sector retained its predominance. Nevertheless, demographic expansion during the eighteenth century, particularly in proto-industrial regions, exacerbated pressures on subsistence. The proliferation of small-scale cultivators and landless laborers, whose livelihoods were increasingly dependent on industrial employment, implied that the subsistence requirements of a substantial share of the population were mediated through market exchange, frequently necessitating supplies from geographically distant regions. This dependence was particularly pronounced in alpine zones, where the predominance of pastoral husbandry constrained the cultivation of staple crops.

⁶ Acte final du Congrès de Vienne du 9 Juin 1815, Art. 74-84.

⁷ Although the designation was widely applied to the region long before 1848, the modern federal state known as “Switzerland” was only established in that year. Moreover, several territories that we retrospectively classify as “Swiss” (such as Geneva) were not necessarily perceived as such by contemporaries and, in some cases, explicitly excluded from earlier state formations such as the Helvetic Republic (1798–1803). For a detailed discussion on spatial conceptions of the Swiss Confederation, see Würzler (2016).

⁸ For more details on the economic situation, see Bergier (1983, pp. 167-87), Pfister (1992, pp. 77-100), Pfister (1997), Church and Head (2013, Chapters 4, 5).

Table 1: The occupational structure of Switzerland during the nineteenth century

	Total population	Labour force	Primary sector	Secondary sector	Tertiary sector
1798	1,680,000	800,000	63%	25%	13%
1820	1,956,000	930,000	59%	30%	11%
1850	2,392,740	1,200,000	54%	33%	13%
1880	2,846,102	1,521,817	37%	36%	14%

Source: Bergier (1983, Table XXII, pp. 225-6)

From approximately 1750 onward, the prevailing paradigm of food supply regulation underwent a significant reorientation. Interventionist measures and direct price controls gave way to free trade policies, thus attenuating the impact of localized supply shocks (Persson 1999, Chapter 1). The Swiss case conformed to this wider European trajectory, although the institutionalization of such principles proceeded only incrementally. Structural transformations in transport and communication infrastructures constituted decisive preconditions for this shift. The construction of the Gotthard road in the 1820s, for instance, facilitated the integration of alpine markets. Similarly, the diffusion of price information through local newspapers (*Intelligenzblätter*), which from the early eighteenth century reported weekly quotations for principal commodities, enhanced market transparency and reinforced the mechanisms of integration.

3 Sources and Methodology

The wage and price series presented in this article are based on a newly constructed dataset of wage rates and commodity price quotes from mid-eighteenth to mid-nineteenth century. During this period, every canton had its own currency. Measurement units for volume and weights were also highly localized, often varying between municipalities within the same canton. To make comparison possible across time and space, we build currency and metrology conversion tables to standardize commodity prices to grams of silver per metric unit and wages to grams of silver per time unit.⁹ We further divide Switzerland into four regions to study regional heterogeneity. The West encompasses all French-speaking areas, while the Central, Northern, and Eastern regions are predominantly German-speaking (online appendix Figure A.10).

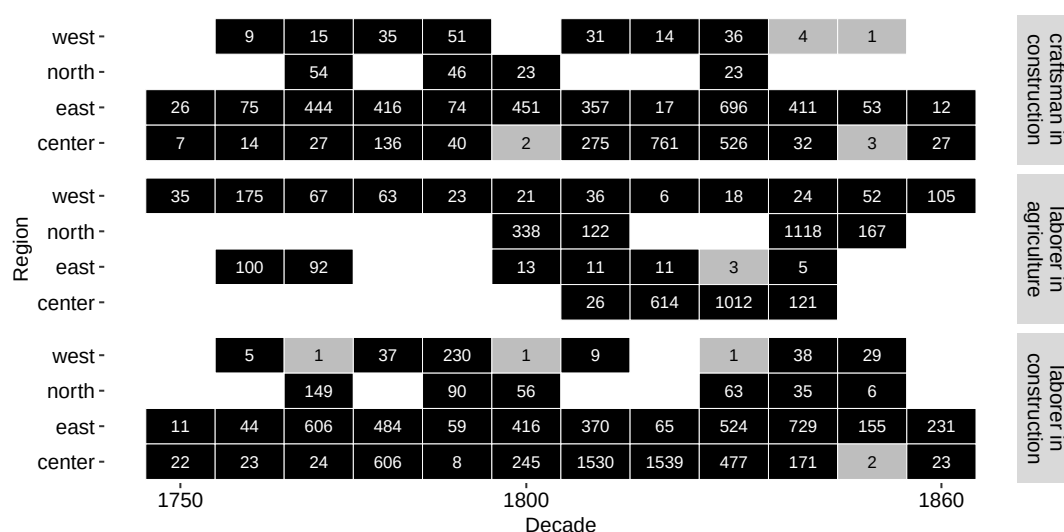
3.1 Wages

3.1.1 Sources of wage data

Our analysis is based on more than 17,700 individual wage quotes, which were applied to more than 27,000 day wages, collected from 90 distinct archival source documents (online

⁹ We describe the standardization process in online appendix Section A.3.1.

Figure 1: Temporal and spatial coverage of wage data



Note: This figure summarises the coverage of wage data by region and occupation in ten-year intervals from 1750 to 1860. Each cell reports the number of wage observations for a given region–occupation–period. Black cells indicate more than five observations, grey cells indicate one to four observations, and white cells indicate no observations.

appendix Table A.11). Source documents are accounting books of institutions such as cantonal governments, hospitals, or monasteries, and private individuals' accounting books, such as owners of construction companies, farmers who employed agricultural day laborers, or wealthy families who employed construction workers for building maintenance.

A large part of the wages of construction workers in our sample were collected from large public construction projects such as the construction of roads (Vaud, Muristalden, Gotthardstrasse, Sustenstrasse), the construction of public buildings (Schallenbergertor in Bern or Grossmünster in Zürich), or general maintenance of public infrastructure, usually organized by the cantonal department of construction (e.g. in Appenzell, Basel, Bern, Luzern, Obwalden, St. Gallen, Zug, and Zurich). Agricultural wages are from individual accounting books of private farmers and landowners, or institutional landowners such as monasteries and hospitals. Figure 1 illustrates the coverage of our wage data across time and space. We have full temporal coverage for construction craftsmen and laborers in the center and east of Switzerland and for agricultural laborers in the west. In contrast, the data is lacking for the construction sector in the north and for agricultural labor in German-speaking Switzerland. For agricultural workers, our data are predominantly from the western region.

To compare wages across time and space, we standardize the value of cash and in-kind benefits to grams of silver.¹⁰ Source documents report cash wages in location-specific currencies and in-kind benefits in location-specific units. We convert the value of cash wages

¹⁰ See online appendix Section A.2.1 for more details on our procedure to identify relevant archival sources across Switzerland, to transcribe wage rates (e.g., translation and harmonization of job titles) and to deal with payment in kinds.

to their grams of silver equivalent using a currency conversion grid that we developed and describe in online appendix Section A.3.2. We convert payments in kind, such as wine and bread, from their location-specific unit of measurement to metric units, using the unit-conversion grid described in online appendix Section A.3.1. We then calculate the monetary value of in-kind benefits using the year-specific commodity price in grams of silver. In cases where workers were reported to receive a meal, but we do not know the content of the meal, we assume that the meal consisted of 0.5 kilograms of bread and 1 liter of wine, which we evaluate at the year-specific price in grams of silver.¹¹

3.1.2 Compositional bias correction and construction of wage series

To study the evolution of daily wage rates over time, we average daily wage rates by decade and occupation category. Because our wage data are from a diverse range of sources and locations, changes in the composition of the underlying raw data over time might bias the temporal evolution of our wage series. To correct for such compositional effects, we regress observed wages on a set of fixed effects that absorb systematic wage differences associated with observable characteristics. Specifically, for each occupation o , we estimate the following log-wage model:¹²

$$\begin{aligned} \ln(w_i) = & \sum_t \alpha_{t,o(i)} \text{decade}_{t(i)} + \sum_s \gamma_{s,o(i)} \text{season}_{s(i)} + \sum_l \beta_{l,o(i)} \text{canton}_{l(i)} + \sum_j \eta_{j,o(i)} \text{jobtitle}_{j(i)} \\ & + \sum_d \phi_{d,o(i)} \text{employer}_{d(i)} + \sum_m \rho_{m,o(i)} \text{meal}_{m(i)} + \epsilon_i. \end{aligned} \quad (1)$$

All regressors are indicator variables and $\ln(w_i)$ is the natural logarithm of the daily wage rate of the i 'th wage observation, which was paid in decade $t(i)$, season $s(i)$ and canton $l(i)$, for the job title $j(i)$. The variable $\text{employer}_{d(i)}$ identifies the employer paying the wage (farmer, hospital, monastery, private individual, or government for either public construction or maintenance). The variable $\text{meal}_{m(i)}$ indicates whether the worker in observation i received in-kind wage benefits, did not receive them, or if this information is missing.¹³

We construct corrected decade-specific wage estimates by evaluating all non-time effects at fixed reference values and adding the decade effect α_t . The reference wage is defined as the sum of coefficients weighted by the empirical shares of the corresponding attributes in the estimation sample. This yields a time-invariant component of log wages that reflects a constant composition with respect to seasonality, location, job titles, employers, and in-kind benefits. Adding the decade effect recovers the decade-specific evolution of wages, purged of compositional changes.

¹¹ Half a kilogram of bread and 1 liter of wine, evaluated at average prices (reported in online appendix Table A.1) are worth 1.6 grams of silver, which is the price of a daily consumption basket.

¹² This approach is standard in the literature, see for example Clark (2005).

¹³ We compute the coefficients of this model by minimizing the sum of squared residuals ϵ_i . To avoid that extreme values affect our results, we exclude observations below $Q1 - 1.5IQR$ and above $Q3 + 1.5IQR$, where $Q1$ and $Q3$ are the first and third quartile of the occupation-specific log-wage distribution and IQR is the interquartile range of that distribution. Figure A.19 shows the distribution of outliers in our data over time.

Formally, the adjusted log-wage for occupation o and decade t is given by

$$\begin{aligned} \widehat{\ln(w_{t,o})} = & \alpha_{t,o} + \sum_s \gamma_{s,o} \omega_{o,season_s} + \sum_l \beta_{l,o} \omega_{o,canton_l} \\ & + \underbrace{\sum_j \eta_{j,o} \omega_{o,jobtitle_j} + \sum_d \phi_{d,o} \omega_{o,employer_d} + \sum_m \rho_{m,o} \omega_{o,meal_m}}_{\text{time-invariant average log wage}} \end{aligned} \quad (2)$$

where the weights ω denote empirical shares in the occupation-specific estimation sample. Because the model is estimated in logarithms, we transform adjusted log wages back to levels using Duan’s smearing estimator.¹⁴ The resulting set of decadal average daily wage rates $\{\widehat{w}_t\}_{t=1750}^{1860}$ constitutes our estimated wage series.

In our dataset, an observation corresponds to a wage quote, which might have been paid out for multiple days or to multiple workers with the same job. Our preferred approach is to weight the observations by the number of days worked when estimating the coefficients and calculating the shares ω of each dummy variable. We report the coefficients and shares of each dummy variable used to construct the average nominal daily wage rate of skilled and unskilled construction workers and agricultural laborers in online appendix Section A.5.2.

We use this methods to construct 10-year averages of daily wage rates in both nominal and real terms. To construct the nominal wage series, w_i is the total daily wage rate of the i ’th observation, consisting of the cash wage plus in-kind benefits expressed in grams of silver per day of work. To construct the real wage series, w_i is the nominal daily wage rate of the i ’th observation divided by the price of a daily consumption basket in the year of the wage observation.

Conceptually, this construction corresponds to predicting wages for a representative worker whose attributes (season, canton, job title, employer, and in-kind benefits) are included in the proportions observed in the full estimation sample. The resulting wage level abstracts from changes in sample composition over time. Furthermore, this approach implicitly assumes that the effects of season, canton, job title, employer, and in-kind benefits on wages are stable over the estimation window. In other words, the wage premia associated with these characteristics do not vary systematically across decades, such that the decade fixed effects α_t capture the full temporal evolution of wages after conditioning on composition. In online appendix Section A.5.2, we examine this assumption by re-estimating the wage trajectories on separate subperiods. The resulting series are close to the full-period estimates, indicating that any variation in attribute-specific premia over time does not materially affect our inferred wage path.

To gauge the impact of the compositional bias correction, we compare the corrected wage series with a series of unconditional 10-year averages of all daily wages paid for a specific

¹⁴ Following Duan (1983), we compute a smearing factor as the sample average of $\exp(\widehat{\epsilon}_i)$ and multiply $\exp(\widehat{\ln(w_{t,o})})$ by this factor when converting adjusted log wages to levels. This corrects for retransformation bias under log-normal errors.

occupation type. Online appendix Figure A.6 shows a side-by-side comparison of these wage series. The compositional bias correction reduces variability across periods and yields more stable wage trajectories. The corrected and raw series follow the same long-run path.¹⁵

3.2 Consumption Price Index

To evaluate historical wages in terms of their purchasing power, we deflate nominal wages with a consumer price index (CPI). This index is based on the respectability consumption basket defined in Allen (2001) and refined in Allen (2015). This basket combines the prices of 12 different commodities, is widely used in the literature and therefore allows us to contrast our results directly with results for other countries from the literature. We compare the prices of the most important goods in the basket in different locations in Switzerland and find that their level and trends were very similar across all Swiss regions (See online appendix Section A.4.1, and in particular Figure A.2). Motivated by this observation, we pool our price data across locations and construct a single CPI for all of Switzerland. As with the wage data, we use a regression model to purge the price data from compositional changes in seasonality and quality in the raw data. In contrast to nominal wages, prices fluctuated a lot from year to year. To capture these fluctuations, we calculate the CPI on an annual basis. Since our price data are incomplete for some commodity-year combinations, we use a local level model to impute the missing prices.

The consumption basket consists of staple food items, energy sources, and basic non-food necessities. Food consumption is dominated by bread, which accounts for about forty percent of total expenditure, and is complemented by legumes (peas and beans), animal products (beef, butter, cheese, and eggs), and wine. Together, these items provide approximately 1,940 kilocalories and 78 grams of protein per day, corresponding to subsistence-level nutritional requirements. In addition to food, the basket includes soap, candles, linen cloth, and firewood, which capture essential household needs such as hygiene, lighting, clothing, and heating. Quantities are fixed over time and correspond to the annual respectability basket proposed by Allen (2001) and Allen (2015). Table A.1 reports the full basket composition, quantities, expenditure shares, and implied nutritional content.¹⁶

While we adopt the definition of the Allen basket, we do not rely on other assumptions made in Allen (2001). Allen assumes that a male adult worked 250 days per year and required three consumption baskets to feed a family of two adults and two children. This allows him to draw conclusions regarding the standard of living of working class families. However, subsequent work argues that these assumptions are not tenable since the number of work days per year varied over time and women and children generally also contributed to the family budget (Horrell et al. 2021). For the purpose of our research, we do not need these assumptions. The data available from other studies (including Allen's) allow a comparison of daily real wages

¹⁵ For further details, see online appendix A.5.1.

¹⁶ Due to lack of data, we exclude rent from our consumption basket. To ensure comparability, we also exclude rent from the consumption baskets in other studies before comparing estimates.

defined as the nominal day wage divided by the price of a *daily* consumption basket (annual consumption basket divided by 365).

3.2.1 Sources for price data

Our analysis is based on more than 23,300 price quotes for 12 different commodities, collected from archival source documents, printed historical sources and secondary literature (see online appendix Tables A.12, A.13 and A.14). The most important source of information are historical newspapers, publications by authorities, institutional accounting books and scientific studies of historical price series. In the early eighteenth century, weekly newspapers known as *Intelligenzblaetter* emerged in many Swiss cities. These newspapers often reported the prices of essential food staples such as grains, bread, and meat. The prices listed were typically daily prices from local weekly markets or statutory prices set by authorities. A related source are government archival records. These records include the average price of commodities traded on official markets as reported by local officials that monitored these markets. They also include periodic decrees that set maximum prices for regulated products such as bread or wine.

For unregulated products, in particular non-food products such as firewood, clothes, and candles, we collect prices from private and institutional accounting books. These books report quantities and prices of goods bought or sold by private households or institutions such as hospitals and monasteries. The drawback of collecting price data from this type of source is that we only observe single transaction prices at certain points in time.

We augment our archival price data with price series from secondary sources. Detailed studies on various sectors, regions, and time periods in Swiss economic history exist for which researchers have collected price data. The commodity prices are usually reported in terms of local currencies and local units of measurement. We convert prices to grams of silver per metric unit. We explain the details of this harmonization process in online appendix Section A.3.

3.2.2 Compositional bias correction and construction of price series

To construct annual commodity price series, we aggregate individual price quotes to the yearly level. As with wages, the composition of observed price quotes varies over time, both with respect to the quality of the good and the season in which prices are recorded. Such compositional changes may bias the temporal evolution of price series. We therefore adjust price quotes for compositional effects using a fixed-effects regression approach that parallels the wage adjustment described in Section 3.1.2.

Specifically, we estimate the following log-price model separately for each commodity:

$$\ln(p_i) = \sum_q \eta_{q,c(i)} \text{quality}_{q(i)} + \sum_s \gamma_{s,c(i)} \text{season}_{s(i)} + \rho_i, \quad (3)$$

where $\ln(p_i)$ denotes the natural logarithm of the price quote recorded in observation i , expressed in grams of silver per standardized unit. The indicators $\text{quality}_{q(i)}$ capture

differences in the reported quality of the good, while $season_{s(i)}$ indicate the season in which the price was observed. The coefficients $\eta_{q,c(i)}$ and $\gamma_{s,c(i)}$ therefore absorb systematic price differences associated with quality and seasonal variation. The residual ρ_i represents the remaining within-commodity price variation after accounting for these compositional effects.

We construct adjusted log prices by replacing the estimated quality and season effects with a fixed reference composition. Seasonal and quality effects are normalized to their empirical distribution within each commodity, thereby preserving the commodity-specific mix of seasonal patterns and quality levels observed in the data. Formally, the adjusted log price is defined as

$$\widehat{\ln(p_i)} = \rho_i + \sum_q \eta_{q,c(i)} \omega_{quality_{q,c(i)}} + \sum_s \gamma_{s,c(i)} \omega_{season_{s,c(i)}} \quad (4)$$

where $\omega_{x,c(i)}$ denotes the within-commodity share of observations with characteristic x .

The adjusted price in levels is then given by

$$\hat{p}_i = \exp(\widehat{\ln(p_i)}) \cdot S_{c(i)}. \quad (5)$$

where S is Duan's smearing factor.¹⁷

Finally, the annual price of commodity c in year t is computed as the unweighted average of all adjusted price quotes for that commodity and year:

$$\bar{p}_{c,t} = \frac{1}{|\mathcal{I}_{c,t}|} \sum_{i \in \mathcal{I}_{c,t}} \hat{p}_i, \quad (7)$$

where $\mathcal{I}_{c,t}$ denotes the set of price quote observations for commodity c in year t and $|\mathcal{I}_{c,t}|$ is the number of observations in that set.

3.2.3 Imputation of missing price-year data

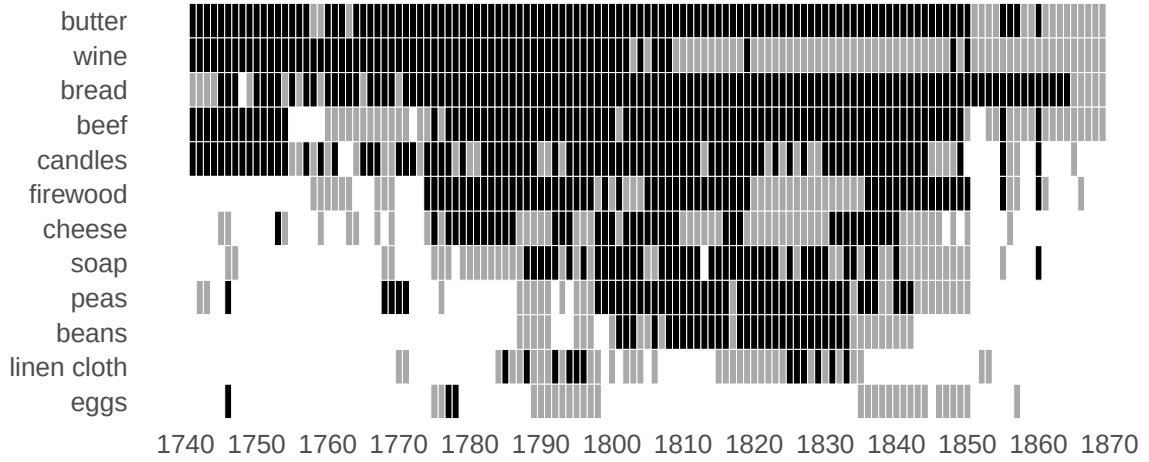
To calculate the annual price of the consumption basket, we require annual prices for every commodity in the basket. However, prices for some commodity-year combinations are missing. We impute these missing commodity prices with a state-space model, estimated by the Kalman filter, which uses the persistence of each series and the co-movement across commodities to infer the unobserved values. Figure 2 shows the coverage of our price data over the period 1740 to 1870. We observe prices for bread, wine, beef and butter in every year. Combined, these four items account for almost 75 percent of the price of the entire consumption basket, when measured in years without missing price data. Other important

¹⁷ Because the regression model is estimated in logarithms, we apply Duan's smearing estimator when transforming adjusted log prices back to levels. For each commodity, we compute the smearing factor

$$S_c = \frac{1}{|\mathcal{I}_c|} \sum_{i \in \mathcal{I}_c} \exp(\hat{\rho}_i), \quad (6)$$

where $\mathcal{I}_c$ is the set of all price quotes for commodity c , $|\mathcal{I}_c|$ is the number of observations in that set and $\hat{\rho}_i$ are the estimated residuals from Equation 3.

Figure 2: Temporal coverage of price data



Note: This figure summarises the coverage of price data coverage by commodity and year from 1740 to 1870. Black cells indicate more than five observations, grey cells indicate one to four observations, and white cells indicate no observations.

items such as firewood, cheese, soap and peas are observed in around 50 percent of the years. Minor items (in terms of expenditure share) in the consumption basket, such as beans, linen cloth and eggs, are observed in 20 percent to 40 percent of all years.

To compute annual prices of the consumption basket, missing prices must be imputed. The historical price literature addresses this problem in two main ways. A first approach fills gaps by linear interpolation or by ad hoc extrapolation rules (e.g. Allen 2001; Pfister 2017).¹⁸ A second approach specifies a statistical model for the joint evolution of all prices, estimates its parameters, and predicts missing values from the fitted model (e.g., Chambru and Maneuvrier-Hervieu 2023).

In this paper, we impute missing prices with a model-based approach. The main reason is methodological: the non-parametric construction of confidence intervals by bootstrapping requires an algorithmic imputation rule that can be repeated for each bootstrap iteration. We follow Pérez-Castroviejo and Tusell (2007) and impute missing prices with a local level model, which is a simple state space model (see Durbin and Koopman 2012, Chapter 2). The model consists of an observation equation and a transition equation. Let y_{it} denote the logarithm of the price of commodity $i \in \{1, \dots, p\}$ in year $t \in \{1740, \dots, 1870\}$. The observation equation is

$$y_{it} = \alpha_{it} + \varepsilon_{it}, \quad (8)$$

where α_{it} represents the latent price level of commodity i in year t and ε_{it} is an idiosyncratic

¹⁸ Examples of the imputation procedures in Allen (2001) include: “Earlier meat prices extrapolated backward based on the price of cheese” (p. 435), “Portions of the time series for eggs were extrapolated using herring prices and meat prices” (p. 437), and “Strasbourg prices were used for meat, cheese, wine, candles, lamp oil [in Paris]” (p. 439).

measurement error, with $\varepsilon_{it} \sim \mathcal{N}(0, h_i)$. Stacking the observation equations for all commodities yields the multivariate form

$$\mathbf{y}_t = \boldsymbol{\alpha}_t + \boldsymbol{\varepsilon}_t, \quad \boldsymbol{\varepsilon}_t \sim \mathcal{N}(0, \mathbf{H}), \quad (9)$$

where $\mathbf{y}_t, \boldsymbol{\alpha}_t$, and $\boldsymbol{\varepsilon}_t$ are $p \times 1$ vectors and $\mathbf{H}$ is a $p \times p$ matrix.

