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**THE RURAL URBAN WAGE GAP IN THE INDUSTRIALIZATION  
OF RUSSIA, 1885-1913**

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**The Rural Urban Wage Gap in the  
Industrialization of Russia, 1885-1913**

by

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**Abstract**

This study provides statistical evidence that Russian rural/urban wages diverged substantially during the industrialization of Russia in the late nineteenth century. However, over time both the variation declined and integration somewhat increased as rural labor responded to new opportunities. The patterns were moderately clear for nominal wages. This study supports Paul Gregory's conclusion that relative advances in the productivity of land in agriculture were accompanied by far greater mobility of labour than is commonly thought in view of the constraints of Russia's rural institutions.

**KEYWORDS:** Russian economic history; rural-urban wage gap; labour history; industrialization

**JEL:** N13, N33, 014

Spatial wage differentials are not well understood in large part because earnings are

difficult to identify and measure. Despite the existence of a sizeable wage gap in the U.S. in the 1890s, for example, as Williamson and Hatton (1991) have shown, after adjustments for cost of living, the labor force appeared highly mobile between sectors. Cost of living adjustments did not account for the persistent and substantial geographic differentials, however, such as between north and south, found by Rosenbloom (1990) and Wright (1987). For Russia, there has been no effort to estimate the nature and dynamics of the wage gap in part because the data on urban and rural wages have not been drawn into a wage series for any region. Data on aggregates are used here, nevertheless, to examine as a first pass on the existing data the rural/urban wage gap in Russia during industrialization. In historical writing, there has been a consensus for over a hundred years that Russian peasants were pushed off the land by impoverishment, especially in the central regions. This paper aims to reevaluate that assumption using econometric tests and comparative evidence for the US, the UK and Europe, on the basis of rough data for the wage gap.

The Russian evidence points to substantial rural/urban migration between the late 1880s and 1914. In general, migration is not the equivalent of mobility. Despite considerable migration in the nineteenth century, for example, Boyer and Hatton (1994) found that labor markets in Europe and England remained regionally segmented. Labor markets between London and other places were probably better arbitrated than the relatively segmented regional markets (Boyer and Hatton 1991,1994). Since it is the relationship between a few large cities and the countryside that assumes enormous importance for much of European history (de Vries 1994; Grantham 1989), the study of wage differentiation between the capital cities and rural areas during industrialization for the Russian case should show some tendency toward integration, even if regional labor markets are highly segmented.

In the early stage of industrialization, the rural/urban wage gap will widen. Further industrialization will depend to some extent on the easing of transportation and information costs that are the components of the wage gap. We examine data from Russian history during the burst of industrialization from roughly 1885 through 1913 to discover if labor market integration accompanied the state-led style of growth that characterized the Russian pattern in the 1890s and early twentieth century. In this overwhelmingly peasant society, railroad construction was largely engineered by the state. Russia's boom consisted mostly of gains in heavy industry with a 25-fold increase in the production of coal from 1870 to 1897 and 200-fold increase in the production of oil. During the decade of the 1890s the expanse of railroads more than doubled. In turn, the railroad lines created new investment possibilities, linked new

urban networks with Siberia, and facilitated transportation of capital goods as well as labor.

The main source of urban labor and migration was the peasantry. Urban ethnic groups left Russia for Europe and America, and whole families migrated to Siberia, but the main flow of young single male peasants was to Moscow and St. Petersburg. After emancipation and before the turn of the century the number of peasants in cities, well documented because of the passport system, increased by 4.6 times. According to the 1897 census, 43.5% of the urban population was of peasant status. Although the institutions that inhibited Russian agriculture and industry are prominent in the literature on Russian history--particularly the village commune, which had control over the land--their role may well have been greatly misinterpreted. Village elders failed to stop outmigration, if indeed that was even in their interest. "It was not the obshchina that made the village," wrote Moshe Lewin, "it was the other way around" (Lewin 1990, p. 22).

