Do Wages Grow over Experience? Deciphering the Russian Puzzle

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The positive and concave relationship between log earnings and potential experience has been considered, starting probably from J.Mincer, one of stylized facts of labor economics. As Mincer wrote, "The basic features of the age profiles are easily summarized: except for the initial years of gainful activity, earnings are higher at higher levels of schooling, and increase with age through much of the working life. The absolute and, more consistently, relative rate of increase in annual earnings diminishes with age, becoming negative, if it changes at all, during the last decade of working life. There is no visible decline at these later ages in weekly earnings. Apparently, declines in weeks worked per year are the main factor in the decline of annual earnings during the preretirement years" (Mincer 1974). Neumark (1995) considered rising earnings over much of the life-cycle "one of the most robust findings in labor economics". Controversies related to the "Mincer" earnings equation have been limited to a few econometric estimation issues (Polachek 2006), including functional form for experience that would fit the data best and whether the best fitting function has changed over time (Murphy and Welch, 1990).

The consensus view has a well-established basis both in theory and in empirical work. On the theory side, as pointed out by Rubinstein and Weiss (2006) in their thorough review of the literature, virtually all well-established theories offer similar predictions regarding the shape of post-school wage growth. Both the human capital theory — the original source of inspiration for Mincer's work — and search and matching models come to similar predictions regarding the shape of the wage profiles over the lifecycle. The same is true of models with deterred remuneration in which employers take time to learn about the true ability of workers.

On the empirical side, almost all evidence on wage growth profiles have overwhelmingly verified the early findings of an increasing and concave relationship between earnings and age or experience (Rubinstein and Weiss, 2006; Hutchens 1989; Johnson and Neumark 1996; Myck, 2010; Paccagnella, 2016, among many others). However, most (if not all) studies have focused on a few rich and most developed countries. In addition, they have usually exploited cross-section

data. The recent study by Lagakos et al. (2018a) is probably the first that systematically compares life cycle wage growth across variety of countries, contrasting high-, middle- and low-income economies.

Russia and other transition countries have never been rigorously explored from this angle though their case can be very informative. It can highlight how human capital has been accumulated and utilized under different politico-economic regimes. There are multiple reasons to believe that wage profiles in these economies may have specific properties and that they differ from those in both advanced and developing economies.

There is some empirical cross-section evidence that wages in Russia peak early and then decline rapidly (Gimpelson 2019; Gimpelson and Zinchenko 2019). Another specific feature observed in the profiles in Russia is that they are extremely flat. As shown by Lagakos et al (2012), among all countries in their sample of developed and developing countries, Russia had the lowest height of profile at 20 years of potential experience, their measure of profile steepness. The value was way below that one predicted by the Russia's GDP per capita.

Observed patterns can be due to the early depreciation of human capital, not fully offset by new investments (the supply side explanation). Or it can be due to the fact that the stock of skills acquired during Soviet times is not in demand anymore. The mix of hard and soft skills generated and accumulated under the socialist regime could fit well the planning economy but is obsolete in the circumstances of the market economy.

One can conceptualize these reasons as the effect of experience and the cohort effect. Over their labor market *experience* individuals can acquire additional human capital in the form of productive skills and knowledge, but also their human capital depreciates over age due to properties of the human biology. Also, belonging to particular generations or *cohorts*, individuals absorb ideas, values, norms and skills of that time when they get educated, socialized and enter the labor market. When cross-sectional data is examined, the two effects are mixing. In longitudinal data, when one can track a particular cohort, the effect of experience is mixing with the *time* effect, the wage growth caused by technological progress or by any macro shocks. In data that combine multiple cohorts over time the three effects sum up. In the literature, this problem is known as the age-period-cohort or APC problem.