The multivariate transition equation is

$$\boldsymbol{\alpha}_t = \boldsymbol{\alpha}_{t-1} + \boldsymbol{\eta}_t, \quad \boldsymbol{\eta}_t \sim \mathcal{N}(0, \mathbf{Q}), \quad (10)$$

where $\boldsymbol{\eta}_t$ is a $p \times 1$ vector and $\mathbf{Q}$ is a $p \times p$ matrix. The latent price levels $\boldsymbol{\alpha}_t$ follow a random walk, which means that price shocks are permanent.

This local-level structure captures smooth long-run price trends while allowing shocks to accumulate over time. Following Pérez-Castroviejo and Tusell (2007), we assume that the measurement-error covariance matrix $\mathbf{H}$ is diagonal with commodity-specific variances h_i and zero on the off-diagonals. The innovation covariance matrix $\mathbf{Q}$ is heteroskedastic and equicorrelated, with elements

$$q_{ij} = \begin{cases} \sigma_i^2, & i = j, \\ \rho \sigma_i \sigma_j, & i \neq j, \end{cases}$$

so that all state innovations share a common correlation coefficient ρ . This structure implies that all commodities are exposed to a common global disturbance component while retaining commodity-specific innovation variances.

The model contains $2p + 1$ free parameters: p innovation variances, p measurement-error variances, and one correlation coefficient. The parameters are estimated by maximum likelihood. For a given parameter vector, the likelihood of the observed price panel is evaluated with the Kalman filter, and the parameters are updated iteratively using a quasi-Newton (BFGS) routine until convergence. The Kalman smoother step recovers the conditional expectation of the latent states given all observations.¹⁹

We use the smoothed states to impute missing prices. Where y_{it} , the average price of commodity i in year t , is unobserved, its value is replaced by the corresponding smoothed estimate $\hat{\alpha}_{it}$, which represents the best linear unbiased estimate of the latent price level. The smoother combines information from two sources: the persistence of each series implied by the random-walk structure, and the comovement across commodities captured by the covariance matrix $\mathbf{Q}$. If, for instance, the price of beef is missing in a particular year, the estimate reflects both the past evolution of beef prices and contemporaneous shocks detected in related commodities. This approach ensures that imputed prices are consistent with individual price dynamics and with common market disturbances.

Online appendix Figure A.20 presents the price series for all consumption basket commod-

¹⁹ Computational implementation is done with the KFAS module in R (Helske 2017).

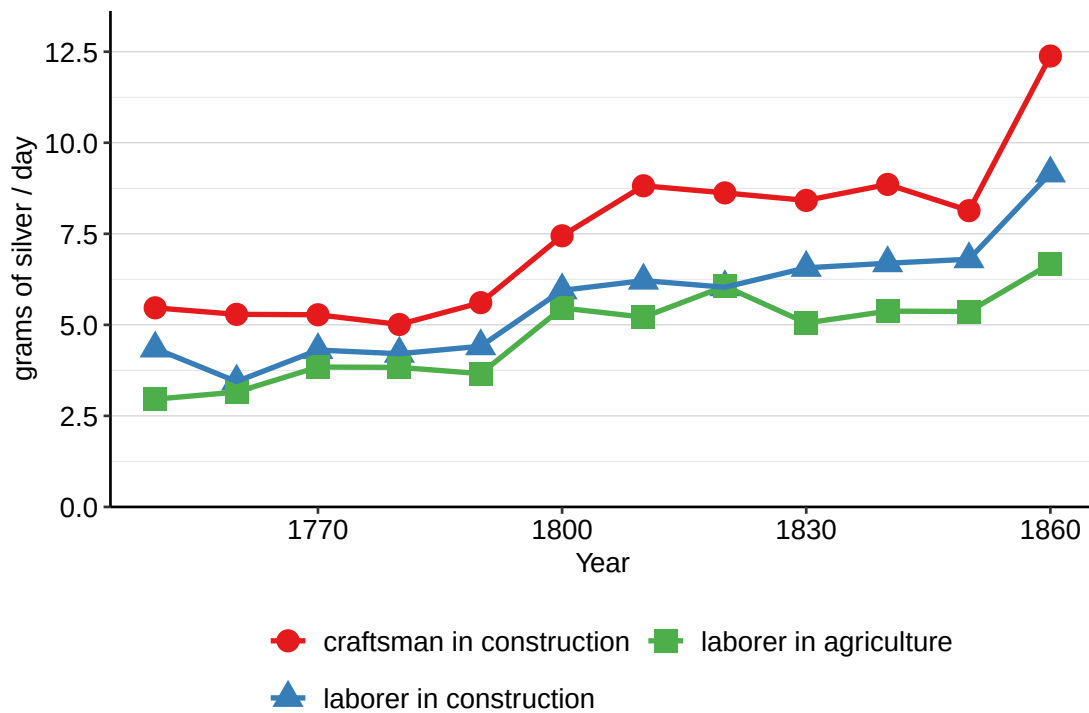
ities. Imputed values are denoted by red crosses. The imputed values align closely with the observed data and display smooth, economically plausible transitions without artificial jumps.

4 Results

4.1 Wage series

4.1.1 Nominal Wages

Figure 3: Nominal Daily Wage Series



Note: This figure shows the decadal estimates of daily wages in grams of silver for male workers in the construction and agricultural sectors. Wages include in-kind benefits. The wage estimates are calculated with the regression approach described in Section 3.1.2.

Figure 3 presents our main result: decadal estimates of daily wages in grams of silver for male workers in the construction and agricultural sectors. These estimates are calculated using the regression approach described in Section 3.1.2 and include in-kind benefits.²⁰ In online appendix Section A.5.3, we present the same figure at a geographically disaggregated level. We find little systematic regional variation and therefore focus the discussion on Switzerland-wide estimates. To the best of our knowledge, we are the first to estimate a representative wage series for eighteenth-century Switzerland. For the nineteenth century, our estimates align

²⁰ Online appendix Figure A.7 shows the estimates of the average wage rate using the plain average. The comparison with Figure 3 shows that the regression approach helps stabilize the estimated wage series but does not alter levels or trends. If not stated differently, we use the information on in-kind payments from the sources and treat all cases with missing information as cash-only wages. We discuss this in detail in online appendix Section A.6.

closely with those in the literature on Swiss construction workers' wages, as we show in a full comparison in online appendix Section [A.5.4](#).

Figure [3](#) shows a similar trend emerging for each of the three occupation groups. Nominal wages were relatively stable in the period from the 1750s to the 1780s, increased between the 1780s and 1800s, and remained relatively stable again in the first half of the nineteenth century. The increase in wages at the end of the eighteenth century coincided with substantial increases in the price of food products. While rising food prices increased the value of in-kind benefits, the sustained increase in the wage level around 1800 is primarily due to increases in cash wages, which likely reflected the rising prices of the 1790s.²¹ After 1850, wages increased once again. Although our estimates for 1860 rely on few data points, this increase is consistent with earlier studies on Swiss construction wages (online appendix Section [A.5.4](#)).

The nominal wage series also reveals differences across skill levels and sectors. It suggests a skill premium in the construction sector of 1.2 grams of silver in the mid-eighteenth century and 2.1 grams of silver in the mid-nineteenth century, in both cases equivalent to 29% of the unskilled wage. Comparing laborers' wages across sectors, construction workers earned a premium of 0.6 grams of silver (18% of the agricultural laborer wage) in the mid-eighteenth century, rising to 1.7 grams of silver (30%) in the mid-nineteenth century.

4.1.2 Consumption Price Index

Figure [4](#) plots the price of the annual consumption basket in grams of silver.²² As with wages, we focus on Switzerland-wide estimates because of very limited regional variation in prices (see online appendix Section [A.4.1](#)). The consumption basket covers 130 years, starting in 1740. Over this period, its price increased from 500 grams of silver to around 750 grams of silver in 1860. Prices were volatile, with major increases during the famine years of 1770–1771 and 1816–1817 (Kurmann [2011](#)), the years following the French Revolution of 1789, and the French occupation of Switzerland in 1799.

4.1.3 Real Wages

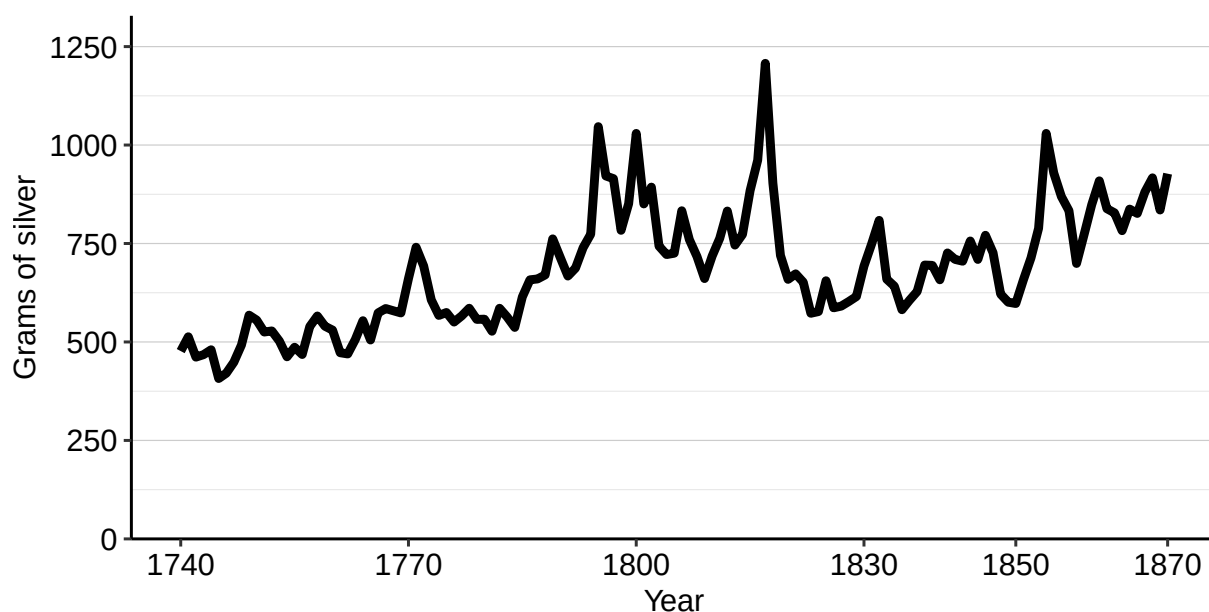
We construct real wages by dividing the total nominal daily wage rate by the cost of a daily consumption basket (i.e., the annual basket price from Figure [4](#) divided by 365). We then apply the regression approach described in Section [3.1.2](#) to estimate decadal average real wage series. Figure [5](#) presents the results. The estimates indicate that the real wages of all occupation groups increased during the period of our study. Between 1750 and 1860, real wages increased by approximately 45% for skilled construction workers, by 43% for unskilled construction workers, and by 30% for agricultural day laborers.²³

²¹ This mechanism is mentioned in Stolz ([1970](#), p. 146) for the example of construction workers in the canton of Zurich.

²² In online appendix Table [A.1](#), we summarise the composition of the consumption basket and provide the price per unit of consumption in grams of silver per year.

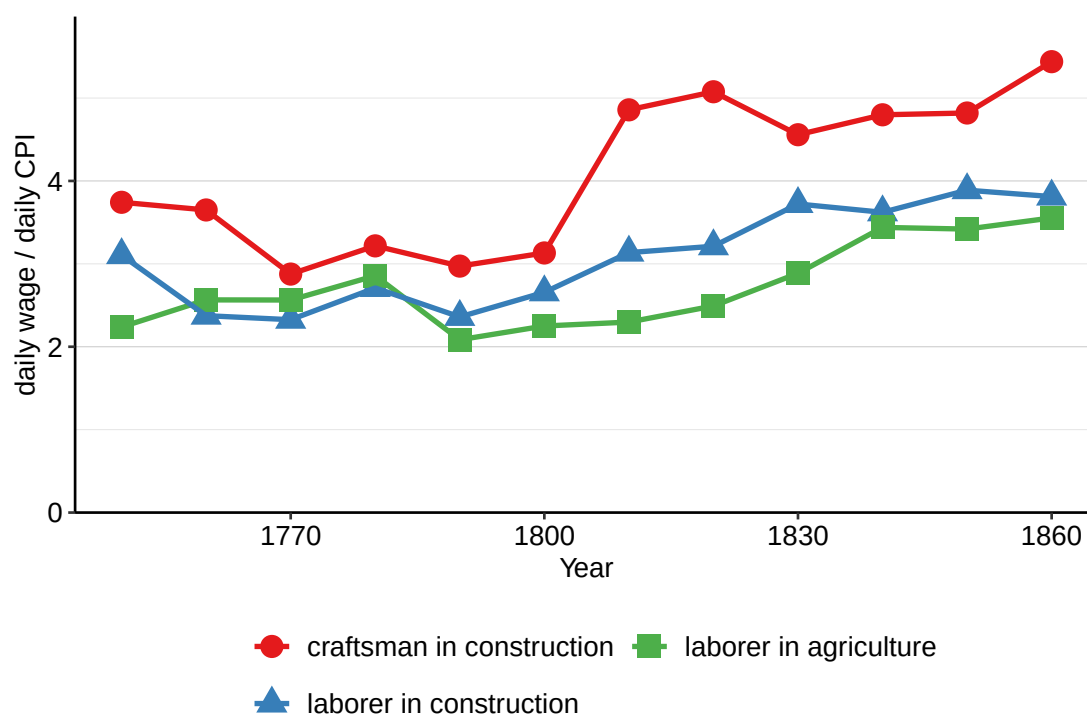
²³ To smooth the volatile decadal estimates, these numbers compare the average real wage for the periods 1750–1770 and 1840–1860.

Figure 4: Price of Consumption Basket



Note: The figure shows the price of the annual consumption basket in grams of silver, covering the period from 1740 to 1870. The basket follows Allen (2001) and is defined in online appendix Section A.4.2 and Table A.1. Commodity prices are annual averages based on available observations across Switzerland, adjusted for source and location effects as described in Section 3.2.2. Missing commodity prices are imputed as described in Section 3.2.3.

Figure 5: Real Daily Wage Series



Note: This figure shows the decadal estimates of real daily wages for male workers in the construction and agricultural sectors. Real wages are computed by dividing the nominal daily wage in grams of silver by the cost of a daily consumption basket (the annual basket price divided by 365). The wage estimates are calculated with the regression approach described in Section 3.1.2.

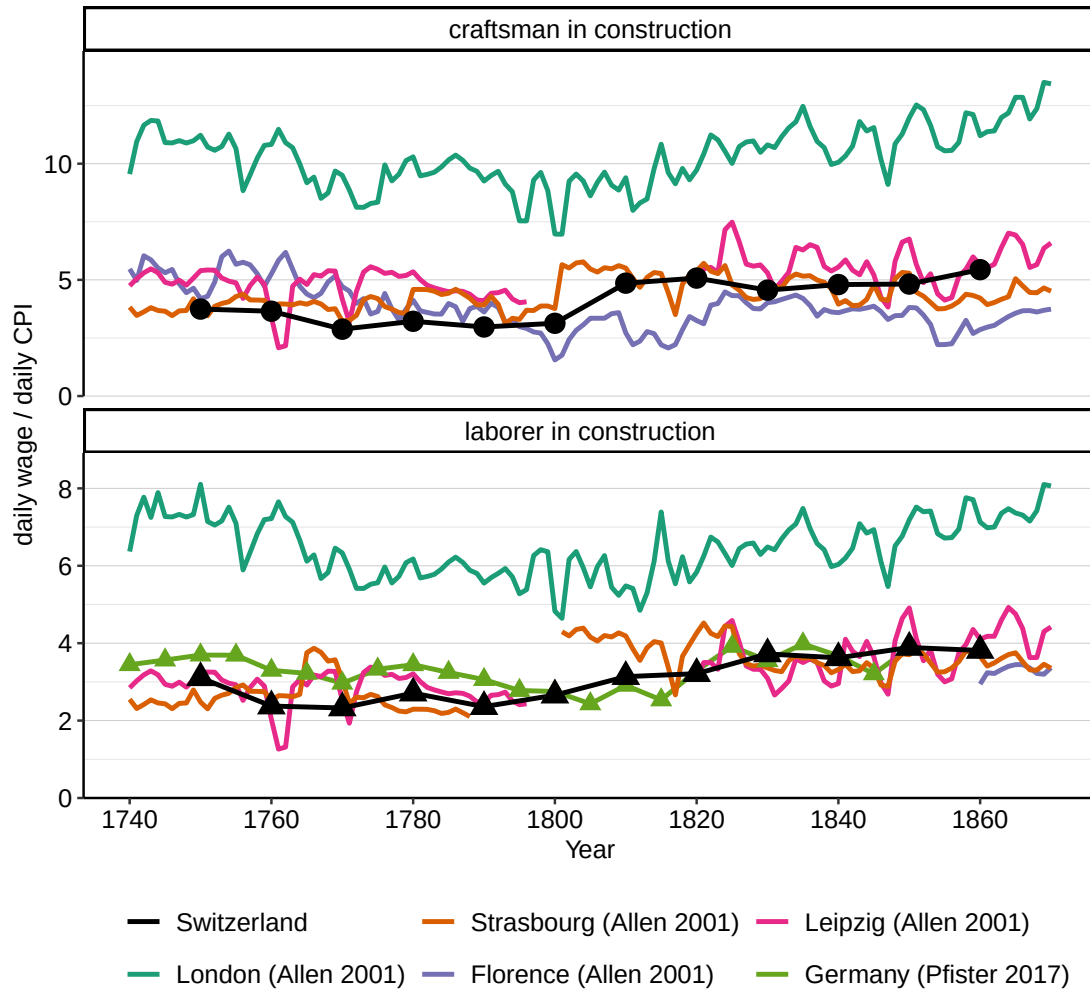
Comparing Figures 3 and 5 shows that while nominal wages increased for all occupations between the 1790s and the 1800s, real wages only rose between the 1800s and the 1810s. This reflects the timing of price movements: prices increased in the period 1780–1800 and declined between 1800 and 1810 (see Figure 4). The real wage gain thus resulted from nominal wages rising to offset increased living costs in the 1790s, then remaining stable as prices fell after 1800. Similarly, while nominal wages increased again after 1850, rising prices in this period meant that real wages remained largely stagnant.

Figure 6 compares the real wages of construction workers in Switzerland with those of their counterparts in other European cities, based on data from Allen (2001), and with a real wage estimate for laborers in Germany by Pfister (2017). Since the comparative literature focuses on construction wages, we limit the international comparison to this sector. The upper panel shows the wages of skilled workers (craftsmen), while the lower panel shows the wages of unskilled workers (laborers). For both occupations, we reach the same conclusion: in 1750, wages in Switzerland were on par with Strasbourg, Florence, Leipzig, and Pfister’s estimate for Germany, and well below Allen’s estimate for London. While there are some short-term deviations, our real wage series follow the same level and trajectory as those by Allen for Strasbourg, Leipzig, and Florence, and by Pfister for Germany. Swiss real wages thus appear to have been broadly representative of continental European levels throughout our period, while remaining distinctly below those in London. In online appendix Figure A.18, we present the same figure including uncertainty intervals for our estimates. Most short-term deviations lie within the confidence band of our estimates, while Allen’s London estimate lies consistently outside of it.

Studer (2008) concluded that real wages in Zurich were lagging behind the rest of Europe in 1800 and only caught up after the 1820s. Our estimates suggest that this finding is an artefact of short-term deviations around 1800 rather than a reflection of structurally lower wage levels. By extending the series back to the mid-eighteenth century, we show that Swiss wages were already on par with continental European cities before 1800. Studer’s conclusion thus appears to be driven by the specific starting point of his series rather than by a persistent wage gap.²⁴

²⁴ We provide a direct comparison of our wage series with those of Studer (2008) in online appendix Figure A.12.

Figure 6: Real Daily Wages in Construction: Comparison to European Cities



Note: This figure shows our real wage series, real wage estimates for various European cities from Allen (2001) and real wage estimates for Germany from Pfister (2017). Real wages are the nominal daily wage in grams of silver divided by the cost of a daily consumption basket in that location in grams of silver.

4.2 Quantification of uncertainty

This section quantifies the uncertainty in our wage series arising from incomplete information on in-kind benefits and from the sampling process inherent in archival records.

4.2.1 Uncertainty due to in-kind benefits

During the historical period that we study, in-kind benefits were an important component of total wage compensation. Unfortunately, they are often poorly documented in archival sources (see e.g. Chambru and Maneuvrier-Hervieu 2023; Humphries and Weisdorf 2019; Ridolfi 2019). The lack of consistent information on in-kind benefits poses a significant challenge. Of all wage observations, 37.2% explicitly mention the provision of in-kind benefits such as wine, bread, or a meal. In 6.6% of cases, sources explicitly state that no in-kind benefits were provided. The

remaining 56.2% lack any mention of in-kind benefits.²⁵ In online appendix Section A.6, we analyze primary and secondary sources and conclude that the use of in-kind benefits varied substantially across employers and sometimes even between workers with the same employer. More generally, we find that the presence or absence of in-kind benefits cannot be inferred from attributes of the wage observation, such as the job description, period, region, or employer.

To address this uncertainty, we construct three versions of the wage series under different assumptions about in-kind benefits. Our preferred version follows the sources strictly: it includes in-kind payments where they are explicitly mentioned and treats all other observations as cash-only wages. Unless stated otherwise, all results in the paper are based on this assumption. The second version provides an upper bound: whenever the sources are unclear, we assume that workers received a meal (equivalent to 0.5 kilograms of bread and 1 liter of wine) in addition to cash wages. The third version provides a lower bound by assuming that all workers received only cash wages, disregarding even explicitly recorded in-kind benefits. Although this assumption is factually incorrect, it offers a useful benchmark for comparison with series in the literature, such as those in Allen (2001), where in-kind benefits may also be missing.²⁶ Together, the upper and lower bounds quantify the uncertainty stemming from missing in-kind information.

Figure 7 presents the resulting range of wage estimates. In construction, the wage series increases markedly under the upper-bound assumption. In contrast, restricting the series to cash wages produces only small changes. Adding meals to all uncertain observations raises the estimated wage series for craftsmen in construction by 20% and for laborers in construction by 27% relative to the preferred estimate. Restricting the series to cash wages alone reduces them by 10% and 5%, respectively. Agricultural wages exhibit a different pattern. Adding a meal to all uncertain observations leaves the series nearly unchanged, but restricting them to cash wages alone reduces agricultural wages by 50%. This reflects the high prevalence of explicitly documented in-kind benefits in agricultural wage observations.

4.2.2 Sampling-based uncertainty

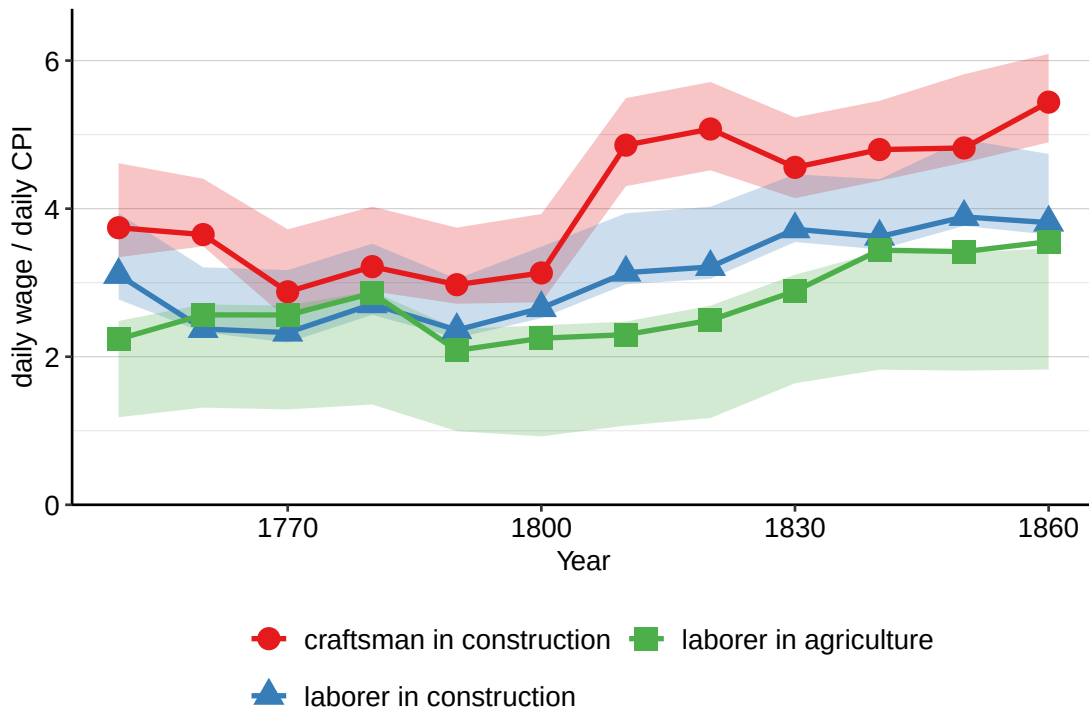
Our wage series are based on a sample of price and wage quotes recovered from archival sources. As in most studies that rely on documentary material, the surviving records represent only a fraction of the observations that once existed. Consequently, the estimated wage path is subject to sampling uncertainty: if a different set of documents had been collected, the resulting estimates would differ because of sampling variation. Ignoring this uncertainty risks overstating the precision of historical wage estimates and may lead to overconfident interpretations of levels, trends and international comparisons.