Markets expanded in the late nineteenth century partly as a product of regional complementarities and historical concentration of industry. The stark geographic contrast between North and South gave substantial comparative advantage in industry to the northern cities and towns. The railroads supplemented a network of rivers and canals, which throughout the nineteenth century supplied considerable grain supplied from the agricultural south and frontier regions. Rye output declined in the north, as production shifted into the commercial fiber crops and seed oils. Wheat and barley expanded in the southeast and Siberia; wheat was produced on one half of all sown fields in new Russia. Regional markets for machinery also appeared, with expansion of private landholding, especially in the period after the Stolypin reforms of 1906-1913. As could be expected, the rate of seasonal and long-term out-migration shows a highly migratory population. Labor traveled between north and south and eastward to Siberia, although the flows also returned from Siberia, and labor from the south went north to the cities. The number of seasonal and permanent wage earners more than quadrupled in number between 1860 and 1913 to nearly 13 million (Rashin 1940).

Factors in the out-migration from rural Russia, although beyond the scope of this paper, are nevertheless implicit of concern. This migration may have been driven by earnings opportunities, or, more likely, by the range of earnings opportunities (David 1974). The level of urban wages far exceeded the rural wage, especially in the poorly paid non-agricultural localities of the north, but labor would have traveled to the opportunities, which were expanded because of the breadth and range of jobs in urban areas.

Because of the quality of the available data for Russia, there are few approaches that would lead to a final determination of how efficient labor markets were becoming. Studies of market integration in Europe and America point up both the difficulty of judgment and the continuing need for reevaluation even when sources are available and prices known. Although it had been generally established for European history in the research on prices done in the 1930s, for example, that in pre-industrial times wages exhibited uniform features, such as sticky nominal wages that almost never fell and overwhelming influence over the real wage by cost of living (prices), an exception was recently demonstrated in the case of the Dutch Republic, where by the mid-seventeenth century, easily half the labor force worked mostly for wages and salaries (de Vries 1994).

In this paper we trace the evolution of labor markets in Russia in the late nineteenth century, beginning in the 1880s at the beginning of rapid growth. We divide the paper into parts, 1) the historical issues, 2) the data and methodological issues, 3) the approach, 4) the evidence, and 5) the conclusions.

## I.

### **Historical Issues**

According to the predominant interpretation of the Soviet era, lasting until roughly the mid-1980s, the factory labor force in late imperial Russia grew significantly but largely as a consequence of the immiseration of peasant-proletarians who were pushed off the land by population growth and further impoverished by continuing forced labor on large noble estates. The radical Marxist intelligentsia at the time shared with government officials a strong concern for the persistence of inefficient institutions such as the repartitional land commune, which contributed to backwardness and poverty. The industrialist and finance minister Sergei Witte wrote in his report on the budget of 1899 that no country in Western Europe was so frequently in the grips of famine or had a peasantry so impoverished that it "could not succeed in sustaining its economic well-being" (Simonova 1973, p. 243). Lenin emphasized landless and unemployed labor in the countryside as a sign of a changing economy. Discontent and supposedly poorly paid, the peasant turned factory worker made the revolution.

Gerschenkron (1962), from a liberal economic perspective, accepted the notion of diminishing returns to agriculture and sought to explain why Russia's circumstances did not

inevitably choke off growth. He pointed out that domestic savings and the labor supply grew too slowly to sustain an industrial revolution but that the government performed necessary substitutions to expedite the growth process. Gerschenkron found much of the impediments to growth in the land commune and local authority enhanced by the reform of 1861, which prevented the shift of workers out of agriculture and, as a consequence, inhibited domestic savings. The commune bore collective responsibility for redemption of the land and monitored visas for labor off the farm.

This thesis undermined the Marxist view of revolution, derived from the writings of Lenin, regarding the formation of a proletariat on the eve of World War I. Nevertheless former Soviet and Russian scholars, who underscored the coercive role of the powerful state, agreed about the restrictive nature of the governmental apparatus in preventing out-migration from the village. Arguing enough to defeat the populist position that the commune entirely prevented the spread of capitalism, they nevertheless insisted that the commune was a sufficiently resilient and critical factor in Russia's persistent backwardness that only collectivization could remove it (Danilov 1971, pp. 358-59).

