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Robert C. Allen and Ekaterina Khaustova

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Russian Real Wages Before and After 1917: in Global Perspective

by

Robert C. Allen

Global Distinguish Professor of Economic History
Faculty of Social Science
New York University Abu Dhabi
bob.allen@nyu.edu

Ekaterina Khaustova

Russian State Social University
ekhaustova@mail.ru

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Russian Real Wages Before and After 1917

The working class is the protagonist of the Russian Revolution. In Marxist accounts, the exploitation of the proletariat increased as the Russian economy expanded before the First World War, and that increasing exploitation was the major background factor leading to the overthrow of Russian capitalism. Is there, in fact, evidence that real wages declined or that exploitation in any other sense increased prior to 1913? There have been surprisingly few attempts to measure changes in real wages in this period¹. As socialism developed after 1917, capitalist exploitation, presumably, ended, so the standard of living of workers should have risen. But did it? What happened to the standard of living of Russian workers after 1917? There is even less research on this topic.² A substantial literature has found that living standards fell after 1928³, but what about the years of the NEP? This paper uses newly assembled data bases to answer these questions.

An unusual feature of our investigation is that we consider Russian wage history from an international perspective. In recent years, many scholars have measured real wages and used them as an indicator of economic growth for a growing list of countries over a longer and longer time frame.⁴ One country notably missing from the list is Russia, and it is the aim of this paper to fill that gap. This is important for several reasons. First, Russia is the largest country in Europe. The history of the continent can never be complete without studying Russia. Second, more particularly, in Gerschenkron's (1962) influential schema of industrialization in Europe, Tsarist Russia was the archetypical backward country. In the middle of the nineteenth century, its huge agrarian sector and feudal social system placed Russia hundreds of years behind western Europe in social and economic development. Gerschenkron thought that this situation meant that Russia's institutions and growth experience were markedly different from those of Britain, the archetypical advanced country, and Germany, the intermediate country. Did Russia also have a unique history of real wages? Third, while Gerschenkron was not so sure that his schema extended to other continents, we must wonder how Europe's 'backward' country compared to other 'backward' countries like India, Japan, and Egypt. Were real wages higher in Russia than wages in leading countries in Asia and Africa or were they at a similarly miserable level? Did economic growth translate into rising real wages in any of these economies?

¹Mironov (2010) is the most recent. See also Allen (2003, pp. 37-46) and Borodkin, Grenville, and Leonard (2008).. Gregory (1980) studies the growth of consumption per head, which covers the whole society and not just workers.

²Most research is concerned with either what happened before the First World War or what happened after the start of the Five Year Plans in 1928. Zaleski (1971, p. 390) did link real wage indices to span the period 1900-1927/8 but never discussed the results!

³Chapman (1954, 1963), Bergson (1961), Hunter and Szyrmer (1992). Allen (2003) reaches more optimistic conclusions.

⁴Allen (1994, 2001, 2007), Allen, Murphy, and Schneider (2012), Allen, Bassino, Ma, Moll-Murata, and van Zanden (2011), Arroyo Abad, Davies, van Zanden, (2012), Bassino and Ma (2006), Broadberry and Gupta (2006), Broadberry, Campbell, Klein, Overton, van Leeuwen (2015), Frankema and van Waijenburg (2012), Özmucur and Pamuk (2002), Pamuk and Shatzmiller (2104), Plessis and Plessis (2012), Rönnbäck (2014)., Schneider (2013), Van Zanden (1999), Zwart (2016), Zwart and van Zanden (2015).

The international comparisons we consider turn out to be important for another reason, as well, namely they change our understanding of Russian history. Once the data are assembled, it is straight forward to calculate the change in real wages realized by workers in cotton mills in Russia between 1913 and 1928, for instance, but what we make of that change depends very much on our perspective. From a Russian point of view, the change looks quite large; from a global perspective, it is not so great. International comparisons show us Russian history in a new light, as we will see.

Data sources

Our investigation is based on a wide ranging collection of new data for the Imperial period and the NEP. (For the extension to 1937, we saw no need to add to the comprehensive collection of information by Zaleski (1955) and Chapman (1963)). The data include wage rates and the prices of consumer goods.⁵ While previous work like Mironov's has concentrated on St. Petersburg, we collected data for Moscow and Kursk as well as the capital. Mironov collected new data for St Petersburg for 1703-1853 but relied on an outmoded Soviet index to measure inflation between 1853 and 1913. We have collected original data for St. Petersburg to compute a better weighted index for that period. Moscow and St. Petersburg were the two largest industrial centres, so it was essential to include both of them in view of our focus on the industrial proletariat. We added Kursk precisely because it was a small, provincial manufacturing city. While we do not claim that it represents all of Russia outside of the two leading cities, we do think it is a weather vane that may indicate trends in outlying districts that warrant further study.

Our information for Moscow and St Petersburg before the First World War came largely from municipal statistical handbooks: *Vedomosti spravocnix tsen v Saint Petersburge na pripasi, materiali, platy rabochim i prochee, izdavaemie Saint Petersburg gorodskoi ypravoi*. (Saint Petersburg 1854-1917) and *Vedomosti o spravocnix tsenax na pripasi i materialy v Moskve* (Moscow 1871-1917), *Ezemesyachniy statisticheskii bylleten po gorody Moskve* (1892-1917). The 1899 volume for St. Petersburg and the 1883 volume for Moscow were missing from the collection in the Russian National Library, so we interpolated the gaps.

These sources include monthly and sometimes weekly data. We collected monthly data for bread and for the wages of carpenters and labourers. For other items, we collected quarterly data. The data were then averaged to create annual series that were representative of conditions throughout the year.

The Moscow yearbooks began in 1871. For earlier years, we collected prices and wages from Tsentralniy Gosydarstvenniy Arxiv Goroda Moskvi. The major data source was *Raporti trgovix starost o tsenax, Spravochnie tseni vedomstva Moskovskoi dvottsovoi konori a tak ze ministerstva Imperatorskogo Dvora, O dostavlenii spravocnix tsen i materialov, Delo Moskovskoi raspriaditelnoi dymi o dostavlenii spravocnix tsen, Delo Moskovskoi gorodskoi dymi*. With this information, we could trace the same types and qualities of goods and labour back to the 1820s.

There were no statistical yearbooks for Kursk, so all information was obtained from records in the archive Gosydarstvenniy Arkhiv Kyrskoi Oblasti.

To study wages and at the height of the New Economic Policy, we collected data for

⁵Full references to the data are listed in the Appendix.

1924-9. Our main source was *Ezemesyachnii statisticheskii bylleten po gorody Moskve I Moskovskoi Gyubernii* where we found prices for many goods sold in state and cooperative shops and on the private market. We calculated a weighted average price where the weights reflected sales in 1928.⁶ The prices of bread, beef, and potatoes were affected, for the private market accounted for 5%, 11%, and 76% of the sales of these foods.

The history of nominal wages

We have collected data for three types of workers—building craftsmen (carpenters, bricklayer, or masons), building labourers, and employees in cotton textile mills. Building craftsmen and labourers figure in virtually all studies of historical real wages since every country had a construction industry, and building workers were hired by the institutions whose records are the main source of historical wages and prices (Beveridge 1939, pp. xxi-xxvi, xlix-lii). While payment in building was often purely monetary—where it was not the value of payments in kind must be added to the cash component—there is a question of how continuously the workers were employed. In our comparisons, we assumed they worked a full year, which may not have been true.⁷ To judge the seriousness of this issue, we also discuss the average earnings of workers in cotton mills. Many countries had cotton mills by the late nineteenth century, cotton was the exemplar of the new industrial order, and the mills operated throughout the year, so the seasonality issue that is present in construction does not arise.

We have collected data on building wages for Moscow, St. Petersburg, and Kursk. The former two were the major industrial cities of Russia, while Kursk was a provincial centre included to test the generality of the patterns observed for Moscow and St. Petersburg. We compare these wages to those in four other countries—the two leading economies of the period (the UK and the USA) and two less developed countries (India and Egypt). For the UK we focus on Manchester, although wages for London have also been examined, and their history is similar. For the USA, we concentrate on Boston. In the case of both of these countries, labour markets became increasingly integrated, so that by the twentieth century, both real and nominal wage levels were similar in all of the major industrial centres. In the cases of India and Egypt we focus on Bombay and Cairo.

Our wages for cotton mill workers are national averages. It will be noted that the cities whose building wages we study were also centres of cotton textile production. This improves comparability between the different types of wages. Also, our cost of living indices pertain to the cities for which we have building wages. Since these are also cotton textile centres, the price indices should be appropriate for cotton as well.

We begin with building wages for Russian cities. Figure 1 plots the daily wage of carpenters, and Figure 2 shows the wages of labourers. The earnings of labourers were similar in all three cities. The earnings of carpenters were higher. Carpenters in Moscow and St Petersburg were similar. The wages of carpenters in Kursk were on a par with those in Moscow before about 1860 and slid significantly behind in the late nineteenth century when

⁶“Comparison of Real Wages in Various Cities,” *International Labour Review*, 1928, pp. 659.

⁷When our sources give monthly wage rates, they report rates for every month, but they do not indicate employment levels by month.

they were little above the earnings of labourers. Kursk were not keeping up with wages in the big cities in this period. The similarity of wages in Moscow and St Petersburg raises the possibility that their labour markets were integrated, while the lower carpenter's wages in Kursk suggests that integration did not extend to all cities.

How did Russian wages compare to those in other countries? Figures 3 and 4 compare the wages of building craftsmen and labourers in leading cities before the First World War. All wages have been converted to US dollars at the prevailing exchange rates. The pattern of earnings is the same for both skill levels. Earnings were always higher in Manchester and Boston than in other cities, with USA in the lead and pulling increasingly ahead of Britain in the decade before the First World War. Egypt and India were at the bottom of the League Table. Moscow and St Petersburg were closer to Bombay and Cairo than they were to Boston and Manchester.

Industrialization is about the growth in manufacturing as well as construction, so we also consider earnings in industry. Data are available of average earnings in the manufacturing sector. Since earnings varied considerable among industries in all countries and since the mix of industries differed between countries, we focus on one industry, namely, cotton textiles. It was often the first sector in which factory production took off, and it employed a similar workforce with many women and children in most countries.⁸ This makes comparisons more meaningful.

Figure 5 shows the average annual earnings of employees in cotton mills in the USA, UK, Russia, and India before the First World War. The pattern is similar to the pattern for building workers: Annual earnings were highest in the USA followed by Great Britain. Indian earnings were lowest. Russian earnings were about double Indian earnings but only half of those in the UK and one third of the US level. We have no time series data for Egypt since its industry was so small, but the scattered information indicates that earnings were between those in Russia and India (Allen 2015).

If we extend these wage series to the Second World War, many features remain the same although there are expected alterations (Figures 6-8). The USA and Britain remain the highest paying countries. The wage stagnation that appeared in late nineteenth century Britain continues, and the USA lead over the UK becomes much greater after the First World War. The 1920s were difficult for Britain, while the USA boomed. Indian and Egyptian wages remained very low.

The most dramatic change by far was in Russian wages. These increased quite dramatically after 1917. By the late 1930s, the earnings of Russian building labourers and craftsmen were approaching USA levels when Russian rubles are converted to USA dollars. The earnings of Russian cotton mill workers surged ahead of American earnings. It is true that nominal earnings inflated considerably in Russia, especially after 1928. However, much of the rise in Russian earnings when converted to dollars reflects exchange rate policy. We can only see whether the increase represents an improvement in real purchasing power if we relate the Russian earnings to Russian consumer goods prices expressed in the same currency.

the cost of subsistence

⁸The Indian industry is an exception to this generalization, for in India most cotton mill workers were adult men.

Comparisons of nominal wages show dramatic differences between countries with the highest nominal wages being in the richest countries. To the degree that countries were open to world trade, one might expect that differences in nominal earnings would have translated into differences in real earnings since international trade tends to equalize the prices of internationally traded goods like food, cloth, etc. Countries, however, differed considerably in their openness to trade. The UK practised complete free trade until the depression of the 1930s and forced India and Egypt to have very low tariffs. On the other hand, the USA and Russia pre-1917 had very high protective tariffs on manufactured goods, but no tariffs on the agricultural products which they exported. While international trade might have equalized their agricultural prices, it would not have equalized cotton cloth prices, for instance. Even in the case of the UK, some goods (eg housing) were not traded, so trade would not equalize their cost. And, of course, the Soviet Union in the 1930s was about as far from free trade as it was possible for a country to be, so expectations based on international arbitrage are irrelevant to its circumstances. The only way to find out what wages could buy is to calculate the cost of living.

Our approach to measuring the standard of living is an extension of the established procedure based on subsistence baskets and welfare ratios. The welfare ratio equals the annual earnings of the worker concerned divided by the cost of maintaining a family at subsistence (Blackorby and Donaldson 1987, Allen 2001). If the welfare ratio equals one, then the worker earns just enough to keep his family at subsistence. If the ratio is less than one, then earnings are inadequate even for that low standard and either painful decreases in spending are required or more income has to be generated by increasing the family's scale of paid work. If the ratio exceeds one, then there is a surplus over subsistence. This is often realised by increasing the quality of food consumed as well as by purchasing more goods and housing.