To assess the robustness of our results, we quantify sampling uncertainty using a block bootstrap. The idea is to repeat the entire estimation procedure on many resampled versions of the original data. Each bootstrap draw replicates every step of the pipeline, including the

²⁵ Percentages are weighted by employment days.

²⁶ See Geloso (2018) for a discussion of missing in-kind payments in Allen's Strasbourg wage series.

Figure 7: Uncertainty of real wage estimates due to in-kind payments



Note: This figure presents the ranges of real wage series estimates under different assumptions concerning in-kind benefits. Wages are deflated with the cost of a daily consumption basket (the annual basket price divided by 365). The solid line represents the baseline wage series also reported in Figure 5. The shaded area indicates the range obtained under different assumptions concerning the payment of in-kind benefits. The solid line represents the preferred series, which includes all cash and recorded in-kind payments.

construction of the commodity price series, the imputation of missing prices and the estimation of the wage model. This approach yields a distribution of wage trajectories that reflects the uncertainty arising from the documentary sample.

A central feature of archival material in this context is that individual observations are not discovered in isolation but as part of larger documents such as payrolls or accounting books. Therefore, observations from the same document share contextual features and are not independent. To preserve this dependence structure, each bootstrap sample resamples documents with replacement rather than individual observations. All price or wage quotes contained in a document are kept together, and the number of documents drawn in each iteration matches the number observed in the original dataset. This procedure ensures that the bootstrap distribution reflects the fact that the archival sample consists of clusters of observations rather than independent draws.

We generate 1,000 bootstrap replications. For each decadal wage estimate, we summarise the resulting distribution with the 5th and 95th percentiles. These percentile intervals illustrate the extent to which sampling variation affects our results and provide an intuitive measure of the

uncertainty surrounding the estimated wage path.²⁷

The shaded areas in Figure 8 show the range between the 5th and 95th percentiles of the bootstrapped wage estimates. The figure indicates that sampling uncertainty is non-trivial. The bands are relatively wide, especially for construction craftsmen, and narrower for construction laborers and agricultural laborers. This pattern reflects differences in the size and structure of the source documents across occupations. For all three occupations, the percentile ranges move upward during the early nineteenth century, confirming the increase in real wages. The long-run occupational ranking is also supported: the intervals for craftsmen lie above those for construction laborers, which in turn lie above those for agricultural laborers. At the same time, the shaded areas overlap in many decades. This overlap shows that the data leave room for smaller underlying differences than the point estimates suggest.

While the shaded bands already provide a visual indication of the magnitude of sampling uncertainty, formal tests allow us to assess long-run differences more directly. In online appendix Section A.7.1 we conduct two sets of bootstrap-based tests. The first test compares average real wages in an early period (1750–1790) with those in a late period (1820–1860) for each occupation. The bootstrap distributions show that these long-run differences are positive for all occupation types, indicating that the long-run rise in real wages is not driven by particular documents or sampling variation. The second test examines average real wage gaps between occupation pairs. The bootstrap distributions place these gaps consistently above zero, supporting the occupational ranking described above. Taken together, these tests confirm that the long-run patterns in the wage series are robust to sampling uncertainty, even though the surviving archival material leaves scope for considerable variation in the specific real wage path.

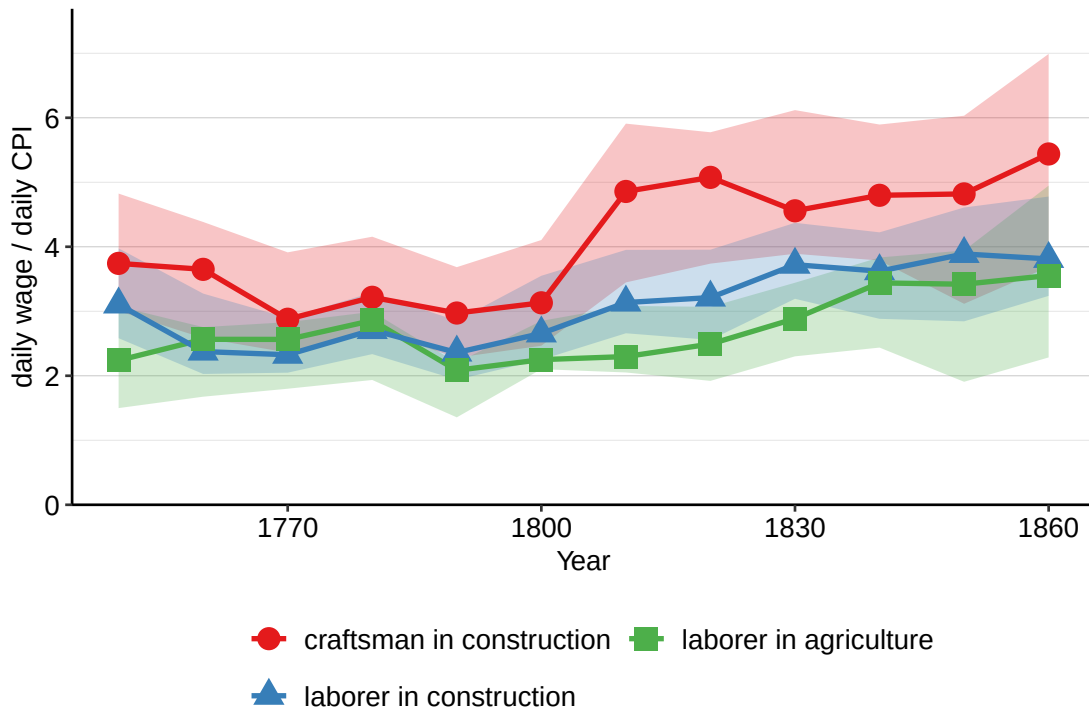
5 Conclusion

How did wages develop in pre-industrial and early-industrial Switzerland? Answers to this question are important not only for a better understanding of this transformational period in Swiss history but also for the broader question of what drove the industrial revolution. In this paper, we present the first estimates of daily wage rates during the period 1750 to 1860. We rely on more than 17,700 wage quotes collected from archival sources from across Switzerland to compute a series of nominal and real wages for skilled and unskilled male workers in the construction sector and day laborers in the agricultural sector. We harmonize this hand-collected wage and price data with newly constructed conversion tables.

Our results indicate that nominal wages evolved similarly for the three occupation groups: nominal wages stagnated between 1750 and 1780, increased sharply around 1800, likely because of rising prices of food and other consumption goods during that period, and remained stagnant again until 1850. Our last wage estimate for the decade 1860 shows a new increase in nominal wages for workers in the construction sector. There is a clear occupational

²⁷ Further details on the bootstrap procedure are given in online appendix Section A.7.

Figure 8: Uncertainty of real wage estimates due to sampling uncertainty



Note: This figure presents the ranges of real wage series estimates for different occupations. Wages are deflated with the cost of a daily consumption basket (the annual basket price divided by 365). The solid line represents the baseline wage series also reported in Figure 5. The shaded areas represent the 5th to 95th percentile of the range of decadal wage estimates obtained from 1,000 block-bootstrap resamples of the wage and price data. For each bootstrap iteration, prices are cleaned and imputed as described in Section 3.2 before calculating the price of the consumption basket, which is used to deflate observed wage rates. Wage estimates are constructed using the regression approach described in Section 3.1.2.

ranking: craftsmen in construction earned higher wages than laborers in construction, and laborers in construction earned more than laborers in agriculture. Comparisons with existing estimates for mid-nineteenth century Switzerland show that our nominal wage estimates match earlier figures well in terms of level and trend and that the increase after 1850 marks the onset of a long period of sustained nominal wage growth. Deflating nominal wages with the price of a basket of consumption goods yields a real wage increase of roughly 30 to 45 percent over our sample period. Virtually all of this increase occurs in the early part of the nineteenth century, while the second half of the eighteenth century saw no real wage changes.

To quantify the uncertainty of our results, we examine two sources of variation: in-kind benefits and sampling uncertainty. A straightforward assessment of the role of in-kind benefits is difficult because of incomplete documentation. The range created by alternative assumptions shows that missing information on payments in kind can meaningfully affect wage levels, especially in agriculture, but does not overturn the broad patterns in the construction sector. Addressing sampling uncertainty, a block-bootstrap procedure indicates that the archival record leaves scope for considerable variation in individual decadal estimates. However, the bootstrap-based tests show that the long-run increase in real wages for all

occupation types, as well as the occupational ranking, are robust to sampling variation.

We compare our real wage series with those for various European cities by Allen (2001), those for Germany by Pfister (2017), and those for the city of Zurich by Studer (2008). Our findings suggest that Swiss real wages in the construction sector during the second half of the eighteenth century were comparable to those in neighboring regions such as Strasbourg and Southern Germany, while remaining distinctly below those in London. This contrasts with Studer (2008), who concluded that construction wages in Zurich lagged behind those in continental European cities well into the nineteenth century. Our extended series shows that this conclusion is driven by the limited time coverage of his data: because his series begins in 1800, a temporary divergence between Zurich and Strasbourg wages around that date appears as a structural gap rather than a short-term deviation.

Overall, our results suggest that Switzerland occupied an intermediate position within Central Europe, with wage levels neither exceptionally high nor exceptionally low, and with real wage growth beginning in the early nineteenth century. Our estimates provide one of the key inputs, the price of labor, needed to assess the relevance of the high-wage hypothesis for Switzerland. Combining these wage series with systematic data on energy prices would allow future research to evaluate whether relative factor prices can help explain the timing and pattern of Swiss industrialisation.

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Online appendix
(Male) Wages in Switzerland, 1750-1860

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A.1 Swiss historiography on historical living standards

The study of wages and the living standard of workers in Switzerland in the nineteenth century has a long tradition.¹ This section reviews key contributions to the literature, focusing on the evolution of data sources, methodological approaches, and findings regarding wage developments in Switzerland from 1800 onward. To the best of our knowledge, our paper is the first to estimate wages in Switzerland for the period before 1800.

Chatelanat (1878) is one of the first systematic attempts to quantify the changes in wages and prices in Switzerland. Specifically, he studied the period from the late 1840s to the early 1870s, using data from the canton of Bern. In contrast with the common approach of contrasting changes in wages with changes in the price of one important food staple such as bread, he used household account books to create a consumption basket with which he calculated the changes in cost of living for workers. Chatelanat used historical price data from a diverse range of sources such as government records, private accounting books, his own surveys, and secondary literature. To calculate the change in wages, he used survey data from the statistics office of the canton of Bern that asked all municipalities in the canton to report wages of different occupations in the past and today. His results suggest that real wages stagnated or declined over the period 1840 to 1870. The price of the consumption basket increased by 60–70% while the daily wages of construction laborers increased by 60%.

Notz (1925) investigates changes in real wages among middle-income workers during 1800–1833 and 1892–1923. Using data on wages, prices, and household budgets from Basel, he examines the wages of construction workers and public sector employees. His analysis reveals that the real wage of postal workers in Basel increased by 40% over the first three decades of the nineteenth century and by 175% over the course of the whole nineteenth century (p. 246).

Siegenthaler (1965) and Gruner (1968) collected a large amount of data from primary sources to create estimates of the development of the living standard of Swiss laborers from 1830 to 1914. Among others, they calculated the average nominal daily wages of workers in nine different industries. Using a consumption basket approach,² they constructed indices for consumer prices and real wages in the secondary sector. The findings in Siegenthaler (1965) suggest that daily wages increased by 186% in real terms between 1840 and 1890. Although he compares his wage and price series with similar estimates for France and Germany, the methodological differences in constructing these series made it impossible to compare the standard of living of workers in Switzerland with those in neighboring countries.

Bernegger et al. (1986) collects hourly wages for various industrial sectors in the German-speaking part of Switzerland. He constructs nominal and real hourly wage indices starting in 1821 and extending into the twentieth century for different industries. To account for changes

¹ Profound economic and social changes led to investigations of real wages of Swiss laborers starting in the 1870s (Böhmert 1873, 1874; Chatelanat 1878; Landolt 1891). At the same time, the emergence of statistical sciences led to studies on price and wage statistics (e.g. Mühlemann 1882; Müller and Waser 1878; Stockalper 1869).

² The consumption basket contains bread, potatoes, milk, butter, meat, coffee, eggs, firewood, clothes and rent (Siegenthaler 1965, p. 427).

in the structure of the economy over this long time horizon, he allows for compositional shifts in industry sizes when constructing a wage index for the total secondary sector. His index suggests that between 1821 and 1890 real hourly wages increased by 340% in the construction sector and by 273% in the whole secondary sector.

Studer (2008) is the first and so far only study that closely follows the methodology of Allen (2001). He combines wage and price data from secondary sources (Böhmert 1873; Dürst 1951; Notz 1925) and archival sources from the archive of the canton of Zurich to build two nominal wage series for skilled and unskilled construction workers spanning the years 1800 to 1913. He deflates his nominal wage series with a consumer price index that is based on the respectability consumption basket proposed by Allen (2001). This allows a direct comparison of real wages in Zurich with those of other European cities as reported in Allen (2001). His results suggest that in the early nineteenth century, real wages in Zurich were below those in other European cities. According to his wage series, real wages of laborers caught up with Strasbourg, Leipzig, and Madrid around 1825 and with Paris, Amsterdam, and Antwerp around 1850. Craftsmen's wages caught up with Strasbourg and Leipzig around 1825 and with Paris and Amsterdam only in the 1870s.

Apart from these works, which focus specifically on the development of real wages over time, a large body of research in economic history touches on these questions. Works investigating the economic development of a specific canton or sector during the time of our study include Banderet-Lüdin (1944), Brugger (1956), Chevallaz (1949), Dürst (1951), Landolt (1891), Notz (1925), Pfister (1997), Schinz and Cicoira (1989), Stolz (1970) and Wicki (1979).

A.2 Additional information on the data collection process

In this section, we describe the sources from which wage information was collected, the data collection and harmonization process, and the methodology we employ to correct for compositional effects when estimating the wage series.

A.2.1 Data discovery, transcription and harmonization

To identify archival sources with suitable wage data, we searched the online catalogs of all cantonal state archives in Switzerland, focusing on records such as accounting books from government finance and construction departments, large public building projects and institutions such as monasteries and hospitals. The relevant records were examined in person, photographed, and transcribed. Wage data was included if they provided geographic and temporal information, details on the job or task performed, and daily wage rates or total compensation that allowed calculation of daily wages. Sources spanning multiple years were prioritized to separate temporal changes in wage and source-specific level differences.

A record in the source typically includes the date of payment, the job title or a description of the task, the number of workers engaged and the number of days worked, the daily wage rate and the total wage paid to the worker for that period. Sometimes, the record also includes the name of the worker and information on in-kind benefits such as the provision of food to

the worker. In the transcribed dataset, an observation corresponds to an entry in the original source. While one record might report the daily wage of a worker for one day, another record might report a wage payment for multiple days or multiple workers of the same occupation. We therefore record the number of days worked, which is the number of times that the day wage was paid out. When we construct average wages, we weight observations by the number of days worked.

In order to combine the transcribed data from different sources, we harmonize the spelling of job titles, translate french job titles to their german counterpart and assign every standardized job title a skill level and sector. Following the terminology from Allen (2001), we group job titles into three occupation categories: laborer in agriculture, laborer in construction, and craftsman in construction. Laborers in agriculture are unskilled casual workers who are paid by the day and perform manual tasks in the agricultural sector. The most common occupation titles for agricultural laborers are "Tagelöhner" or "Journalier". Laborers in construction are unskilled workers who perform assisting tasks in the construction sector. The most common occupation titles in this category are "Handlanger" and "Manoeuvre". Craftsmen in construction are skilled professionals, such as masons, carpenters, or stonecutters.

To be able to compare wages across time and space, we standardize the value of cash and in-kind benefits to grams of silver. Source documents report cash wages in location-specific currencies and in-kind benefits in location-specific units. We convert the value cash wages to their grams of silver equivalent using the currency conversion grid that we developed for this project (see Section A.3.2). We convert payments in kind, such as wine and bread, from their location-specific unit of measurement to metric units, using the unit-conversion grid described in Section A.3.1. We then calculate the monetary value of in-kind benefits using the year-specific commodity price in grams of silver. In cases where workers were reported to receive a meal, but we do not know the content of the meal, we assume that the meal consisted of 0.5 kilograms of bread and 1 liter of wine, which we evaluate at the year-specific price in grams of silver.³

A.3 Harmonization of wage and price data

Before the introduction of the federal constitution in 1848 and the adoption of the metric system in 1877, the units of measurement in Switzerland varied significantly by region, time, and the measured commodity. Consequently, during the period and within the region of our study, quantities, prices, and wages were recorded in many different units. To enable cross-regional comparisons of prices and wages, we convert historical units of measurement to modern metric units and historical currency units to their silver equivalents (the amount of silver that one unit of the currency could buy). We have created conversion tables for this purpose.

³ Half a kilogram of bread and 1 liter of wine, evaluated at average prices (reported in Table A.1) are worth 1.6 grams of silver, which is the price of a daily consumption basket.

A.3.1 Units of measurement

The conversion rates for measurement units are sourced from Ris-Schnell (1889) and Dubler (1975). Measurement systems in the Swiss territories were highly fragmented during our period of observation. Units often differed across cantons and sometimes even between towns within the same canton. In addition, some cantons adjusted their units when they adopted the inter-cantonal concordat on weights and measures in the 1830s.

Our metrology conversion table contains 225 distinct entries. Each entry refers to a specific combination of location, unit of measurement, commodity and, where relevant, commodity quality, for example spelt with or without the shell. The entries are time specific. A given unit is associated with one metric equivalent only for the years in which that definition was in force. When a canton changed its measurement system, for example after joining the concordat, the conversion factor in our table changes accordingly.

In practice, each price or in-kind wage observation is linked to the appropriate entry in this conversion table. The mapping uses information on the location, the commodity, the recorded unit and the year of the observation. The conversion then translates the historical unit into a metric quantity, such as kilograms or liters, which we combine with the silver price of the currency to obtain values in grams of silver. This procedure ensures that our price and wage series are comparable across regions and over time, and it limits measurement error that would arise from ignoring regional and temporal variation in units.

A.3.2 Currencies

We translate all monetary units into units of silver, using exchange rates between local small denominations and internationally traded large denominations reported in Körner et al. (2001). Except for the short Helvetic period (1798-1803), monetary sovereignty remained with the cantons and other regional authorities during our period of study. Therefore, a large number of physical coins and accounting systems were in use throughout Switzerland. Most of the wages and prices that we collected were reported in local currencies. To make prices and wages comparable, we estimate yearly conversion rates from these local currencies to a standardized unit of accounting: grams of pure silver. This allows us to compare wages and prices between Swiss regions that used different local currencies and to compare our results with the international literature on daily real wages, which are often reported in grams of silver per day.

To create these conversion rates, we collect exchange rates between local currencies and full-bodied coins of large denomination. These coins were internationally traded, and their value derived from the precious metal (silver or gold) that they contained. During the Ancien Regime (eighteenth century), we use exchange rate information from Körner et al. (2001) and for the first half of the nineteenth century from Meier (1951) and Schüepp (1919). Using the silver or gold content of the large denomination, we calculate the silver equivalent of local currencies at specific points in time.

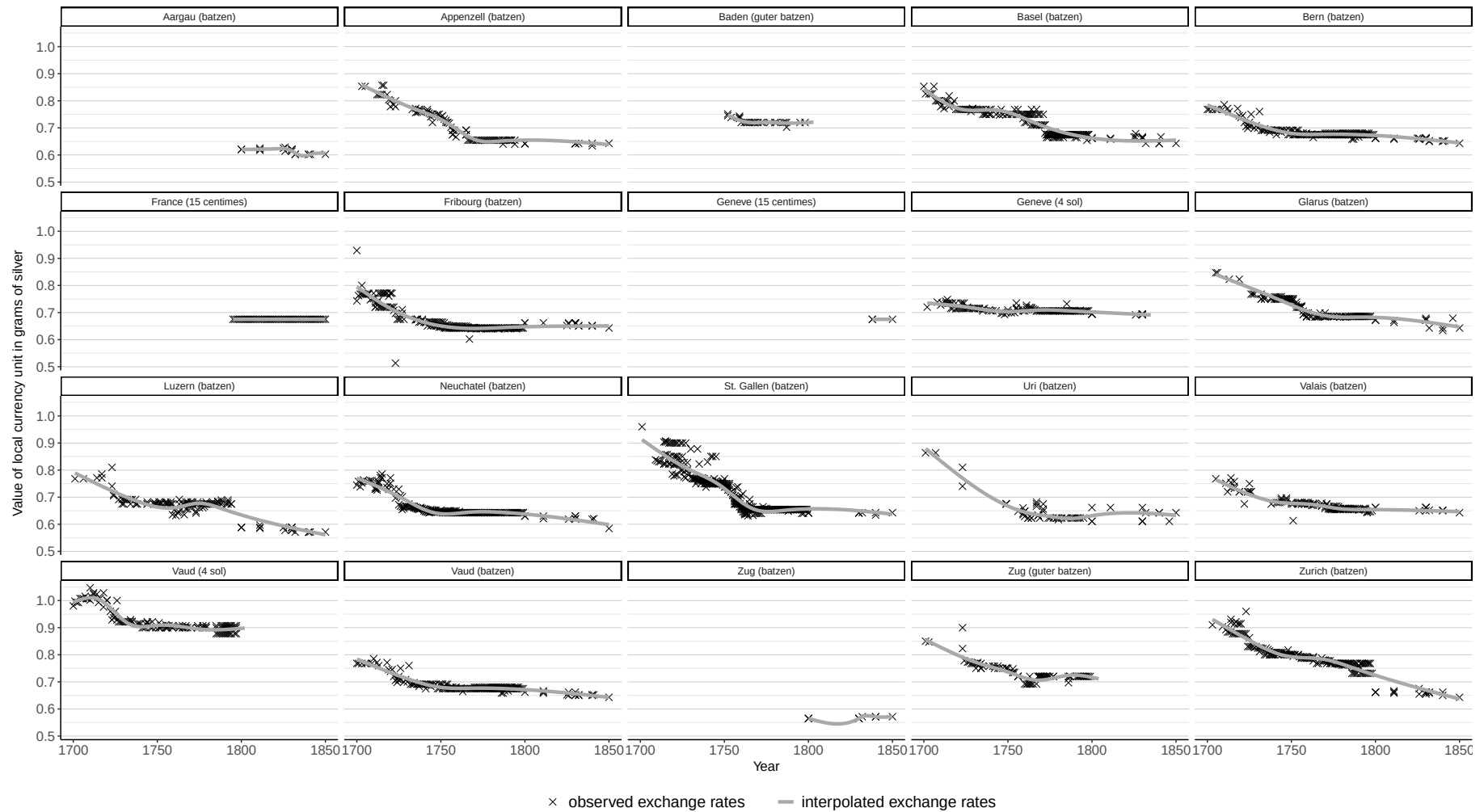
In Figure A.1 we show the collected currency exchange rates (black markers) and our estimate of the local currency to grams of silver conversion rate (gray line) over time. The estimate is a spline function fitted to the collected exchange rates. The figure provides several insights. First, most local currencies depreciated significantly during the period 1700-1760. Second, currency exchange rates remained relatively stable during the period of our study (1750-1850), with a slight general downward trend towards the end of the period. Third, even though local currencies had the same name (e.g. Batzen), they were not identical in their value. It is therefore important to identify the exact type of currency in which source documents reported prices and wages.

For the period of our study, it is important to distinguish between the physical money used for transactions and the monetary units used for accounting. Physical money were mostly tangible coins used for physical transactions. They included large, high-purity gold and silver coins for large payments and trade across different currency regions, as well as smaller, lower-purity silver coins and coins made of copper alloy for everyday use within a currency region.⁴

Accounting money was an abstract form of currency used to record monetary amounts. These units, like Gulden, Schilling, and Heller, were fixed in their value relationships and served as a standard for economic calculations. Some accounting units corresponded to a specific physical coin (e.g. Gulden), while other accounting units only existed on paper (e.g. "Rechnungsbatzen"). Unfortunately, some accounting units had the same name as a physical coin, but were not valued the same. Most cantons used variations of more than one accounting system concurrently.