In the view of Paul Gregory, the Gerschenkronian, populist, and Marxist perceptions about the factors in Russia's backwardness should be reexamined; Gregory's work on the economy of the era of tsarist industrialization (1994) underscored the importance of comparing the actual data with impressionistic understanding. Agricultural output in Russia, as in France, was given in his work a larger role than it was previously assigned, even without much technological transformation (Grantham 1989). Gerschenkron's position was subjected to other critical reevaluation (Harrison 1990). Together with Gregory, he brings Russia into the category of countries (Germany, France, United States, Japan, Norway, Canada, and the United Kingdom), which could hardly be called dual economies. To the extent that the rate of productivity growth can be known from the available sources, Gregory estimates 1.35% productivity growth in agriculture between 1883-1887 and 1909-1913, three-fourths of the industrial productivity growth rate and nearly equal to the economy-wide 1.5% (Gregory 1982, pp. 168-69). In the appendix we present an analysis of the structural transformation of exports and output of grains that suggests a shift of the supply curve to satisfy consumption as well as foreign demand. Grain transport figures began more and more to favor domestic loads. The peasants themselves, who, during this period came to be the owners rather than the tenants on their holdings, increased capital used in agriculture. The railroad made urban markets accessible to all the factors of production, even without innovation beyond a

reduction in fallow and the use of clover.

There is very little pre-revolutionary, former Soviet or Russian work on agricultural or industrial wages other than studies carried out in the first decades of the twentieth century. Much of the voluminous data produced from Russian archives has concerned the incidence of strikes and the other conditions of work. Because historians are swamped with police records of numbers of passports issued, there are countless publications of how many peasants from which regions officially migrated to the cities and Siberia (Kirianov 1987; Rashin 1940). K. Pazhitnov's massive study of the position of workers in pre-revolutionary Russia (4 vols. 1924) remains the standard presentation of wages for certain branches of industry, and S. G. Strumilin provides a careful attempt to estimate the average nominal and real wage. There has been no special interest, however, in the differentiation between rural and urban wage rates.

On agricultural wages, N. Druzhinin (1978) and P. Ryndziunskii (1983) used scattered data among other information for a statement about rural conditions after emancipation. After the publication of work by Koval'chenko and Milov (1974), it is clear that in contrast to the estimates of Chayanov, hired labor was extensive on peasant farms. Historians used to believe that grain production for the market went on only on noble estates, which had access to improved farm implements. Koval'chenko has done considerable work over the past two decades, however, proving that peasants did have access to some improvements. Most important, his work has presented strong evidence of the emergence of a labor market.

## II.

### **The Data and Methodological Issues**

The historical study of wages focused attention on cost of living adjustments as essential to the measurement of integration. The ordinary procedure of measurement is thus to capture earnings. Yet, the earnings approach poses problems of estimation and evaluation. It should include estimates of the average weekly value of extra wages during harvest, board and free food at harvest time. For urban labor, a cost-of-living adjustment includes non-cash payments, hours, working conditions, and wage-earning opportunities for other family members. Information that is difficult to obtain. Characteristically, these adjustments are difficult to make, especially for agricultural wages. The fluctuations of real agricultural wages, for example, and the inelasticity of agricultural supply, may have been mis-measured for

French history by price deflators that used widely traded agricultural commodities leading to a discrepancy of as much as 25 to 33%,

There is no meaningful general price of non-traded foods because they were usually not profitable to ship and because women and children whose alternative employments within agriculture were generally poorly paid could grow crops such as potatoes, maize, and chestnuts. At the margin, the price of traded agricultural commodities--vital as it was for all those who, like the woodcutters and iron workers and rural weavers, had to buy their food in markets--overstates the true cost of subsistence for the mass of country people, who had a variety of nonmarket sources of subsistence (Grantham 1989, p. 66).

Historians tend to avoid problems of estimating agricultural earnings by focusing on nominal wages. But for industrial labor information "typical" workers' budgets are considered essential. In our analysis, it has not been possible to redo the indexes created at the turn of the century. Our data are from S. G. Strumilin, who drew wage rates from the scarce available sources. Since Strumilin's time there has been no large project to unearth urban wages, in contrast to what has been done for European history. As a consequence, there are large gaps, and systematic data is only available after the Factory Inspectorate initiated its surveys in 1900. We have taken both nominal wages and price deflators from Strumilin.