Since the APC forms an identity, to separate the path of human capital accumulation from the effects of time and cohort one needs to introduce additional assumptions constraining one of the components. In this paper we employ the method suggested by (Heckman et al. 1998) and employed by (Lagakos et al 2018). The method relies on the human capital theory (Ben-Porath

1967). According to it, human capital investments depend on the period over which individuals are going to gain returns. Closer to retirement age, the period of return shortens, thus disincentivizing further investments. Optimality suggests that in the final stage of ones' career investments into human capital would be zero and thus wage growth due to human capital accumulation would also be close to zero. Thus, the rest of the growth can be attributed to the sum of depreciation and time effects. The latter one is assumed to be the same for different cohorts and experience groups. Once one of the three effects is identified the other two can be easily separated.

Our analysis exploits the Russian Longitudinal Monitoring Survey of Higher School of Economics (RLMS-HSE) for the period of 2000-2019[1]. The RLMS is a series of nationally representative surveys that covers over time about 10 thousand adults in almost 5 thousand households. The baseline sample in the study consists of male full-time wage employees who satisfy a few criteria. They are 20 to 60 years old, have the length of work experience up to 40 years, are not currently enrolled in full-time educational institutions. See the descriptive statistics for the core variables in the baseline sample in the Table 1 below.

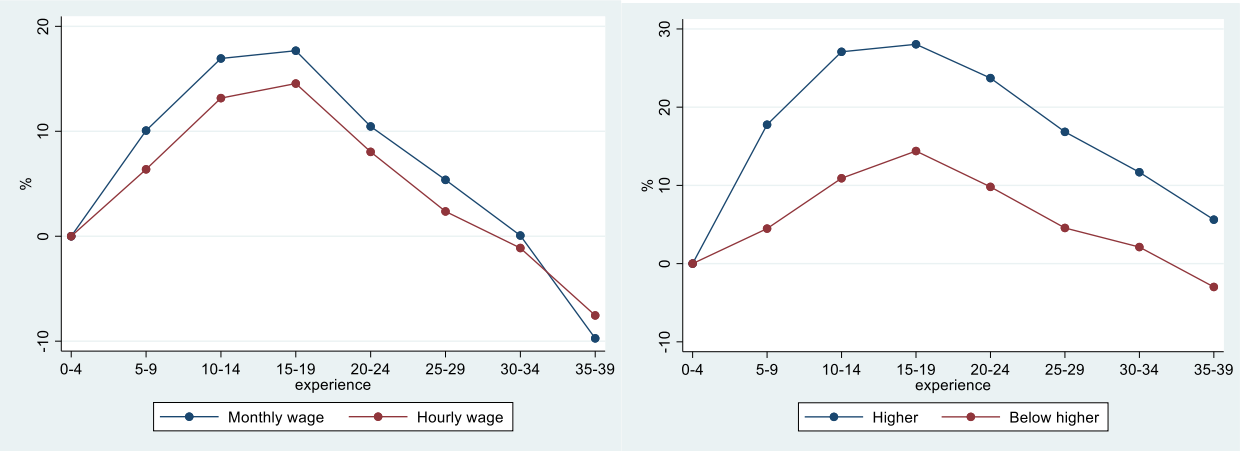
Table 1. Descriptive statistics

Variable	**Mean**	**SD**
Hourly wage (Rub in 2010 prices)	92.8	72.8
Education level		
Higher	23.4	0.5
Secondary professional and vocational	47.4	0.4
Secondary general and below	29.2	0.5
Potential experience (reported schooling)	19.8	10.8
Potential experience (predicted schooling)	19.9	10.6

Baseline results are obtained for hourly wages which are calculated from the self-reported earnings and hours of work during the last 30 days. The path of hourly wages is depicted over the 5-year potential experience bins. The potential experience is conventionally calculated as Exp = Age - Reported years of schooling – 6.

[1] https://www.hse.ru/en/rlms/

The “raw” (without controlling for other characteristics and without separating APC effects) profile on pooled data is flat and shows no significant increase in wages over the experience scale. (see Graph 1). The profiles peak early (at 15-19 years of experience) and decline steeply afterwards, so that the pre-retirement average wage happens to be below the starting level.



Graph 1. Left panel: Monthly and hourly wage growth over potential work experience compared to average wage at 0-4 years of experience.