⁴ Meier (1951, p. 72) estimates that 481 different physical coins issued by 79 different authorities were in use in early nineteenth century Switzerland.

Figure A.1: Estimated Value of Local Unit of Accounting in Grams of Silver



Note: This figure presents the value of local currency units in grams of silver over time. The black crosses show the values that are implied by the exchange rates that we collected from secondary sources. The grey lines show the estimated value, which is a spline function fitted to the observed values. The local currency unit of reference is reported in parentheses after the location name.

A.4 Additional information on prices and the CPI

A.4.1 Price integration

Around 1750, the prevailing approach to stabilizing food supplies shifted from intervention and price regulation to favoring free trade, which helped mitigate local supply shocks (e. g. Persson 1999, Chapter 1). This trend was also evident in Switzerland. For example, the physiocrat Isaak Iselin of Basle highlighted the significance of free trade for agricultural and societal development in his essay on social order (*Versuch über die gesellige Ordnung*, Iselin [1772] in Weber and Götz (2016, p. 200, 212)). However, implementing these ideas took time. As Pfister (1998) demonstrated for Berne, a key step was the abolition of tithes in 1798, which ended the use of public grain inventories for market intervention. Despite the Helvetic Republic’s short lifespan, this reform was never reversed. Later, the liberal cantons enshrined free trade in their constitutions during the Regeneration period in 1831. Still, the federal constitution of 1848 (Art. 29) guaranteed free trade only across cantonal borders, allowing local guild systems to persist until the late nineteenth century (Dubler and Winzeler 2007).

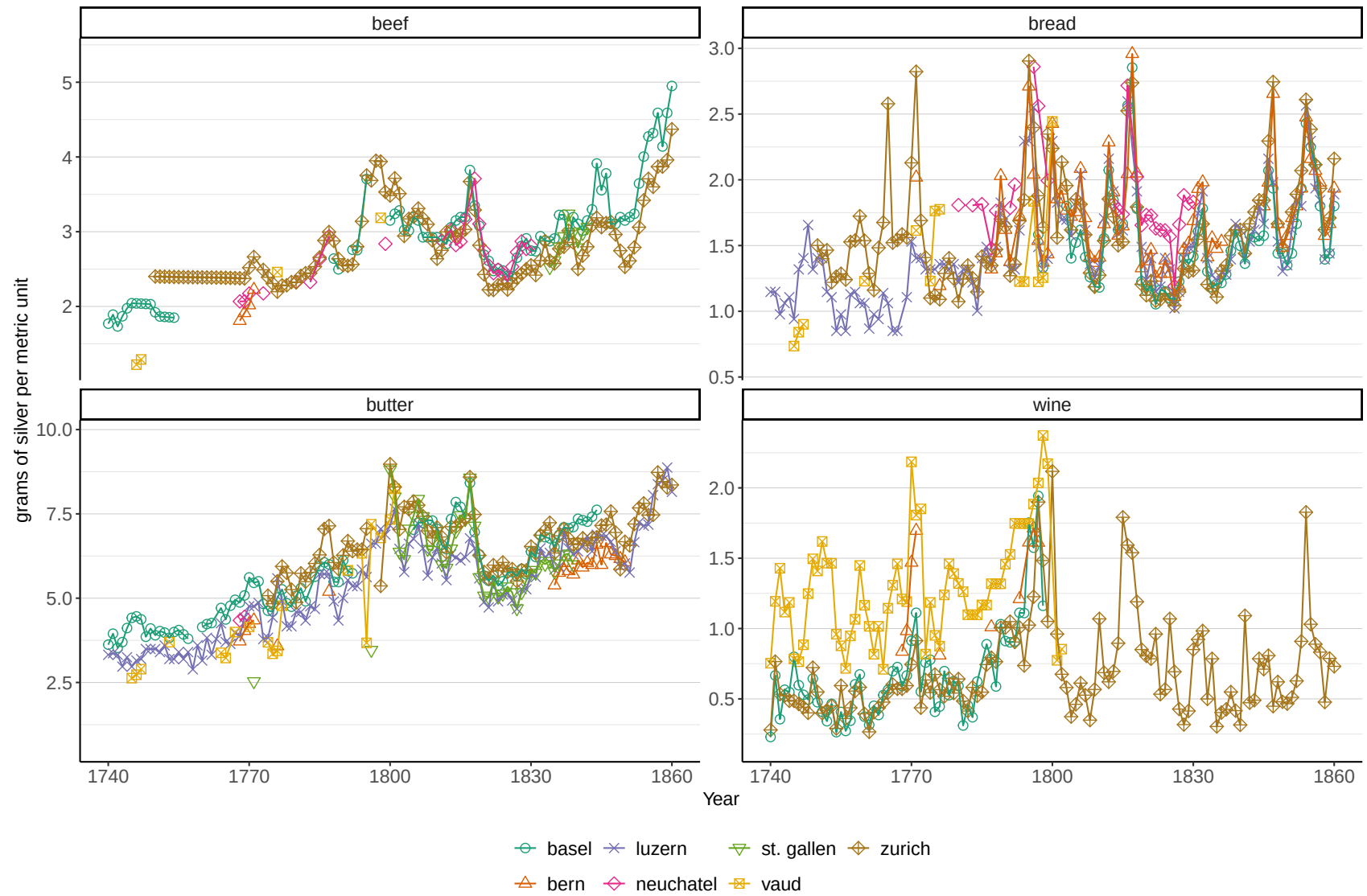
Changes in the institutional framework were not the sole factor in market integration; improvements of transportation and information technologies also played pivotal roles. The implementation of the railway network, which began in 1847 and reached 500 km by 1855 (Jung 2006, p. 460–61), falls outside our observation period. However, significant road construction projects in the early nineteenth century, such as the new Gotthard road in the 1820s, were crucial.⁵ In terms of price information, local newspapers (*Intelligenzblätter*) published weekly prices of key commodities starting in the early eighteenth century (see our discussion of data sources below).

Given this background, we would expect a considerable degree of market integration throughout the observation period. Online appendix Figure A.2 presents the average annual prices of four major food products from various locations across Switzerland. Despite the fact that these prices are from different data sources, they are highly synchronized across locations, with similar long-run levels and short-term fluctuations.⁶ In the context of early modern Germany, Pfister (2017) observed that a single national price index captured much of the variability in town-specific CPIs, suggesting that prices from different locations could meaningfully aggregate into national-level series. These findings, alongside Switzerland’s historical developments, support calculating average prices for the entire country. We therefore construct price series for individual commodities as well as for the aggregate consumption basket, representing Switzerland as a whole.

⁵ The records from some of these projects are an important source for our wage data; for instance, invoices for the Amsteg-Goeschenen section of the Gotthard road (1823–1826) detail wages for 212 craftsmen and 719 laborers (StAUR R-150-13/41, see Table A.11).

⁶ These prices are harmonized to grams of silver per metric unit but not adjusted for compositional effects.

Figure A.2: Average Annual Prices of the Four Most Important Commodities in the Consumption Basket Across Different Cantons



Note: These figures plot prices averaged to the yearly level of the four commodities with the maximum temporal and spatial coverage in our data.

Table A.1: Goods basket for the consumer price index

Commodity	Quantity	Price/unit (g silver)	Spending share (%)	Kcal /day	Protein /day (g)
Bread	182 kg	1.498	40.0	1222	50
Peas	26 l	0.844	3.2	80	5
Beans	26 l	0.733	2.8	80	5
Beef	26 kg	2.869	10.9	178	14
Butter	5.2 kg	5.962	4.5	104	0
Cheese	5.2 kg	4.044	3.1	53	3
Eggs	52	0.179	1.4	11	1
Wine	91 l	1.285	17.2	212	0
Soap	2.6 kg	6.159	2.3		
Linen Cloth	5 m ²	7.707	5.7		
Candles	5.2 kg	6.471	4.9		
Firewood	5 m btu	5.368	3.9		
Total		682		1940	78

Note: This table lists all goods that are included in the consumer price index. The quantities are estimated to be enough to keep one adult nourished for 365 days. Price/unit is the adjusted and imputed price per unit (as described in section 3.2), averaged over the whole period of study. Total price/unit is the sum of the product of price and quantity. It reflects the average annual cost of the consumption basket. The selection of commodities and quantities follows Allen (2001). Information on caloric value and protein content is from Allen (2015).

A.4.2 Consumption basket and consumer price index

To deflate nominal wages, we construct a price index that is based on a basket of consumption goods that are necessary to sustain an early modern city dweller. Table A.1 reports the goods and their weight (Quantity) in the consumption basket. We base this consumption basket on the one used in Allen (2001, Table 3) to make our real wages directly comparable with the estimates he produces for various European cities. Because the quantity of each good in the basket is fixed, the resulting CPI is a Laspeyres index. We make a few minor adjustments to the consumption basket to reflect the availability and consumption habits in Switzerland. Switzerland consumed mainly wine and very little beer before the twentieth century, we follow Ridolfi (2019) and substitute the 182 liters of beer in the original basket with 91 liters of wine. This results in the same caloric content as the original basket and increases the price of the basket by less than 1% in the year 1800. Furthermore, we use only candles as source of light (as opposed to candles and lamp oil) and only firewood as source of heat (as opposed to firewood and coal).

A comparison of Table A.1 with Table 3 in Allen (2001) reveals that the spending shares are very similar.⁷ The largest expense item is bread, which constitutes 40% of the value of our consumption basket (compared to 30% in Allen). The second largest is wine (17% in our

⁷ Allen reports average prices for Strasbourg in 1745–1754 while we report a Switzerland-wide average for the whole period 1740–1870.

basket and 21% for beer in Allen), and the third largest is meat (11% and 14%, respectively). For other items such as beans, peas, butter, eggs, textiles, and candles, the spending shares are similar. Spending on cheese and firewood is a bit lower in our consumption basket compared to Allen's (Cheese is 3.1% versus 3.6% and firewood is 3.9% versus 5.0%).

The Allen consumption basket is broadly consistent with consumption patterns documented in the literature on early modern Switzerland. Chevallaz (1949) estimates that annual bread consumption per person ranged between 168 and 224 kilograms, and Notz (1925) reports that the consumption basket of a lower-class family of two adults and two children in the year 1806 contained 410 kilograms bread, 100 kilograms meat, and 20 kilograms butter.

While we adopt the definition of the Allen basket, we do not rely on other assumptions made in Allen (2001). Allen assumes that a male adult worked 250 days per year and required three consumption baskets to feed a family of two adults and two children. This allows him to draw conclusions regarding the standard of living of working class families. However, subsequent work argues that these assumptions are not tenable since the number of work days per year varied over time and women and children generally also contributed to the family budget (Horrell et al. 2021). For the purpose of our research, we do not need these assumptions. The data available from other studies (including Allen's) allow a comparison of daily real wages defined as the nominal day wage divided by the price of a *daily* consumption basket (annual consumption basket divided by 365).⁸

A.4.3 Comparison of our CPI with others from the literature

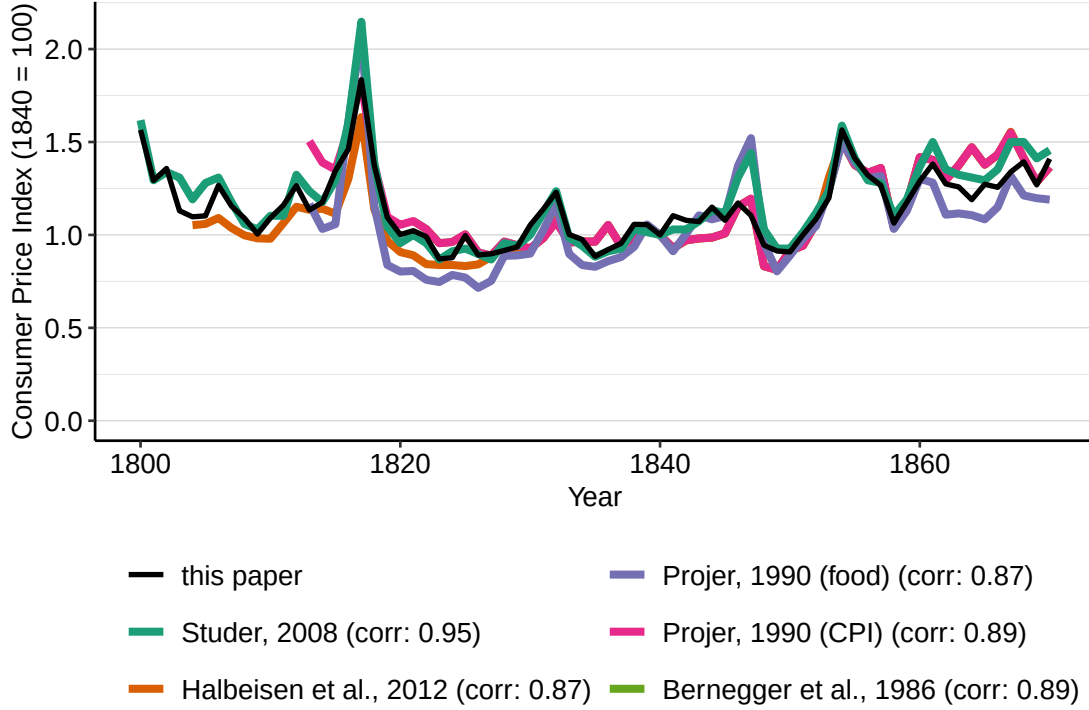
Various studies have constructed CPIs for nineteenth-century Switzerland. Figure A.3 shows that our CPI based on the basket in Table A.1 aligns closely with these earlier works. The correlation coefficients between our CPI and those of the literature are high, ranging from 0.87 to 0.95. The highest correlation, 0.95, is with the CPI of Studer (2008), which uses the same consumption basket as our analysis. The greatest discrepancy occurs between 1848 and 1849, a period of poor harvests in Europe. In that period, the CPI from Studer and the food price index from Projer (1990) show significantly higher price increases than our index.

Since we use the same consumption basket as Allen (2001) and Pfister (2017), we can directly compare the estimated cost of that basket between different locations in Europe. Online appendix Figure A.4 shows that prices in Switzerland were always lower than prices in London and Paris, which is no surprise since these were the two largest cities in Europe at that time. Furthermore, the price of the consumption basket was always higher in Switzerland than in Germany.⁹ Prices in Switzerland were on a similar level as Strasbourg and Amsterdam until 1820 when Swiss prices decline to a lower level. The fact that prices after 1820 in Switzerland were lower than in Strasbourg seems puzzling, given the geographic proximity. It is even more puzzling given that after 1800, Allen uses prices from Basel for the Strasbourg price series.

⁸ We do not adjust for the price of rent.

⁹ Because of lack of price data, the consumption basket of Pfister (2017) does not contain cheese. We show in Figure A.5 that the omission of cheese is insignificant and does not influence this result.

Figure A.3: CPI: Comparison with Earlier Studies for Switzerland



Note: This graph compares the price of the consumption basket defined in Table A.1 with consumer price indices from Bernegger et al. (1986), Projer (1990), Studer (2008), and Halbeisen et al. (2012). All series are re-indexed to 1840.

Since our data coverage is high during that period (Figure 2) and prices in Switzerland are still above those in Germany, we think that our price series is more reliable and the price series for Strasbourg is inflated.

A.5 Additional information on the wage series estimation

A.5.1 Raw averages

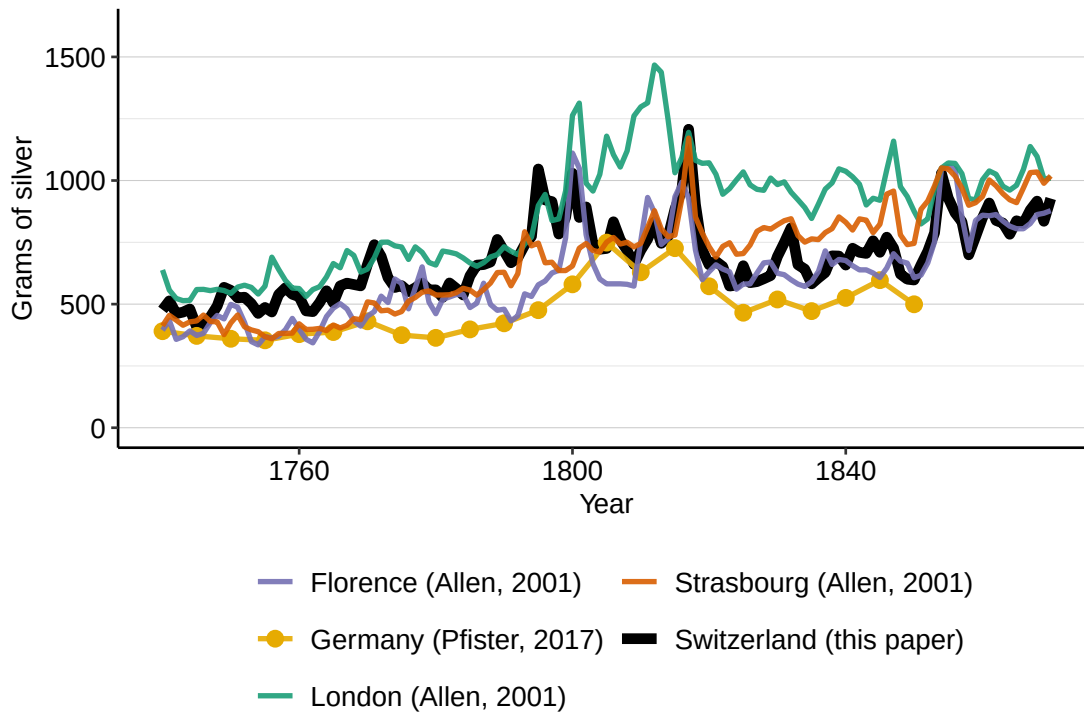
To gauge the impact of the compositional bias correction, we compare the corrected wage series with a series of unconditional 10-year averages of all daily wages paid for a specific occupation type. The average wage rate in the 10-year interval around year t is defined as:

$$\bar{w}_t = \frac{1}{\sum_{i \in S} d_i} \sum_{i \in S} w_i d_i \quad (\text{A.1})$$

where S is the set of all wage observations that belong to a specific occupation type and were paid in the 10-year interval $[t - 5, t + 4]$. w_i is the total daily wage rate as defined above, and d_i is the number of days worked associated with observation i . The denominator is the total number of days worked in the set S .

Figure A.6 compares these raw ten-year averages with our main wage estimates based on the compositional bias correction. The correction reduces variability across periods and yields

Figure A.4: CPI: International Comparison



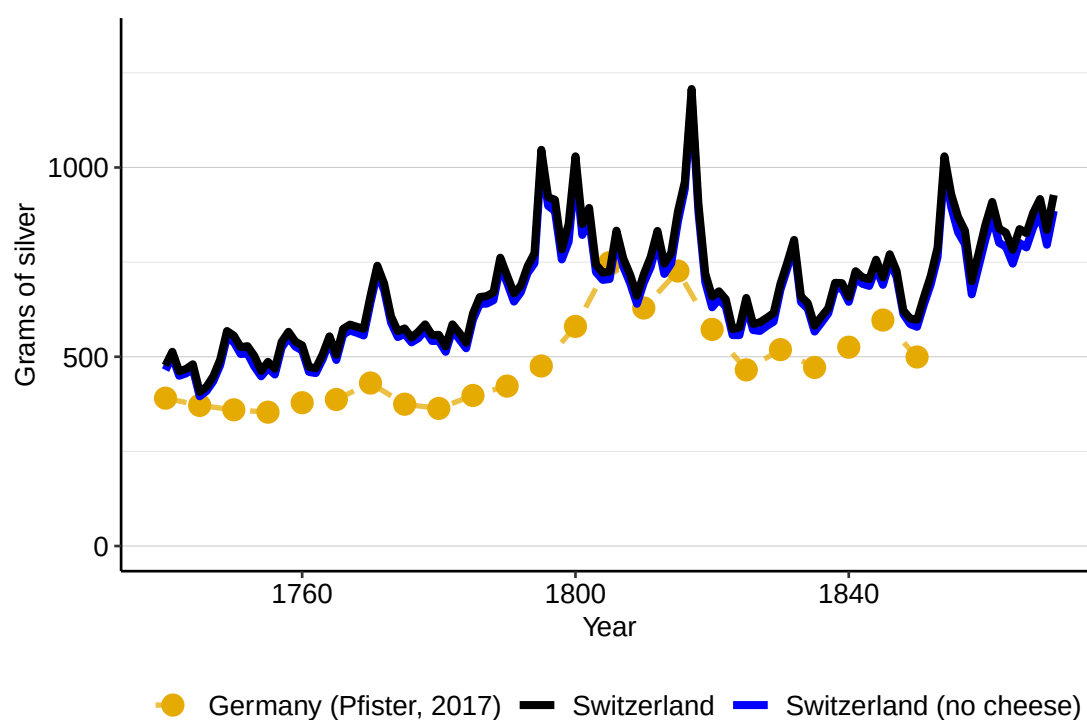
Note: The consumption baskets for London, Amsterdam, Strasbourg and Germany use beer instead of wine and the consumption basket for Germany contains no cheese, which has an average spending share of 2.6% in the Swiss consumption basket.

more stable wage trajectories. The corrected and raw series follow the same long-run path. Figures A.7 and A.8 present the distribution of the raw data and the decadal raw averages.

A.5.2 Compositional bias correction

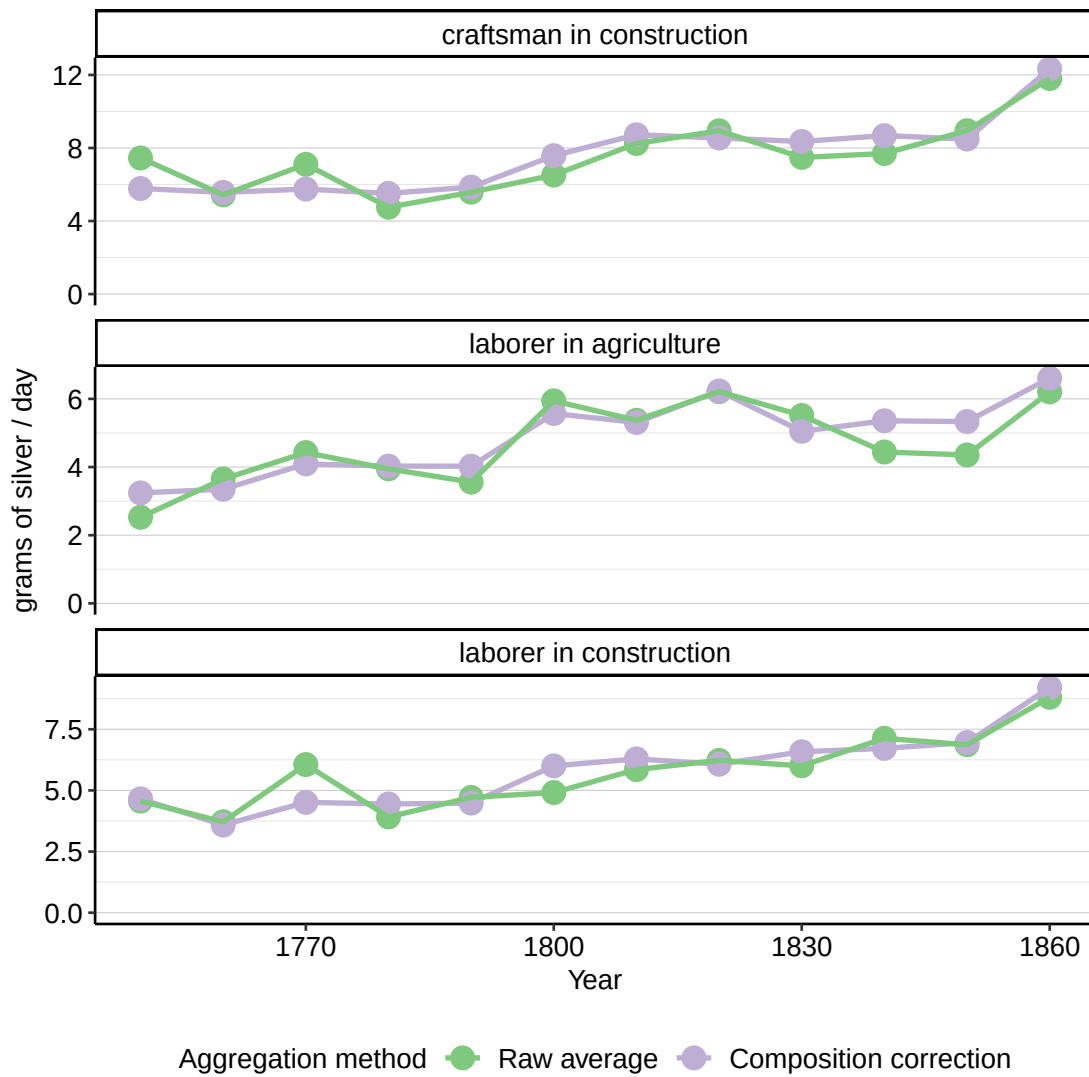
Tables A.4–A.9 present the coefficients of equation 1 and the shares of each category in the sample, calculated separately for each occupation category. To examine the stability of the coefficients of the time-invariant regressors in equation 1, we divide the sample into three subperiods (1746 to 1785, 1786 to 1825, and 1826 to 1865) and re-estimate the model separately for each subperiod. For each subperiod, we construct predicted wages using the same procedure as in the main text, applied to the respective subsample. Online appendix Figure A.9 plots the resulting wage trajectories. The subperiod-specific series are close to the full-period estimate. The main deviation arises for construction craftsmen in the final subperiod, where the predicted nominal wage lies below the full-sample trajectory. The deviation is small and does not change the overall wage path discussed in the main text. These results are consistent with the assumption that attribute-specific premia are broadly stable over time and that the decade fixed effects capture the temporal evolution of wages after conditioning on composition.