What was the cost of subsistence? Urban households in all countries studied here averaged about four people,⁹ so the cost of subsistence for the household is set at four times the cost of subsistence for the average person. Basic needs budgets are defined that meet nutritional needs inexpensively and that reflect the food habits of poor people around the world. These are 'poverty line' budgets that do not capture spending patterns in all particulars. Details of the budgets vary between countries to reflect local circumstances, but the overall structure is the same, and they are intended to represent equivalent levels of well being (Table 1). All of the budgets contain four food types—carbohydrates, vegetables, meat, and fat. The carbohydrate is chosen to reflect the predominant food of the country and the form in which it was usually purchased—rye bread in Russia, wheat bread in the UK and USA, wheat flour in Egypt, and rice and sorghum in Bombay. The carbohydrate is the main source of calories. The diet also includes 50 kg of potatoes (Russia, UK, USA) or 20 kg of dried legumes (Egypt, India), again reflecting culinary norms. There are also 5 kg of the cheapest grade of meat and 3 kg of butter, oil, or lard, as appropriate, in the diet. The quantity of the carbohydrate is set at the level that gives a total dietary calorie content of 2100 calories per day. This represents the US Department of Agriculture's (2010, p. 44) food security line. It is intended to be a society-wide average providing many more calories for

⁹For India, for instance, see Shirras (1923, p. 23-5) shows most working class families in Bombay occupied a single room with an average of 4.03 occupants in 1921. Bombay Labour Office (1928, p. 19) shows an average of 3.74 people per room in Ahmedabad. Propkopovich (1909, p. 10) reports an average of 3.78 people per family.

men doing heavy work and many fewer calories for young children. On average, everyone receives enough to grow or to work, as appropriate. A quasi-vegetarian diet with no alcohol is the typical fare of the world's poor, and, as it happens, was barely affordable by Russia's low wage workers in the nineteenth century.

The non-food items in the budgets include clothing, lighting, fuel for cooking and heating, and housing, and requirements for them must be set. A point of departure for fuel and lighting is the Energy Poverty Line of the Millennium Development Goals, which sets the minimum at 1.6 million BTUs of fuel and .4 million BTUs for lighting (Modi, McDade, Lallement, and Saghir 2006, p. 9). The former, which is based on engineering studies, provides enough energy for cooking but nothing beyond that for heating, so the requirement is suitable only for the tropics. The latter provides enough energy for three hours of light per night from a candle or an electric light bulb. Other sources of information are needed to determine clothing requirements and to extend the fuel and lighting requirements across climate zones.

Comparing St. Petersburg with Bombay and places in between requires consideration of the cost of dealing with the Russian winter. In the 1960s, the World Health Organization made some calculations to raise the daily food requirement to compensate for cold weather, but this was given up in the 1970s on the grounds that 'there is no quantifiable basis for correcting resting and exercise energy requirements according to the climate.' (*Energy and Protein Requirements* 1973, p. 28) We follow this lead and make no change to food requirements but consider how much additional clothing and fuel would be required to deal with the Northern winter. We do this with budget data and, in the case of fuel, with engineering calculations as well.

The budget approach utilizes Prokopovich's (1909) survey of the spending of St Petersburg workers in 1907/08 and Shirras' (1923) survey of workers in Bombay cotton mills in 1921/22. Both surveys show average spending on clothing, footwear, bedding—these are grouped into a category we call apparel—fuel, and lighting. The Bombay survey breaks all of this information down by income levels, and the St Petersburg survey does the same for apparel. In Bombay the range 30-40 rupees/month was the lowest income range with a large number of workers as was 300-400 roubles/year in St Petersburg. We assumed these low income workers to be at similar levels of deprivation, so that differences in their expenditures represented responses to climate and not to real income differences. (Both budget surveys showed expenditures rising with income.) For fuel and lighting, the averages for all workers provide a less precise basis of comparison.

This methodology implies much more substantial purchases of apparel in Russia than in India. Both surveys tell us expenditures in money—rupees or rubles. To compare quantities in the two countries, these must be divided by prices. For clothing, bedding, and footwear, we use the prices of coarse cotton cloth as the deflator. In that way we compare expenditures in 'metres of cloth equivalents'. Table 2 shows the results. In St Petersburg, the low wage workers consumed almost three times as many metre-equivalents of apparel as their counterparts in Bombay. Clothing consumption was almost 60% greater, while bedding was eight times more—the nights are much colder in Russia than in India—while footwear was, not surprisingly, 27 times greater. Spending on apparel increased more with income in Russia and in India. The average family member in St Petersburg consumed almost four times as many metre-equivalents as the average Bombay family member. Much of the extra income went on clothing for which the Russian consumption was three times the India. Living in the northern winter required considerably more clothing.

We do similar calculations for lighting and fuel. By the twentieth century, kerosene

was the principal illuminant in the two countries. Dividing kerosene expenditures by its prices indicates consumption. We can only compare average households in St Petersburg and Bombay. Each member of the average working class household in Bombay consumed .37 million BTUs of kerosene, while the average household member in St Petersburg consumed .87 million BTUs—over twice as much. This looks like the cost of long winter nights.

The disparity was much greater for fuel. In Bombay, firewood was the main fuel with the addition of some charcoal. Dividing fuel expenditure by the price of firewood shows that fuel consumption in India averaged 3.15 million BTUs per person. Among the low income workers, fuel consumption was only 2.52 million BTUs. This levels are slightly above the Millennium Development Goals.

In Russia, coal was the main fuel. Dividing expenditure per head in the average working class family by the price of coal indicates that average consumption in Russia was 24.62 million BTUs per year—close to 10 times more than in Bombay. One limitation of this calculation is that we have no breakdown of fuel spending by income class. Judging by apparel, where average spending was double that of the low wage workers, the low wage workers in St Petersburg were consuming on the order of 12 million BTUs per person.

We can test this conjecture by approaching the problem from a different perspective. Heating engineers have developed a methodology to calculate the energy required to keep a building at a desired temperature.¹⁰ Critical variables are the surface area of the space to be heated, the temperature to be maintained, the pattern of the exterior temperature over the year, and the insulating efficiency of the construction. No matter how many rooms there were in a dwelling, it was normal to heat only one, and we proceed accordingly. We posit housing space of 3 square metres per person—the figure shown in Table 1—so a family of four lived in a room of 12 square metres.¹¹ We assume the room was 3 x 4 metres with a ceiling height of 2.4 metres. The R value of the floor, walls, and ceiling depends on the construction materials used, their thickness, and layering.¹² We assume a value of 2. We assume the room is heated to an internal temperature of 15 degrees centigrade (59 degrees Fahrenheit). The external temperature is measured by the ‘heating-degree days,’ that is, the sum over the year of the difference between the desired internal temperature and the external temperature. We obtained this from the heating industry website <http://www.degreedays.net/>. This website gives heating degree-days calculated at half hour intervals over five year periods for most airports and weather stations in the world. The values chosen for the parameters could be debated, but alternatives give similar results. Under the assumptions made, the fuel required per person per year works out to have been 12 million BTUs in Moscow and St Petersburg, 8

¹⁰<http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/heatloss.html> summarizes the basic theory and equations. I am indebted to Michalis Moatsos, who has used this methodology in his own work, for bring it to my attention. See Moatsos (2015).

¹¹Shirras (1923, p. 25) reports that the typical Indian working class family in Bombay lived in a room of 9.6 square metres giving with an average of 2.3 square metres per person. In Ahmedabad, the average working class room was 13.3 square metres giving 3.6 square metres per person. Russian were similarly crowded. Our calculations are intended to capture this reality.

¹²For r values of common building materials, see, for instance, <http://www.coloradoenergy.org/procorner/stuff/r-values.htm>

million in Boston, 7 million in Manchester, 0.5 million in Cairo, and zero in Bombay. For the latter two, the appropriate fuel allowance is the 1.6 million BTUs required for cooking in the Energy Poverty Line of the Millennium Development Goals. The calculations of energy required for heating are in line with our conjectures based on the budget data of the energy consumed by low income workers in St. Petersburg. The calculations also provide consistent values for the energy requirements for the other cities in our study.

Housing was an important element of expenditure. In many previous studies using the subsistence basket approach, an allowance for housing has been set at 5% of the cost of the other items in the budget (e.g. Allen 2001). This low percentage is in line with the experience of medieval and early modern Europe, as well as that of many people living in rude shelters or tents in India today, but it is too low for many people in urban economies in the twentieth century. Also this treatment of housing means that rental cost per square metre of housing does not enter into the relative cost of living in different places. We avoid these limitations by setting a ‘subsistence housing requirement’ of 3 square metres per person and pricing that at the rate at which working class housing was let in each city. Our housing requirement represents extreme overcrowding by modern standards but was typical of low wage countries earlier in the twentieth century. At the time, US and UK workers lived in multi-room houses with much more space per person (Board of Trade, *Cost of Living in American Towns*, BPP 1911, Cd 5609, p. lx, Shirras 1923, p. 24). Their incomes, however, were far above subsistence, and this prosperity was apparent in the large size of their houses.

Table 1 shows the quantities of clothing, fuel, lighting, and housing in Bombay and St. Petersburg based on the analysis just explained. For our calculations, we need corresponding values for Manchester, Boston, and Cairo. Housing is fixed everywhere at 3 square metres per person. Values of the other goods are scaled between those of St Petersburg and Bombay to reflect differences in climate, in particular, the degree days of heat. Our cost of living index has two advantages over existing indices. The first is that it is more accurate. Recent studies of Russian real wages (Allen 2003, pp. 37-46, Mironov 2010, pp. 52-3) use the St Petersburg consumer price index created by V.L. Dalmatov and published by Strumilin (1966, pp. 81-2) to deflate wages in this period. Figure 9 contrasts this index with our new index for St. Petersburg. Both tell a similar story from the early 1880s to the First World War, but very different stories before that. The Dalmatov index shows much more inflation from 1853 to 1885 than ours does and, thereby, suppresses the growth in measured real wages in that period. Which to believe? Our knowledge of the Dalmatov index is sketchy, but we know it included 26 products.¹³ Furthermore, the index is a simple average of these series rather than a weighted average in which the weights reflect the importance of the items in the budget. Equal weighting implies that bread, for instance, gets an implicit weight of 4% (1/26). In reality, of course, bread was far more important in determining the well being of Russian workers. In our index, the weight of bread varies from about one quarter to one third of spending depending on fluctuations in prices. Our index provides a far more accurate representation of the situation of Russian wages than the Dalmatov index used by Allen (2003) and Mironov (2010).

The second advantage of our index is that it can be readily used in international comparisons. By costing out the basic needs budgets in Table 1 in terms of the prices in different cities, we can address questions like: How did the cost of subsistence vary over time and between place? Did international trade equalize living costs or were there

¹³Mironov (2010, pp. 52-3) provides a good discussion of the Dalmatov index.

significant differences? Figures 10 and 11 provide some answers. Figure 10 reports living costs before the First World War. The countries divide into two groups. India and Egypt had distinctly lower living costs than the UK and the USA. Costs in the latter were generally higher and particularly so during the Greenback inflation of the Civil War period. This division is an example of the phenomenon explained by the Balassa (1964)-Samuelson (1964, 1994) theorem, namely, that non-traded services are cheaper in low wage countries than in rich countries, so they have lower living costs even if free trade equalizes the prices of goods. From this perspective, Imperial Russia belonged with the rich countries and not the poor countries. Before the First World War, lower living costs offset the lower nominal wages to some degree in Egypt and India, but not in Russia.

After World War I, the same patterns hold with one major exception (Figure 11). In the 1920s, the cost of living was highest in the USA and UK with the former slightly in the lead as before the War. Indian costs were substantially lower. The Russian cost of living had slipped slightly in the late 1920s, but was still closer to the UK than the Indian level. This pattern did not last during the 1930s, for the cost of living in the Soviet Union exploded during the first Five Year Plans. Retail prices inflated roughly ten fold between 1928 and 1937. Comparison of Figures 6-8 with 11 shows that prices were rising faster than wages, which spelled trouble for Russian workers.

Trends in Real Wages

We can measure real wages by dividing nominal wages by the cost of living. We scale this calculation in a particular way, so that the result has a more intuitive interpretation. The procedure is to express the nominal wage in annual terms. In the case of cotton mill operatives where they data are average annual earnings, no adjustment is required. In the case of building workers, however, where the data are day wages, the daily wage must be multiplied by the number of days worked in a year. We assume 'full time-full year' and take that to have been 250 days. This may overestimate the number of days that anyone could work in construction in Russia (or the USA) over the course of the year. Implicitly, we assume that they could find work outside of construction at the same wage. The calculations with cotton operatives are a check on this assumption.

The cost of living that we have calculated is the annual cost of an individual. On the assumption that there are four people in a household—more precisely, that the income earned by the worker supports himself and three dependents—we calculate the annual subsistence cost of a family. The ratio of annual income to annual subsistence cost is our measure of the real wage.

We begin by examining the trend in these ratios for Russian workers (Figures 12-14). Our three cities show three different patterns. After an increase from very low levels in the late 1850s, real wages in Moscow were flat until the First World War. Labourers earned bare subsistence, while carpenters took home about 50% more. The real earnings of workers in cotton factories are also shown on this graph, and it is reassuring that their real incomes are closely in line with those of building labourers in Moscow. This provides some assurance that the real wages of the building workers, which were calculated on the assumption of full year employment, are not seriously misleading.

St Petersburg presents a much more optimistic picture than Moscow. In the capital, the real wages of both skilled and unskilled workers rose steadily and approximately doubled between the mid-nineteenth century and the First World War. In the 1860s real wages were lower in St. Petersburg than in Moscow but ended up considerably higher.

The pattern for real wage changes that we compute is very different from that pattern reported by Mironov (2010, pp. 56-7) for carpenters in St. Petersburg. He concluded that real wages fell from the 1850s to the 1880s when they began to rise, reaching the same level at the outbreak of the First World War as they had achieved in the middle of the nineteenth century. In contrast, we find rising real wages across the period. The difference reflects the difference in consumer price indices, previously discussed.

In contrast to St. Petersburg or even Moscow, the labour market in Kursk was much less favourable. In Kursk, there was scarcely any indication of long run improvement in real wages, labourers often earned less than the cost of subsistence, and craftsmen often earned no more than unskilled labourers. Anyone with skill would have had a strong incentive to move to either of the major cities.

What standard should we use to judge the history of real wages in Russia? One possibility is to compare the change in real wages to the change in output per worker, for that shows whether workers were maintaining their share of the economic pie. Building workers in Moscow and Kursk did badly by this criterion since their real wages did not rise even though GDP per head was increasing. The growth in the real wage in St. Petersburg, however, came close to matching the growing in GDP per capita. Not only are these comparisons muddled by the different experience of workers in different cities, but GDP includes the very large agricultural sector, and changes in its circumstances may swamp other factors influencing distribution.