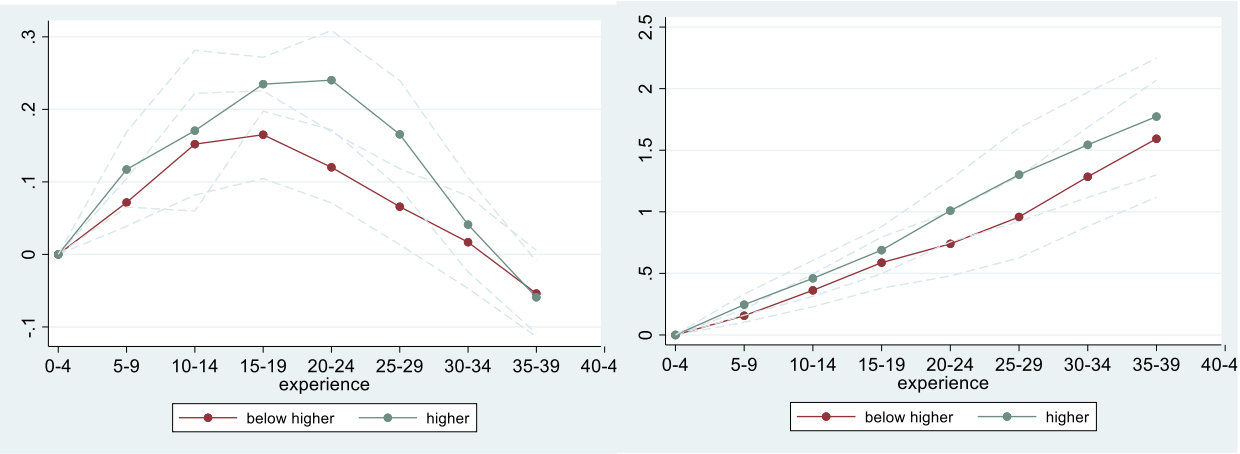
Right panel: Hourly wage growth over potential work experience compared to average wage at 0-4 years of experience for individuals with and without higher education.

Further, we would like to estimate separately the effect of human capital accumulation over experience. Ideally, this could be done by estimating an equation of the form (1):

$$\log w_{ict} = \alpha + \sum_{k=1}^{K} \theta_k exp_{kict} + \sum_{l=1}^{L} \delta_l educ_{lict} + \gamma_t + \lambda_c + \varepsilon_{ict}, \quad (1)$$

where w_{ict} - the wage of individual *i*, from cohort *c* in period *t*; exp_{kict} - 5-year bins of labour market experience of individual i from cohort c in period t, k=1…K; θ_k is the experience effect, k=1…K; $educ_{lict}$ – level of education of individual i from cohort c in period t, l=1…L; γ_t – period *t* effect, t=1…T; λ_c – cohort *c* effect, c = 1, …, (T + K – 2) cohorts; ε_{ict} – random error

Estimating (1) is not feasible because of the exact multicollinearity. If either time or cohort dummies are dropped, coefficients θ represent a mix of experience and cohort effects in the former and a mix of experience and time effects in the latter case (see Graph 2). The results without cohort dummies reproduce the shape of raw profiles above, while if time is not controlled for, wages monotonously increase over the entire career.



Graph 2. Hourly wage growth over potential experience. Left panel: Estimates of equation (1) without time dummies. Right panel: Estimates of equation (1) without cohort dummies.

The graph 2 suggests that a strong cohort effect exists and acts in the opposite direction relative the effect of experience. It offsets the latter, flattens the crude profile and decreases at older ages. On the other hand, the time effect appears to be strong too.

To apply the idea of (Heckman et al. 1998) for separating the APC effects we need to introduce a few assumptions. First, the wage growth driven by human capital investments during the final period of career is close to zero. Second, we may need to assume what could be the rate of amortization *d* and length of the non-investment period *y*. Let us briefly discuss the estimation procedure that we borrow from (Lagakos et al. 2018).

