Wage Determination In Rural Russia: A Stochastic Frontier Model

Constantin Ogloblin and Gregory Brock, Georgia Southern University

The paper examines the structure of Russia's rural wages at the end of the first decade of transition using data from a nationally representative household survey. The stochastic frontier model is applied to obtain consistent wage equation coefficient estimates and capture labor market imperfections that are found to be an essential factor of wage determination. Mean hourly wages do not differ by gender, but women's greater endowments in human capital suggest possible discrimination. The wage structure is highly gender specific. Education yields significant returns for women, while for men experience is more important. Local cost of living is a major determinant of wages. Workers' private plots exert significant influence on the rural labor market.

1. Introduction

While much has been written about wages in the Russian transition economy (e.g. Brainerd, 1998 and 2002; Ogloblin, 1999; Newell and Reilly, 1996 and 1999; Reilly, 1999), the idiosyncrasies of rural wages are studied to a much lesser degree. What are the returns to human capital in rural Russia? Is there a gender pay gap and how different are male and female wage structures? How do wages in agriculture compare with other industries? What other factors determine Russia's rural wages? Do Russian rural workers receive economic rent? Our study attempts to answer these questions. We examine the structure of Russia's rural wages at a later stage of transition, when the mass privatization program had been completed, new wage setting practices established, and the economy was recovering from a financial crisis resulting from the delusions of the early hectic reforms.

We model and analyze Russia's rural wages using the stochastic frontier technique. Since originally proposed in 1977 (e.g. Aigner et al., 1977), the method has been extensively used to analyze production and cost efficiency. Recently the method has also been applied to modeling the wage structure in imperfect labor markets (Hofler and Murphy, 1992; Hofler and Murphy, 1994; Hofler and Polachek, 1985; Polachek and Yoon, 1987; Polachek and Yoon, 1996; Polachek and Robst, 1998). We argue that the stochastic frontier regression properly models Russia's rural labor market which is characterized by significant imperfections.

The paper contributes to the literature in three ways. First, it sheds light on Russia's rural wage structure which is neglected in the literature. Second, it is the first study of a transition labor market that applies and tests the stochastic frontier method. Third the inefficiency term in the stochastic frontier wage equation is usually attributed entirely to imperfect information (ignorance) in the labor market (e.g., Hofler and Polachek, 1985). We extend this interpretation by taking into consideration other labor market imperfections that may contribute to this term, such as market power and efficiency wages, and amend the frontier wage model accordingly.

2. Methodology

As demonstrated in the literature (Polachek and Yoon, 1987 and 1996), the reduced form of the wage equation derived from the supply and demand model in a perfectly competitive labor market can be expressed as

$$W_{if}^{p} = X_{if}' B + v_{if} \quad (1)$$

where W_{if}^{p} is worker i's wage in firm f, X_{if} is a vector of wage determining factors, which have worker and firm components, B is a vector of coefficients that reflect marginal effects of wage determining factors, and v_{if} is a random disturbance distributed as $N(0, \sigma_v^2)$. In the model, the worker components include human capital and other productivity characteristics of the worker—which influence both the worker's labor supply and the firm's demand—and other worker characteristics that determine the opportunity cost of the worker's time such as opportunities for income outside the labor market influencing the worker's labor supply. The firm components include characteristics that influence labor productivity at the firm and hence the firm's demand for labor.

Theory also shows various labor market imperfections cause the actual wage to deviate systematically from the perfectly competitive level. In particular, when a firm seeks to hire a given quality worker, full information about the worker's reservation wage (i.e. the minimum wage that the worker will accept) is unknown and the firm therefore is likely to end up paying more than necessary to keep a worker employed or to hire a worker of the same quality but with a lower reservation wage. Other reasons for the actual wage to deviate upward systematically from the competitive level frequently mentioned in the literature are efficiency wages (i.e. wages paid above the market clearing level to stimulate work effort and/or reduce shirking) and workers' market power resulting in economic rent. Thus, a worker's wage determination may be described as follows:

$$W_{if}^{a} = X_{if}' B + u_{if} + v_{if} \quad (2)$$

where W_{if}^{a} is worker i's actual wage in firm f, and u_{if} is a non-negative random disturbance, which is assumed to be distributed as $N(m_{if}, \sigma_u^2)$ truncated at zero.