We can eliminate agriculture and get a comparison that focuses on income distribution in industry by comparing the growth in real value added per worker in industry to real annual earnings per worker in industry (Figure 15). The comparison in this case is more exact since the work force is the same and value added equals wages plus profits, so any shortfall in wages was a gain for capitalists. And there was such a shortfall. The average real wage was flat from 1885 to World War I, while value added per worker doubled. The share of value added going to industrial workers dropped from 40% to 20%. The gains from growth were going to capitalists rather than workers. Similar patterns have been observed in recent decades as well (Picketty 2014).

While most of the gains from economic growth were going to groups other than workers in the late nineteenth and early twentieth centuries, it is a very long way from that finding to the conclusion that rising inequality caused revolution in 1917. Nevertheless, the Bolshevik Revolution was made in the name of the working class, and we ask, therefore, if it served their interests better than the pattern of growth achieved under the Tsars.

The short answer is 'yes.' The greatest gains realized by Russian workers between 1860 and the Second World War occurred in the 1920s. We can compare the earnings of carpenters and building labourers in 1928 with their counterparts in 1913, and we find that the real wages of building workers in Moscow rose by about 90%, while the incomes of cotton mill operatives jumped by a factor of 2.4. These increases were greater than those realized during the expansion of the late Imperial economy. It looks like Russian workers really were gainers from the 1917 Revolution.

These gains proved short lived, however. During the first Five Year Plans, there was rapid inflation, as we have seen. Between 1928 and 1937, consumer prices rose much more rapidly than urban wages. Over this period, real wages sagged, as most historians have observed (Chapman 1954, 1963, Zaleski 1955, Bergson 1961, Hunter and Szyrmer 1992). The effect was to push Russian real wages back to where they had been around 1880—at the start of the Imperial boom. The subsistence ratio of a cotton mill operative plunged to 1.07 in 1937 implying that earnings were only 7% more than the very minimal standard we have set

for a family's subsistence. Carpenters earned 40% more than subsistence, while labourers only realized three quarters of that cost. Either other family members had to work to make ends meet or labourers could not have been supporting a family at all. The subsistence budget is so abstemious that there was little scope for reducing spending.

All of this is from a Russian perspective from which it looks like the Russian proletariat did very well out of the 1917 revolution and the NEP. These gains were erased in the drive to industrialize the country in the 1930s.

However, we get different insights viewing Russian history from an international perspective. The most important finding is that the rises and falls in Russian real wages become almost indiscernible in view of the large differences between rich and poor countries. Figure 16 tracks the subsistence ratios of building labourers. The trend lines divide into two groups. At the top are the USA and UK. There was very little difference between real wages in the two countries before 1900 when both were growing rapidly. The real earnings of American building labourers continued to grow rapidly through the First World War and even the 1930s. British real wages stagnated after 1900 in the British climacteric and remained depressed through the 1920 as the British pound returned to the gold standard at the pre-war parity. At the bottom were India, Egypt, and Russia. Real wage growth looks almost nonexistent compared to the USA throughout and the UK pre-1900. The jump in Russian real wages in the 1920s is dimly perceptible but is dwarfed both by the difference in levels between the poor and the rich countries and by the growth in the USA.

The patterns are similar for skilled building workers (Figure 17) and cotton mill operatives (Figure 18). In both cases, the wage trajectories divide into the two groups of rich and poor countries. With respect to building craftsmen, the main difference is that the slow down in wage growth in the UK starts decades earlier than it did with building labourers. The American industrialization boom saw a dramatic rise in skilled wages relative to unskilled wages, and that changes underlies the difference in Figures 16 and 17 (Allen 1994). The growth in the real wage of skilled craftsmen in Russia is difficult to observe and looks like a catching up to Indian levels. The rise in real wages in the 1920s in Russia is matched by a similar rise in India in the 1930s. Thus Russian experience does not look very different from that of any other poor country.

The real wage curves of cotton operatives also divide into rich and poor groups. Among the rich countries, there was little difference between the real earnings in the USA and UK. American workers generally earned a premium, but it was small, and real wages grew from the 1860s to the 1930s in both countries. Real wages were lower in both Russia and India. There was little difference in real earnings between the two countries before the First World War. The rise in real earnings following the Russian revolution is apparent in this graph. Its significance, however, is called into question both by the fall in the 1930s and by the pronounced rise in real earnings that took place in India in that decade.

Conclusion

The wage history reviewed here points to the following conclusions:

The first pertains to divergence in the world economy. Between the Industrial Revolution and the Second World War, the rich countries in the world pulled decisively ahead of the rest. This conclusion is well established using GDP estimates (Maddison 1995, Allen 2011), and it is apparent in the real wages considered in this paper. The USA and the UK before 1900 had not only high wages but the most rapidly growing wages in the sample.

India, Egypt, and Russia had low real wages, and they did not grow as fast as those in the USA. By the real wage criterion, Russia lay among the 'backward' countries.

The second conclusion pertains to wages as seen from a purely Russian perspective. When seen only in its own terms, apparently significant movements in real wages took place. In the late nineteenth century, particularly between the 1880s and the First World War, real wages increased in St Petersburg but stagnated in Moscow and Kursk. The political revolution of 1917 also revolutionized the labour markets, for wages in Russia were much higher in 1928 than they had been before the war. As is well established, the 1930s were a difficult time for Russian workers, for real wages dropped to levels not seen since the 1870s.

The third conclusion is that enthusiasm for the importance of these shifts must be tempered by seeing them in the international perspective of the first conclusion. Russian wage history, for instance, does not look very different from India's. Most poor countries had low and stagnant wages between 1870 and the Second World War, and that conclusion certainly applies to Russia.

The fourth conclusion is about the possibilities to improve human well-being. Russian economic development between the 1870s and 1913 was not equitable in that most of the gains from growth in the industrial sector went to capitalists rather than workers. Real wages doubled in the 1920s, so it looks like the 1917 revolution may have redistributed those profits back to the workers. That certainly brought them gains, but those gains look small from an international perspective. The important conclusion is that the standard of living of people in poor countries cannot be raised to that in rich countries simply by ending exploitation and distributing income equitably—desirable as such changes might be. The only way to raise incomes generally is rapid economic development to bring GDP up to the level of an advanced country. That generally requires mobilizing the social surplus and applying it to development in the modern sector. The 1917 revolution had redistributed that surplus to the working class, but there was not time between then and 1928 for the surplus to have been dissipated in population growth. Stalin mobilized it directly from the Russian working class to effect the country's industrialization. Lenin had given the Russian worker what he could in view of the country's underdevelopment. Stalin took from them what was necessary in order for Russia to catch up to the West.

Table 1

Subsistence Basket of Goods
(Kilograms per person per year unless otherwise stated)

	Russia	Boston	Manchester	Bombay	Cairo
	<u>all cities</u>				
<u>food (kg)</u>					
rye bread	267				
wheat bread		252	252		
wheat flour					195
rice				92.5	
sorghum				97.5	
meat	5	5	5		5
eggs				5	
beans				20	20
potatoes	50	50	50		
oil	3	3	3	3	3
<u>nonfood</u>					
soap (kg)	1.3	1.3	1.3	1.3	1.3
cloth (meter)	53	39	36	19	19
lighting (mBTU)	.9	.7	.7	.4	.4
fuel(mBTU)	12	8	7	1.6	percent
housing (sq m)	3	3	3	3	3

notes:

all food quantities are kilograms per person per year. Diets have been set to give 2100 calories per day.

meat is usually beef but in some cases pork

beans are dried peas, beans, or other lentils

oil is butter, lard, margarine, or vegetable oil according to local practice.

cloth -metres of cloth per person per year. Cloth is cheap cotton

lighting millions of BTUs per person per year.

heating is coal in Russia, UK, and USA, wood in India. In Cairo people bought flour and made bread dough, which was baked by a baker. Fuel charge set at 10% of cost of flour following Vallet (1911, p. 61, 107).

Units

kg = kilogram

mBTU = million British Thermal Units

meter = meter

sq m = square meter

Table 2

Non-food consumption per head among Workers
in Bombay and St Petersburg

	<u>Bombay</u>		<u>St Petersburg</u>	
	Low wage	Average	Low wage	Average
apparel etc (in cotton cloth equivalents, metres)				
clothing	17.00	23.13	26.86	62.50
foot ware	.59	1.19	16.19	30.63
bedding	1.28	3.38	10.08	21.37
total	18.88	27.69	53.13	114.50
fuel (mBTU)	2.52	3.15		24,62
light (mBTU)	.27	.37		.87

Figure 1
Russian carpenters' wages before First World War (rubles per day)

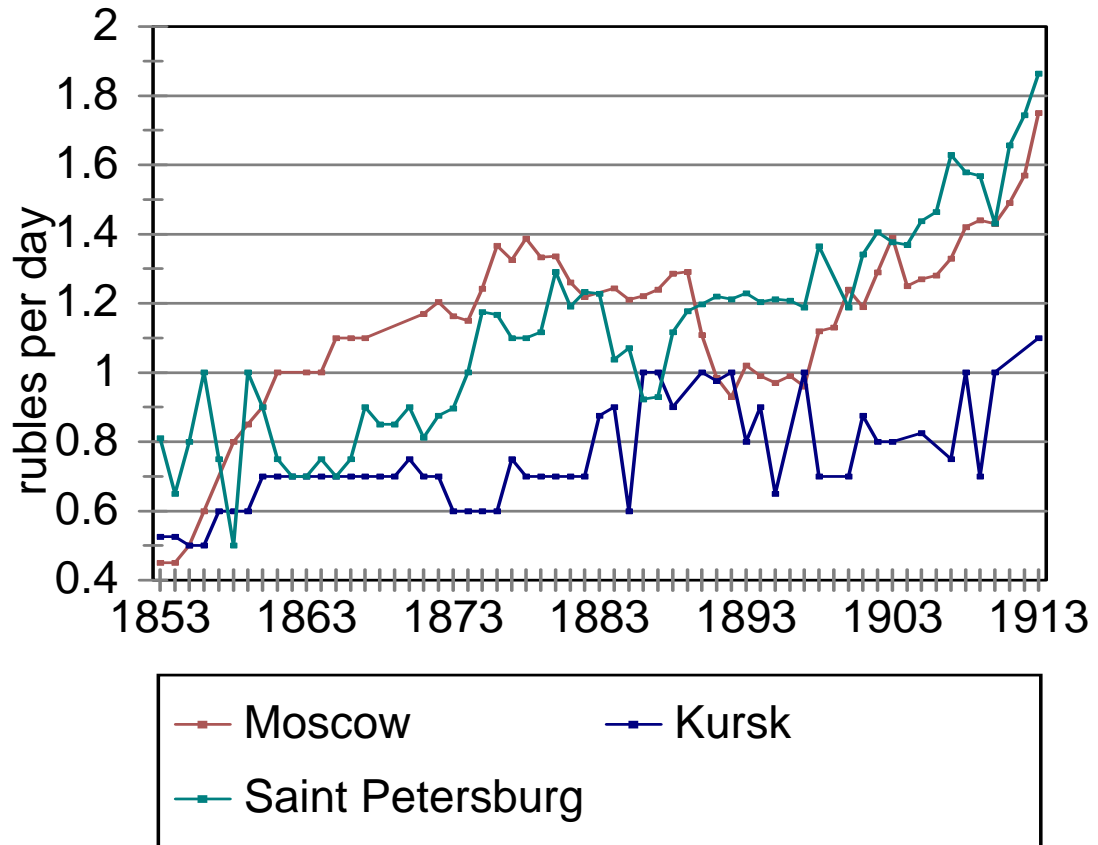


Figure 2

Russian building labourers' wages before First World War (rubles per day)