Strumilin's urban wage series come from A. Rykachev's series of daily rates for St. Petersburg construction workers (five professions, joiners, painters, carpenters, masons, plasterers, and day laborers) (Rykachev 1911). We separated the series for professional building trades and the so-called "black workers," who were day laborers of various kinds paid at roughly 59% of skilled construction labor. For Moscow (suburban area), Strumilin found daily wage rates for 3128-7460 workers at a machine tool factory from 1878 to 1901 at a factory outside Moscow (Kolomna). Another series (annual cash wages) for railway workers (permanent and day laborers) we drew K. Pazhitnov, whose source is the Ministry of Transportation statistical journals. We used these earnings divided by 270, which is the standard Soviet estimate of days worked per annum at the end of the nineteenth century.

Agricultural wage rates were taken from Strumilin's reworking of data from the survey of households undertaken on an annual basis (after 1882) by the agricultural statistical sector of the Department of Agriculture. Those wage rates were averaged from guberniia and district means without account of the extremely unequal extent of hired labor in the various regions. Strumilin in turn used for his discussion a further average of the wage for scything, harvest



labor, and planting and for women and men. His averages including males and females reduced the wage rate he reported. As a consequence, we have used the wage rate for males alone, since the urban occupations driving the wage gap we discuss in this paper largely consisted of men. Although women increasingly migrated to towns, they took jobs in textile production, an occupation not included in data accessible to us.

For the deflators, Strumilin presented the three price indexes for the turn of the century. Two of these, compiled during this period, were for retail prices. The Petersburg index of the Institute of Economic Research and the Petersburg and Moscow index prepared by M. E. Kokhn used weights based on the structure of average budget expenditures of industrial workers. The discrepancies between the two, which are highly correlated, are attributable to the scale of indexing. Kokhn used 24 products for Petersburg and 15 for Moscow, and the Institute, 27 commodities. Strumilin preferred the Podtiagin index based on wholesale prices for 66 commodities taken from the annual of the Ministry of Trade and Industry's *Survey of Commodity Prices in Major Russian and Foreign Markets*. This index often included both Moscow and Petersburg, and so it captures national trends. Its drawback is wholesale rather than retail prices, and it could include world market prices and thus diverge significantly from retail prices. The three indexes, to be sure, show general agreement, with the exception of a steeper drop in price level after 1900 for the Podtiagin index (figures in the appendix show the difference in wage gap measured by the Kokhn and Podtiagin indexes). The Podtiagin index fluctuates more than the other two, especially during the rise in prices after 1905 (see Gregory 1982, pp. 201-203). Strumilin used the Podtiagin index to deflate agricultural wages, after first removing commodities likely to be purchased only by urban laborers.

The measurement problems of studying labor market integration do not end with the data. Integration is difficult to judge; observed wages may diverge even in an integrated market (Rosenbloom 1990, p. 88). We have used econometric analysis to determine if long-run ratios will revert to a stable path and if, even in the short run, some integration is observable.

### III.

#### The Model

We used correlation coefficients for initial estimates even though but they may be a

misleading indicator of labor market behavior. They may measure response to the same price shocks, and they normally show trends (upward or downward). Any model that picks up these effects will have a high  $R^2$ . Nevertheless, we looked for a relationship between the wage gap with a lag and the rural (real and nominal) wage while removing trends:

(1)

$$\log y_t = a_0 + a_1 \log x_t + a_2 \log x_{t-1} + e_t$$

where  $y$  = the agricultural wage  $x$  = the urban/rural wage gap. "When the wage gap was large in the previous year," wrote Williamson, "farm wages rose to catch up with industrial wages, presumably in response to farm emigration and the increased labor scarcity thus created in the wake of that emigration" (Williamson 1990). The procedure uses a lagged wage gap at time (t-1) because of the unlikely circumstance of the labor markets being perfectly arbitrated at any moment. The results of this method include the AR (1) or Cochrane-Orcutt procedure to resolve problems of positive serial correlation, an approach that incorporates the residual from the past observation into the regression model for the current observation.