To analyze what causes systematic deviation of actual wages from the level determined by a perfectly competitive market, we decompose the mean of disturbance term uif as follows:

$$m_{if} = Z_{if}' D\,, \quad (3)$$

where Z_{if} is the vector of worker and firm characteristics and D is the vector of parameters that show how the "Z" variables influence the gap between the actual wage and the perfectly competitive wage level (we call it the "wage markup"). If the coefficient is positive, then the "Z" variable is contributing to the markup, if it's negative, then the variable and the wage markup are inversely related.

This is essentially a variant of the stochastic frontier model widely used to estimate production and cost efficiency. The model described by equations (2) and (3) is the wage equation analogue of the Battese and Coelli (1995) production frontier specification (with the reverse sign of the u term). This equation can be estimated by maximum likelihood using the cost-function analogue of the log-likelihood function presented in Battese and Coelli, 1993.

Following Battese and Corra (1977), we replace σ_v^2 and σ_u^2 with $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and define $\gamma = \sigma_u^2 / \sigma^2$, where $0 \le \gamma \le 1$. The γ parameter shows whether or not the wage markup is an essential factor of wage determination. If γ is statistically different from zero, then labor market imperfections are significant and the wage equation cannot be consistently estimated by OLS, so the u term should be included.

3. The sample

The study is based on the data drawn from Phase II of the Russia Longitudinal Monitoring Survey (RLMS), a household-based nationally representative survey designed to measure systematically the effects of Russian reforms on households and individuals. Carefully designed by an interdisciplinary partnership of leading Russian and American experts, the survey is of exceptionally high quality for a country undergoing such dramatic upheaval.[1] The study uses two rounds of the survey, Round 8 (data collected in October 1998 – January 1999) and Round 9 (data collected in September – December 2000). From the individual questionnaire datasets we selected adult, working-age respondents (men aged 18-59 and women aged 18-54) who lived in rural RLMS sites. Additional variables and site identifiers were obtained by matching the individual datasets with the household and community datasets.

The RLMS data show that wage employment plays a very important role in rural Russia (Table 1). In both 1998 and 2000, labor force participation rates in rural and urban areas are about the same. The wage employment rate is somewhat higher in urban sites, but this is only because the unemployment rate is higher in rural areas. But in both years the percentage of wage employed in total employment is higher and other forms of employment play a less important role in rural than in urban areas. In rural Russia, more than 90% of the employed working age population works for a wage.

Table 1. Labor Force Participation and Employment in Russia [a]

	1998		2000	
	Rural	Urban	Rural	Urban
Labor force participation rate, % [b]	83.0	84.8	82.0	84.1
Unemployment rate, %	24.9	15.6	22.3	12.9
Wage employment rate, % [c]	69.3	75.8	71.1	76.5
Wage employment, % of total employment [d]	92.3	89.8	91.6	87.8

[a] Calculated from the RLMS data, Rounds 8 and 9 for women aged 18-54 and men aged 18-59.

[b] Calculated using the ILO definition of unemployment.

[c] Percentage of labor force that worked for an enterprise, organization, collective farm, state farm, or cooperative (including those on maternity or childcare leave).

[d] Other forms of employment include farmers, entrepreneurs, and other self-employed.

To examine wages, we selected respondents who worked for an organization which they did not own (i.e. those who were truly wage employed). Overall, almost 40% of rural workers are employed in agriculture and supporting activities. But the industrial distribution of wage employment is remarkably gender specific in both 1998 and 2000. For both men and women, agriculture is the biggest employer. However, industrial gender segregation is fairly visible and follows the traditional Russian stereotypes, with women gravitating to health care, edu-

[1] Detailed project descriptions including the sampling techniques and the RLMS datasets are available from http://www.cpc.unc.edu/projects/rlms/rlms_home.html.

cation, and personal services while men gravitating to agriculture, manufacturing, construction, and transportation (see Ogloblin 1999).