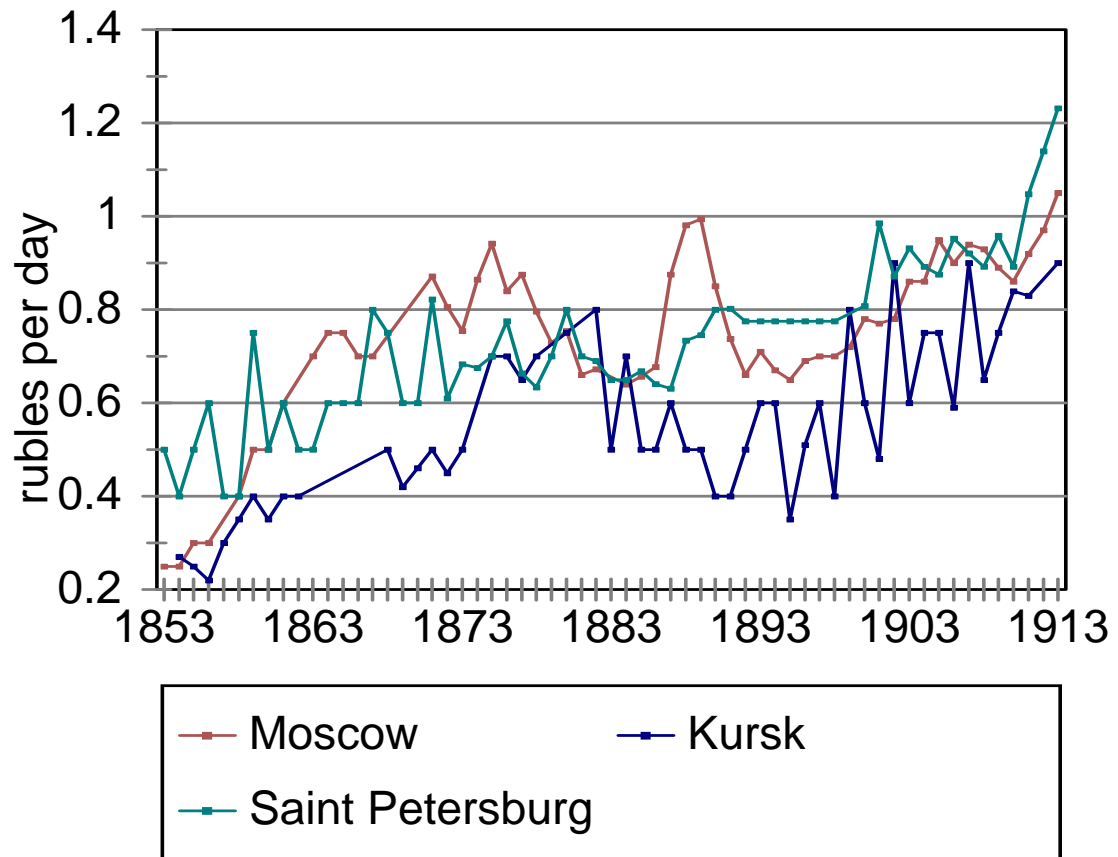


Figure 3

Daily Wage Building of Labourers before First World War

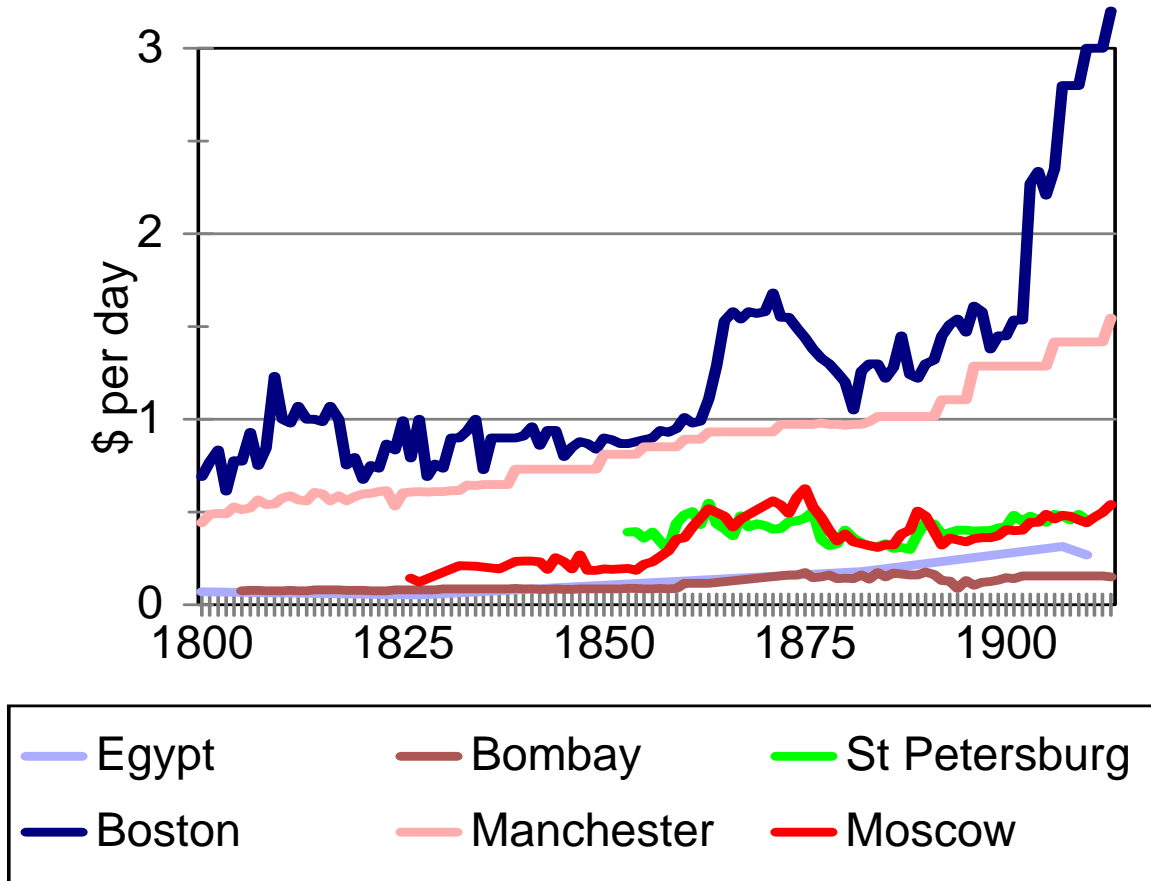


Figure 4

Daily Wage Building of Building Craftsmen before First World War

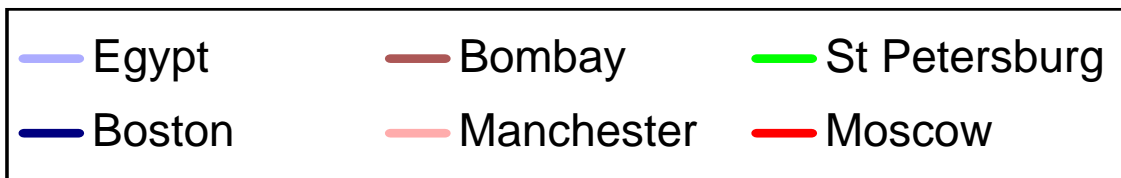
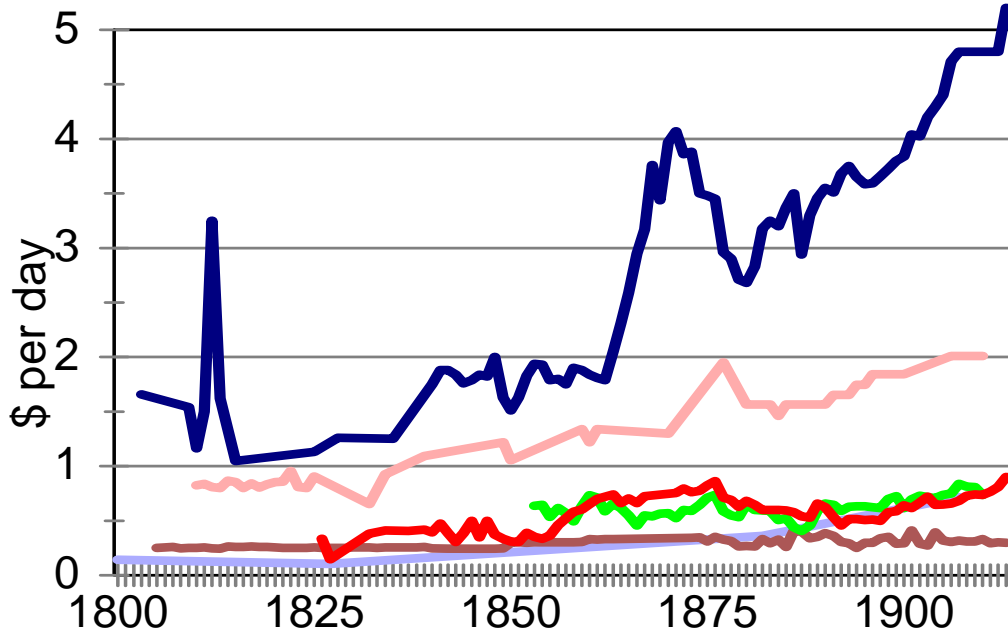


