

# Why Russian Workers Do Not Move: Attachment of Workers Through In-Kind Payments<sup>a</sup>

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## Abstract

We relate the phenomena of sluggish interregional labour reallocation, in-kind compensation, and wage arrears in Russia to 'attachment' strategies of firms: paying wages in non-monetary forms makes it hard for workers to raise the cash needed for quitting the region. Attachment may facilitate investments that do not pay off if workers are expected to leave the region. However, since it eliminates workers' outside options, it may also be used to exploit them. Exploitation does not only occur in monopsonistic regional labour markets. Even if there is some competition, all firms in a region may use attachment. Here, workers are locked-in and do not receive any compensation for their forgone option to move. Data of the Russian Longitudinal Monitoring Survey (RLMS) support our theory. Workers who receive in-kind payments have a 19% lower probability to move than workers who do receive their wages in cash.

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## 1. Introduction

Reallocation of workers from obsolete industries to more profitable sectors is one of the most important challenges for many former centrally planned economies on their road towards a market economy [cf. Aghion and Blanchard (1994)]. Due to the Stalinist mode of industrialization, this problem has an important regional dimension. In particular qualified blue collar workers and engineers were concentrated in isolated mono-structural regions, while, at present, most job opportunities are to be found in the metropolitan centres. In Russia, interregional allocation of labor appears particularly problematic. Search frictions, as analyzed by Mortensen (1982) and Pissarides (1985), and in the case of transition economies, Shimer (1997), are exacerbated by the inefficiency of labor exchanges, and by underdeveloped housing markets. Moreover, cities limit the mobility of workers by imposing administrative barriers to entry against migrants from other parts of the country.

Consequently, a number of regionally segmented labor markets have emerged. According to data from the Russian Ministry of Labor, the ratio between vacancies and unemployment, for instance, has been varying from 1% to 27% across regions, and it has increased rather than decreased over the period 1992-95. Job reallocation indices reinforce the impression of regional segmentation. While in Poland 12% to 26% of 'excess job reallocation' took place across regions [Faggio and Konings (1999)], interregional reallocation in Russia only accounts for 0% to 5% in the same period of time.<sup>1</sup> The low interregional mobility in Russia is correlated with two phenomena that are particular to Russia and that appear to have severe consequences on enterprise efficiency and the well-being of immobile workers.

First, skilled workers have become a scarce resource in more prosperous regions, constraining the growth potential of profitable firms. A survey among

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<sup>1</sup>Calculated on the basis of the Russian Enterprise Registry Longitudinal Dataset; we are grateful to Jozef Konings for providing us with these figures. Due to significant growth of the shadow economy, official figures probably underestimate actual mobility. Kapeliushnikov (1999) argues that labour mobility in Russia is not lower than in other transition countries. However, huge regional disparities and their persistence indicate that mobility is much too low to induce regional convergence.

Russian industrial firms reports that 32% of firms have difficulties finding skilled blue collar workers, while only 4% have problems finding unqualified workers. The figure for other occupational groups are within the same range.<sup>2</sup> At the same time, unprofitable firms are hoarding labor [Brown (1998)]. Second, many workers in less prosperous regions do not receive any monetary compensation at all [Earle and Sabirianova (1998)]. However, firms continue to provide a wide range of goods and services, and in-kind compensation is on the rise (cf. the following section for background information).

We argue that the coincidence of slow labor reallocation, in-kind compensation and non-payment of monetary wages is a consequence of firms' policies to attach their core workers. We present a simple model, outlined in Section 3, which analyzes the situation of a worker who lives in a region the industry of which has a rather low productivity, and in which one large firm is the monopsonist on the local labor market. The worker knows that in the future, there may be potentially better paying jobs in another region. In order to be able to find a job in the other region, the worker needs cash to pay search and transportation costs.<sup>3</sup> We argue that in-kind payments and the provision of fringe benefits, rather than cash payments, impose some forced consumption on workers. Many of the goods and services are non-tradables; the transformation of others into cash involves substantial transaction costs. Hence, the worker cannot save the cash needed to finance the costs associated with moving to the other region, and she consequently foregoes lucrative job opportunities.