4. The wage equation

All variables included in the wage equation are defined and described in Table 2. The dependent variable is the natural logarithm of the hourly wage calculated as the average monthly wage after taxes received by a respondent from his/her primary place of employment[2] during the last 12 months before the interview divided by the respondent's usual monthly hours worked.[3]

Consistent with the human capital theory, our X vector in (2) includes a set of dummy variables reflecting workers' level of education, labor market experience and on-the-job training. We complement these variables with the respondents' self-estimate of the level of skill they have achieved in their profession. Industry and occupation dummies are included to capture job-specific characteristics.

Table 2 .Variable Definitions and Descriptions

Variable		Men		Women	
		Mean	St. dev.	Mean	St. dev.
wageh	log average hourly wage during the last 12 months	2.488	0.831	2.557	0.753
round	1 if the year is 2000	0.537	0.499	0.549	0.498
eduinc	1 if education is incomplete secondary or below	0.284	0.451	0.098	0.297
eduvoc	1 if education is secondary with vocational training	0.265	0.442	0.181	0.385
eduspe	1 if education is specialized secondary	0.106	0.308	0.339	0.474
eduniv	1 if a respondent has a college/university degree	0.099	0.299	0.170	0.376
otjtrn	1 if had on-the-job-training in the last 2-3 years	0.068	0.251	0.094	0.292
exper	total years of labor market experience	18.714	10.820	17.832	9.366
expersq	$exper^2/100$	4.671	4.327	4.056	3.322
skills	self-estimate of the level of skills on a scale of 1 to 9	5.922	1.997	5.688	2.007
ocmngr	1 if manager	0.035	0.183	0.054	0.227
ocprof	1 if professional	0.066	0.248	0.210	0.408

[2] Since less than 3% of rural workers reported a second job, the influence of secondary wage employment on our results is not likely to be significant.

[3] In both the monthly wages and hours worked are trimmed by 1% from above and from below to exclude outliers.

Variable		Men		Women	
		Mean	St. dev.	Mean	St. dev.
octech	1 if associate professional or technician	0.026	0.159	0.246	0.431
occlrk	1 if clerk	0.016	0.124	0.116	0.320
ocsrmr	1 if service/market worker	0.043	0.204	0.098	0.297
occrft	1 if craft or related trade	0.237	0.426	0.031	0.173
ocoper	1 if operator or assembler	0.451	0.498	0.040	0.196
inmanf	1 if employed in manufacturing	0.094	0.292	0.058	0.234
inconst	1 if employed in construction	0.083	0.276	0.011	0.104
intrans	1 if employed in transportation	0.078	0.268	0.024	0.152
intrsrv	1 if employed in trade and consumer services	0.035	0.183	0.085	0.279
inhsmn	1 if employed in housing and municipal services	0.059	0.236	0.029	0.168
ineduc	1 if employed in education	0.042	0.200	0.232	0.422
inhealth	1 if employed in health care	0.019	0.137	0.138	0.345
inpadm	1 if employed in government, public administration	0.010	0.102	0.049	0.216
inprsrv	1 if employed in police, fire, armed forces	0.055	0.229	0.007	0.085
inother	1 if employed in other industry	0.040	0.196	0.087	0.282
inindt	1 if industry is indeterminate	0.023	0.149	0.014	0.120
cstliv	log cost of the national consumer basket in the PSU	6.985	0.279	7.000	0.286
land	log the amount of land (*sotkas*) that a respondent has	2.447	1.089	2.317	1.121
nkids	number of children under 18 years old in the household	1.113	0.982	1.161	1.021
frmpriv	1 if employed at a private firm	0.132	0.338	0.091	0.287
frmixed	1 if employed at a firm with mixed ownership	0.080	0.271	0.049	0.216
frmindt	1 if ownership of the firm is indeterminate	0.232	0.423	0.147	0.354
tenure	years of tenure with the current firm	7.870	8.514	8.442	8.087
powrnk	self-estimate of power in society on a scale of 1 to 9	3.189	1.728	3.216	1.692
locun	PSU unemployment rate	22.751	10.684	22.870	10.320
ctfnjb	1 if certain to find work if the organization closes	0.172	0.377	0.098	0.297