Figure 5

Annual Earnings of Cotton Mill Operatives before First World War

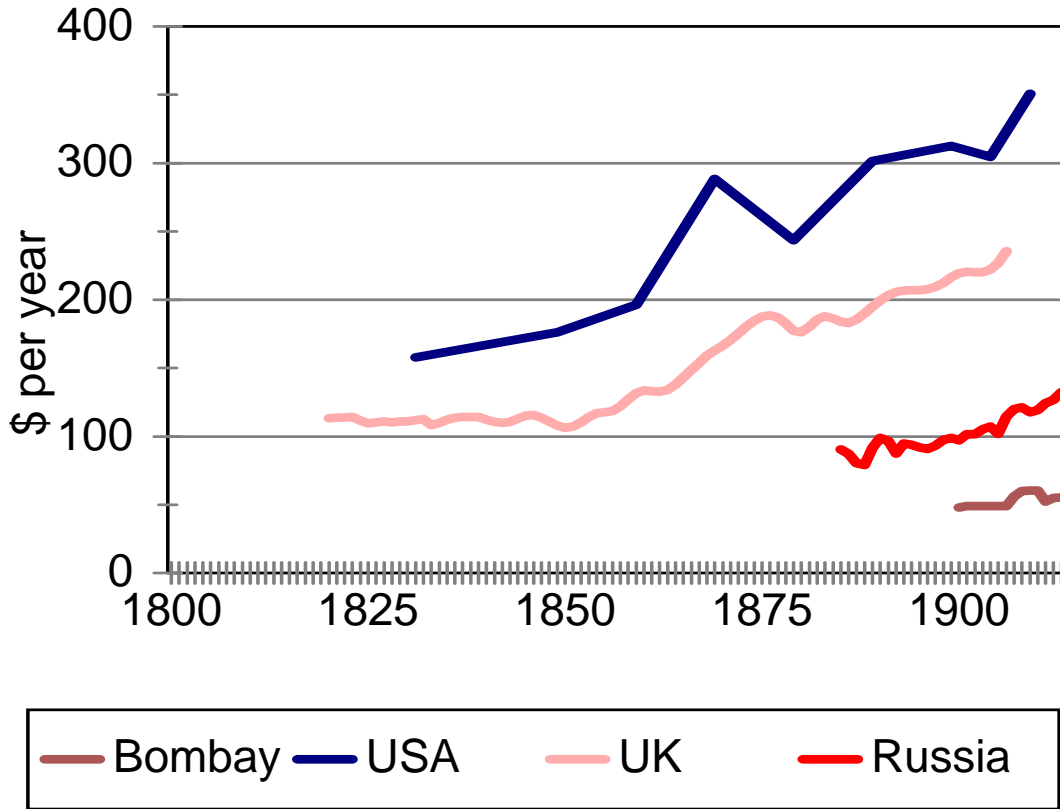


Figure 6

Daily Wage Building Labourers after First World War

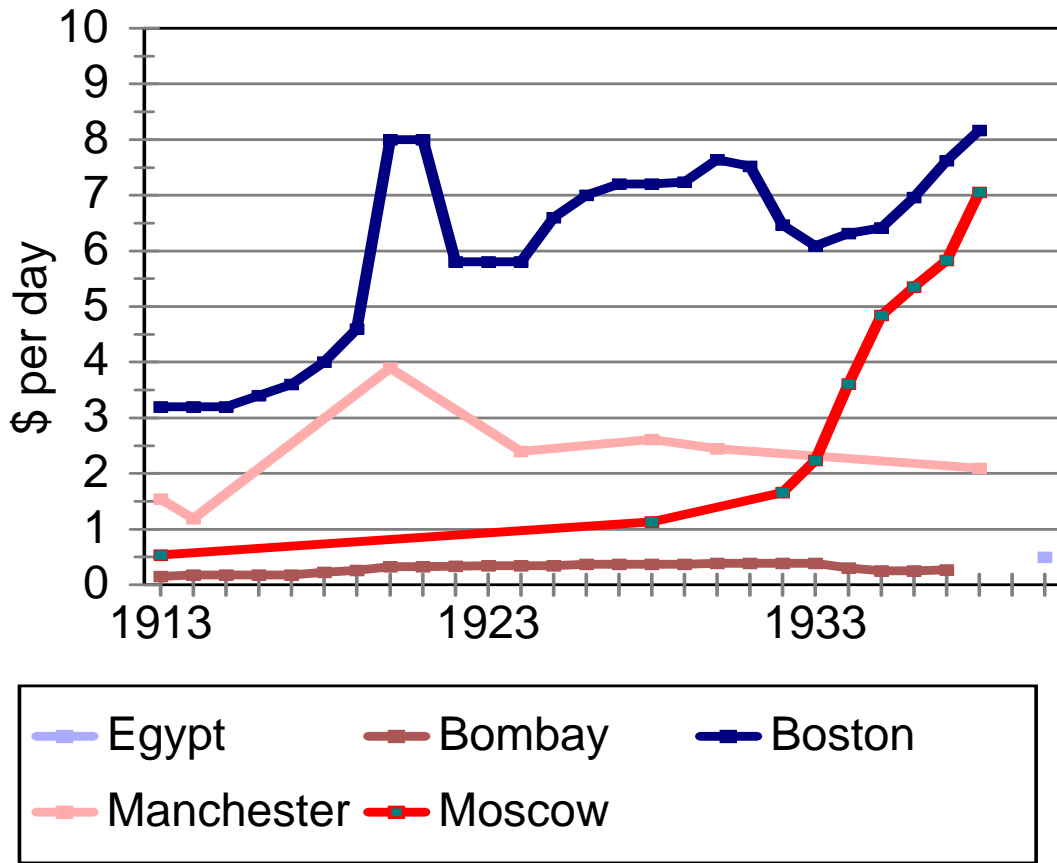


Figure 7

Daily Wage Building Craftsmen after First World War

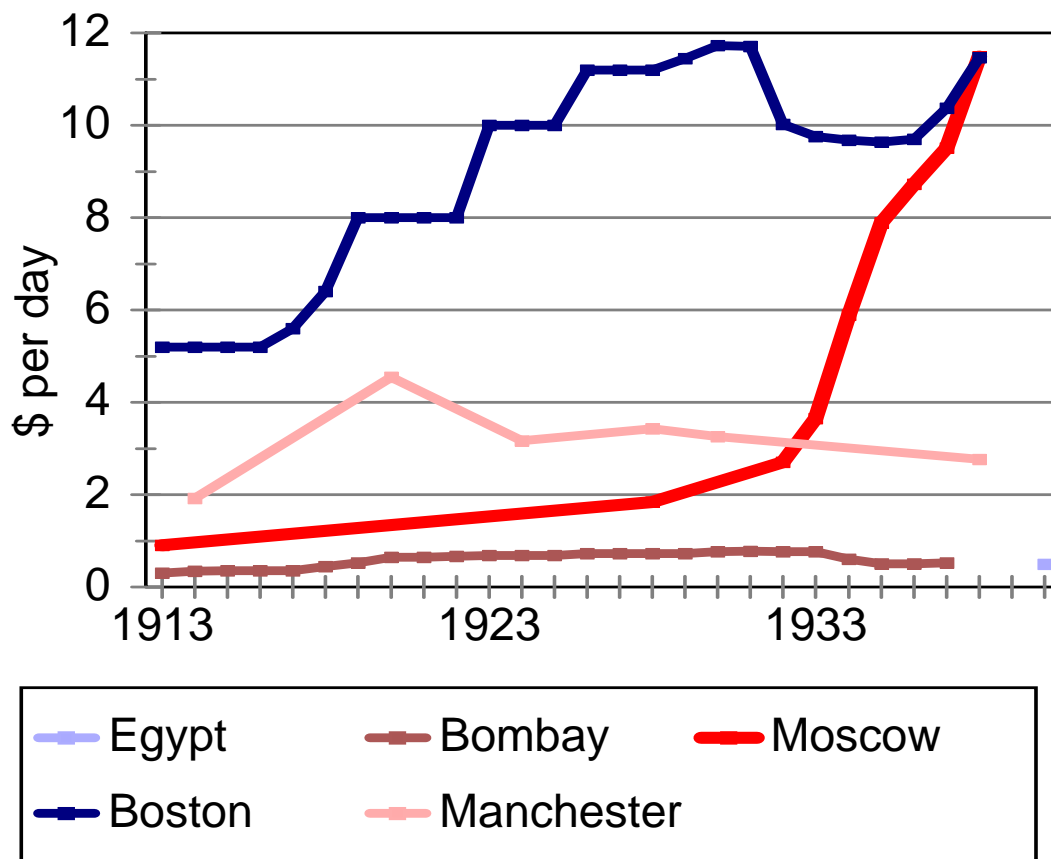


Figure 8

Annual Earnings of Cotton Mill Operatives after First World War

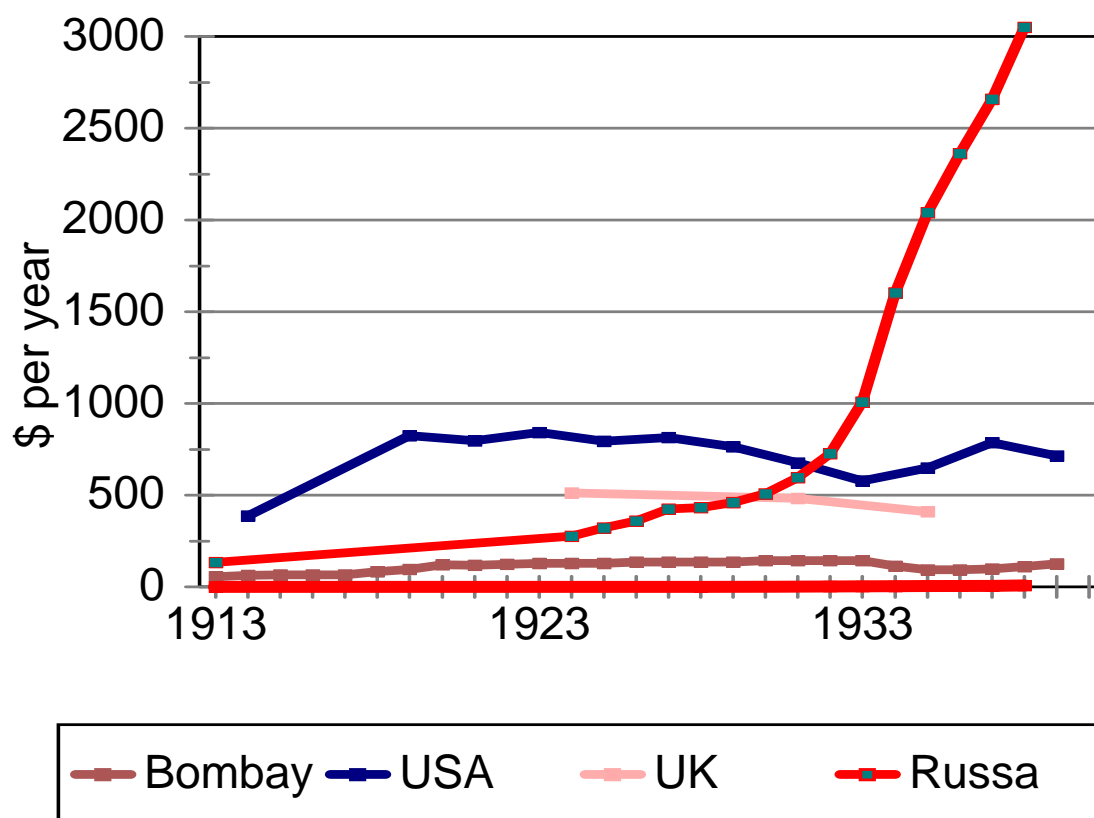


Figure 9

Comparison of two consumer price indices for St. Petersburg

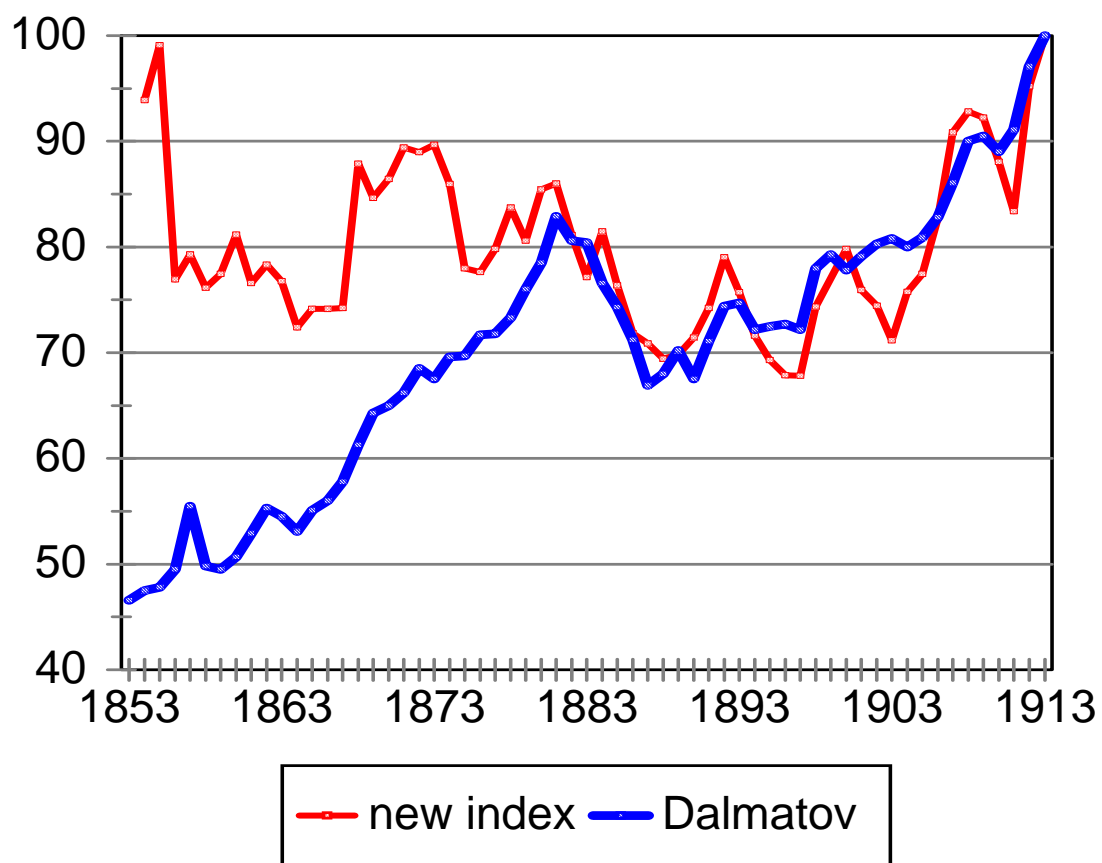


Figure 10

The annual cost of subsistence per person before World War I

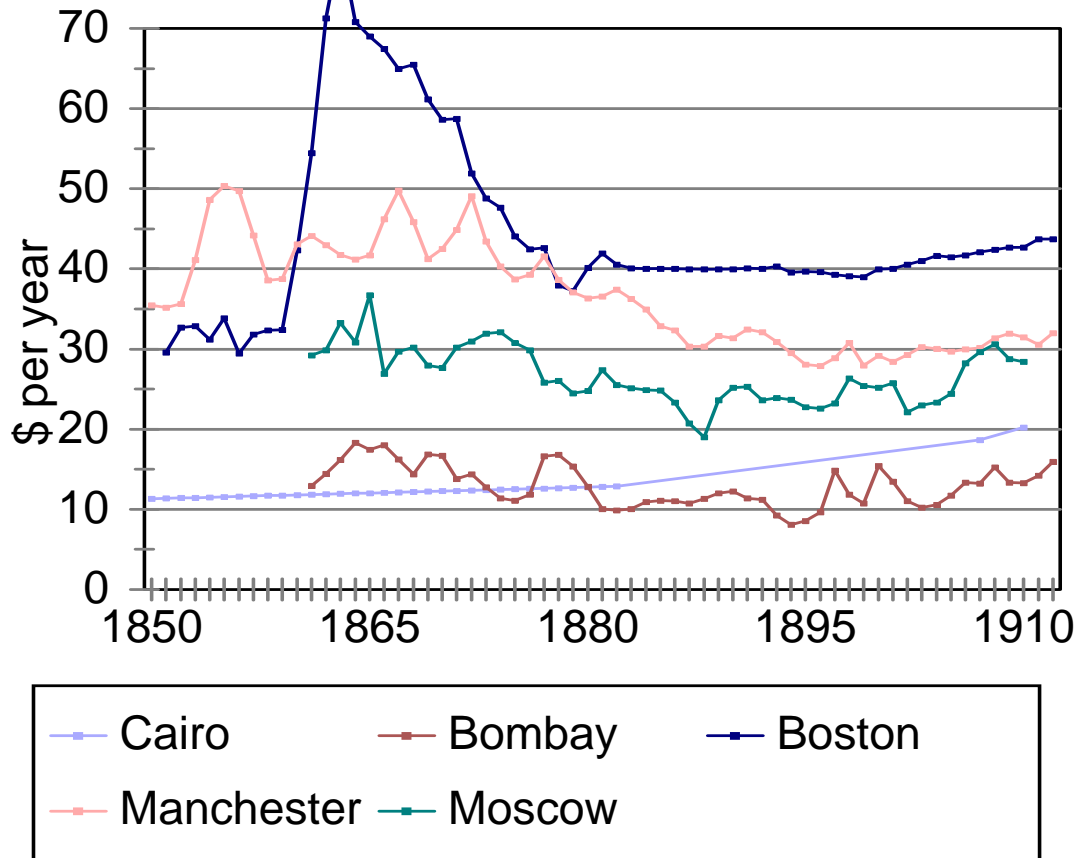


Figure 11

The annual cost of subsistence per person after World War I

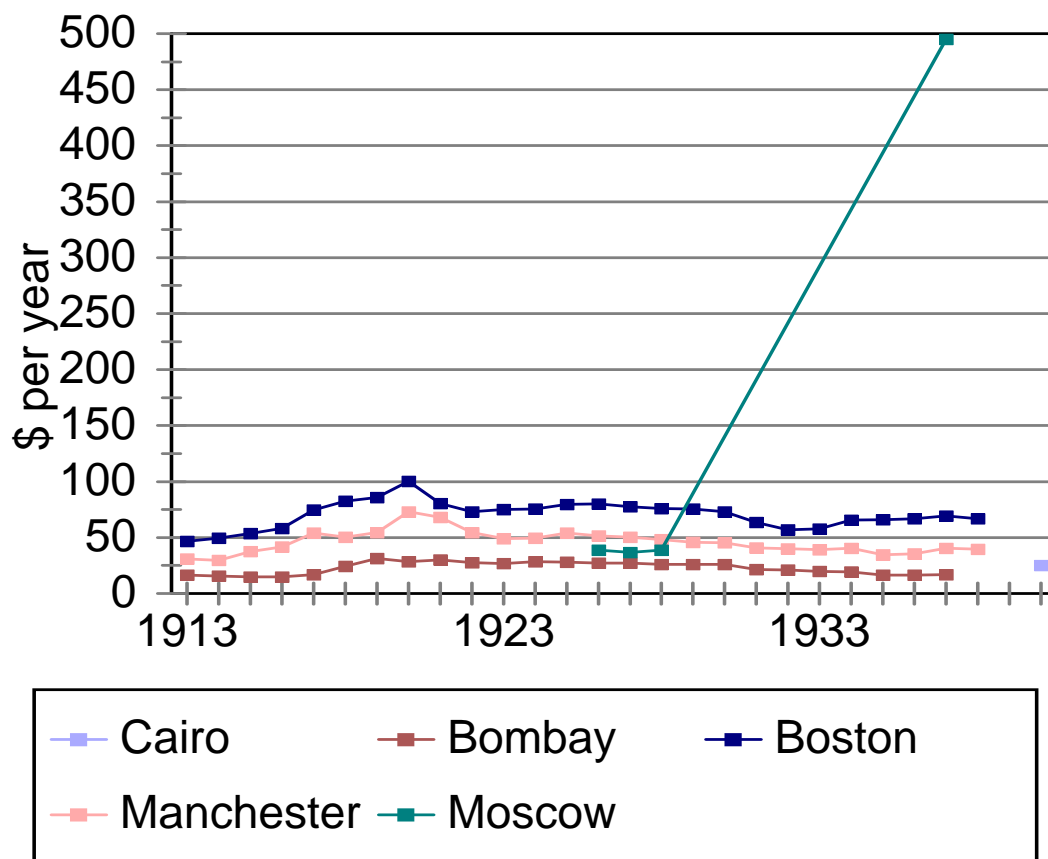


Figure 12

Real wages in Moscow, 1853-1937