Figure A.5: CPI: Comparison with Pfister (2017)



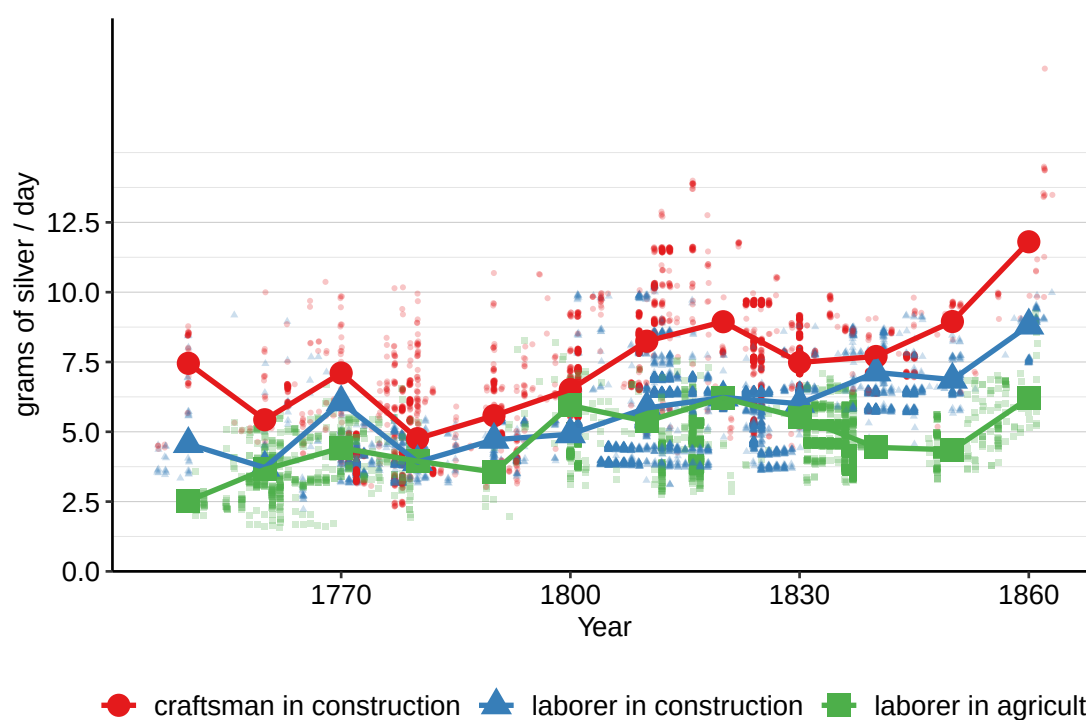
Note: This graph compares the price of the consumption basket in Switzerland, constructed in this paper, with the price of the consumption basket in Germany, constructed by Pfister (2017). Both baskets contain the same amount of goods, except for alcoholic beverages (182 liters of beer in Germany vs 91 liters of wine in Switzerland) and cheese (only in the Swiss consumption basket). The price series "no cheese" excludes the cheese from the Swiss consumption basket. Cheese has an average spending share of 2.6% in the Swiss consumption basket.

Figure A.6: Comparison of aggregation methods for nominal wage data



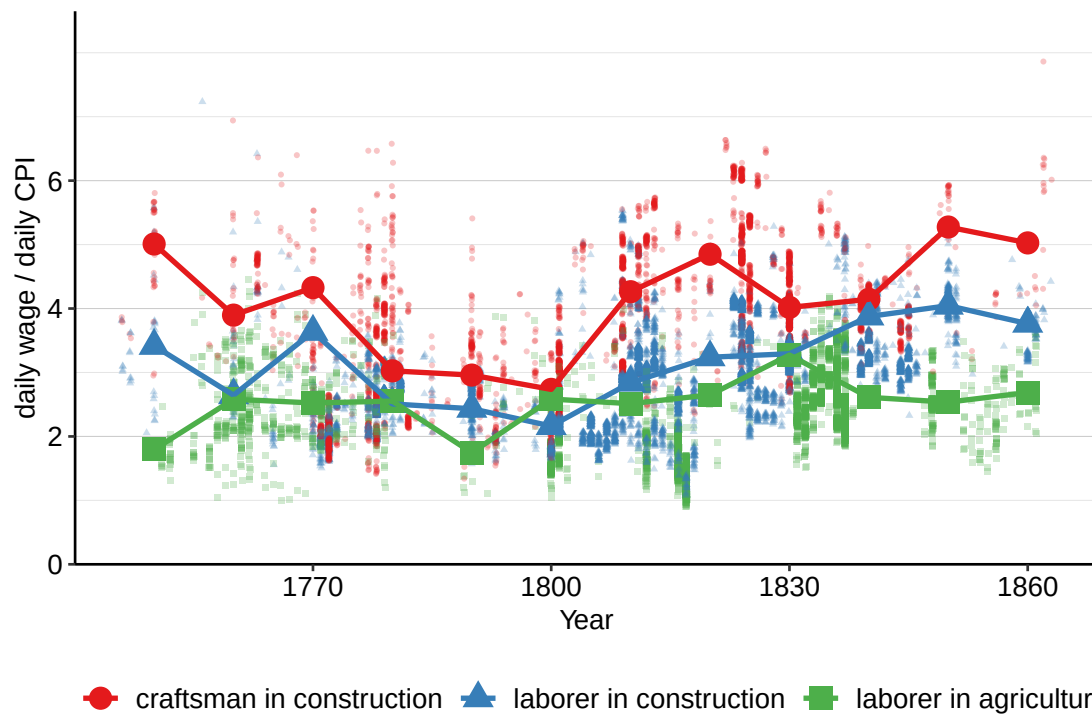
Note: This figure compares the raw average of total daily wages with the wage series obtained from the composition correction approach as described in Section 3.1.2. Wages are in grams of silver per day and include in-kind benefits.

Figure A.7: Nominal Daily Wages: Raw Data and Ten-Year Averages



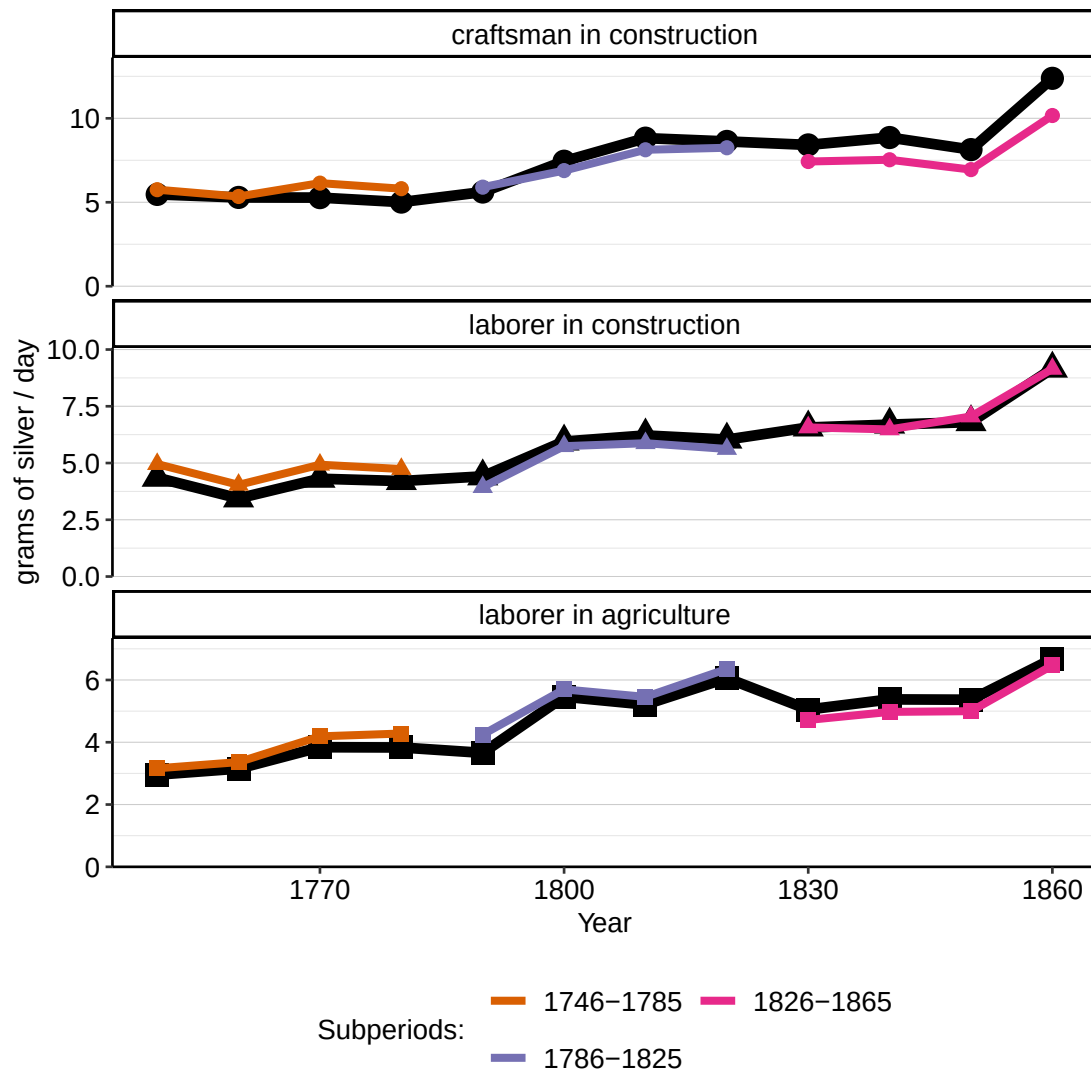
Note: Wages are in grams of silver per day and include in-kind benefits. The small dots are individual wage rate observations. Large dots represent the ten-year average wage rate, where individual wage rates are weighted by the number of days worked.

Figure A.8: Real Daily Wage Series: Raw Data and 10-Year Average



Note: Wages are deflated with the price of a daily consumption basket (the price of the CPI divided by 365 days). The small dots are individual wage rate observations. Large dots represent the ten-year average wage rate, where individual wage rates are weighted by the number of days worked.

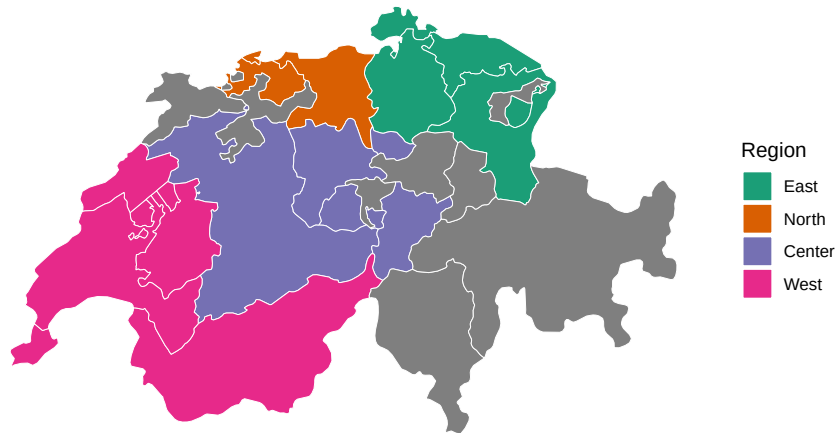
Figure A.9: Nominal daily wage estimates based on different subperiods



Note: This figure shows daily wage series estimates for workers estimated on different subsamples of the data along with the main estimate in black. Wage estimates are constructed with the regression approach described in Section 3.1.2, where the underlying data sample is restricted to observations from one of three subperiods.

A.5.3 Regional nominal wages

Figure A.10: Map of Switzerland



Note: This map shows the geographic division of Swiss cantons into regions used in this paper.

We examine regional heterogeneity by dividing Switzerland into four regions: East, North, Central, and West. These regions, illustrated in Figure A.10, are defined using present-day borders. The West encompasses all French-speaking areas, while the Central, Northern, and Eastern regions are predominantly German-speaking.

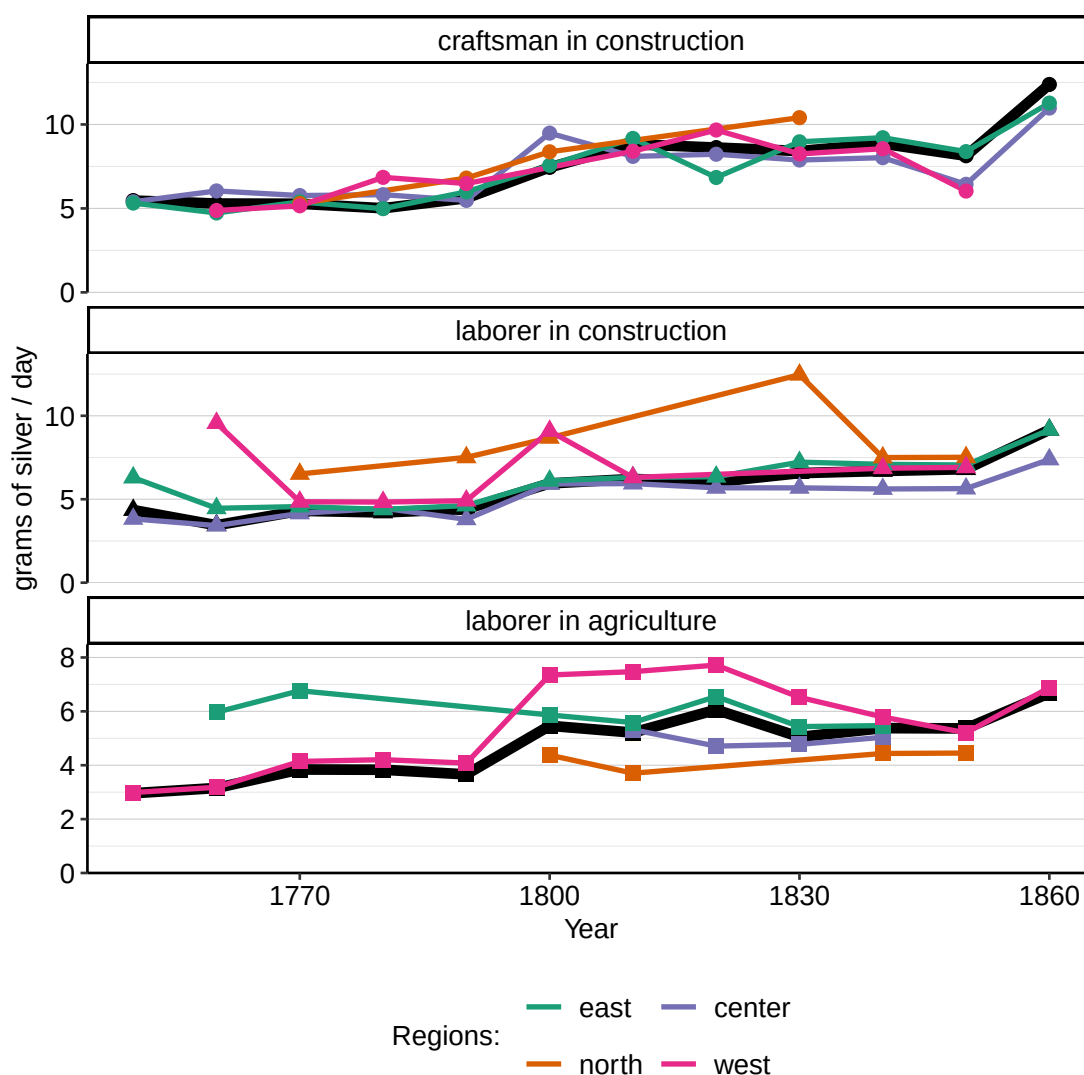
The West includes Geneva— a major center of commerce, trade, and banking— which, around 1800, was the largest city in Switzerland with approximately 22,000 inhabitants.¹⁰ Other cantons in this region include Vaud, a primarily agricultural area; Jura, where watchmaking began to gain economic significance in the nineteenth century; and Valais, a mountainous canton characterized by agriculture and livestock farming. The Central region comprises urban centers such as Berne (ca. 12,000 inhabitants) and Lucerne (ca. 4,000 inhabitants), alongside alpine regions like Uri and Obwalden. The North includes the urban hub of Basle (ca. 12,000 inhabitants) and the largely rural canton of Aargau. The East encompasses the cities of Zurich (ca. 10,000 inhabitants) and St. Gallen (ca. 8,000 inhabitants), as well as more rural cantons such as Appenzell and Thurgau.

As shown in Figure A.11, wage levels and trends over time are remarkably consistent across all regions and occupations. This uniformity suggests that, despite differences in regional economic structures, wage developments in early modern Switzerland were largely synchronized, potentially reflecting shared macroeconomic conditions or integrated labor markets.

The regional analysis reinforces findings from the aggregate wage series. The consistency in wage levels and trends across regions indicates that national patterns, such as the gradual rise in wages and the relative ranking of occupations, are not driven by any single region but instead reflect broader, nationwide dynamics.

¹⁰ Population data for 1800 are from Schuler (2023).

Figure A.11: Nominal daily wages by occupation and region



Note: This figure shows daily wage series estimates for workers in different regions along with the main estimate in black. Wage estimates are constructed with the regression approach described in Section 3.1.2, where the underlying data sample is restricted to observations from one of the four regions.

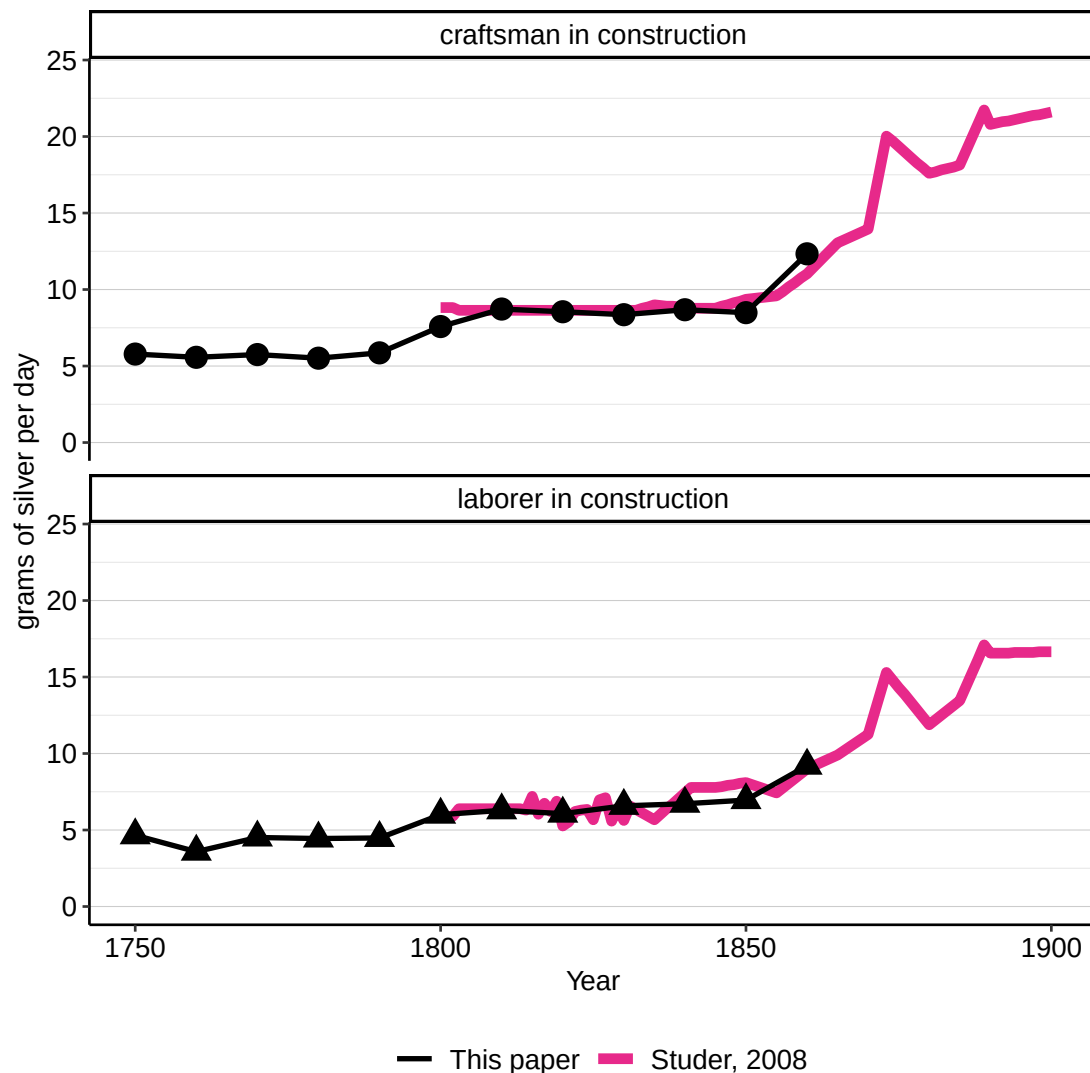
The most notable regional divergence appears among unskilled construction workers in the West, where wages show greater volatility compared to other regions. These fluctuations are largely attributable to a smaller sample size in this subgroup, which increases estimate variability.