Workers' reservation wages are also influenced by the cost of living. We have used the RLMS data to calculate a national consumer basket that includes 25 main food items bought by a typical Russian household in 2000. Then we have calculated the cost of this food basket for each PSU. The differences in the cost of living across PSUs are substantial. The cost of the food basket varies from 723 to 1228 rubles in 1998 and from 1175 to 1993 rubles in 2000. We include the natural log of this variable in vector *X*.

Another factor that is likely to influence the reservation wage in rural areas is workers' private plots. Even during the Soviet era people in rural Russia used private plots as a supplementary source of subsistence and income. In our sample, more than 90% of the respondents used land with the average size of the plot of 20 *sotkas* (0.5 acres). We hypothesize that workers who have a bigger private plot will accept a lower wage. The wage is not the only motivation for rural workers to seek formal employment. Other benefits include a continuous official employment record that guarantees a state pension and social benefits provided by the organization. Also, rural workers often take advantage of their access to the firm's inputs and outputs to use on their private plots. And the bigger the worker's private plot, the more important those other benefits of formal employment are relative to the wage. To test this hypothesis, we include the log of the amount of land used by the household in vector *X*.

We include the number of children in the family as a vector *X* variable to see whether this factor influences the reservation wage. A factor whose influence on the reservation wage is often analyzed in the literature is unemployment benefits. In rural Russia, however, unemployment benefits exist only on paper. According to the RLMS, only 3.6% of unemployed rural workers received unemployment benefits in 1998 and only 1.1% received them in 2000.

In vector *Z* we have attempted to capture the factor responsible for the wage markup. First, we included dummy variables for the firm type. Wages paid by state owned firms, which have a softer budget constraint, are more likely to contain economic rent in the form of hidden social benefits than are wages paid by private firms. On the other hand, private employers are more interested in their workers' productivity and hence are more likely to pay efficiency wages. Thus, the sign of the private firm dummy coefficient shows which of the two influences on the wage markup prevails.

Four *Z*-variables proxy for employee market power, which is likely to be directly related with the worker's tenure with the firm, his/her power rank in society, certainty to find work no worse than his/her present job if the organization where he/she currently works for some reason closes and inversely related to the local rate of unemployment. In developed countries' labor markets, employee market power is usually associated with labor unions. However, as Gimpelson and Lippoldt (2001) note, Russian unions have little influence in general, and in rural areas they are even less likely to play any role in the process of wage determination.

5. Results

Descriptive statistics in Table 2 show no significant gender wage differential. It is worthy of note, however, that rural female workers are by far better educated than their male counterparts. Among wage employed women, 50.9% have specialized secondary or higher education, with 17% holding a university degree, while for men these percentages are only 26.4 and 9.9 respectively. That is, despite their better human capital endowments, women are paid about the same average hourly wage as are men. Whether or not this is a result of employer discrimination by gender is a subject of a separate study currently being done.

To explore the effects of worker and firm characteristics on the wage level, we initially estimated an OLS wage equation with the X-vector variables as regressors separately for 1998

and 2000. An *F*-test showed that the coefficients in the 1998 equation are not significantly different from those in 2000 (we failed to reject the null hypothesis even at the 30% confidence level). For the pooled 1998 and 2000 sample, however, we concluded that the regression coefficients are significantly gender specific (the null hypothesis was rejected with a 99% confidence). Hence, we pool years 1998 and 2000 but estimate our wage equation separately for men and women. The stochastic frontier equation is estimated by maximum likelihood using the program Frontier 4.1.[4] The stochastic frontier and OLS estimates, are shown in Table 3.