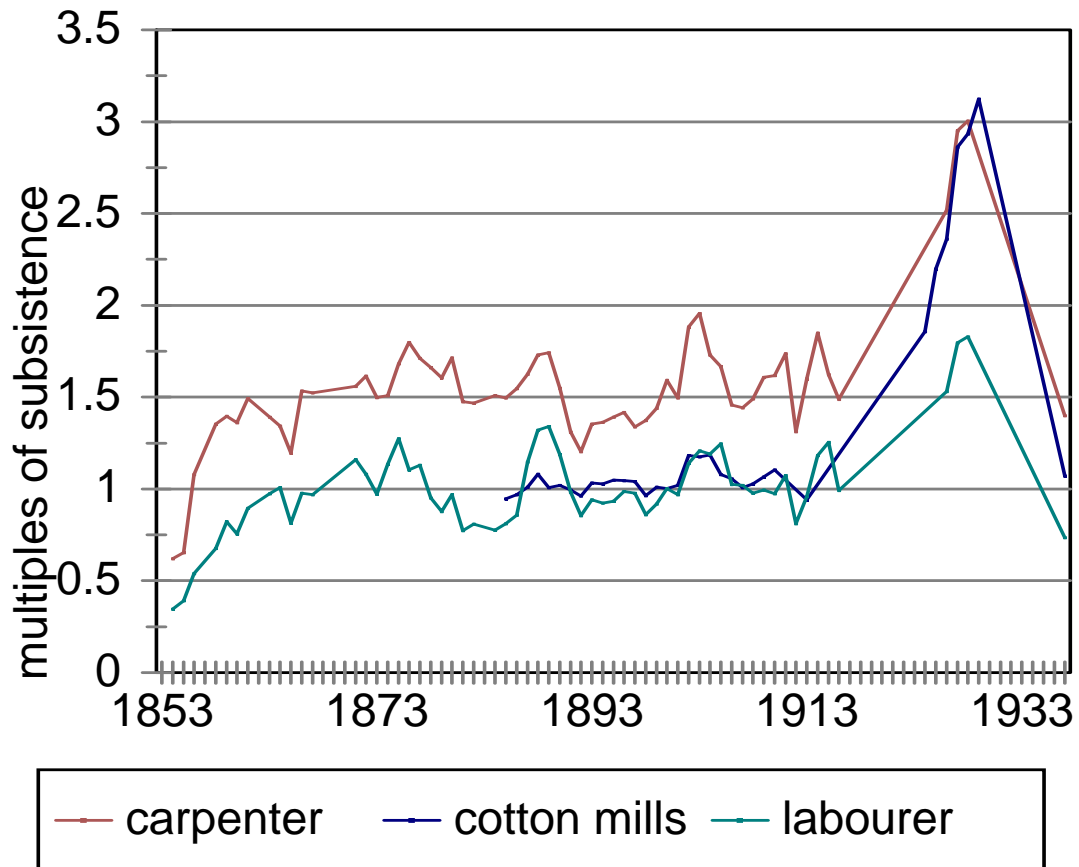


Figure 13

Real wages in St. Petersburg, 1853-1913

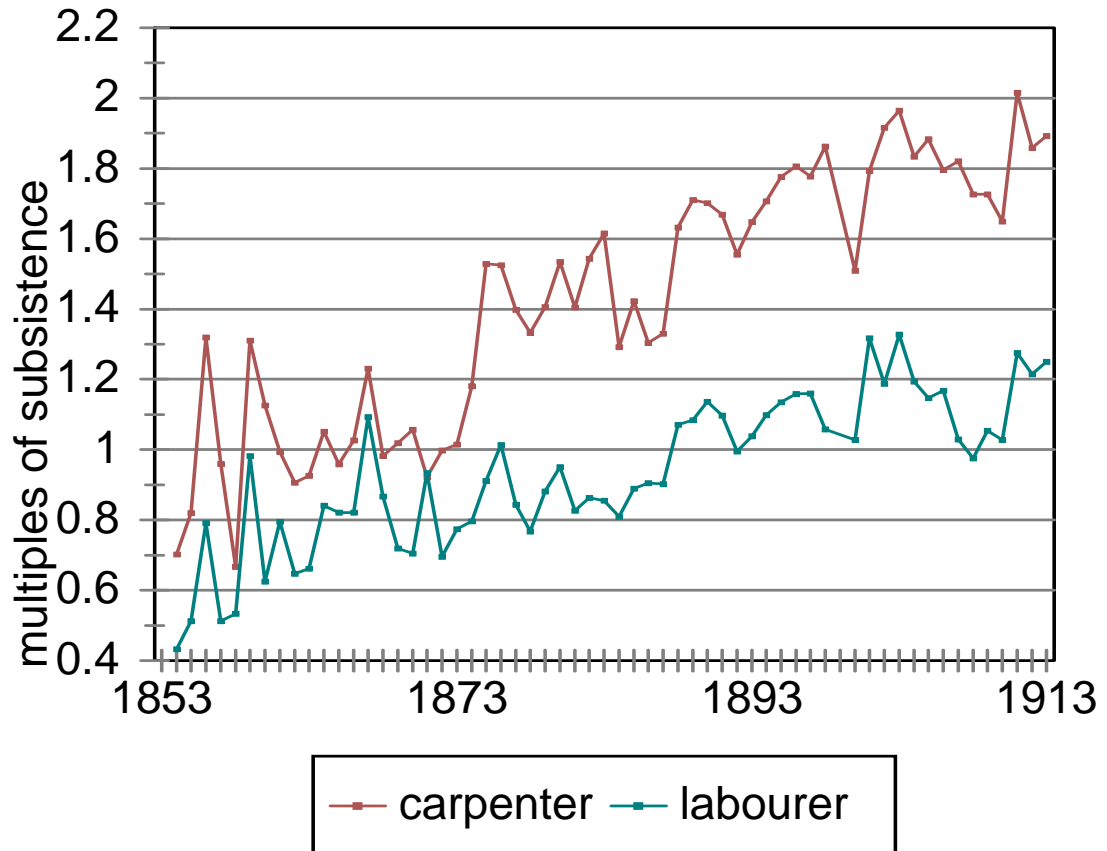


Figure 14

Real Wages in Kursk, 1853-1913

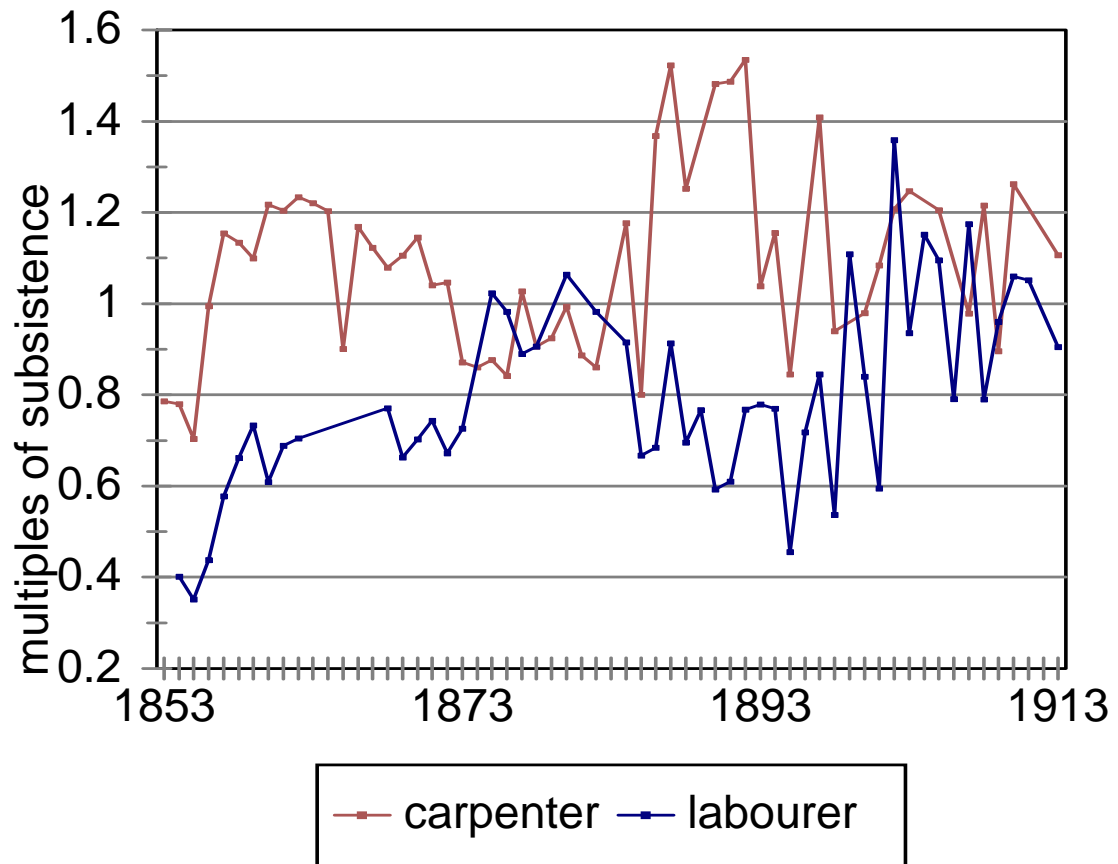
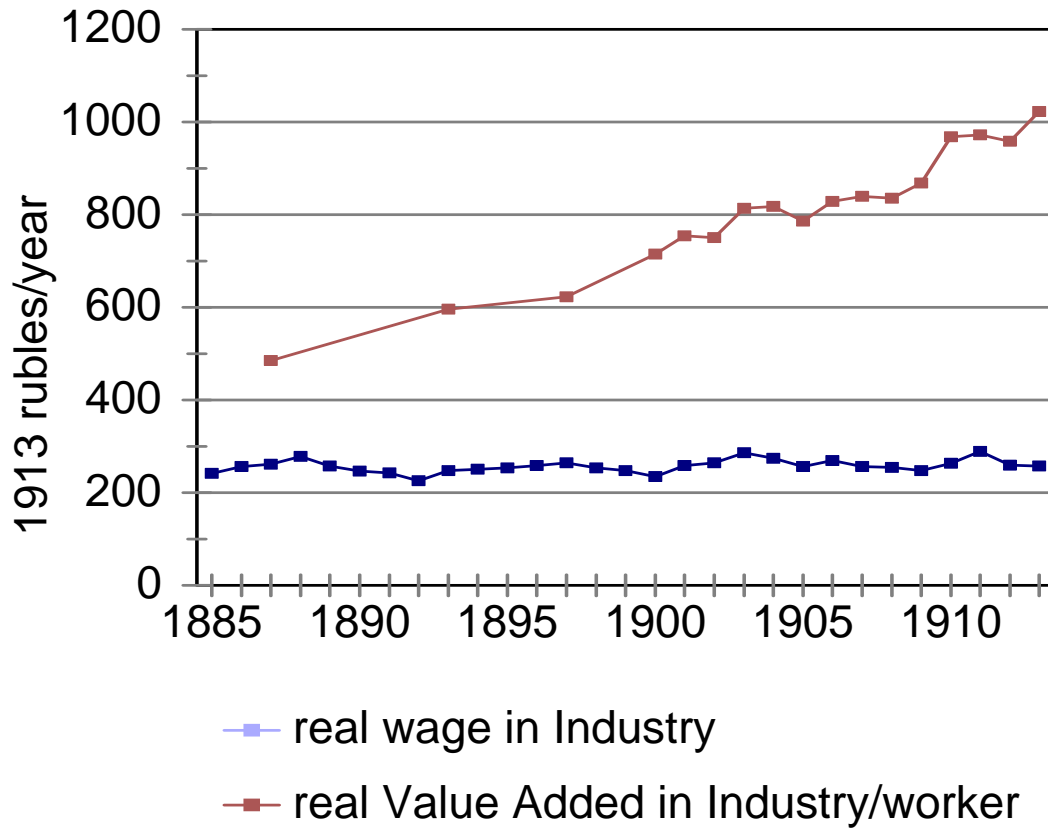


Figure 15

Real Value Added per Worker and the Real Wage in Industry



Source:

Real wage in industry was average annual earnings in factories (without Poland and Finland) deflated with our consumer price index for St. Petersburg.

Real value added in industry in 1913 equals value added in large scale industry on Soviet interwar territory according to Falkus (1968, p. 62). Real value added for earlier years was computed by carrying this 1913 figure backwards with Kafengauz's 'expanded index' (Gregory 1997, p. 198).

Employment in large scale industry from Crisp (1978, pp. 348-9).