A.5.4 Comparison of our wage series with others from the literature

Figure A.12 compares our estimated nominal wage series to those for the city of Zurich from Studer (2008). Both studies find a daily wage level of 6 grams of silver for laborers and 8 grams for craftsmen in 1800, a period of nominal wage stagnation from 1800 to 1850, and the onset of nominal wage growth after 1850. This suggests that the trends identified by Studer for wages

in Zurich hold for broader Switzerland.¹¹

Figure A.12: Nominal daily wage rate of construction workers, comparison with Studer (2008)

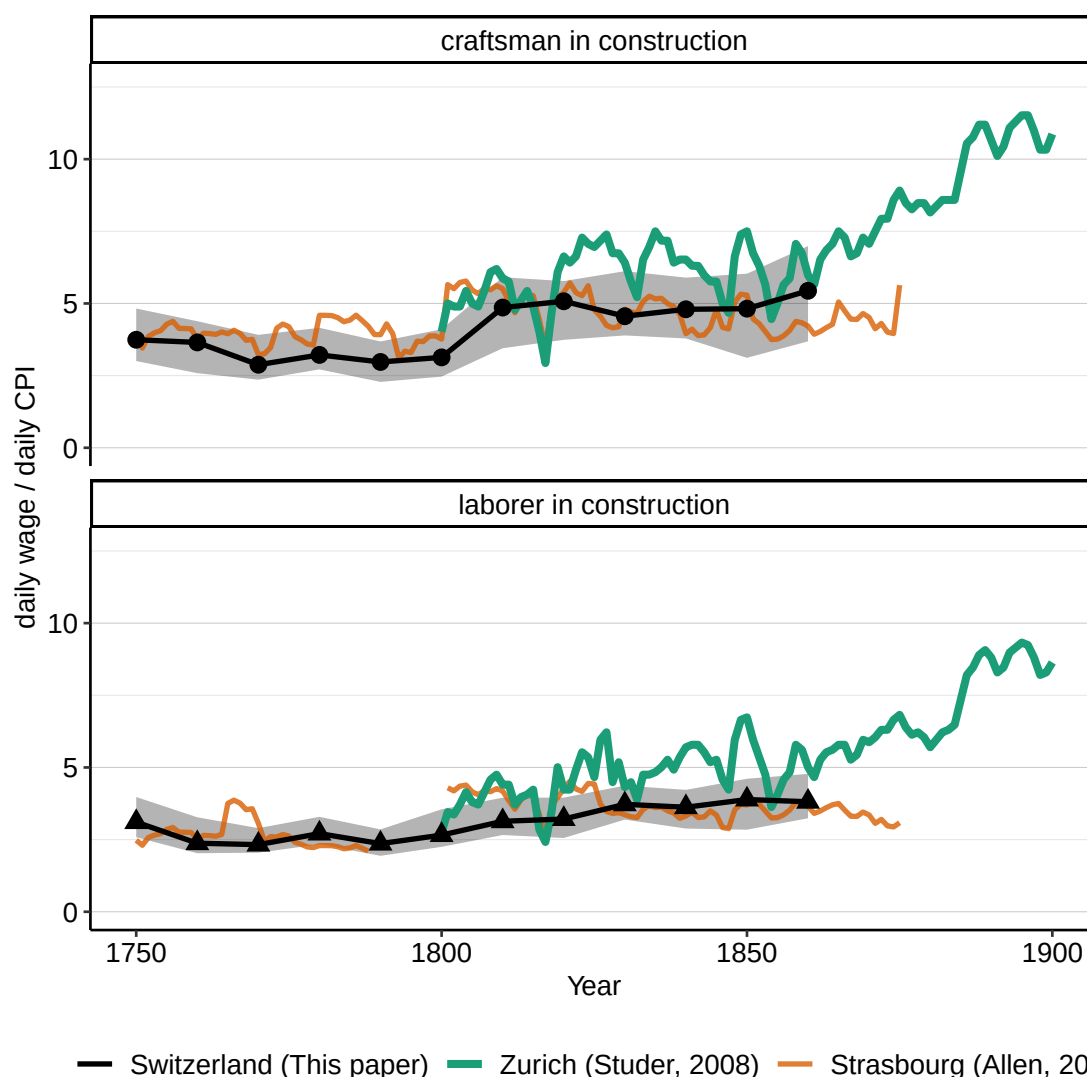


Note: Figures compare our estimated nominal wage series for skilled and unskilled construction workers in Switzerland to those from Studer (2008) for the city of Zurich. Wages are in grams of silver per day.

Figure A.13 compares our estimated real wage series to those from Studer (2008) and those for Strasbourg and Amsterdam from Allen (2001). Studer (2008, p. 23) interprets his findings as evidence that in 1800 real wages were "substantially lower" in Zurich than in other European cities such as Strasbourg. In light of our additional results regarding sampling uncertainty and the results for the 18th century we argue that his conclusion does not hold up. Instead, it appears that construction wages in Switzerland were not substantially different from those in Strasbourg.

¹¹ Studer constructs a wage series for skilled and unskilled construction workers in the city of Zurich starting in 1800. For the period 1800 to 1870, he uses secondary sources (Böhmert 1873; Dürst 1951; Notz 1925) and primary sources from the state archive of the canton of Zürich (RR II. 10, vols. 1814–1831; RR II. 14, vol. 1835).

Figure A.13: Nominal daily wage rate of construction workers, comparison with Studer (2008)

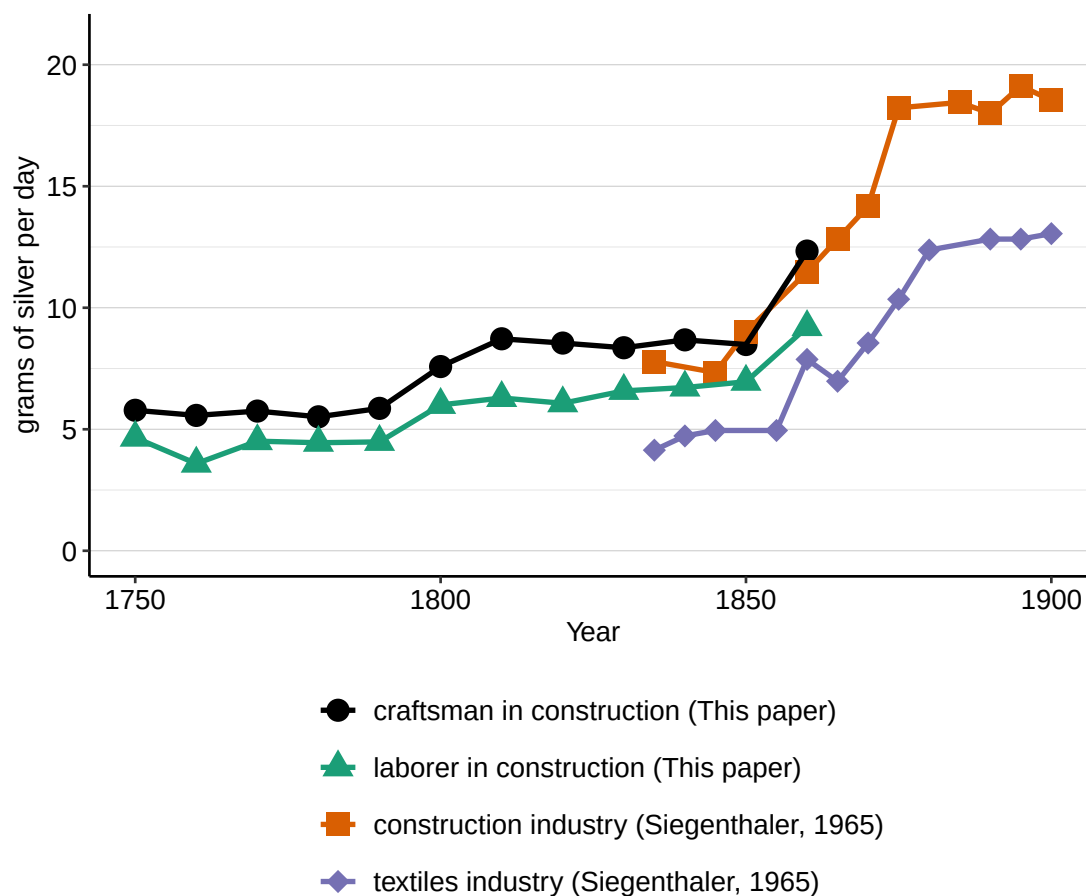


Note: Figures compare our estimated real wage series for skilled and unskilled construction workers in Switzerland to those from Studer (2008) for the city of Zurich and Allen (2001) for Strasbourg. Wages are in number of daily consumption baskets.

Figure A.14 shows that our estimates also closely align with the nominal wage indices constructed by Siegenthaler (1966). Siegenthaler calculates average wages by pooling data across occupations and locations within each sector, resulting in an index for the construction industry for an undefined skill level. His construction wage index lies between our estimates for unskilled and skilled construction workers. For additional context, we include his index for the textiles industry, which by 1850 is 30% lower than the estimated wage of an unskilled construction worker.

In the case of unskilled agricultural wages, to the best of our knowledge, aggregate wage series have not been constructed so far. We can compare our wage estimate for agricultural laborers with the daily wage rates of agricultural workers reported in the literature. Böhmert (1874, p. 155) reports data from a survey in 1870 that asked municipal officials to retrospect-

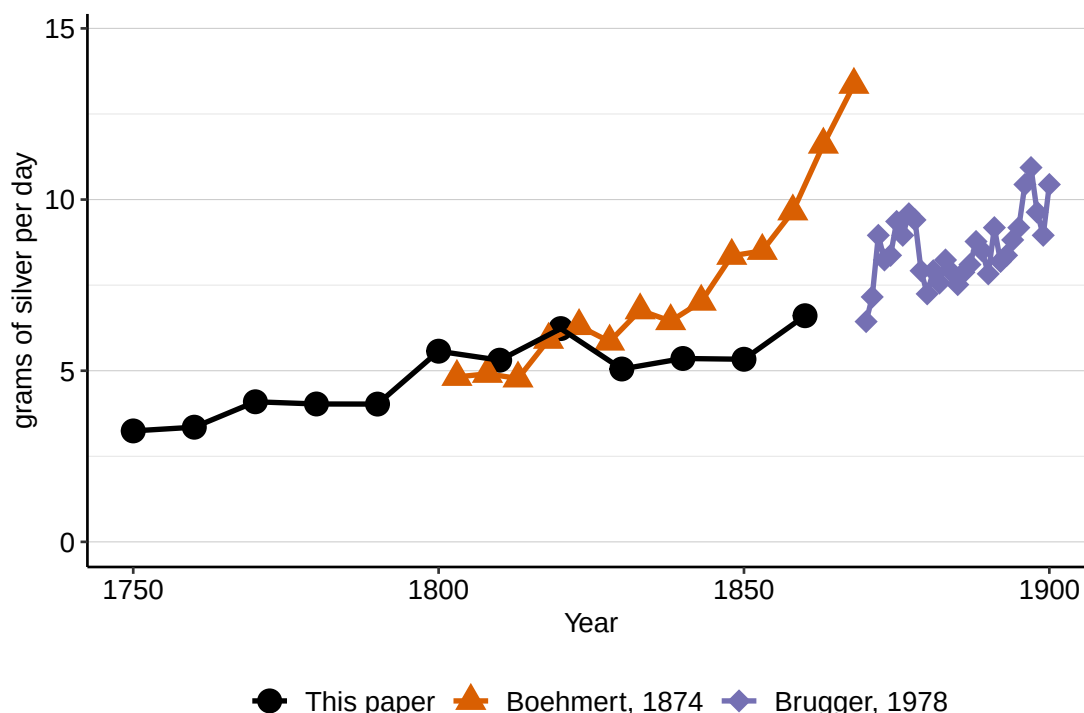
Figure A.14: Nominal daily wages of construction workers, comparison with Siegenthaler (1965).



Note: This figure compares our estimate of the 10-year average daily wage in grams of silver of construction workers to daily wage estimates from Siegenthaler (1965, Table 3, p. 435).

ively report the average wages paid to agricultural daily laborers from 1800 to 1870. Brugger (1979) reports a series of wages for agricultural laborers in Geneva. In Figure A.15 we compare our wage series for agricultural laborers to the wages reported in Böhmer (1874), average by year, and the daily wage rate series from Brugger (1979).

Figure A.15: Nominal daily wages of agricultural workers, comparison with Böhmert (1874) and Brugger (1979).



Note: This graph compares estimates of average daily wages in grams of silver, including cash and in-kind payments, of unskilled agricultural workers. Data is from Böhmert (1874, p. 155) and Brugger (1979). We aggregate the data from Böhmert by taking the unweighted average of the daily wage rates that he reports for different locations in Switzerland.

A.6 Quantifying estimation uncertainty due to payments in kind

A.6.1 Analysis of in-kind payments in our data

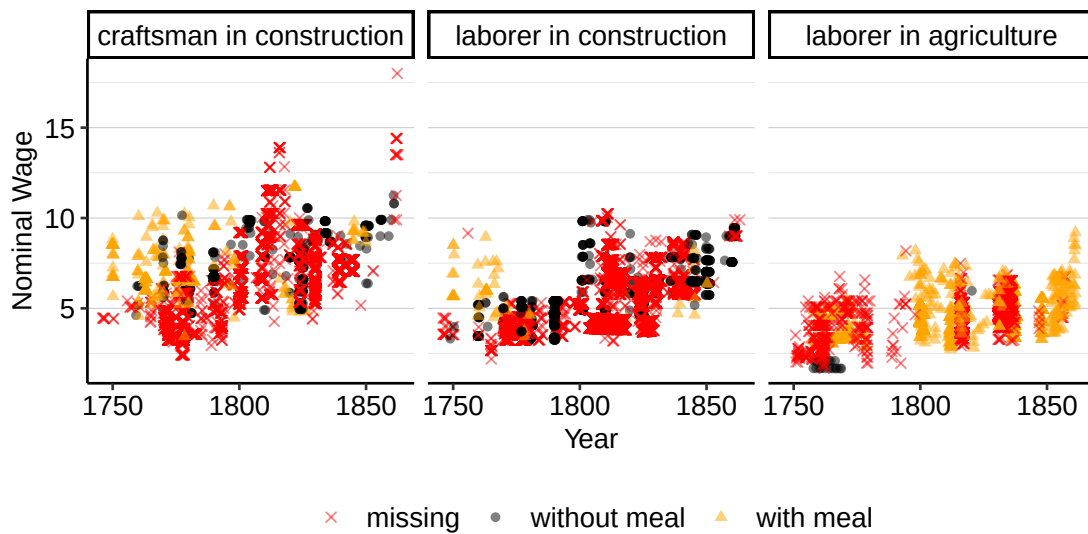
A central challenge in constructing the wage series lies in the inconsistent reporting of in-kind compensation. While every wage observation includes a cash component, only 37.2% explicitly mention in-kind payments such as wine, bread, or meals. By contrast, 6.6% of cases clearly state that no in-kind benefits were provided. The remaining 56.2% do not specify whether such compensation was included, leaving their status ambiguous.¹²

Figure A.16 shows the distribution of total nominal wage (cash and in-kind payment) over time by reported in-kind benefits. Meals are much more often reported for laborers in agriculture as opposed to workers in construction.

In-kind payments have historically constituted an important part of total wage compensation, but their documentation is often inconsistent or incomplete. This section presents examples from both the construction and agricultural sectors to illustrate the variability in the use and documentation of in-kind payments.

¹² Percentages are weighted by employment days.

Figure A.16: In-kind Benefits and Wages



Note: This figure shows the total wage (measured in grams of silver) over time. The shape of the dot indicates whether the worker received a meal, did not receive a meal, or if this information is unknown.

The construction sector in Zurich provides detailed evidence of the economic significance of in-kind payments. Stolz (1970) finds that construction workers in the city and surrounding countryside received bread, wine, and cheese as part of their wages until at least the late eighteenth century. Valuing these at market prices, he estimates that in-kind payments accounted for approximately one-third of total wage compensation during this period.

In addition, it seems that also in the nineteenth century, in-kind payments remained relevant in Zurich's construction sector. In 1873, a large construction company in Zurich provided workers with daily rations of bread and wine, which accounted for approximately 15% of their total wage.¹³ Similar patterns are observed in Basel, where wage regulations for carpenters and masons included both cash and in-kind payments. According to Notz (1925, p. 214), around 1800, wine and bread accounted for approximately 25% of the total daily wages.

However, not all evidence supports the notion that in-kind payments were a general practice in the construction sector. In particular, workers employed by cantonal construction departments seemed to have received cash wages only. Notz (1925, p. 214) asserts that carpenters and masons employed by the city of Basel's construction department received only cash compensation. Records from a road construction project in Bern indicate that craftsmen and laborers were paid entirely in cash, with no evidence of additional in-kind payments.¹⁴ While prisoners employed on the project received bread as part of their provisions, no similar distributions or food costs were documented for regular laborers, suggesting reliance on cash wages alone. Finally, wage lists from the construction departments of Appenzell, St. Gallen, Obwalden, and Uri show no evidence of in-kind payments, indicating a reliance on

¹³ Böhmert (1873, Bd II, p. 140).

¹⁴ StAB B X 141, StAB B X 143; see also Flückiger Strebel and Schiedt (2011, p. 42).

cash wages. These examples align with the statement by Reith (1999, p. 373-374) that in-kind payments in the urban construction sector declined in importance after the seventeenth century.

The agricultural sector also exhibits considerable variability in the use of in-kind payments. While some casual agricultural workers received a substantial portion of their wages in kind, others were paid exclusively in cash. The Zurich Hospital provides a clear example of significant in-kind payments in agriculture. Detailed accounts from its estates show that daily workers in 1796 received 7 Schilling in cash along with 0.5 Pfund of meat, 0.8 Mass of wine, and two small loaves of bread per day. These in-kind payments constituted 70% of the total wage in 1796, declining to 55% by 1828.¹⁵

In contrast to the Zurich Hospital, the Wettingen Monastery in Aargau rarely paid its agricultural daily laborers in kind. While some workers received bread, its value was deducted from their cash wages, suggesting that they purchased it from their employer, possibly at a discount.¹⁶

Payment practices at the Rheinau Monastery further illustrate the variability in in-kind compensation. Harvest workers either received a daily meal consisting of bread, wine, soup, and meat, or no food at all but a 20% higher cash wage. This highlights how, even within a single institution, payment methods could differ significantly.

The examples from the construction and agricultural sectors highlight the significant variability in in-kind payments across regions, time periods, and institutions. While some sources provide clear evidence of in-kind payments, others suggest that cash wages were the sole form of compensation. A significant number of sources, however, remain silent on the matter, leaving it uncertain whether workers received in-kind payments in addition to cash wages. Because of the variability and uncertainty of payments in kind we perform additional robustness checks.

A.6.2 Construction of lower and upper wage bounds

To quantify the extent to which in-kind payments might affect our estimates, we construct wage estimates under three different assumptions. The first assumes that all workers received only cash payments. While the evidence from our primary sources suggests that this scenario presumably understates actual wages, it serves as a useful benchmark for comparison with earlier studies. For instance, Allen (2001) relies solely on cash wages, likely excluding in-kind benefits.¹⁷

The second scenario, used as our baseline throughout the paper, treats all observations with missing information on in-kind payments as cash-only. The third scenario assumes that each ambiguous case included a daily meal in addition to the reported cash wage. Together, these

¹⁵ StAZH H I 507; StAZH H I 510.

¹⁶ StAAG AA 3429; StAAG AA 3430; StAAG AA 3431.

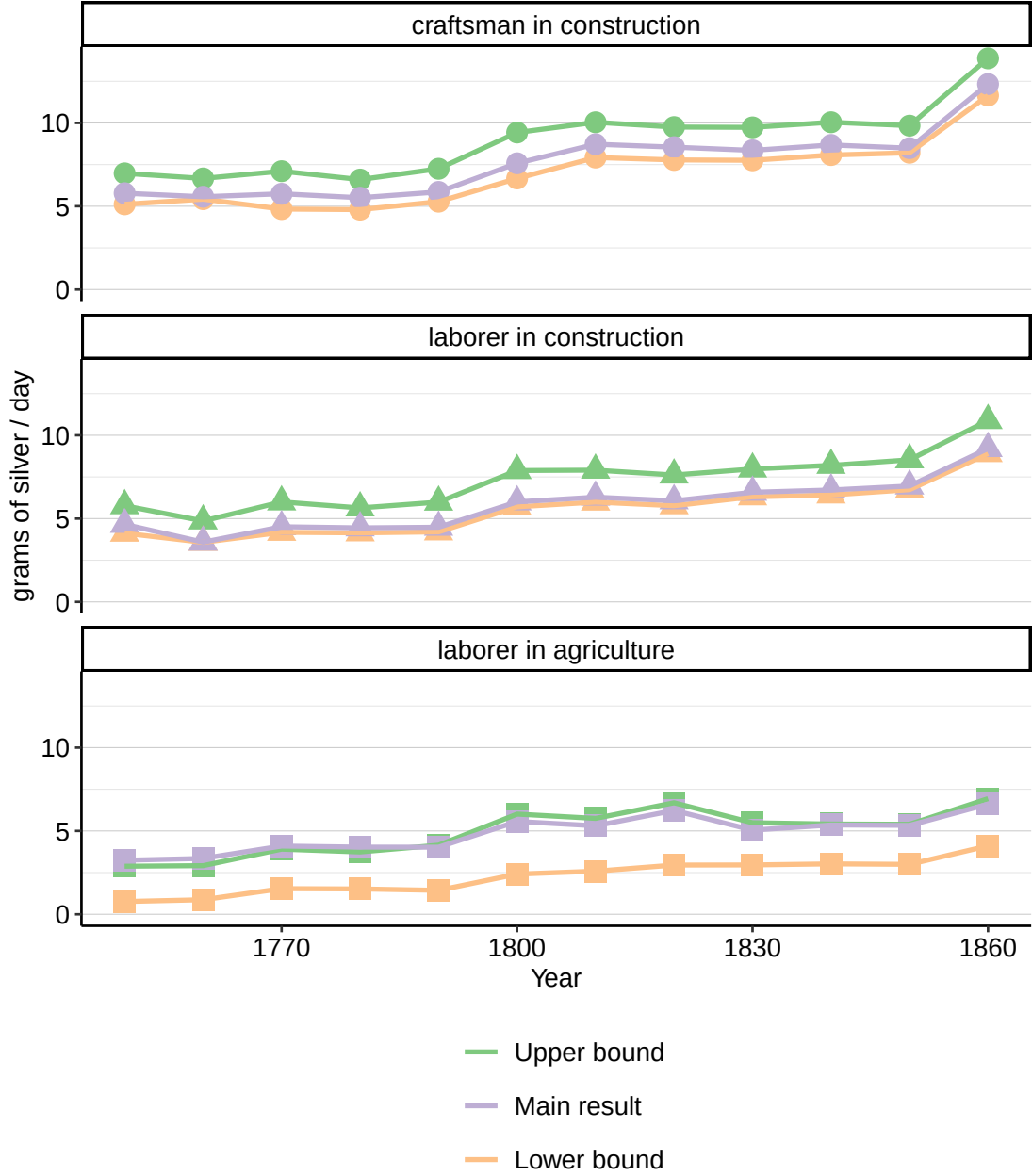
¹⁷ See Geloso (2018) for a discussion of omitted in-kind compensation in Allen's Strasbourg wage series.

three assumptions define a plausible range for wage estimates and illustrate the potential impact of missing data on in-kind compensation.

Figure [A.17](#) displays the resulting wage series under each scenario. In the construction sector, assuming meals were provided in all ambiguous cases increases wage estimates by approximately 20% for craftsmen and 27% for laborers, relative to the baseline. In contrast, restricting all wages to cash-only results in smaller reductions of 10% and 5%, respectively.

In agriculture, the pattern diverges markedly. Adding meals to ambiguous cases has little impact on overall wage estimates. However, excluding in-kind benefits entirely leads to a decline of 50%, yielding implausibly low wage levels. This underscores the importance of in-kind payments in agricultural compensation.

Figure A.17: Nominal daily wages: Uncertainty due to in-kind payments



Note: This figure shows our main wage series estimates together with estimates of lower and upper bounds of these series. The bounds are based on different scenarios regarding the provision of in-kind benefits, in particular a daily meal. All wage series are calculated with the regression approach described in Section 3.1.2.

A.7 Quantifying uncertainty due to sampling

To quantify the sampling uncertainty in the time-specific wage estimates $\hat{w}_t$, we implement a cluster bootstrap at the document level that accounts for the dependence of observations within source documents. Each bootstrap iteration resamples documents with replacement and re-estimates the wage series using the procedure described in Section 3.1.2. We set the number of bootstrap replications to $B = 1,000$.

Wage observations are clustered in source documents such as payrolls or accounting books. Observations from the same document share contextual features and are therefore likely to be correlated. Ignoring this dependence would understate the uncertainty in the wage estimates. The cluster bootstrap preserves the within-document correlation structure by resampling entire documents, following the recommendations in Efron and Tibshirani (1994).

Let D denote the number of documents, and let $S_d = \{(x_i, w_i) : i \in d\}$ be the set of wage observations in document d , with covariates x_i (job title, canton, year, and so on). In each bootstrap replication $b = 1, \dots, B$, we draw D documents with replacement from the set of observed documents, giving each document equal probability. All wage observations in the selected documents enter the bootstrap sample, with multiplicity determined by the number of times their document is drawn. For nominal wages, we re-estimate equation 1 on the resampled data and construct the corresponding wage series $\hat{\mathbf{w}}^{*(b)} = \{\hat{w}_t^{*(b)}\}_{t=1750}^{1860}$. For real wages, each wage-bootstrap replication is paired with a single CPI bootstrap draw sampled independently from the set of bootstrapped CPI paths, and real wages at the observation level are recomputed before re-estimating the model.

From the bootstrap distribution of $\hat{w}_t^{*(b)}$ we compute pointwise percentile intervals, defined for each year t as the 5th and 95th percentiles of $\{\hat{w}_t^{*(b)}\}_{b=1}^B$. The resulting intervals are shown as shaded regions around the point estimates in Section 4.2.2 and summarise the sampling variation in the estimated wage paths.

A.7.1 Bootstrap tests for long-run evolution and differences across occupations in real wages

This section reports two sets of bootstrap-based tests that complement the graphical uncertainty assessment in Section 4.2.2. Throughout, we use the same cluster bootstrap draws described in Section A.7. For bootstrap replication b , $\hat{w}_{o,t}^{*(b)}$ denotes the estimated real wage for occupation o in decade t .