A monopsonistic firm may want to use attachment strategies because of two reasons. First, attachment may assure a firm's incentives to carry out investments that do only pay off if the worker stays in the firm. Non-monetary compensation can reduce or even eliminate the risk of the worker's leaving and consequently facilitate the investment.<sup>4</sup> While attachment may hence be locally efficient, it can impose negative externalities on the productivity of firms in another region, which would like to hire the worker. Second, attachment may allow firms to exploit workers. If the worker has an outside option that allows him or her to

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<sup>2</sup>Longitudinal Survey of Russia Industrial Enterprises, referred to in Denisova et al. (1998).

<sup>3</sup>cf. Brown (1997) who finds that workers with higher wages are more likely to migrate.

<sup>4</sup>Related papers are Marin and Schnitzer (1999) and Ellingsen (1998) who also argue that in-kind payments can be a device to overcome contractual problems.

generate the cash needed in order to move, the firm must compensate him for the foregone option to leave. This however is not the case, if outside options that allow to accumulate sufficient amounts of cash are lacking in the region.

In Section 4, we show that the existence of equilibria with exploitation is not constrained to the case of monoposonistic regional labor markets. Even if there is competition on the regional labor market and there are options available that would allow to raise the cash needed, equilibria may emerge in which all firms pay in-kind. In this case, the worker is locked into the region and does not receive any compensation for his forgone option to move. This result is in line with Earle and Sabirianova (1998) who have shown that an important determinant for a firm's decision not to pay wages is the existence of other firms in the same region who have accumulated wage arrears.

In Section 5 we provide some empirical evidence for the relevance of worker attachment by Russian firms. Using round 6 and 7 of the Russian Longitudinal Monitoring Survey (RLMS), the largest Russian household survey, we analyze to what extent in-kind payments restrict worker mobility. We estimate a probit function for which the dependent variable is whether or not a person has moved in round 7, given that he or she intended to move in round 6. The explanatory variables are personal characteristics, some controls, and whether or not the person has received in-kind payments. We find that workers who receive a part of their salary in kind have a 19% lower probability to move than workers who do receive their wages in cash. This result appears to be robust against another specification which attempts to take into account some peculiarities of the wage formation of persons who intended to move (versus persons who did not have such an intention). In Section 6, we conclude with a short discussion of other potential empirical tests, and provide an outlook on worker attachment as a more general phenomenon in the relationship between labor and capital throughout economic history.

## 2. Background and Related Literature

In this section, we provide some background about the provision of non-monetary compensation in Russia. In the Soviet Union, many firms constituted a sort of micro social insurance system, providing a wide range of non-monetary benefits

	1990	1994	1998
Catering	55	50	41
Medical services	64	63	56
Vacation facilities	62	56	44
Professional training	78	71	59
New housing	45	34	18
Kindergarten services	66	54	32

Table 2.1: Percentage of firms providing different types of fringe benefits, Brown et al (1999).

to their workers, including hospitals, rest houses, child care, catering. Although federal legislation required that all assets related to provision of such services had to be transferred to municipalities, firms appear to be rather unwilling to do so. In some cities, in particular, mono-structural ones, firms own up to 85% of the social assets [Healey et al. (1998)]. More information is contained in a recent enterprise survey carried out by Brown et al. (1999). It shows that the provision of services has only slightly decreased among the 200 respondents. Table 2.1. shows that the only sharp drops were in construction of new housing and kindergarten services. While the fall in the construction of new housing is very likely due to the shortage of capital, we will later argue that the fall in kindergarten services is in line with our theory. The picture of rather sluggish divestiture of social assets is even stronger, if one considers employment in activities of the firm, which are related to the provision of goods and services to workers. As Table 2.2 shows, the figures are rather stable, and in medical services and catering they have even increased. Again, only the provision of kindergarten services have drastically decreased.

Other surveys corroborate the impression that the survey conveys. According to the Russian Labor Flexibility Survey [Standing (1997)], 37% of the firms provided company rest houses, 42% health services, 29% child care, and 35% subsidized catering. Commander and Schankermann (1997) report similar figures, while the figures of another survey [VCIOM (1997)] are substantially higher.