Figure 16

Real wages of building labourers

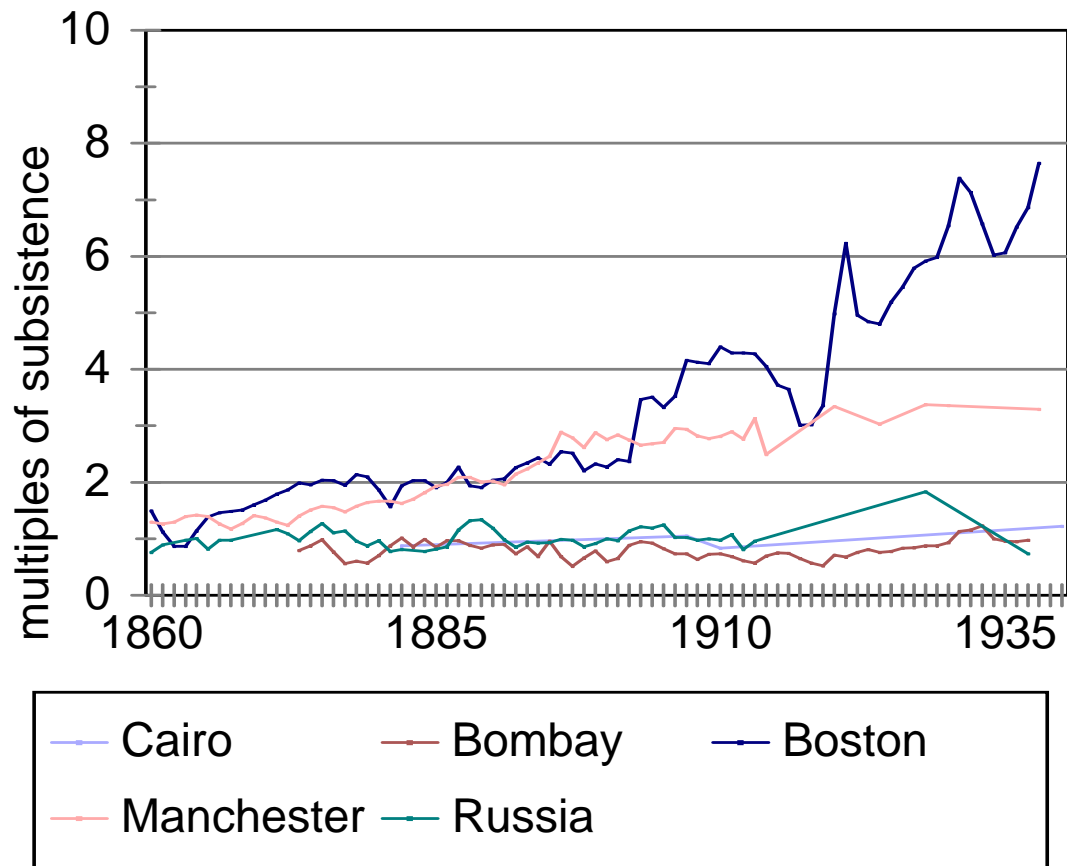


Figure 17

Real wages of building craftsmen

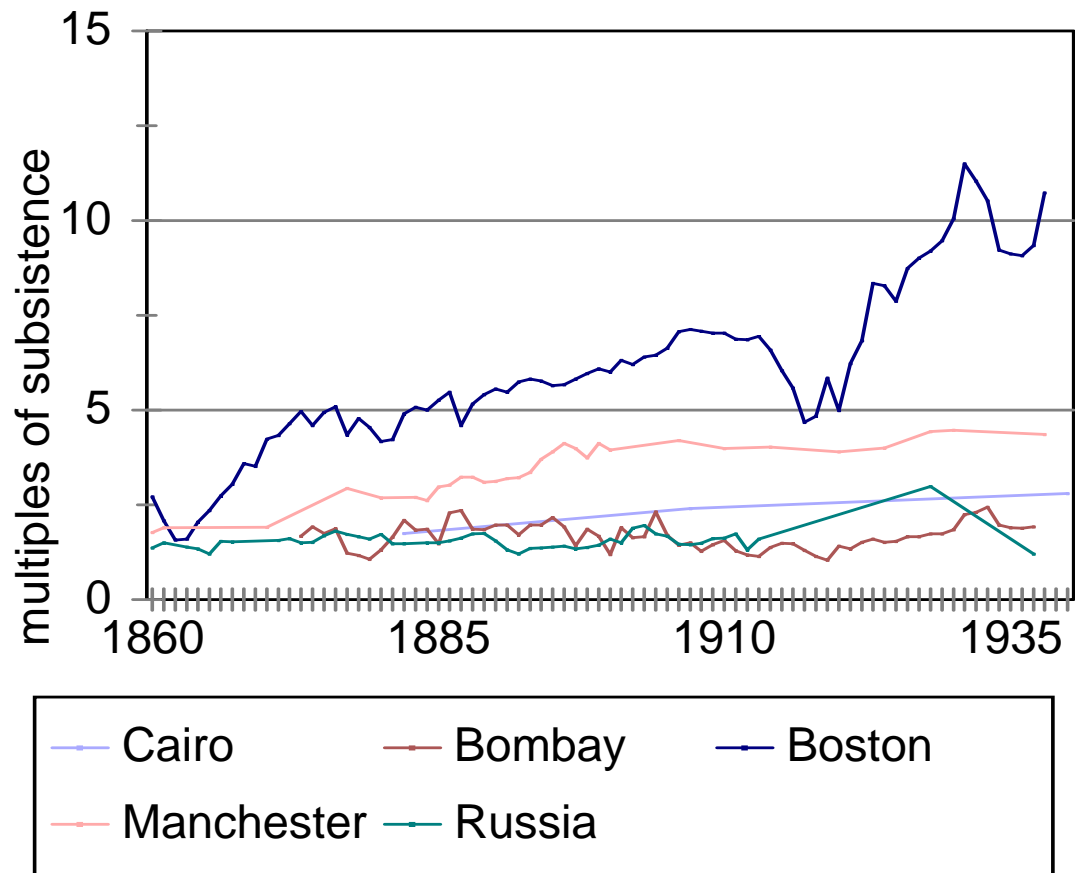
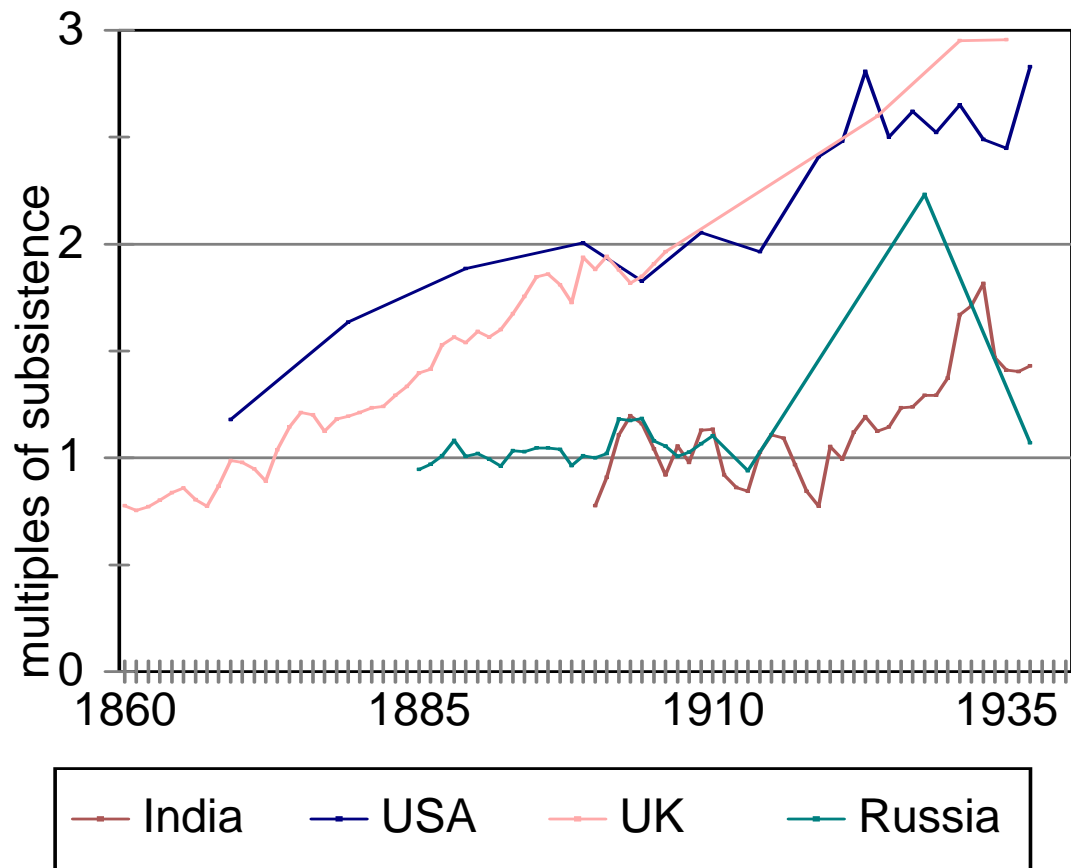


Figure 18

Real earnings of cotton operatives



Data Appendix

I. Russia: Saint Petersburg

building wages and prices except rent, 1853-1917

Rossiyskaya Natsionalnaya Biblioteka (Russian National Library) Saint Petersburg.
Vedomosti spravochnich tsen v Saint Peterburge na pripasi, materiali, platy rabochim i prochee, izdavaemie Saint Petersburg gorodskoi ypravo 1853-1917. 3/314. The volume for 1899 was missing, so we interpolated the index for that year.

Our main series of cotton cloth prices is for a variety called polotno flamskoe. It was about twice as expensive as the cheap cotton cloth that formed the bulk of Russian mill production (Odell 1912, p. 28), so we divided its price in half for our calculations. This adjustment is made for all three Russian cities.

rent per square metre
1853-1913 assumed to equal rent in Moscow

II. Russia: Moscow

building wages and prices except rent, 1824-1870

Tsentralfniy Gosydarstvenniy Arxiv Goroda Moskvi. Raporti trgovix starost o tsenax; fond 14, opis 4, № 141, 153, 154, 166, 179, 193, 194, 206, 208, 223, 235, 237, 249, 262, 263, 292, 704.

Spravochnie tseni vedomstva Moskovskoi dvottsovoi konori a tak ze ministerstva Imperatorskogo Dvora; f 14, opis 4, № 275.

O dostavlenii spravochnix tsen i materialov; f 14, opis 4 № 567, 664, 666.

Delo Moskovskoi raspriaditelnoi dymi o dostavlenii spravochnix tsen; f 14, opis 4, № 630.

Delo Moskovskoi gorodskoi dymi; f 14, opis 4, № 420

building wages and prices except rent, 1871-1917

Rossiyskaya Natsionalnaya Biblioteka (Russian National Library) Saint Petersburg.

Vedomosti o spravochnix tsenax na pripasi I materialy v Moskve 1871-1917. 3/315

The volume for 1883 was missing, so we interpolated the index for that year.

Ezemesyachniy statisticheskii bylleten po gorody Moskve (1892-1917) 3/1058

prices except rent 1924-1929

Rossiyskaya Natsionalnaya Biblioteka (Russian National Library) Saint Petersburg.

Ezemesyachniy statisticheskii bylleten po gorody Moskve I Moskovskoi Gybernii 1924-1929.

Sostavlenn statisticheskim otdelom goroda Moskvi II23/959

prices 1937

Chapman (1963, pp. 190-5).

rent

1913: Zaleski, (1955, p. 380).

pre-1913: The rent for 1913 was extrapolated backward with the Dalmatov index of the cost of rental accomodation in Strumilin (1954, pp. 431-2).

1914-17, 1924-7: assumed equal to 1913 and 1928, which were virtually equal.

1928-40: Zaleski (1955, p. 380), Chapman (1963, p. 195).

wage rates

building craftsmen and labourers

1926-1928 carpenters daily wage in USSR *Statisticheskoye obozrenie* (Russian National Library Saint Petersburg, Code is П23-1520, Number 4-6)

1928: carpenters and labourers in Moscow, daily wage in "Comparison of Real Wages in Various Cities," *International Labour Review*, 1928, p. 658. The Moscow and USSR wage for carpenters in 1928 are close.

1926-8: labourers daily wage. Moscow wage was adjusted in 1926 and 1927 in proportion to movement of carpenter's wage.

1937–The 1928 figures were extended forward in proportion to average earnings in construction Zaleski (1971, pp. 346-7, 1980, pp. 564-5, series 215).

cotton mill operatives

These wages are national averages and not city specific.

1885-1913: Strumilin (1926, 1966, pp. 92, 94) reports average factory earnings for the pre-World War I period. In the period 1901-1910, cotton industry employees earned 4% more than the industrial average, and the latter was increased by 4% in the other years to reflect that.

1924-1928 *Ezemesyachniy statisticheskiy bylleten po gorody Moskve i Moskovskoi Gybernii 1924-1929* in Russian National Library Code: П23/959

1929-1931 *Tryd v SSSR. Statisticheskiy spravochnik*, 1932.

1932-1935 *Tryd v SSSR. Statisticheskiy spravochnik*, 1936.

1937: Zaleski (1980, pp. 362-3) series 205

III. Russia: Kursk

building wages and prices except rent, 1850-1917

Gosudarstvenniy Arkhiv Kyrskoi Oblasti. Raporti i svedeniya yezdnix ispravnikov; f 1, opis 1, № (2073.30), (2134.25), (1976.31), (1921.101), (2073.30), (2134.25), (2310.27), (2984.24); f 4, opis 1, № 117, 108, (2187.703), (1921.100), (1976.31),

Vedomosti spravochnix tsen na proviant i fyraz; f 39, opis 1, № 102, 103, 104, 369; f.125, opis 1, № 128, 198, 200, 202.

Vedomosti spravochnix tsen po gubernii; f 1, opis 1, № 431, (2644.4), 2697, (2872.13), (3015.11), (3077.5), (3241.9).

Mesyachnie vedomosti spravochnix tsen na proviant I fyraz; f 1, opis 1, № 68, (1841.33), (2113.15), (2147.14), (2205.31), (2296.1), (2310.27), (2331.4), (167.144); f.33, opis 2, chast 2, № 5513; f.33, opis 2, chast 4, № 11696, 11696; f 33, opis 2, chast 5, № 16121; f.56, opis 1,

№ 263, 358.

Svedeniya ob yrozae xlebov I tsenax na rabochyy sily; f.1, opis 1, № 2389, (2452.85).

Vedomosti o torgovix tsenax na proviant I fyraz; f. 1, opis 1, № 1700.122.

Mesyachnie listi tsen na osnovnie produkty pitaniya; f.33, opis 2, chast 2, № 3433

Vedomosti o tsenax; f. 33, opis2, chast 2, № 4250; f. 56, opis 1, № 331.

Vedomosti o spravochnix tsenax; f. 33, opis 2, chast 3, № 7670, 7837, 8400, 9315, 10231.

Materiali, prislanniye dlya opyublikovaniya v gazete “Kyrskiye Gybernskiye Vedomosti”; f.33, opis 2, chast 3, № 6514, 7248.