Long-run evolution of real wages. We test whether the real wage of a given occupation differed between an early period and a late period. Let T^E denote the decades in the early period (1750–1790) and T^L the decades in the late period (1820–1860). For occupation o and bootstrap replication b , define the period difference

$$\Delta_o^{*(b)} = \frac{1}{|T^L|} \sum_{t \in T^L} \hat{w}_{o,t}^{*(b)} - \frac{1}{|T^E|} \sum_{t \in T^E} \hat{w}_{o,t}^{*(b)}.$$

where $|X|$ is the number of observations in set X . The bootstrap set $\{\Delta_o^{*(b)}\}_{b=1}^B$ provides information about the sampling uncertainty associated with the long-run change in real wages. We report the 5th, 50th and 95th percentiles of this distribution and the corresponding bootstrap p-values.

Real wage differences across occupations. We also examine whether real wages differ across occupation types. For two occupations (o_1, o_2) , define the decadal gap in bootstrap replication

b as

$$g_{o_1, o_2, t}^{*(b)} = \hat{w}_{o_1, t}^{*(b)} - \hat{w}_{o_2, t}^{*(b)}.$$

To summarise the long-run difference over a period T (1750–1860), define the average gap

$$G_{o_1, o_2}^{*(b)} = \frac{1}{|T|} \sum_{t \in T} g_{o_1, o_2, t}^{*(b)}.$$

We report the 5th, 50th and 95th percentiles of $\{G_{o_1, o_2}^{*(b)}\}_{b=1}^B$ and the corresponding bootstrap p-values.

Bootstrap p-values. For each statistic we compute a one-sided bootstrap p-value for the null hypothesis that the difference is less than or equal to zero. Let $\{T^{*(b)}\}_{b=1}^B$ denote the bootstrap draws of a generic statistic T (either $\Delta_o^{*(b)}$ or $G_{o_1, o_2}^{*(b)}$). The p-value is defined as

$$p = \frac{1}{B} \sum_{b=1}^B 1\{T^{*(b)} \leq 0\}.$$

where $1\{\text{statement}\}$ is an indicator function that is one if a statement is true and zero otherwise. This quantity measures the share of bootstrap replications in which the difference is zero or negative. Small values of p indicate that the bootstrap distribution has little mass at or below zero.

Results. Tables A.2 and A.3 summarise the bootstrap distributions of the two test statistics. For the within-occupation long-run differences, the 5th percentile of the bootstrap distribution is positive for all occupations. This indicates that the increase in real wages between the mid-eighteenth and mid-nineteenth century is robust to sampling uncertainty. The long-run increase in real wages for craftsmen in construction ranges between 0.8 and 2.2 daily consumption baskets (5th to 95th percentile).

For the cross-occupation comparisons, the percentile intervals for the average real wage gaps are positive for both occupation pairs. These results support the occupational ranking documented in the main text while also showing that the estimated gaps are associated with non-trivial sampling uncertainty. The wage premium for skilled workers in the construction sector, relative to unskilled, averaged across the entire period and bootstrapped, ranges between 0.04 and 1.8 daily consumption baskets, indicating a positive but imprecisely estimated gap.

Table A.2: Bootstrap-based tests of long-run increase in real wages

Occupation	5th pct	Median	95th pct	p-value
Craftsman in construction	0.798	1.425	2.244	0.001
Laborer in construction	0.503	0.952	1.336	0.003
Laborer in agriculture	0.290	0.718	1.497	0.002

Notes: This table reports the 5th, 50th and 95th percentiles of the bootstrapped distribution of the statistic $\Delta_o^{*(b)}$, defined as the difference between the average real wage in an early period (1750–1790) and a late period (1820–1860). The p-value equals the share of bootstrap draws for which $\Delta_o^{*(b)} \leq 0$.

Table A.3: Bootstrap-based tests of real wage differences between occupations

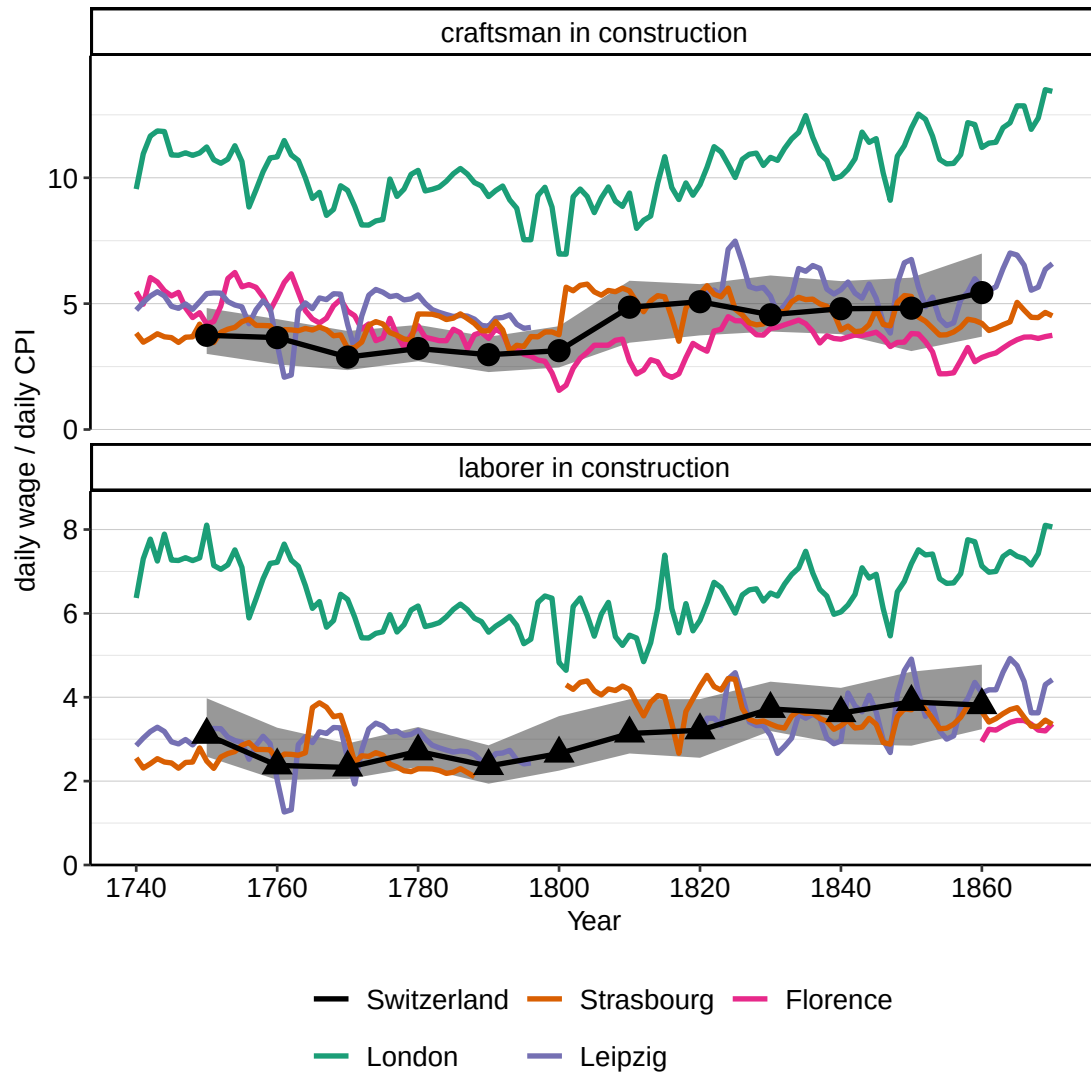
Occupation pair (first minus second)	5th pct	Median	95th pct	p-value
Craftsman in construction, laborer in construction	0.052	0.912	1.845	0.042
Laborer in construction, laborer in agriculture	0.056	0.568	1.177	0.035

Notes: This table reports the 5th, 50th and 95th percentiles of the bootstrapped distribution of the statistic $G_{o_1, o_2}^{*(b)}$, defined as the average decadal real wage difference between two occupations over the period 1750–1860. The p-value equals the share of bootstrap draws in which $G_{o_1, o_2}^{*(b)} \leq 0$.

A.7.2 Sampling uncertainty and comparison of our estimates to the literature

Figure A.18 compares our wage estimates with the international series from Allen (2001) and reports the associated sampling uncertainty. The uncertainty range is consistent with the conclusions in the main text. Construction wages in Switzerland were close to those in Strasbourg throughout the period.

Figure A.18: Real wage series with sampling uncertainty ranges and estimates for other locations



Note: This figure shows our estimates of real daily wage series, including the range between the 5th and 95th percentile of the bootstrap replications, alongside estimates for other locations from the literature. For further details on the sampling uncertainty range see notes to Figure 8.

A.8 Additional tables

Table A.4: Coefficients and shares of time-invariant characteristics: nominal wage of craftsman in construction.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	missing	*	0.378	canton	appenzell innerrhoden	*	0.015
season	fall	-0.12	0.165	canton	bern	-0.37	0.019
season	summer	-0.07	0.219	canton	basel	-0.03	0.004
season	winter	-0.18	0.106	canton	luzern	-0.27	0.098
season	spring	-0.09	0.132	canton	obwalden	-0.07	0.014
occupation	ziegler	*	0.001	canton	st. gallen	-0.19	0.457
occupation	maurer	0.09	0.315	canton	uri	-0.25	0.128
occupation	dachdecker	-0.01	0.079	canton	zurich	0.14	0.241
occupation	zimmermann	0.06	0.372	canton	neuchatel	-0.33	0.000
occupation	steinmetz	0.26	0.028	canton	fribourg	-0.54	0.004
occupation	forster	-0.31	0.000	canton	valais	-0.29	0.003
occupation	gesell	0.11	0.023	canton	vaud	-0.10	0.017
occupation	schreiner	0.11	0.001	employer	public maintenance	*	0.579
occupation	steinhauer	0.12	0.031	employer	farmer	-0.08	0.008
occupation	gipser	-0.06	0.000	employer	public construction	0.32	0.346
occupation	maurergeselle	0.09	0.140	employer	hospital	-0.19	0.009
occupation	steinbrecher	0.05	0.003	employer	private	0.31	0.057
occupation	hafner	-0.10	0.000	meal	no	*	0.042
occupation	tischler	0.04	0.004	meal	yes	-0.13	0.251
occupation	maler	0.43	0.000	meal	missing	0.03	0.708
occupation	gassenbesetzer	0.05	0.001				

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.5: Coefficients and shares of time-invariant characteristics: nominal wage of laborer in construction.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	missing	*	0.206	occupation	strassenarbeiter	-0.28	0.108
season	fall	-0.07	0.168	canton	appenzell innerrhoden	*	0.033
season	spring	-0.05	0.186	canton	bern	-0.12	0.039
season	summer	-0.04	0.325	canton	basel	0.17	0.050
season	winter	-0.11	0.115	canton	luzern	-0.07	0.049
occupation	handlanger	*	0.477	canton	obwalden	0.08	0.011
occupation	brunnenarbeiter	0.02	0.081	canton	st. gallen	0.01	0.329
occupation	gehilfe	-0.02	0.009	canton	uri	0.09	0.274
occupation	gassenbesetzer	0.02	0.050	canton	zug	**	0.108
occupation	holzf?ller	-0.05	0.005	canton	zurich	0.24	0.095
occupation	wegmacher	-0.05	0.049	canton	fribourg	0.28	0.000
occupation	arbeiter	-0.04	0.018	canton	valais	0.69	0.000
occupation	brunnenknecht	0.13	0.004	canton	vaud	0.16	0.013
occupation	ruchwerker	-0.22	0.006	canton	geneve	1.09	0.000
occupation	tagl?hner	-0.05	0.009	employer	public maintenance	*	0.579
occupation	sager	0.04	0.000	employer	farmer	-0.16	0.005
occupation	knecht	-0.11	0.000	employer	public construction	0.09	0.399
occupation	ruchknecht	0.08	0.094	employer	hospital	-0.36	0.000
occupation	zimmerknecht	0.20	0.001	employer	private	-0.06	0.016
occupation	strassenknecht	0.37	0.020	meal	no	*	0.128
occupation	dachdecker	0.05	0.000	meal	yes	0.11	0.100
occupation	wegleute	-0.00	0.069	meal	missing	-0.09	0.772
occupation	heuen	0.25	0.000				

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.6: Coefficients and shares of time-invariant characteristics: nominal wage of laborer in agriculture.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	summer	*	0.090	canton	thurgau	-0.14	0.042
season	spring	-0.01	0.071	canton	schaffhausen	0.17	0.014
season	winter	-0.10	0.056	canton	zurich	0.44	0.538
season	missing	-0.10	0.691	canton	valais	0.33	0.048
season	fall	-0.04	0.092	canton	fribourg	0.01	0.000
occupation	landarbeiter	*	0.149	canton	vaud	0.72	0.035
occupation	holzf?ller	-0.05	0.025	canton	geneve	0.21	0.001
occupation	dachdecker	0.07	0.003	employer	kloster hermettschwil	*	0.036
occupation	handlanger	-0.16	0.050	employer	kloster wettingen	0.06	0.191
occupation	tagl?hner	-0.06	0.759	employer	farmer	-0.36	0.038
occupation	gehilfe	0.28	0.000	employer	private	**	0.140
occupation	heuen	0.07	0.000	employer	public maintenance	**	0.000
occupation	knecht	0.16	0.014	employer	monastery	**	0.056
occupation	arbeiter	0.06	0.001	employer	hospital	**	0.538
canton	aargau	*	0.227	meal	yes	*	0.840
canton	bern	0.43	0.094	meal	missing	-0.19	0.158
canton	basel	**	0.000	meal	no	-0.48	0.002

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.7: Coefficients and shares of time-invariant characteristics: real wage of craftsman in construction.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	missing	*	0.378	canton	appenzell innerrhoden	*	0.015
season	fall	-0.14	0.165	canton	bern	-0.19	0.019
season	summer	-0.10	0.219	canton	basel	0.11	0.004
season	winter	-0.21	0.106	canton	luzern	-0.18	0.098
season	spring	-0.14	0.132	canton	obwalden	-0.01	0.014
occupation	ziegler	*	0.001	canton	st. gallen	-0.13	0.457
occupation	maurer	0.08	0.315	canton	uri	-0.16	0.128
occupation	dachdecker	-0.01	0.079	canton	zurich	0.39	0.241
occupation	zimmermann	0.06	0.372	canton	neuchatel	0.07	0.000
occupation	steinmetz	0.25	0.028	canton	fribourg	-0.30	0.004
occupation	forster	-0.32	0.000	canton	valais	-0.05	0.003
occupation	gesell	0.14	0.023	canton	vaud	0.25	0.017
occupation	schreiner	0.13	0.001	employer	public maintenance	*	0.579
occupation	steinhauer	0.10	0.031	employer	farmer	-0.29	0.008
occupation	gipser	-0.14	0.000	employer	public construction	0.21	0.346
occupation	maurergeselle	0.11	0.140	employer	hospital	-0.20	0.009
occupation	steinbrecher	0.07	0.003	employer	private	0.08	0.057
occupation	hafner	-0.15	0.000	meal	no	*	0.042
occupation	tischler	0.03	0.004	meal	yes	-0.14	0.251
occupation	maler	0.32	0.000	meal	missing	-0.03	0.708
occupation	gassenbesetzer	-0.05	0.001				

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.8: Coefficients and shares of time-invariant characteristics: real wage of laborer in construction.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	missing	*	0.206	occupation	strassenarbeiter	-0.27	0.108
season	fall	-0.01	0.168	canton	appenzell innerrhoden	*	0.033
season	spring	-0.07	0.186	canton	bern	-0.02	0.039
season	summer	-0.03	0.325	canton	basel	0.21	0.050
season	winter	-0.08	0.115	canton	luzern	-0.03	0.049
occupation	handlanger	*	0.477	canton	obwalden	0.06	0.011
occupation	brunnenarbeiter	0.03	0.081	canton	st. gallen	-0.02	0.329
occupation	gehilfe	-0.10	0.009	canton	uri	0.14	0.274
occupation	gassenbesetzer	0.01	0.050	canton	zug	**	0.108
occupation	holzf?ller	-0.07	0.005	canton	zurich	0.37	0.095
occupation	wegmacher	-0.11	0.049	canton	fribourg	0.53	0.000
occupation	arbeiter	-0.06	0.018	canton	valais	1.08	0.000
occupation	brunnenknecht	0.11	0.004	canton	vaud	0.29	0.013
occupation	ruchwerker	-0.25	0.006	canton	geneve	1.47	0.000
occupation	tagl?hner	-0.07	0.009	employer	public maintenance	*	0.579
occupation	sager	-0.06	0.000	employer	farmer	-0.29	0.005
occupation	knecht	-0.19	0.000	employer	public construction	-0.01	0.399
occupation	ruchknecht	0.09	0.094	employer	hospital	-0.48	0.000
occupation	zimmerknecht	0.31	0.001	employer	private	-0.29	0.016
occupation	strassenknecht	0.32	0.020	meal	no	*	0.128
occupation	dachdecker	0.12	0.000	meal	yes	0.18	0.100
occupation	wegleute	-0.00	0.069	meal	missing	-0.16	0.772
occupation	heuen	0.22	0.000				

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.9: Coefficients and shares of time-invariant characteristics: real wage of laborer in agriculture.

Variable	Category	Coefficient	Share	Variable	Category	Coefficient	Share
season	summer	*	0.090	canton	thurgau	-0.10	0.042
season	spring	-0.00	0.071	canton	schaffhausen	-0.19	0.014
season	winter	-0.12	0.056	canton	zurich	0.51	0.538
season	missing	-0.01	0.691	canton	valais	0.41	0.048
season	fall	-0.05	0.092	canton	fribourg	-0.01	0.000
occupation	landarbeiter	*	0.149	canton	vaud	0.78	0.035
occupation	holzf?ller	-0.06	0.025	canton	geneve	-0.01	0.001
occupation	dachdecker	0.09	0.003	employer	kloster hermettschwil	*	0.036
occupation	handlanger	-0.15	0.050	employer	kloster wettingen	0.06	0.191
occupation	tagl?hner	-0.06	0.759	employer	farmer	-0.40	0.038
occupation	gehilfe	0.55	0.000	employer	private	**	0.140
occupation	heuen	0.12	0.000	employer	public maintenance	**	0.000
occupation	knecht	0.38	0.014	employer	monastery	**	0.056
occupation	arbeiter	0.00	0.001	employer	hospital	**	0.538
canton	aargau	*	0.227	meal	yes	*	0.840
canton	bern	0.52	0.094	meal	missing	-0.34	0.158
canton	basel	**	0.000	meal	no	-0.16	0.002

Note: This table presents the coefficients and weights used to construct the time-invariant wage component, as specified by equation 2. * indicates reference categories; ** indicates that this category is collinear with other regressors and therefore not included.

Table A.10: Temporal and spatial coverage of price data

Commodity	Years	Cantons	Year-Canton Pairs	Observations
Bread	130	9	454	6,595
Candle, soap, fat	115	5	202	1,840
Candles	114	5	183	1,385
Soap	81	5	126	455
Dairy and egg	131	11	551	9,917
Butter	131	10	525	9,218
Cheese	85	6	141	593
Eggs	31	5	33	106
Firewood	93	4	139	589
Linen cloth	45	1	45	167
Beef	123	8	269	2,377
Pulses	70	4	115	697
Peas	70	4	114	413
Beans	51	2	80	284
Wine	131	9	552	1,186
All commodities	131	13	1,039	23,368

Note: This table reports the number of distinct years, cantons, year-canton pairs and unique observations for each commodity in our price data. Commodities are grouped into categories, which are reported in bold font.

Table A.11: Archival sources for wage data

Archive	Reference	Start	End	Number of Observations				Number of Days
				Construction		Agriculture		
				Craftsmen	Laborers	Laborers	Total	
ACV	P Château de La Sarraz D 45/I	1755	1780	29	1	166	196	3,307
ACV	P Mercier 983	1844	1846	0	61	0	61	371
ACV	P Ravy 14	1774	1777	7	0	1	8	70
ACV	PP 106/73	1820	1835	37	0	1	38	223
ACV	PP 809/1	1765	1770	8	1	0	9	551
AEF	CH AEF CSN II.3.91 (478350)	1819	1820	5	0	0	5	54
AEF	CH AEF Famille d'Alt 15 (33496)	1818	1820	1	0	1	2	5
AEF	CH AEF Fonds de Weck 4 (56339)	1848	1848	1	0	0	1	8
AEF	CH AEF HB B 4.264 (1512)	1807	1810	31	9	0	40	253
AEV	CH AEV AVL 495	1777	1798	0	0	6	6	26
AEV	CH AEV, Ambuel, R 6	1774	1795	19	0	62	81	1,557
AEV	CH AEV, Guillaume de Kalbermatten, R 13	1751	1762	0	0	107	107	1,275
AEV	CH AEV, Guillaume de Kalbermatten, R 37	1831	1831	0	0	10	10	128
AEV	CH AEV, Guillaume de Kalbermatten, R 40	1847	1857	0	0	35	35	140
AEV	CH AEV, Guillaume de Kalbermatten, R 32	1808	1834	1	0	8	9	209
AEV	CH AEV, Guillaume de Kalbermatten, R 33	1808	1816	0	0	4	4	27
AEV	CH AEV, Joseph de Lavallaz, P 726	1798	1805	0	0	18	18	319
AEV	CH AEV, Joseph de Lavallaz, P 780	1812	1815	0	0	11	11	138
AEV	CH AEV, AC Grône Suppl., Pa 109	1805	1805	0	1	0	1	1
AEV	CH AEV, Hoirie Calpini, 377	1836	1837	0	0	24	24	322

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Archive	Reference	Start	End	Number of observations			Number of days	
				Construction		Agriculture		
				Craftsmen	Laborers	Laborers		Total
BGE	Arch. Tronchin 333	1756	1756	0	1	0	1	1
LAAI	E.72.02.11	1760	1861	123	684	0	807	5,255
SWA	SWA HS 110	1816	1817	0	0	592	592	2,571
StAB	B X 143	1779	1781	113	552	0	665	4,237
StAB	B X 276	1824	1825	253	272	0	525	525
StAB	B X 278	1824	1825	159	141	0	300	300
StAB	B X 510	1790	1790	31	198	0	229	985
StAB	B X 511	1777	1777	13	32	0	45	169
StAB	B X 515	1791	1791	0	24	0	24	124
StAB	DQ 192	1812	1826	16	8	33	57	1,822
StAB	DQ 351	1831	1836	0	0	966	966	4,552
StABS	Bau D 5	1803	1850	10	51	0	61	6,085
StABS	Bau F 25	1772	1832	134	258	1	393	393
StALU	AKT 19C/1329	1765	1765	12	17	0	29	2,655
StALU	BL 16	1837	1841	0	119	0	119	2,517
StALU	COD 10005	1746	1746	3	6	0	9	174
StALU	COD 10010	1747	1747	2	8	0	10	165
StALU	COD 10025	1750	1750	2	6	0	8	110
StALU	COD 10075	1760	1760	1	3	0	4	66
StALU	COD 10105	1770	1775	25	9	0	34	516
StALU	COD 10110/10	1785	1785	12	7	0	19	246
StALU	COD 10110/16	1790	1790	5	0	0	5	30

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Archive	Reference	Start	End	Number of observations			Number of days	
				Construction		Agriculture		
				Craftsmen	Laborers	Laborers		Total
StALU	COD 10110/20	1793	1793	32	7	0	39	212
StALU	COD 10110/5	1780	1780	10	5	0	15	282
StALU	COD 10345	1824	1824	91	75	0	166	1,836
StALU	COD 10350	1829	1830	346	118	0	464	5,200
StAOW	02.R.0012	1749	1770	3	6	0	9	51
StAOW	02.R.0013	1797	1830	10	2	0	12	134
StAOW	02.R.0015	1831	1859	27	12	0	39	385
StAOW	02.R.0086a	1829	1863	66	141	0	207	1,903
StASG	CD 1/15	1770	1803	11	44	0	55	55
StAUR	AA-270 2	1770	1794	4	40	0	44	44
StAUR	R-150-13/41	1823	1826	212	719	0	931	18,916
StAUR	R-150-13/5	1811	1818	319	1,330	0	1,649	25,185
StAZG	CA 15.3	1804	1829	0	950	0	950	13,329
StAZH	D 828.1	1839	1850	10	12	0	22	147
StAZH	D 828.2	1849	1849	2	0	0	2	28
StAZH	F III 13	1797	1797	2	0	0	2	248
StAZH	F III 14	1750	1796	42	11	0	53	1,165
StAZH	F III 17	1770	1770	6	5	0	11	299
StAZH	F III 19	1780	1780	2	0	0	2	52
StAZH	F III 3	1780	1790	21	0	0	21	545
StAZH	F III 9	1750	1770	19	7	0	26	567
StAZH	G II 12	1763	1776	87	23	0	110	27,827

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Archive	Reference	Start	End	Number of observations				Number of days
				Construction		Agriculture		
				Craftsmen	Laborers	Laborers	Total	
StAZH	G II 13	1778	1804	39	9	0	48	412
StAZH	J 292	1758	1773	0	0	188	188	1,142
StadtASG	Aemterarchiv XV 207	1771	1772	283	487	0	770	11,524
StadtASG	Aemterarchiv XV 216	1777	1778	285	419	0	704	16,585
StadtASG	Aemterarchiv XV 230	1791	1791	36	4	0	40	2,198
StadtASG	Aemterarchiv XV 252	1800	1801	421	346	0	767	13,149
StadtASG	Aemterarchiv XV 277	1809	1809	344	307	0	651	13,283
StadtASG	Aemterarchiv XV 317	1830	1830	684	490	0	1,174	14,874
StadtASG	Aemterarchiv XV 323	1839	1845	340	634	0	974	5,267
StadtASG	Spitalarchiv O 113	1772	1773	103	0	0	103	504
StadtASG	Spitalarchiv O 123	1782	1783	51	0	0	51	250
StadtASG	Spitalarchiv O 133	1792	1792	4	0	0	4	4
StadtASG	Spitalarchiv O 153	1812	1812	4	2	0	6	6
Entire Dataset:	93 different sources	1746	1863	4,973	8,674	4,056	17,703	285,412

Note: AC Rolle: Archives communales de Rolle; ACV: Archives cantonales vaudoises; AEF: Archives de l'Etat de Fribourg; AEG: Archives de l'Etat de Geneve; AEV: Archives de l'Etat du Valais; BGE: Bibliothèque de Genève; LAAI: Landesarchiv Appenzell Innerrhoden; SWA: Schweizerisches Wirtschaftsarchiv, Basel; StAAG: Staatsarchiv Aargau; StAB: Staatsarchiv Bern; StAB: Staatsarchiv Kanton Bern; StABS: Staatsarchiv Basel-Stadt; StALU: Staatsarchiv Luzern; StAOW: Staatsarchiv Obwalden; StASG: Staatsarchiv St. Gallen; StATG: Staatsarchiv Thurgau; StAUR: Staatsarchiv Uri; StAZG: Staatsarchiv Zug; StAZH: Staatsarchiv Zürich; StadtASG: Stadtarchiv St. Gallen.