Consider time trend of the average wage growth g_M. It is equal to the sum of the time effect, g_γ, and g_λ - the change in total productivity due to change in the cohorts' composition of the labour force:

$$g_M = g_\gamma + g_\lambda \quad (2)$$

Given that, the iterative estimation goes the following way. First, the wages get deflated by the estimated time trend of wage growth, g_M. Second, the equation (3) is to be estimated:

$$\log w_{ict}^d = \alpha + \sum_{k=1}^{K} \theta_k exp_{kict} + \delta educ_{ict} + \gamma_t^* + \lambda_c + \varepsilon_{ict}, \quad (3)$$

Where w_{ict}^d is deflated wage of individual i, from cohort c in period t; exp_{kict} - 5-year groups of labour market experience of individual *i* from cohort c in period t, k=1…K; θ_k is the experience effect, k=1…K; $educ_{lict}$ – level of education of individual *i* from cohort c in period t, l=1…L; $\gamma *_t$ – transformed period *t* effects such that $\frac{1}{T}\sum_{t=0}^{T} \gamma_t^* = 0$, t=1…T; λ_c – cohort *c* effect, c = 1, …, (T + K – 1) cohorts; ε_{ict} – random error.

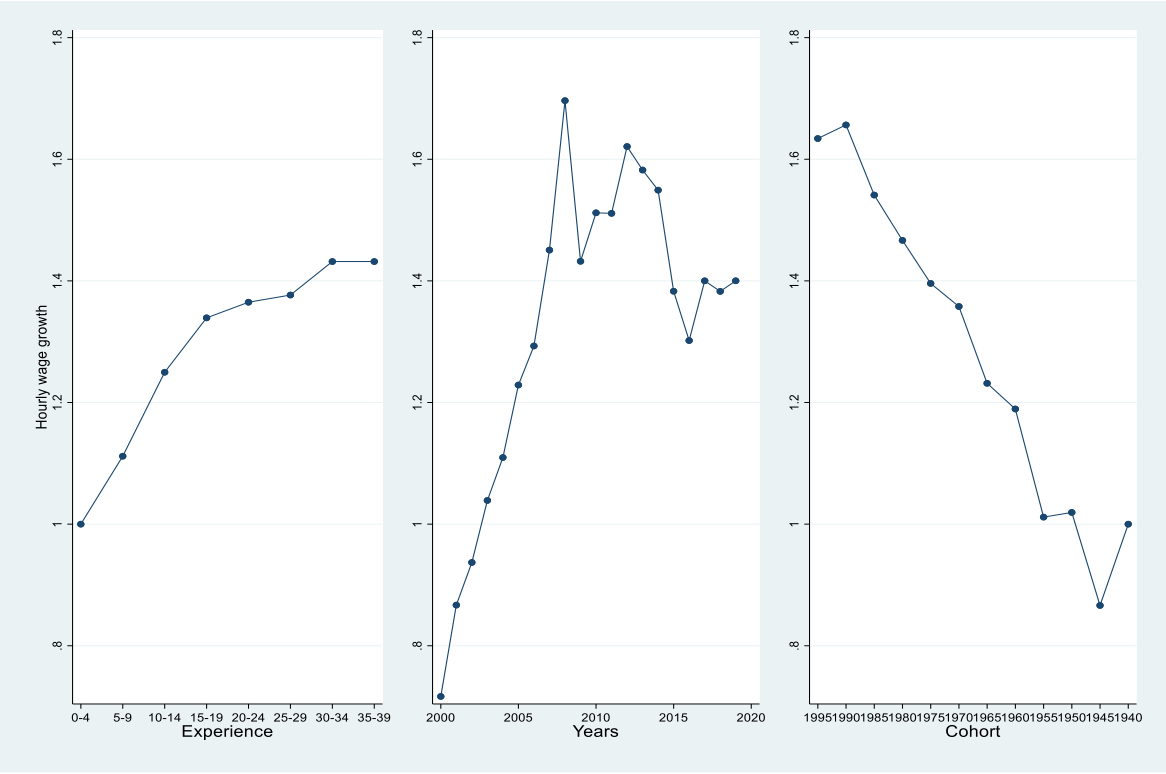
Estimates of the equation (3) give the average wage growth in the last y years of career. Let us define it as g_y. According to the assumption borrowed from (Heckman et al 1998), the observed growth g_y comes from the time effect and depreciation. So, the equality (4) should hold:

$$g_M = d + g_y + g_\lambda \quad (4)$$

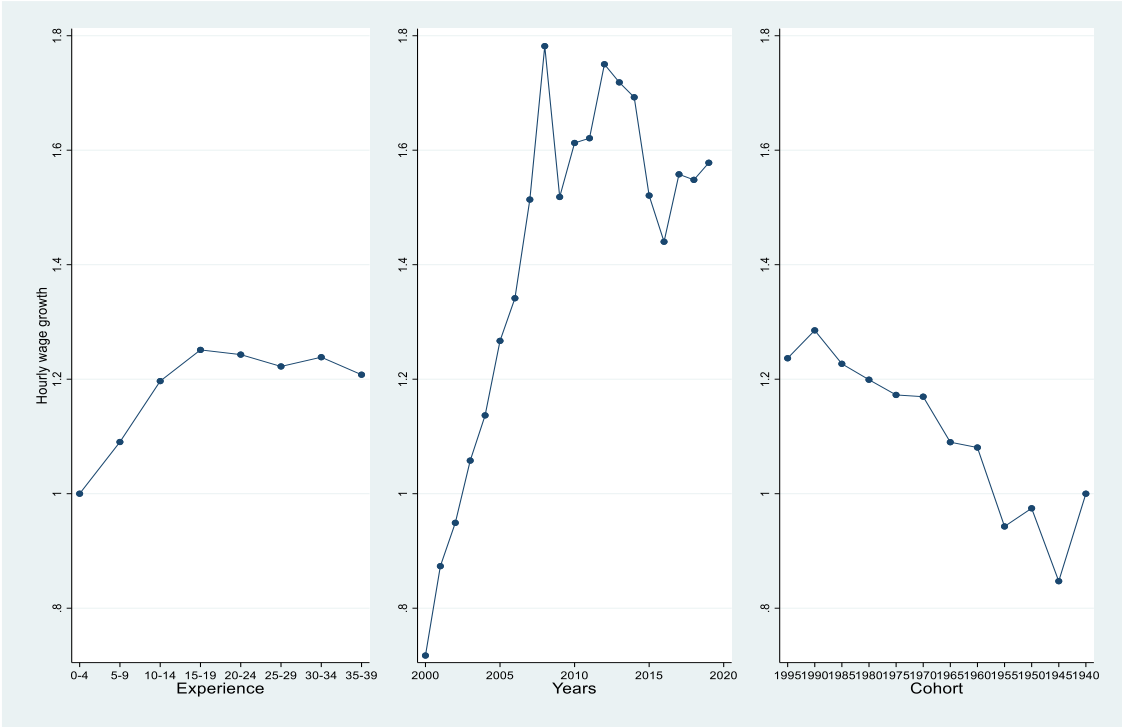
The iterative procedure is repeated with the updated value of g_M until (4) holds.

The results from the described estimation procedure with y=5 years and d=0%, 0.5% and 1% per year are presented by Graph 3. First, the estimated time effect pictures perfectly the evolution of the Russian economy with rapid growth between the crises in 1998 and 2008 and further stagnation in 2010s. The results of the main interest are the experience and cohort effects. If the assumed depreciation is not too high, wages do not fall at all after the period of rapid growth in the first 20 years of career. Conditional upon the depreciation assumption, they show either slow growth or stagnation, not the fall. At the same time, younger cohorts benefit considerably compared to the older cohorts as can be seen in the panels A and B of Graph 3.