The method used by Rothenberg (1988) to discover if farm wage rates in Massachusetts converged during the first half of the nineteenth century was a measure of dispersion, the coefficient of variation. We conducted this test to look for possible changes in the degree of market integration

(Table II). We incorporated the Boyer and Hatton technique of calculating the coefficient of variation for every year within the urban labor market and between the rural and urban markets, which we regress against a time trend. To show the evolution of market integration, the coefficient on the time trend should be negative.

We then applied tests for cointegration, beginning with a test for a unit root in the wage ratio (Boyer and Hatton 1994). The model is:

(2)

$$\log(w_i/w_j)_t = b_0 + b_1 \log(w_i/w_j)_{t-1} + u_t$$

In this model,  $u_t$  is the random uncorrelated disturbance term,  $w_i$  is the wage in location  $i$  and  $w_j$  in location  $j$ . If a unit root exists (the null hypothesis), then the disturbance would lead in the long term to a failure of the two wages to return to equilibrium. For the markets to be integrated, it would be essential that the coefficient on the log of the wage ratio be less than one. In the long run,  $b_1 < 1$  would converge to equilibrium. In a test for the unit root, we regress the log of the wage ratio on a constant; the Cointegrating Regression Durbin Watson (CRDW) should be equal to zero with a unit root. It is difficult ordinarily to reject the null hypothesis that a unit root exists.

After testing for weak stationarity as demanded in the time series analysis, using an error correction model, we follow the (Engle and Granger) procedure to estimate a cointegrating regression and then use a lagged error term from that regression in the dynamic model. A simple first order error correction model was,

(3)

$$\Delta \log w_{it} = c_0 + c_1 \Delta \log w_{jt} + c_2 u_{t-1} + v_t$$

where  $u_t$  is the error term from the initial regression,

(4)

$$\log w_{it} = d_0 + d_1 \log w_{jt} + u_t$$

A  $t$  statistic on  $c_2$  is the test for integration.

#### IV. The Evidence

Table I presents the results of the regressions of the log of rural wages against the logs of the lagged gap with nominal and real factory wages. With correction for serial correlation, which on the

whole was present, the data present some problems. The second, fourth, and fifth series have signs in the right direction:

- y= rural nominal daily wage rate--average for males for the entire country
- x = a) Strumilin's estimated average nominal factory wage rate  
 b) average daily rate for unskilled railroad workers  
 c) average daily rate for all unskilled workers, including railroad workers

In the second row, the series "factory," Strumilin's estimated nominal wage, has coefficients of the right sign, although the relationship suggests no strong lagged response. The F value for real wages makes that coefficient not statistically significant. The coefficient for railway workers is large. In view of the expansion of railways during this period, that information supports what intuitively is suggested, that when the agricultural wage rate is estimated for the entire country, areas of extensive hired labor in agriculture lay along new railway routes. From this table, it may be understood that among urban trades on the whole, the coefficient of integration is small and insignificant, although bearing a positive sign. The coefficient for construction workers (excluding professional levels) has a negative sign showing the strong effect of the relative rise of agricultural wages and stagnation of unskilled construction wages in St. Petersburg, which was affected by war and revolution. On the whole, with the exception of the results for construction wages, the information content in this regression seems encouraging as a place to begin. Arguably, the results are consistent with other tests for tendency toward integration.

The next test results in Table II show in a similar direction that within this time frame these labor markets showed a tendency toward integration. The coefficient of variation test for market integration, where we regressed the coefficient on a time trend, produced a negative sign on the time-trend coefficient. To be sure, wage convergence is indicated only as a dynamic. The coefficient is not significantly different from zero. The downward trend was present but weak. Looking at the table as a whole, however, the lack of difference between the several series (real and nominal wage rates for factory labor, nominal rates for construction and averaged unskilled labor) shows that in the general tendency of the

coefficient, there was not much difference between occupations. Judging by this test, equilibrating factors in the wage rate were working although extremely slowly.