Brown et al.'s survey also shows that in-kind substitutes for wages are on the rise. In 1991, 3% of the firms provided in-kind payments, in 1994 it was already 10% of the firms, and the figure increased to 27% by 1998. During the same

	1990	1994	1998
Catering	35	49	50
Medical services	30	33	32
Vacation facilities	34	36	30
Professional training	n.a.	n.a.	n.a.
New housing	35	42	34
Kindergarten services	46	41	20

Table 2.2: Percentage of firms employing workers in non-core activities, Brown et al (1999).

period of time, the share of the wage bill paid in kind in the respective firms was rather constant around 30% (between 26% and 37% over time).

Does this firm behaviour just reflect managerial inertia? We argue that the provision of social services and other fringe benefits, and in-kind payments follows some strategic pattern. While we do not dispose of data that would allow to analyze the supply side of services and in-kind payments directly, there is some evidence on firms using the supply of non-monetary compensation for strategic reasons. A survey [VCIOM (1997)] among top managers and executives of 142 enterprises finds that only 37% of the firms continued to run the social assets of their firm because of 'soviet traditions', while 51% responded that social assets were used in order to keep or attract new workers.

Somewhat weaker, but consistent with our argument, is survey evidence about firms' provision of a number of services to workers. Comparing the percentage of firms that provided benefits to the percentage of individuals who receive benefits shows that there appears to be some kind of concentration on some workers, a pattern in line with our argument. 56% of firms provided housing, but only 3% received it. The respective numbers for health care are (56%, 6%), recreation (43%, 6%), canteens (80%, 6%). The data originate from two different surveys<sup>5</sup> and should hence be considered with due caution. However, the gap between what is claimed to be provided and what is actually received indicates that the provision of services is concentrated on some employees, which may be due to

<sup>5</sup>The survey of firms on provision of benefits was carried out in 1996 [VCIOM (1997)]. The survey among workers originates from 1994 [cf. Kolev (1999)].

the strategic reasons we have highlighted in our analysis. Brown et al. (1999) provide additional evidence on concentration of in-kind payments. They report that between 1990 and 1998 in-kind payments affected between 44% and 70% of the employees of the firms in the survey.

To our knowledge, there is no consistent theoretical explanation for the coincidence of low interregional mobility, non-payment of wages and payments in kind. There is however a considerable amount of predominantly empirical and institutional work on the provision of social benefits, which constitutes a considerable part of non-monetary compensation. The most comprehensive study by Commander and Schankermann (1997) argues that in the absence of a market for social services, workers do not want to leave the firm when they have to fear exclusion from consuming these services as a consequence. This argument hinges however on the assumptions that firms are worker-controlled and not willing to sell their services to outsiders. However, managers and to some extent outsiders have substantial stakes in Russian firms [Earle (1998)] and cannot be assumed to maximize insiders' welfare anymore. Moreover, decision-makers can be bribed in order to provide social services to outsiders.<sup>6</sup> Hence, we consider why profit- or rent-maximizing firms would want to provide social services, and in more general terms, payment in kind rather than in cash.

Grosfeld et al. (1999) relate the segmentation of the Russian labor market into highly mobile blue collar workers and immobile white collar workers to uncertainty and risk aversion. The provision of social services can provide some insurance for workers whose expected productivity is rather low, while more productive workers prefer to go on the spot market in order to find a better job. While their theoretical setup differs substantially from ours, their explanation of skill-related segmentation complements our argument of regional segmentation.

### 3. The Model, Monopsony

#### 3.1. Setup

We first consider a model in which a big firm ('F') is a monopsonist on a regional labor market. F is interested in retaining a worker ('W') who is currently working

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<sup>6</sup>This point has been made by Jackman (1995).

in the firm and whose productivity the firm knows. Both F and W live two periods, and there is no time preference.