Although the OLS coefficient estimates are not very different from the frontier estimates, the γ parameter is significant for both genders, which supports our hypothesis that labor market imperfections are an essential factor of wage determination, and hence the model described by equations (2) and (3) is the true model that should be used to analyze the structure of Russia's rural wages. Hence, the further analysis focuses of the frontier equation results.

Table 3. Wage Equation Estimates [a]

	OLS		Frontier	
	Men	Women	Men	Women
Vector *X* coefficients:				
constant	-10.020 (1.724)***	-11.268 (1.475)***	-9.351 (1.542)***	-9.969 (1.191)***
round	-0.374 (0.143)***	-0.442 (0.126)***	-0.747 (0.159)***	-0.487 (0.109)***
eduinc	-0.164 (0.073)**	-0.026 (0.092)	-0.189 (0.072)***	-0.032 (0.088)
eduvoc	-0.039 (0.072)	0.149 (0.075)**	-0.055 (0.073)	0.119 (0.072)*
eduspe	-0.017 (0.100)	0.192 (0.072)***	-0.029 (0.096)	0.207 (0.070)***
eduniv	0.178 (0.130)	0.452 (0.096)***	0.180 (0.124)	0.457 (0.091)***
otjtrn	0.186 (0.104)*	0.252 (0.082)***	0.159 (0.101)	0.233 (0.077)***
exper	0.033 (0.010)***	0.006 (0.010)	0.032 (0.010)***	0.011 (0.009)
expersq	-0.074 (0.024)***	-0.015 (0.028)	-0.064 (0.025)**	-0.027 (0.027)
skills	0.004 (0.015)	0.042 (0.013)***	0.007 (0.015)	0.038 (0.013)***
ocmngr	0.594 (0.180)***	0.093 (0.119)	0.596 (0.178)***	0.083 (0.114)
ocprof	0.591 (0.159)***	0.524 (0.103)***	0.607 (0.152)***	0.544 (0.095)***
octech	0.574 (0.180)***	0.214 (0.083)**	0.603 (0.168)***	0.218 (0.078)***
occlrk	0.532 (0.220)**	0.167 (0.094)*	0.560 (0.209)***	0.180 (0.089)**
ocsrmr	0.146 (0.182)	-0.020 (0.109)	0.226 (0.177)	-0.019 (0.103)
occrft	0.251 (0.092)***	0.132 (0.167)	0.236 (0.090)***	0.072 (0.162)
ocoper	0.365 (0.084)***	0.205 (0.140)	0.369 (0.084)***	0.224 (0.132)*
inmanf	0.690 (0.095)***	0.403 (0.122)***	0.678 (0.093)***	0.358 (0.119)***

[4] Available from http://www.une.edu.au/econometrics/cepa.htm.