In looking at time series relationships between pairs of wages, rural and urban, through error correction models (Table 4) and testing for unit roots (Table 3), we find as predicted from the above that our data is consistent with cointegration. In the unit root test, the null can be confidently rejected for at least one series, once again, the factory daily rate estimated by Strumilin. The Durbin Watson statistic in the unit root test (for  $n=29$ , DW should exceed 1.38), is different from zero in all cases, but not at a level where one could confidently reject the null hypothesis. It should be noted that in the test of the unit root, with the null hypothesis that there is a unit root, the null hypothesis is maintained unless there is overwhelming evidence to reject it. Thus it is more common in this test to accept the null than reject it.

The error correction model does show the significance in the coefficient of the lagged error term for both nominal and real wages and substantial coefficients for all occupations, including as before, the estimated wage for factory labor. The conclusion, although not a strong or final statement, does confirm that there was change in the wage gap in a downward direction and that this change had something to do with urban, particularly factory, wages. The conclusion, once again, cannot be extended to real wages because of the measurement problems.

## V.

### Conclusion

To summarize, Russian rural/urban wages clearly diverged but over time both the variation declined and integration somewhat increased as rural labor responded to new opportunities. The patterns were moderately clear for nominal wages. Paul Gregory's conclusions about relative advances in the productivity of land in agriculture are underscored by the results presented here. Unionization and advances in industrial labor productivity, which Gregory finds outpaced the advance in agricultural labor productivity growth, surely pushed up urban wages. Even before the drafts for the Russo-Japanese war, wages began an upward course that, over the entire period, represented an improvement of 69%. To be sure, famine, war, and revolution affected both seed planted, urban demand for grain, and harvest labor, making real wages especially volatile. Among the problems with the data is a failure to calculate for shifts in agricultural production in some areas toward crops, which were more

costly to cultivate, and onto new fields in frontiers. Annual fluctuations of output had primary effects on wages, and these are difficult to separate out.

Strumilin found sticky nominal wages throughout the period. Given the rate of economic growth, our more optimistic assessment seems appropriate. The wage gap was substantial. Nominal wages in the building trades in the St. Petersburg were on the average about 95% higher than in rural areas, a figure roughly equivalent gap to that observed in developing countries and in other countries experiencing industrialization in the nineteenth century, but well over well over that in the U.S. in the 1890s (Hatton and Williamson 1991, p. 382).

Agricultural wages responded to industrial wages. The explanation surely lies with the relatively unexplored facts of agricultural income. Technological improvements were extensive on the cultivated land of large landholding nobles, and according to the ethnographic surveys, smaller farms owned by peasants also exhibited flexibility in cropping patterns, the wider use of metal-tipped ploughs, and a shift to livestock husbandry in response to rising demand. The onset of a punishing competition with US wheat coincided with intense urbanization. The population as a whole increased from 1863 to 1897 by 53.3%, while the urban population nearly doubled. Domestic demand for meat, oil, and wool raised production from 1883 to 1900 of cattle, which increased by 41%. Wheat held its own, even against a three-fold rise in the output of potatoes in the southern frontier in the decade of the 1880s (Radtsig, 1896, p. 152). Shifts in relative prices due to exports led to the rapid emergence of barley among exports. Peasants near cities in the north sometimes left agriculture entirely and sometimes substituted labor- and fertilizer-intensive oil and fiber crops.

The fragility of the data encourages caution. Market segmentation reflects the relative immobility of agricultural labor during the early stages of industrialization. Even an adjustment of 17% upward in the agricultural wage to allow for the landlords' provision of board to rural workers does not remove a substantial gap. Yet the downward trend in this gap suggests the need to reassess the notion of diminishing returns to agriculture at that time.