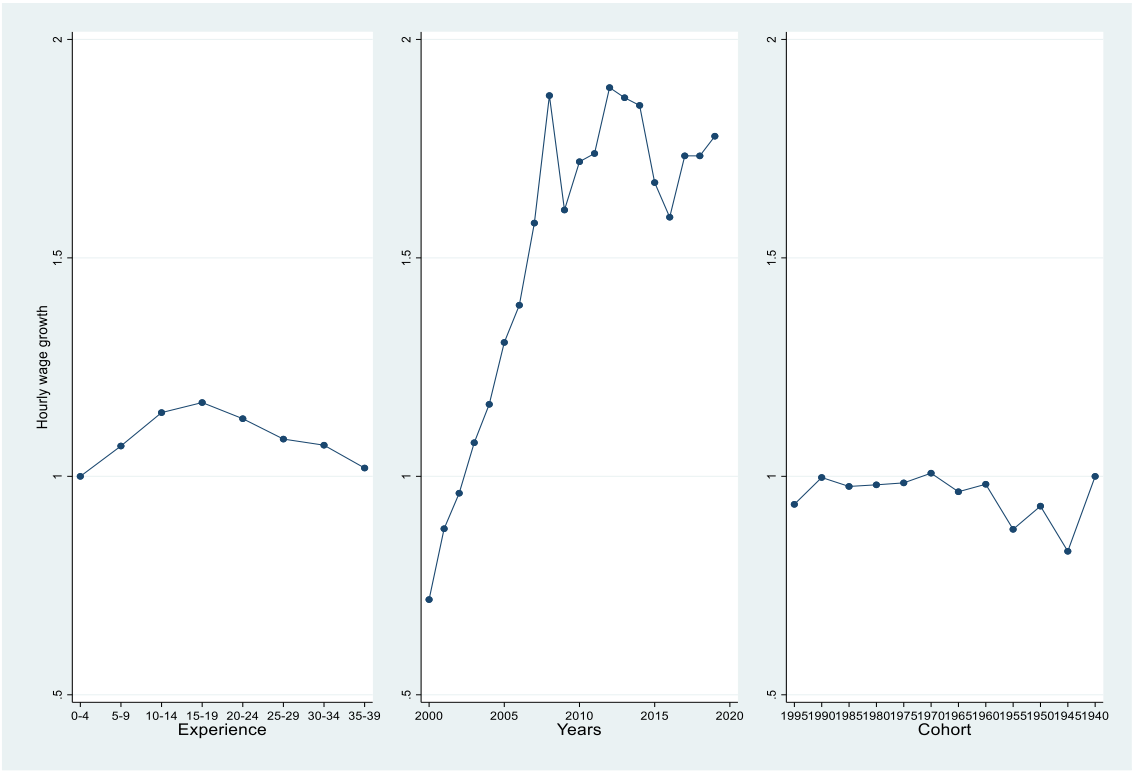
(A) d = 0%



(B) d = 0.5%



(C) d = 1%



Graph 3. Hourly wage growth due to experience, cohort and year effects.

The obtained results are generally robust to various sample restrictions (see Table 2). Using monthly wages instead of hourly ones and excluding current pension receivers result in less steeper

downward slope of the profile in late years of career. The latter result is not surprising as we are excluding individuals with larger non-labour income that can weaken work motivation.

Table 2. Robustness checks of the baseline result, d = 1%

Robustness check	Peak height (steepness)	Peak experience (length from the start)	Height at 35-39 years
Baseline result	**1.17**	**15-20**	**1.02**
Potential schooling instead of reported	1.22	15-20	1.03
Monthly wage instead of hourly	1.27*	15-20	1.17*
Monthly earnings from all jobs	1.25*	15-20	1.14*
Women included	1.12	15-20	0.92*
Non-typical hours excluded	1.21	15-20	1.11
Pension receivers excluded	1.25	15-20	1.17*

In this paper we contribute to the discussion on human capital accumulation in the post-transition region by disentangling effects of experience, cohort and time for Russia. Our results suggest that cross-sectional evidence exaggerates the extent of human capital destruction in older ages. As we show, the early peak and early decline in the Russian wage profile reflect superposition of experience and cohort effects that act in the opposite directions. If a longer labor market experience boosts the human capital (and wages, correspondingly), belonging to older cohorts nets out these advantages. We speculate that this reflects the obsolescence of knowledge and skills acquired by individuals before (or at the early stages of) transition to the market economy.

Our results call for a deeper analysis of how older cohorts that received their experience by working in the planned economy adopted to the new market conditions.

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