inconst	0.830 (0.099)***	0.748 (0.251)***	0.804 (0.097)***	0.860 (0.228)***
intrans	0.706 (0.101)***	0.698 (0.162)***	0.670 (0.101)***	0.715 (0.159)***
intrsrv	0.651 (0.147)***	0.149 (0.111)	0.508 (0.146)***	0.135 (0.105)
inhsmn	0.973 (0.113)***	0.230 (0.150)	0.919 (0.111)***	0.298 (0.137)**
ineduc	0.206 (0.142)	-0.042 (0.081)	0.190 (0.135)	0.010 (0.077)
inhealth	0.151 (0.194)	-0.098 (0.089)	0.074 (0.190)	-0.026 (0.084)
inpadm	0.663 (0.264)**	0.270 (0.118)**	0.667 (0.262)**	0.299 (0.109)***
inprsrv	1.083 (0.151)***	0.247 (0.278)	1.029 (0.149)***	0.337 (0.250)
inother	0.546 (0.135)***	0.294 (0.096)***	0.540 (0.128)***	0.330 (0.089)***
inindt	0.350 (0.174)**	0.022 (0.197)	0.325 (0.165)*	-0.142 (0.194)
cstliv	1.716 (0.257)***	1.928 (0.219)***	1.598 (0.227)***	1.699 (0.178)***
land	-0.076 (0.025)***	-0.076 (0.022)***	-0.064 (0.025)**	-0.056 (0.021)***
nkids	-0.047 (0.029)	-0.011 (0.025)	-0.039 (0.029)	-0.003 (0.024)
Vector Z coefficients:				
constant	—	—	-1.789 (2.753)	-4.148 (2.049)**
round	—	—	2.564 (2.709)	2.397 (1.004)**
frmpriv	—	—	0.126 (0.128)	2.266 (0.957)**
frmixed	—	—	0.155 (0.154)	1.025 (0.516)**
frmindt	—	—	-0.475 (0.209)**	0.877 (0.387)**
tenure	—	—	-0.027 (0.011)**	0.041 (0.016)***
powrnk	—	—	-0.007 (0.029)	0.089 (0.051)*
locun	—	—	-0.007 (0.005)	-0.049 (0.025)*
ctfnjb	—	—	0.023 (0.112)	0.824 (0.270)***
N	577	552	577	552
R^2	0.499	0.528	—	—
F/LR-ratio	18.15***	19.40***	24.60***	42.76***
σ^2	—	—	0.442*** (0.054)	1.268*** (0.672)
γ	—	—	0.363*** (0.111)	0.839*** (0.093)
Markup [b]	—	—	1.442	1.337

[a] Standard errors are in parentheses. Factor baselines are general seconadary education, unskilled ocupation, agriculture, and state owned firm.

[b] Calculated as $\sum_{i=1}^{N} \exp(u_i) / N$.

* Statistically significant at the 0.1 level; ** at the 0.05 level; *** at the 0.01 level.

Returns to education have distinctly gender specific patterns. For men, education is important only as far as secondary education is complete. Further education yields insignificant

returns. For women, returns to education follow a classical pattern predicted by human capital theory. A university degree brings a wage premium of 45.7 log percentage points (57.9%) compared to general secondary education and the returns to specialized secondary and vocational with secondary education are lower (20.7 and 11.9 log percentage points or 23.0 and 12.6% respectively) but still statistically positive.

These patterns of returns to human capital may be explained by the fact that women tend to work in industries and occupations where education is valuable, while men tend to take less human capital intensive jobs. As shown in Table 3, such human capital intensive industries as health care and education account for 37% of wage-employed women and only 6.1% of men. And 45.7% of women are professionals or technicians, while for men this percentage is only 9.2%. Such patterns of employment are consistent with those found by Ogloblin (1999) for Russia as a whole in 1994-96, but for rural Russia they appear even more pronounced. For the same reason, on-the-job training yields significant returns for women, but not for men.

The human capital factor that is important for men is experience. The marginal effect of experience on men's wages is significantly positive for the first year and decreases with experience (the second derivative of *wageh* with respect to years of experience is significantly negative). This typical concave experience-wage profile reaches its maximum at about 25 years. For women, the experience-wage profile is much flatter and statistically indeterminate. This supports the hypothesis that Russian rural men are mainly doing jobs where higher productivity and wages are achieved through experience and physical effort, rather than through formal education and training.

The occupation dummy coefficients give further support to this hypothesis. For instance, men who are in craft and related occupations get significantly higher wages than unskilled workers, whereas for women this is not the case. Also, while the male managers' wage premium is significant and close to that received by professionals, the female managers' premium is not statistically different from zero. This is probably because women hold mostly lower level managerial positions, whereas men tend to be senior managers. In our sample, for instance, about 19% of male managers are directors and chief executives, while for female managers this figure is less than 6%. Such a pattern was typical in the past for Russia in general (McAuley 1981, Katz 2001).

The industry wage differentials are also significant. The earnings in industries that pay wages from their sales revenues (such as manufacturing, construction and transportation) are generally far higher than in the industries that are largely financed from the state budget (such as health care and education). There are, however, notable exceptions.