Table I  
 Regression Results for Real and Nominal Agricultural Wages and  
 The Wage Gap with lag, 1885-1913  
 (t statistics in parentheses)\*

y/x Series	Cons	Coeff.	Coeff.	Rho	F	DW	Adj. R <sub>2</sub>
Batnom/ Cons. nom	-6.05 (-0.02)	-0.13 (-3.06)	-0.01 (-0.37)	1.00	71.19	1.99	0.89
Batnom/ Factory nom	-2.29 (-4.53)	1.30 (4.96)	0.16 (0.56)	.29	97.47	2.01	0.91
Batrl/ Factory real	3.15 (3.44)	0.42 (2.65)	-0.18 (-1.15)	0.70	9.30	2.04	0.48
Batnom/ Railroad nom	70.06 (2.71)	-17.60 (-4.10)	8.63 (1.97)	1.01	113.5	2.33	0.92
Batnom/ Avg. incl Railroad nom	6.75 (0.90)	-0.46 (-5.31)	0.11 (1.27)	0.98	121.3	2.02	0.93
Batrl/ Railroad Real	101.48 (4.57)	-3.57 (-0.76)	-4.66 (-0.99)	0.68	6.41	1.88	0.38

\*The authors acknowledge that the DW is biased upward with the lagged variable. The model used for this regression is (1)

$$\log y_t = a_0 + a_1 \log x_t + a_2 \log x_{t-1} + e_t$$

where  $y_t$  = the agricultural wage  $x_t$  = the urban/rural wage gap

Table II  
 Regressions of Coefficients of Variation of Wages on a Time Trend,

Real and Nominal Wage Variation in Russia, 1885-1913

y	Cons	Time Trend	R <sup>2</sup>	Mean
Series				
Construction/ Batrak nom	-.74 (3.75)	-0.004 (-2.25)	0.50	0.30
Factory/ Batrak nom	0.123 (13.69)	-0.0036 (-6.62)	0.61	0.07
Unskilled/ Batrak rl	0.61 (5.26)	-0.003 (-2.80)	0.52	0.29
Factory/ Batrak rl	0.09 (5.68)	-0.002 (-2.47)	0.35	0.06

Table III



Tests for the Unit Root  
Cointegrating Regression D. W. Statistics

Occupation	Factory (nominal)	Unskilled construction (nominal)	Factory (real)	Unskilled construction (real)
Batrak (non- blackearth) (nominal)	1.60			
Batrak (ng) (nominal)		.92		
Batrak (all) (real)			1.15	
Batrak (non- blackearth) (real)				1.02

\*The model for this test is (2).

$$\log(w_i/w_j)_t = b_0 + b_1 \log(w_i/w_j)_{t-1} + u_t$$

Table IV  
Error Correction Model for Rural/Urban Wage Gap in Russia  
1885-1913\*

(t statistic in parenthesis)

y=delta log of Batnom x=	Cons	Coeff.	Res(-1)	Adj. R <sup>2</sup>	Mean	DW
Unskilled nominal	0.007 (0.54)	0.92 (2.30)	-0.64 (-3.16)	0.33	0.02	1.85
Factory Real	0.008 (0.86)	0.71 (2.72)	-0.45 (-2.28)	0.22	0.01	1.95
Factory nominal	0.007 (0.69)	1.19 (4.35)	-0.65 (-3.34)	0.45	0.02	2.05

\*The model for this table is (3)

$$\Delta \log w_{it} = c_0 + c_1 \Delta \log w_{jt} + c_2 u_{t-1} + v_t$$

where  $u_t$  is the error term from the initial regression,  
(4)

$$\log w_{it} = d_0 + d_1 \log w_{jt} + u_t$$

Table V\*  
Temporary Rural Out-migration:  
Percent of Rural Population Engaged in Non-Agricultural Labor  
off the Estate

Guberniia	% Out-laborers	
	Males	Females
	1880--1892	
Petersburg (5 districts)	13.98	3.76
Smolensk (4)	13.65	1.46
Tver (12)	20.48	3
Nizhegorod (10)	15.71	
Riazan (12)	16.25	
Orlov (5)	14.1	.54
Voronezh (12)	6.89	.5
Kursk (14)	13.48	
	1893-1903	
Moscow (13)	37.81	8.04
Vladimir (13)	26.24	
Iaroslav (4)	28.46	2.12
Smolensk (2)	14.40	.6
Kaluga (3)	27.29	.49
Orlov (4)	11.68	
Voronezh (5)	9.07	.5
Poltava (15)	3.36	.92
Tavride (1)	2.92	1.44
Viatka (11)	13.46	.25

\*Ryndziunskii (1983), p. 108, data from A. M. and N. A. Svavitskie, *Zemskie podvornye perepisi, 1880-1913: Pouezdnye itogi* (Moscow 1926), pp. 45-54.