Perepiska s gybernskimi prisytstviem o spravochnix tsenax; f. 33, opis 2, chast 5, № 14081.

Perepiska s glavnim tyemnim upravleniem o spravochnix tsena[na proviant; f. 33, opis 3, № 759.

Perepiska s prisytstvennimi mestami; f.33, opis 3, № 1922, 841.

Protokoli stroitel'nogo otdeleniya o proverke vedomostei o spravochnix tsenax; f. 33, opis 2, chast 4, № 10268.

Perepiska s Kyrskoi kontrolnoi palatoi; f.33, opis 2, chast 4, № 11737.

Mesyachnie I polymesyachnie vedomosti tsen na prodovolstvie I fyraz; f.4, opis 1, № 103, 95; f. 56, opis 1, № 390.

Tablitsi o raspredelenii zemli i o srednix tsenax na prodovolstvie; f.4, opis 1, № (1963.255).

Statisticheskie svedeniya o chisle gorodov Kyrskoi Gybernii, o tsenax na proviant i fyraz; f.4, opis 1, № (2072.586), (139.134).

Vedomosti tsen na selsko-xozyaistvennyu produktsiy, milo, tkan, saxar; f.4, opis 1, № (2133.645); f.143, opis 1, № 41.

Vedomosti Gybernskoj Zemskoj Ypravi o tsenax na proviant; f.4, opis 1, № (2165.672).

Vedomosti ystanovlennix tsen; f. 56, opis 1, № 395, 398, 406.

rent—assumed to equal half of the rent in Moscow

IV. United Kingdom: Manchester

A. wage rates

building craftsmen and labourers

1839-1900 Bowley (1900, pp. 310-11).

1900-1938 *British Labour Statistics: Historical Abstract, 1886-1968*, London, HMSO, 1971, pp. 30-33.

cotton mill operatives

1850-1906: Boot and Maindonald (2007).

1924, 1931, 1935: Bowley (1937, p. 51) Males and female earnings weighted by 1935 weights.

B. retail prices for cost of living index

bread

1850-1913: Mitchell and Deane (1971, pp. 497-8)

1914-38: Ministry of Labour, *Gazette*, retail prices on 1 July of each year.

beef

1712-1868: Greenwich Hospital ‘flesh’ (Beveridge 1939, pp. 293-5, McCulloch 1880, pp. 1138-40)

1869-1913: extrapolated forward with Clark’s (2004) beef price series.

1914-38: brisket without bone, Ministry of Labour, *Gazette*, retail prices on 1 July of each year.

lard/margarine

1826-72: lard WRP, p. 277, missing values interpolated

1873-77: interpolated

1878-1902: lard, Firm A, WRP, p. 278

1903-13: 1902 price extrapolated forward using prices in Prest (1954, p. 48).

1914-38: margarine, Ministry of Labour, *Gazette*, retail prices on 1 July of each year.

potatoes

1850: Beveridge (1939, p. 427), new potatoes, highest price.

1851-7: prices in 1850 and 1858 are very close, so intermediate prices set at intermediate value.

1858-72: hotel prices, WRP, p. 258.

1873-1902: St. Thomas hospital price, WRP, p. 90.

1903-13: the price in 1902 extrapolated forward using prices in Prest (1954, p. 51).

1914-38: Ministry of Labour, *Gazette*, retail prices on 1 July of each year.

fuel

1905: retail price of coal in Manchester and Salford, Board of Trade (1908, p. 303)

1850-1904, 1906-1938: The price in 1905 was extrapolated to other years using the price series of exported coal from Mitchell and Deane (1971, pp. 483-4).

lamp oil/kerosene

1809-1856: train oil Tooke and Newmarch (1928, Vol. II, p. 407, Vol. III, p. 297, Vol. IV, pp. 429-30, Vol. VI, pp. 163, 405-5).

1857-1876: train oil Aldrich (1893, Vol. I, pp. 211)

1877-1902 WRP, p. 366 kerosene

1903-1913: 1902 price extrapolated forward using prices in Prest (1954, p. 116.)

1914-1938: US export price of kerosene (from US *Statistical Abstract*, various years)

multiplied by 2.75, the approximate mark-up when this series overlaps with the prices for 1909-19.

candles

1712-1867: Greenwich Hospital (Beveridge 1939, pp. 293-5, McCulloch 1880, pp. 1138-40)

1870-1902 WRP, p. 369 composite

1903-1913: 1902 price extrapolated forward using prices or price indices in Prest (1954, p. 102).

soap

1840-1869: export price of soap from WRP, p. 207 increased by 25%, the mark-up implied by overlap with series for 1870-1913.

1870-1902: WRP, p. 302

1903-12: interpolated

1913-20: Beveridge (1920, p. 19).

1921-1938: UK export price from *Statistical Abstract of the United Kingdom*, various years, increased by 25% for retail mark up.

cloth

1821-1938: Mitchell and Jones (1971, p. 195). Average price of British piece goods exported. This has been increased by 75% to form a retail price series.

house rent

1909: Board of Trade, *Cost of Living in American Towns*, BPP 1911, Cd 5609, rent per square metre for 4 room house (assumed to be 40 square metres) was 5 shillings per week. Rent extended to other years with rent series from Bowley (1937, p. 121) and *British Labour Statistics: Historical Abstract, 1886-1968*, pp. 165-6.

V. United States: Boston

A. Wage rates

building craftsmen and labourers

1840-98: BLS 604, pp. 253-60

1900-28: BLS 604, p. 185 (wage per hour multiplied by 8 hours per day).

1928-1938: 1928 value extrapolated forward using the indices for the hourly wages of building craftsmen and labourers in US Statistical Abstract, p p. 342-3.

cotton mill operatives

total wages paid in cotton manufacturing divided by cotton manufacturing employment, ultimately from US censuses of manufactures. Since 1919 the data are summarized in US *Statistical Abstract of the United States*, various years.

B. retail prices for cost of living index

up to 1913, the goods prices are for Boston. Thereafter, they are for average retail prices for the USA. The differences between regions were small in 1890-1903 (U.S. Commissioner of Labor 1903, p. 660) and the average US prices and the Boston prices were similar when the series overlapped.

Bread

1851-88: 1890 price extrapolated backward using the wholesale price of 'B shipbread' from Aldrich (1893, part 1, p. 30, part 2pp.66-7).

1889: Aldrich (1892, Part 1, pp. 32-3)

1890-1903 U.S. Commissioner of Labor (1903, pp. 692-3).

1903-12: interpolated

1913-

meat, potatoes--

1850-80: average of all Massachusetts price quotations in Carroll Wright (1885) for the 1850s and in Weeks (1886, 59-62) for 1850-1880.

1882, 1884--Massachusetts, Department of Labor and Industries, *Report on the Statistics of Labor*, 1884.

1890-1903: U.S. Commissioner of Labor (1903, pp. 698-9, 750-1,784-5, 808-7). 1 bushel of potatoes assumed to weigh 60 lbs. Meat was 'fresh pork'.

1903-22: USA average food prices were used as regional differences were unimportant in this period, and the *Statistical Abstract* ceased printing city-specific prices. US BLS (1923), *Retail Prices: 1913 to December, 1922*, Bulletin 334, pp. 47-8. Meat was 'round steak'.

1923-39: *Statistical Abstract of the United States*, various years. Meat was ‘round steak’.

lard

1890-1903: U.S. Commissioner of Labor (1903, pp. 760-1).

1904-1922: US BLS (1923), *Retail Prices: 1913 to December, 1922*, Bulletin 334, p. 48.

1923-39: *Statistical Abstract of the United States*, various years.

cotton cloth–

quality is ‘shirting’.

1850-80: average of all Massachusetts price quotations in Carroll Wright (1885) for the 1850s and in Weeks (1886, pp. 12-3) for 1850-1880.

1882, 1884–Massachusetts, Department of Labor and Industries, *Report on the Statistics of Labor*, 1884.

1890 ff wholesale price of sheeting. This approximates the retail price of shirting. US *Historical Statistics*, online, series Cc233, Cc234.

kerosene–

all lighting assumed to be kerosene as candles were similarly priced in 1850 but kerosene quickly became much cheaper.

1850-1883: same as food

1889-91: Aldrich (1892, Part 2, pp. 1156-7).

1892-1914: 1890 price extrapolated with Rees’ (1961, p. 110) index of the retail price of kerosene. Rees (1961, pp. 105-13) constructs a price index for lighting that combines the prices of kerosene and gas with shifting rates reflecting the growing importance of gas between 1890 and 1914. However, kerosene was always cheaper per BTU although the price of gas fell relative to the price of kerosene. The index here always uses kerosene since it was cheaper. Electricity was on the order of twenty times more expensive than either gas or kerosene and was not widely used by workers.

1914-40: 1914 value extrapolated with whole price of kerosene in July of each year. Prices from NBER macrohistory data base

<http://www.nber.org/databases/macrohistory/contents/chapter04.html>

Accessed 27 December 2016

soap–

1850-1883: same as food

1889-91: Aldrich (1892, Part I, pp. 416-9)

1892-1913: 1890 price extrapolated with wholesale price of toilet soap from U.S. BLS *Bulletin* 118, p. 234.

1914-40: in the absence of any continuous retail, wholesale, or unit value series, the price of soap was extrapolated with the US consumer price index.

fuel

The fuel was assumed to be anthracite coal.

1851-80: average of all Massachusetts quotations in Weeks (1886, pp. 94-5).

1889-91: anthracite, stove, Aldrich (1892, Part II, pp. 1130-1131).

1902-8: interpolated

1909: Board of Trade (1911, p. 115).

1910-11: interpolated.

1912: US BLS (1913), *Retail Prices: 1913 to August, 1913*, Bulletin 136, p. 134.

1913-1921: US *Statistical Abstract, 1921*, p. 638.

1922: US BLS (1923), *Retail Prices: 1913 to December, 1922*, Bulletin 334, p. 160

1923-1940: extrapolated with US retail price of anthracite coal in NBER macrohistory database:

<http://www.nber.org/databases/macrophistory/rectdata/04/m04045.dat>

rent,

1909: Board of Trade, *Cost of Living in American Towns*, BPP 1911, Cd 5609, p. lx indicates American house slightly larger than British house. I assume that the USA house of four rooms contained 50 square metres. In Boston, the average rent was then \$12 per month or \$2.88/sq m/year.

Other years: The 1909 rent was extended forward and backward with the Hoover-Long rent index in Long (1960, pp. 156-7), the rent index for Boston in Rees, (1961, pp. 97), and the rent component of the cpi in *Historical Statistics of the United States*, 1957 ed, series E 122.

VI. Egypt: Cairo

A. wage rates

building craftsmen and labourers

Yacoub Artin Pacha (1907, p. 125, maçons, ourvriers), Girard (1824), Wilkinson (1835, p. 286)

B. retail prices for cost of living index

all prices from Yacoub Artin Pacha (1907, p. 118-30), Girard (1824), Wilkinson (1835, p. 283-5).

Flour price in 1800 was extrapolated from Wilkinson's price for 1827 in proportion to change in wheat price.

Fuel—using the market price of charcoal in the normal calculation produces an unreasonably expensive budget. Vallet (1911, p. 61, 107) reports that most households paid a baker to bake their bread rather than buying fuel and doing it themselves. I have followed Vallet's lead and assessed the fuel charge 10% of the price of the flour.

VII. India: Bombay

A. wage rates

craftsmen and labourers

craftsman was a carpenter and labourer was a coolie or horsekeeper

1850-63: *Accompagnements Nos. 1 to 9*, (1864)

1873-1912--*Prices and Wages in India* (1893-1910, 1920)

1913-37: average wage of carpenter and labourer for 1908-12 was extrapolated forward using the cotton mill operative series.

cotton mill operatives

Bombay: Mukerji (1959, pp. 92-3, column 5).

B. retail prices for cost of living index

1914-37: All data from Commissioner of Labour Bombay (1921-40). The prices are retail and included rice, jowar (sorghum), gram, eggs, oil, firewood, and cotton cloth (shirtings). The price of soap estimated as half of the price of oil, and candles set equal to oil price.

Prices before 1914 were extrapolated backwards using price series for (mainly western) India. Many of these are wholesale prices for the Ahmednagar district or other Indian series. The following series were used:

rice— *Prices and Wages in India* (1893-1910, 1920)

jowar--*Prices and Wages in India* (1893-1910, 1920)

gram---*Prices and Wages in India* (1893-1910, 1920)

eggs—egg price in the 1860s from *Accompaniments Nos. 1 to 9*, (1864) extended forward with price of gram.

oil--constructed from Kinloch (1852) and *Prices and Wages in India* (1893-1910, 1920) with many interpolations.

fire wood –

1850-1860: price in Pune.from Divekar, et al. (1989, Appendix).

1879-1910: Calcutta wholesale price from *Prices and Wages in India* (1893-1910, 1920)

soap--half of vegetable oil

candles--same as vegetable oil

shirtings--Bombay export price from *Statistical Abstract relating to British India (1867-1922)*

house rent—In 1921 and 1922, the predominant working class rent for a family was 3.75 rupees per month for one room, which housed approximately 4 people in 12 square metres. This implies a rent of .3125 rupees per square metre, rounded to 1/3 rupee. This figure, in turn, was run forward to 1937 using the house rent index in Commissioner of Labour Bombay (1921-40) and backward to 1850 using the cost of the rice-sorghum commodity basket.

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Saurerbeck =Saurerbeck (1886, 1907), Editor of the *Statist* (1918, 1938).

UK Stat Abst =United Kingdom, Board of Trade, *Statistical Abstract for the United Kingdom*, London, HMSO, various years.

US Stat Abst=United States of America, Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States*, Washington, Government Printing Office, various years.

WRP= United Kingdom, Board of Trade, *Report on Wholesale and Retail Prices in the United Kingdom in 1902, with comparative statistical tables for a series of years*, House of Commons Parliamentary Papers, 1903, Vol. 68.

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