First, the negative wage differential between agriculture and other revenue earning industries is large and significant, suggesting that the labor productivity in agriculture is substantially lower. This is consistent with the literature that views Russia's agriculture as a traditionally inefficient sector of the economy, where the misconceptions of the economic reform have been especially destructive, causing decapitalization, downsizing, and fragmentation, which has led to productivity deterioration (see Factor Markets in Russia's Agri-Food Sector, 2002). Apparently, human capital has also drained from agriculture, seeking greater returns in other industries. According to the RLMS data, only 5.1% of the employed in agriculture have a university degree while 26.2% have incomplete secondary education at most. In the rest of the rural economy the respective figures are 14.4 and 18.7%.

Second, within the budgetary sphere, where wages and salaries are constrained by the state budget rather than revenues from sales, government employees have a definite advantage

over the workers employed in health care and education. Given that these wage differentials are essentially marginal effects of industry in the wage equation that controls for human capital and other worker productivity related characteristics and that the RLMS data show no apparent differences in human capital endowments between the government employees and the rest of the budgetary sphere, we can conclude that instead of reflecting productivity, wage setting in the budgetary sector is mainly influenced by government policies, which give a high priority to the government's own employees at the expense of health care and education. That is, state and local budget constraints hold back wages in health care and education, but not in public administration and protective services, where wages are comparable with those in the revenue earning sector.

Finally, interestingly enough, in trade and services men's wages are comparable with those in other nonagricultural revenue earning industries, whereas women's wages are not significantly different from those in agriculture. This is probably because women employed in trade and services are typically shop or stall sellers, while men are typically doing jobs similar to those in other industries (e.g., craft worker, driver, machinery operator).

As expected, rural workers' reservation wages are strongly positively influenced by the cost of living in the PSU. The cost-of-food-elasticity of wage is about 1.6 for women and 1.7 for men, which suggests that differences in food prices signify even greater differences in the general price levels. The significantly negative coefficients of the variable *round* in Table 3 show that, given the cost of living and other factors controlled for in the wage equation, the hourly wage fell substantially in 2000 compared to 1998: by 74.7 log percentage points (52.6%) for men and 48.7 log percentage points (38.6%) for women.

The significant negative coefficients of the *land* variable support our hypothesis that rural workers with bigger private plots will accept a lower wage. The more land a worker has in use, the less important his or her wage is relative to other benefits from formal employment, such as the official employment record that influences the state pension, social benefits provided by the organization, and perhaps also access to the firm's inputs and outputs.

Our results don't show any significant influence of number of children in the family on workers' reservation wages. Apparently, benefits for children work fairly effectively to compensate households that have lower income per person resulting from a greater number of children. In our sample, 86% of respondents who had children under 18 in the family reported that they were entitled to receive children's benefits and the average amount of monthly benefits received was 32% of the average monthly wage.

The wage markup coefficients in Table 3 show that the average wage of a male rural worker is 44.2% above its perfectly competitive level, and for a female worker the markup is 33.7%.[5] In 2000, women's wage markup is significantly greater than in 1998. In the male equation, none of the variables included in the *Z*-vector significantly influences the wage markup except tenure with the current employer that is negatively related.

Tenure with the firm may influence the wage markup in two ways. First, the longer the tenure, the more information the employer has about the employee and hence the smaller the average gap between the actual wage and the wage that employer would have paid to a given

[5] Although part of this markup may come from unobserved worker heterogeneity, this is not likely to alter our results significantly. Polachek and Robst (1998) show that stochastic frontier estimates provide a reasonable measure of imperfect wage information, even though their wage equation is less well fitted than ours. Using the pooled 1998 and 2000 sample is likely to further reduce the unobserved heterogeneity contamination (Polachek and Yoon, 1996). Unobserved heterogeneity is even less of a problem when we compare wage markups for men and women since it is not likely to differ depending on gender.

quality worker, had employer's information about the worker been perfect. Second, employees with longer tenure are likely to be more influential, i.e. have more bargaining power, and hence can extract more economic rent. For men, the information factor is apparently dominant.