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### Appendix A

The following are calculations of agricultural transformation done by Tamara Izmetieva. The model is of structural transformation of output and export patterns during this period.

Yr	1	2	3	4	5	6	7	8	9	10	11	12
90	182	77	61	52	317	-	353	1054	227	544	2179	-
91	176	68	46	46	336	.81	287	791	196	434	1708	.48
92	82	12	44	20	158	4.7	539	947	279	473	2266	2.0

93	156	32	111	57	356	1.6	733	1167	449	676	3025	1.0
94	205	81	153	94	533	2.3	695	1351	364	676	3086	1.2
95	237	91	108	67	504	2.3	626	1215	328	649	2818	.26
96	220	79	82	68	448	0.9	606	1190	325	646	2767	.09
97	213	73	89	44	420	1.4	476	970	306	528	2280	.51
98	178	67	106	25	376	2.0	678	1107	398	556	2740	1.1
99	107	61	74	28	271	2.1	654	1365	290	805	3114	2.1
00	117	93	54	80	344	4.7	658	1402	309	720	3089	.61
01	138	83	78	80	379	1.7	667	1146	313	528	2654	1.3
02	186	98	104	33	452	1.8	932	1387	442	786	3547	.86
03	255	82	146	60	542	2.0	917	1364	466	645	3392	.80
04	281	60	152	54	547	1.3	1014	1516	452	944	3926	1.4
05	294	60	138	127	619	3.6	944	1099	450	755	3248	1.2
06	220	65	149	70	504	2.5	749	990	404	561	2705	.78
07	142	45	133	26	346	2.4	727	1200	457	728	3114	1.0
08	90	25	161	29	305	3.3	813	1176	488	740	3217	.52
09	314	35	219	75	644	4.6	1182	1360	622	946	4110	.9
10	374	40	245	84	744	0.3	1162	1308	603	856	3930	.29
11	240	54	263	85	642	2.7	743	1151	537	703	3134	1.3
12	161	30	169	52	412	0.5	1036	1568	606	862	4037	.74
13	203	39	240	37	519	1.8	1392	1507	741	980	4620	1.4

Variables:

1) export of wheat, 2) export of rye, 3) export of barley, 4) export of oats, 5) total export, 6) coefficient of structural shift of exports, 7) annual harvest of wheat, 8) annual harvest of wheat of rye, 9) annual harvest of barley, 10) annual harvest of oats, 11) total annual harvest, and 12) coefficient of structural shift of harvest figures.

Source: *Sbornik statistiko-ekonomicheskikh svedenii po sel'skomu khoziastvu Rossii i inostrannykh gosudarstv* (St. Petersburg, 1908-1916).

Model of structural shift:

$$s_{i+1} = \sqrt{s_{i+1}}$$

where  $i = 1, \dots, n-1$  and

$$S_{i+1} = \sum_{j=1}^k [W_{i+1, j} / W_{i, j-1}]^2 W_{i, j}$$

n = number of years k= number of components  $W_{i,j}$  weight of j component in i year  
 See L. S. Kazinetz, *Izmerenie strukturnykh sdvigov v ekonomike* (Moscow, 1969), p. 83.

## Appendix B

### Destination of Wheat Transported in Russia, 1897-1900\*

Year	% of wheat transported for internal destination	% of wheat transported for export
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1897	30.1	69.9
1898	37.1	62.9
1899	60.3	37.7
1900	57.6	42.4

\*Source: see above.

### Appendix C

Series Names for Figures 1-5:

WGCUBN	Nominal Wage Gap --Unskilled construction labor and Batrak
BATN	Batrak Nominal Wage
BATMR(MLRL)	Batrak Male Real Wage
FACR(L)	Real Wage -- Factory labor
WGFBN	Nominal Wage Gap --Factory labor and Batrak
WGFR	Real Wage Gap -- Factory labor and Batrak
WGCON24R	Real Wage Gap --All construction labor deflated by Kokhn Index