Table A.12: Archival sources for price data

Archive	Reference	Title	Start	End	Number of Observations								
					Fi	Br	Wi	CS	DE	Me	Pu	Li	Total
AC Rolle	A.BEB 6	Comptes de la bourse communale	1813	1819	6	0	0	0	0	0	0	0	6
ACV	H 215 A	Chambre administrative	1798	1798	0	1	0	0	0	0	0	0	1
ACV	H 372 B	Arrêtés sur les prix des denrées. Grains et vin, tabelles de 1801 et 1802	1801	1802	0	0	4	0	0	0	0	0	4
ACV	K XII b 4/2	Bas-forestiers	1808	1808	27	0	0	0	0	0	0	0	27
ACV	P Château de La Sarraz D45/I	Comptes	1756	1776	0	0	39	0	0	0	0	0	39
ACV	P Frossard/12	Famille Frossard Charrière de Sévery, livre de comptes attribué à Jean-Augustin Constant	1752	1774	0	3	1	42	20	0	0	0	66
ACV	P Frossard/17	Livre de comptes attribuée à Jeanne-Gabrielle de Bondeli, née Constant	1791	1801	0	9	0	4	41	0	0	0	54
ACV	P Frossard/2	Élisabeth de Charrière de Sévery, née de Clerc, livre de la dépense du ménage	1745	1747	0	154	78	4	65	0	0	0	301
ACV	P Ravy 14	Famille Ravy, journal de ménage	1774	1777	0	18	16	4	60	0	0	0	98
AEV	AB Sierre, P 283	Prix du pain de froment et de seigle à 16 onces, sur la place de Sion	1813	1813	0	72	0	0	0	0	0	0	72
AEV	AC Granges, P 348	Comptes-courants divers	1844	1845	0	0	0	0	2	0	0	0	2

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Archive	Reference	Title	Start	End	Number of Observations								
					Fi	Br	Wi	CS	DE	Me	Pu	Li	Total
StAF	Famille d'Alt 15	Factures et pièces comptables	1804	1804	0	0	2	0	0	0	0	0	2
StAF	Fonds de Weck 4	Comptes	1848	1850	0	0	5	0	2	0	1	0	8
StAF	HB B 4.264	Hôpital des Bourgeois de Fribourg, Journal de l'économe	1807	1810	0	0	3	14	37	35	6	0	95
StAF	Helvétique H 460	Registre contenant l'indication par mois du prix des denrées de première nécessité dans chaque district du canton de Fribourg	1799	1802	0	0	17	0	15	6	1	0	39
StAF	Helvétique H 461	Correspondance reçue par la Chambre administrative au sujet des prix des denrées	1800	1802	0	0	26	0	13	6	2	0	47
StAZH	F III 1 a	Almosenamt zu den Augustinern	1770	1798	0	0	0	0	0	0	0	56	56
StAZH	F III 43	Zuchthaus	1775	1797	49	0	0	50	68	43	0	0	210
StAZH	H I 548	Kontokorrent der Fabrikasse des Spitals	1833	1835	0	0	0	0	0	0	0	9	9
StAZH	H I 553	Kassabücher	1795	1795	1	0	0	0	0	0	0	0	1
StAZH	H I 555	Kassabuch	1802	1806	0	0	0	0	0	0	0	12	12
StAZH	H I 557	Kassabuch	1825	1831	0	0	0	0	0	0	0	27	27
StAZH	H I 629	Rechnungsbücher des Spitals	1774	1798	91	0	109	58	166	0	0	14	438
StAZH	RR II 1	Rechnungen der Verwaltung des Almosenamts	1803	1803	0	0	0	0	0	0	0	1	1
StAZH	RR II 120 b.1	Rechnungen des Spitalamts, resp. des Kantonsspitals	1798	1866	21	0	0	114	133	3	0	44	315

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Archive	Reference	Title	Start	End	Number of Observations								
					Fi	Br	Wi	CS	DE	Me	Pu	Li	Total
StAZH	RR II 120 b.4	Fabrikrechnungen der kantonalen Kranken- und Versorgungsanstalten	1852	1853	0	0	0	0	0	0	0	4	4
StAZH	RR II 141	Rechnungen der Verwaltung des Zuchthauses, resp. Hauptbücher der kantonalen Strafanstalt	1799	1870	138	0	0	216	416	418	0	0	1,188
<i>Entire Dataset: 38 different sources</i>			1745	1870	334	257	301	521	4,789	545	10	167	6,924

Note: Abbreviations of commodity groups are Fi: Firewood; Br: Bread; Wi: Wine; CS: Candles and soap; DE: Dairy and egg; Me: Meat; Pu: Pulses; Li: Linen textiles. Abbreviations of archives are AC Rolle: Archives communales de Rolle; ACV: Archives cantonales vaudoises; AEV: Archives de l'Etat du Valais; StAAR: Staatsarchiv Appenzell Auser rhoden; StAF: Staatsarchiv Freiburg; StAZH: Staatsarchiv Zürich.

Table A.13: Published sources for price data

Title	Year(s) published	Place	Start	End	Number of Observations								
					Fi	Br	Wi	CS	DE	Me	Pu	Li	Total
Basler Avisblatt	1729-1845	Basel	1740	1844	0	3720	0	1290	3916	665	9	0	9600
Berner Wochenblatt	ca. 1737-1833	Bern	1776	1833	0	1253	15	0	4	0	283	0	1555
Bulletin officiel	from 1803	Valais	1803	1850	0	195	0	0	795	486	0	0	1476
Donnstags-Nachrichten von Zürich	1730-1842	Zürich	1750	1842	0	614	0	28	56	476	314	0	1488
Feuille d'avis de Neuchâtel	from 1738	Neuchâtel	1768	1830	0	155	11	0	17	54	31	0	268
Frucht- und Weinschlag im Jahr 1476-1800	after 1800	Basel	1770	1798	0	0	28	0	0	0	0	0	28
Urner Amtsblatt	from 1849	Altdorf	1849	1849	0	16	0	0	0	0	0	0	16
<i>Entire Dataset: 7 different sources</i>			1740	1850	0	5953	54	1318	4788	1681	637	0	14431

Note: Abbreviations of commodity groups are Fi: Firewood; Br: Bread; Wi: Wine; CS: Candles and soap; DE: Dairy and egg; Me: Meat; Pu: Pulses; Li: Linen textiles.

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Caspard, Pierre	1979	La Fabrique-Neuve de Cortaillod: Entreprise et Profit Pendant La Révolution Industrielle: 1752-1854	1758	1819	133	0	0	0	0	0	0	0	133
Chevallaz, Georges André	1950	Le vignoble vaudois au temps de LL.EE.	1740	1799	0	0	119	0	0	0	0	0	119
Furrer, Norbert	2010	Vade-mecum monétaire vaudois XVIe-XVIIIe	1798	1798	0	24	25	1	40	24	0	0	114
Haas-Zumbühl, Franz	1903	Die Butterpreise von Luzern von 1601-1903	1740	1870	0	0	0	0	130	0	0	0	130
Haas-Zumbühl, Franz	1903	Die Kernenpreise und Brotpreise in Luzern von 1601-1900	1740	1870	0	126	0	0	0	0	0	0	126
Mühlemann, C.	1882	Einfluss der wichtigsten Nahrungsmittelpreise auf die Bewegung der Bevölkerung im Kanton Bern von 1782 bis 1881	1800	1869	0	85	0	0	0	0	0	0	85

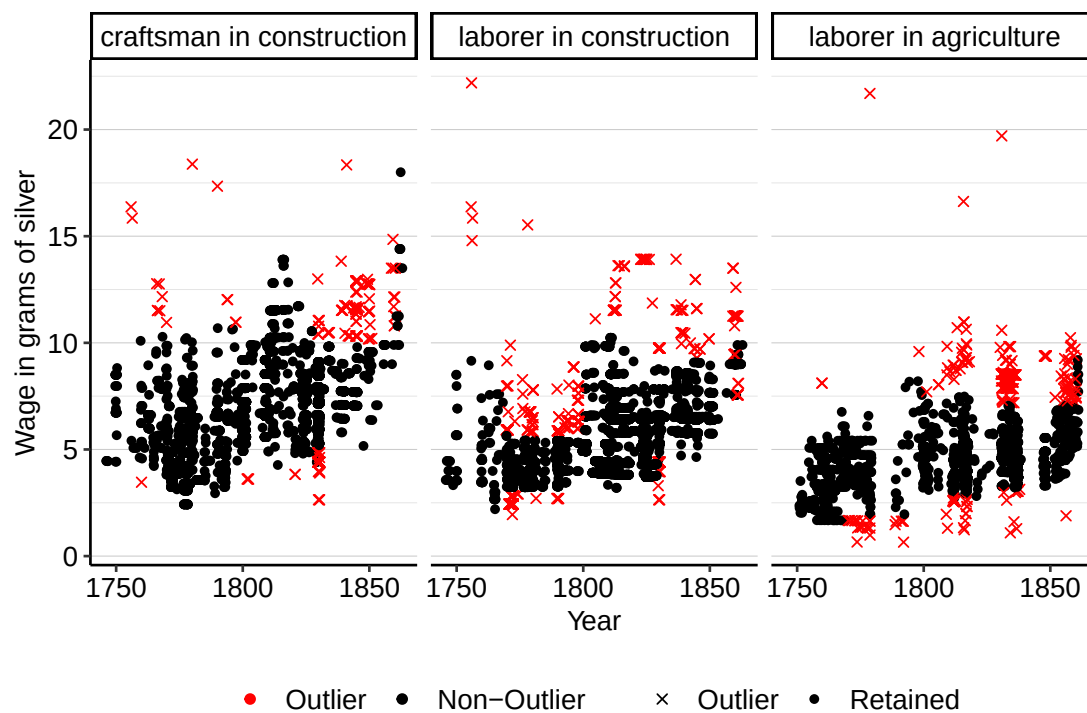
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Author	Year	Title	Start	End	Number of Observations									
					Fi	Br	Wi	CS	DE	Me	Pu	Li	Total	
Müller, C. K. and Waser, J. H.	1878	Weinpreise im Kanton Zurich 1470—1870. Nach Waser	1740	1870	0	0	465	0	0	0	0	0	0	465
Projer, Erich	1987	Die schweizerischen Grosshandelspreise 1806 bis 1928	1806	1850	122	0	0	0	0	0	0	0	0	122
Vettori, Arthur	1984	Finanzhaushalt und Wirtschaftsverwaltung Basels (1689-1798)	1741	1798	0	0	57	0	0	0	0	0	0	57
n.a.	1905	Vieux papiers	1749	1753	0	0	2	0	5	0	0	0	0	7
Zumkeller, Dominique	1989	Le paysan et la terre. Agriculture et struc- ture agraire à Genève au XVIIIe siècle	1740	1797	0	0	147	0	45	0	0	0	0	192
Entire Dataset: 16 different sources			1740	1870	255	385	831	1	340	151	50	0	0	2,013

Note: Abbreviations of commodity groups are Fi: Firewood; Br: Bread; Wi: Wine; CS: Candles and soap; DE: Dairy and egg; Me: Meat; Pu: Pulses; Li: Linen textiles.

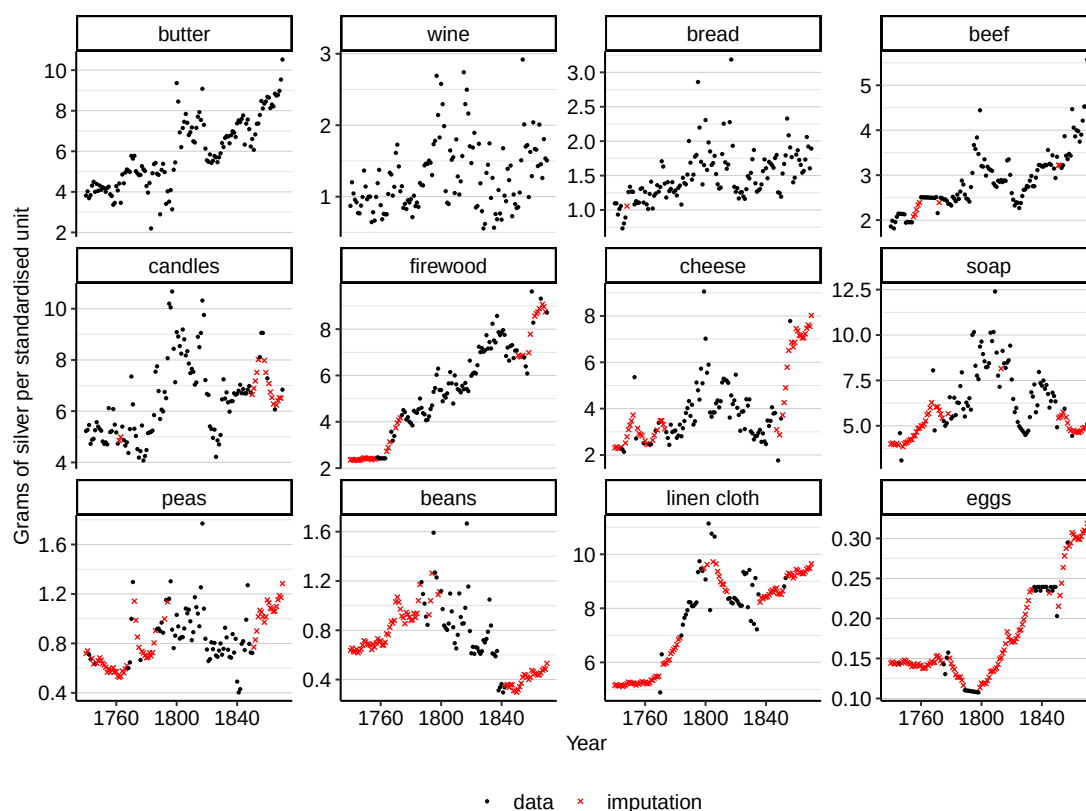
A.9 Additional figures

Figure A.19: Outliers in the Wage Data



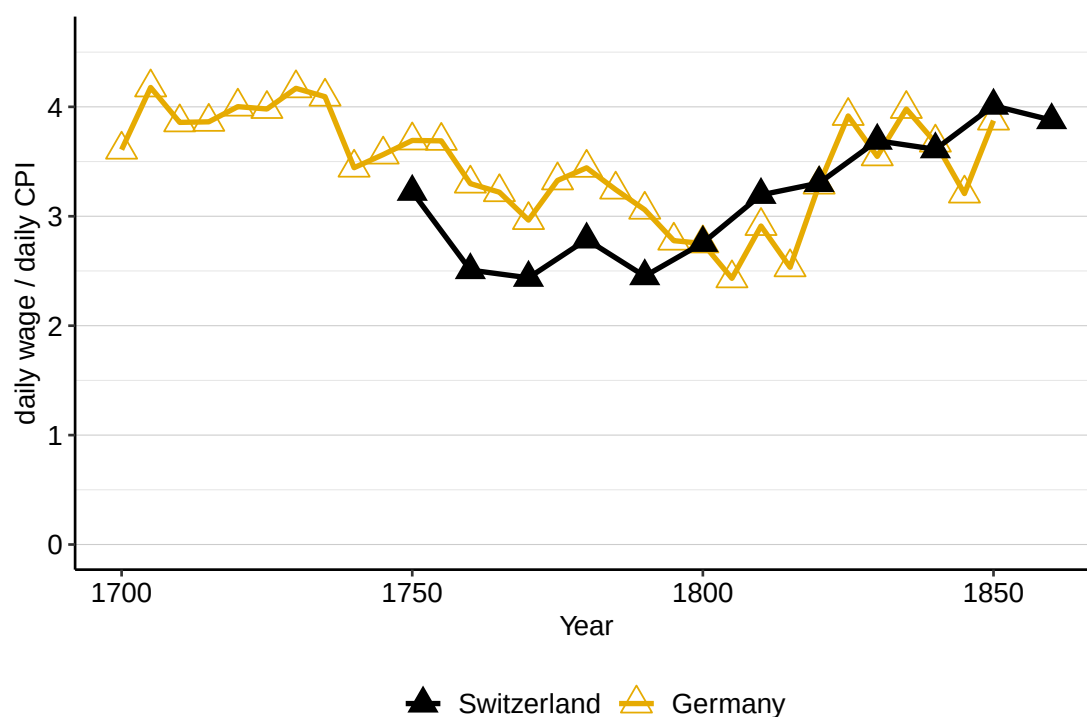
Note: This figure displays how outliers in nominal wages are distributed over time. Outliers are identified using the interquartile range (IQR) method: values above the third quartile plus 1.5 times the IQR or below the first quartile minus 1.5 times the IQR are considered outliers.

Figure A.20: Prices of Consumption Basket Commodities, by Imputation Status



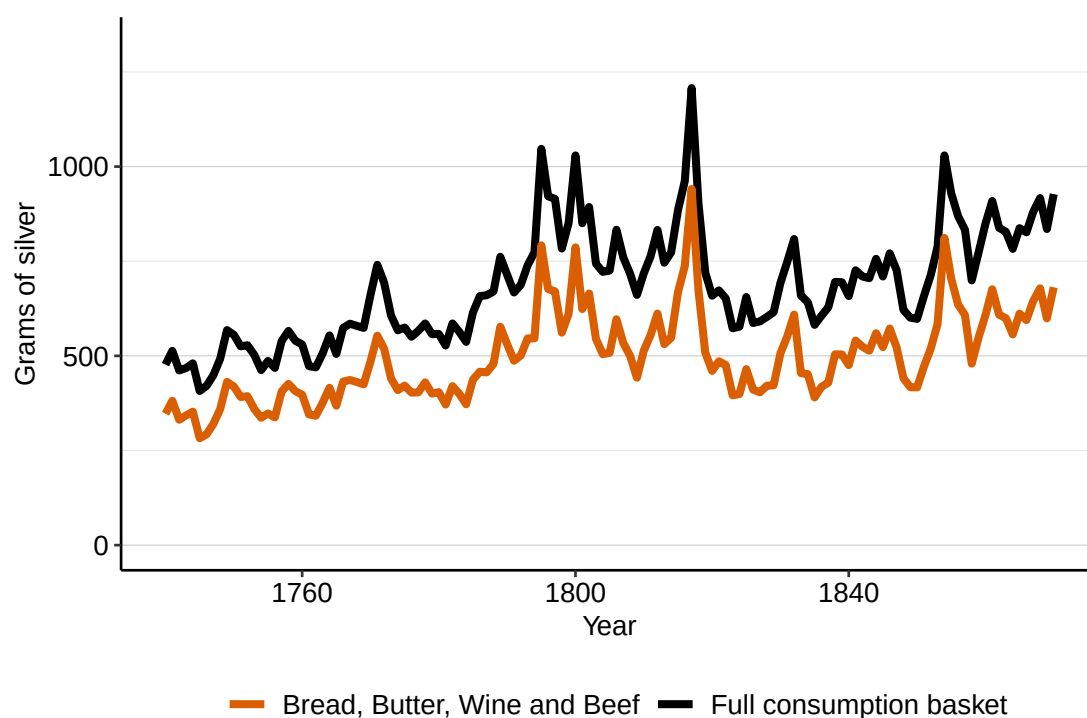
Note: This figure presents the observed and imputed prices of the commodities included in the consumption basket (Table A.1). Black dots are averages computed from data, red crosses indicate that the price is imputed. We explain the imputation procedure in Section 3.2.3.

Figure A.21: Real daily wage of unskilled construction workers, comparison with Pfister (2017)



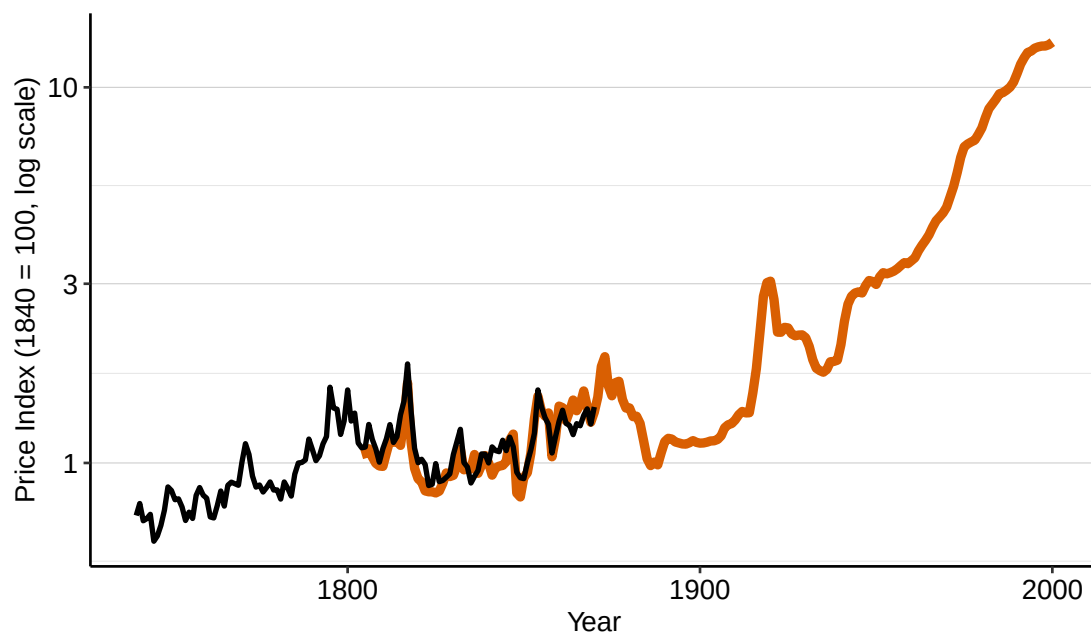
Note: This graph compares our daily real wage series for unskilled construction workers in Switzerland to the daily wage estimates for unskilled construction workers in Germany from Pfister (2017, Appendix S3).

Figure A.22: Price of Full Consumption Basket and its Four Largest Components



Note: This graph depicts the price of four commodities with the best data coverage and the price of the total consumption basket.

Figure A.23: The Consumer Price Index in the Long Run



Source — this paper — Halbeisen et al., 2012

Note: This graph combines the CPI based on our respectability basket with the consumer price index from Halbeisen et al. (2012) that covers the period 1810–2000. Both time series are reindexed to be 1 in the year 1840.

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