In the female equation, however, tenure and the wage markup are directly related, implying that for women the bargaining power is the dominant factor. This may be explained by the fact that among women the percentage of managers and professionals is relatively high (24.6% compared to 8.4% for men) whereas most men (83.2%) are craft workers, operators, or unskilled laborers.[6] Managers and professionals are more likely to gain influence with tenure than are blue collar workers. The fact that respondents' self reported power ranking significantly positively influences the wage markup for women but is insignificant for men supports this reasoning.

In the same way, women who are certain to find work no worse than their present job if the organization where they work closes enjoy a significantly higher wage markup, while for men this factor is insignificant. This goes along with the significantly higher wage markup for women who work for private and (to a lesser degree) mixed firms. Private employers apparently try to attract women, whose percentage in the private and mixed sectors is lower than that of men (see Table 2), by paying efficiency wages, which outweigh hidden social benefits that state organizations are likely to pay. For men this is not the case.

Women's wage markup is negatively related with the local unemployment rate since higher unemployment puts pressure on workers, lowering their willingness and ability to seek economic rent. For men this effect is not significant.

6. Conclusions

Wage employment plays a very important role in rural Russia, with more than 90% of the employed working age population working for a wage. Almost 40% of rural workers are employed in agriculture, which is the biggest employer for both men and women. Industrial and occupational distribution of employment in rural Russia is profoundly gender specific, with women supplying most of the human capital and men employed mainly as blue collar workers. This leads to a very gender specific wage structure.

The mean hourly wages show no gender pay differential, but given women's greater endowments in human capital, hidden pay discrimination against women is likely to exist, which calls for a special study of the gender earnings differential in rural Russia. For women, education is a major influence on wage. Particularly, a university degree raises the wage by 57.9% compared to general secondary education. For men, education higher than general secondary brings no significant return. Russian rural men are mainly doing jobs, where higher wages are achieved through experience and physical effort rather than through formal education and training.

The estimated industry wage differentials show that wages in revenue earning industries, except for agriculture, are significantly higher than those in the non-government budgetary sphere. In agriculture, where the misconceptions of the economic reform have been especially destructive and have led to a drain of human capital, wages are much lower than in other revenue earning industries. In the budgetary sphere, government wage setting gives

[6] The percentages are calculated from the RLMS data, Rounds 8 and 9 for working age, wage employed rural workers.

significant preferences to government employees over those employed in health care and education.

Cost of living, measured by the local food price level is a major determinant of Russia's rural wages. For both genders wages are cost-of-food elastic. But the level of wage is very low relative to the workers' subsistence level. An average rural worker's monthly wage is only enough to buy 45.5% of the monthly food basket that includes 25 main items bought by a typical household.[7] And the situation is getting worse. Despite Russia's recovery from the financial crisis, the hourly wage of rural workers, especially men, controlled for the cost of living and other variables in the wage equation, fell substantially in 2000 compared to 1998.

Of course, rural workers are also likely to get food and money income from their private plots. Examining the role of this and other non-wage sources of income in detail is beyond the scope of this study. However, our finding that workers with bigger private plots accept lower wages suggests that private plots exert significant influence on Russia's rural labor market. This finding also supports our hypothesis that non-wage benefits from formal employment, such as the official employment record, social benefits provided by the organization, and possibly access to the firm's means of production and products are important to rural workers.

We have also found that labor market imperfections are an essential factor of wage determination in rural Russia. The mean wage markup, i.e. the mean difference between a worker's actual wage and the perfectly competitive level of wage for the given quality worker, is 44.2% for men and 33.7% for women. This wage markup is explained by employer's imperfect labor market information and, in the case of female workers, also by economic rent on human capital and efficiency wages paid in the private sector.

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[7] Calculated from the RLMS data, Rounds 8 and 9 as the geometric mean ratio (monthly wage)/(cost of the food basket).

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