In the first period, W either works in the firm or is self-employed. In the beginning of the second period, the firm decides whether or not to invest in order to increase the worker's productivity. This investment only affects the worker's productivity within the firm, but has no effect on the worker's outside option. Consider, for instance, a reorganization of the internal structure of the firm which improves the match between workers' skills and certain tasks rather than an investment that changes the intrinsic productivity of the worker.

In the second period, W has an additional option, namely to move to another region, say Moscow, to find a new, and potentially more rewarding job. It is public knowledge that such job opportunities in Moscow realize with probability  $p$ . In the case the worker wants to move, she must pay search and transportation costs. W needs to dispose of a sufficient amount of cash in order to be able to finance these costs, since no bank would be willing to provide the cash given that W has no collateral. Also, F and W can only write contracts that last for one period, i.e., F and W have no commitment not to breach a long-term contract. In the beginning of the game, W is wealth-constrained, and F has all the bargaining power.

### 3.1.1. Timing

First period:

1. F offers a contract  $(m_1; x_1)$  where  $m_1$  is the monetary component of the wage, and  $x_1$  is the part of the wage paid in kind,<sup>7</sup> both measured in their value to W.<sup>8</sup> It is public knowledge that the wage for a worker with W's qualification in Moscow in the second period,  $w$ , will be  $w^H$  with probability  $p$ ; and  $w^L$  otherwise.
2. The worker chooses among the following options:

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<sup>7</sup>In what follows, we will use the term in-kind payments in a broad sense, i.e., including fringe benefits and services.

<sup>8</sup>In order to keep the model tractable, we here assume that the provision of in-kind payments has neither costs nor benefits that are unrelated to their strategic use. In the Conclusion we will come back to this issue.



- a) Accept the offer: F receives  $R_1 - (m_1 + x_1)$ ; and W receives  $m_1$  in cash and  $x_1$  in kind.
  - b) Reject the offer: W receives  $s_1$ ; the payoff of being self-employed in cash, and F receives nil.
3. The firm chooses whether to invest  $I = f_0; 1g$  in W's productivity. This increases the worker's second period productivity in the firm by  $\theta I$ ;  $\theta > 1$ : Costs of investment  $c(I) \sim I$ .

Second period:

- 1. Both F and W observe the wage W can receive upon moving to Moscow. In order to move, W must pay transportation and search costs  $T$  upfront.
- 2. The firm offers a second-period contract  $m_2; x_2$ :
- 3. The worker chooses between three options:
  - a) Move to Moscow: In this case she pays  $T$  in cash and receives  $w$  afterwards. F receives a payoff of nil.
  - b) Accept the offer: F receives  $(R_2 + \theta I) - (m_2 + x_2)$  and the worker receives  $m_2 + x_2$ :
  - c) Become self-employed: F receives nil, the worker gets  $s_2$ :

### 3.1.2. Assumptions

- A.1.  $w^H > R_2 + T$ ;  $w^L < s_2 + T$ : In case the expected wage in Moscow is high and W has at least an amount  $T$  in cash, F cannot offer a contract that matches W's option to go to Moscow, even if the firm has invested in the worker. In case the wage in Moscow is low, the worker has no incentive to move.
- A.2.  $R_t > s_t$ ;  $t = 1; 2$ : The worker's productivity within the firm is larger than then the value of self-employment.
- A.3.  $(1 - p)\theta < 1 < \theta$ : Investment does not pay off when the worker is expected to move to Moscow in case high wages realize. Investment does pay off if W stays in the region in all contingencies.

### 3.2. Equilibrium under Monopsony

The equilibrium can be derived in a rather straightforward way. Under the assumptions above, F faces the following tradeoff associated with its wage policy. On the one hand, in-kind payments can facilitate the firm's investment. If the worker is paid in cash in the first period ( $m_1 \geq T$ ); F expects W to move to Moscow whenever the wage in Moscow is high. Due to A.3., the firm does hence not invest. By paying in kind rather than cash, F can make it harder for W to move to Moscow. In order to raise the cash needed for moving, W would have to sell the goods that the firm provides. This involves substantial transactions cost, in particular considering that markets in transition are rather thin. In order to keep the analysis simple, we consider that the transactions costs are prohibitively high, and that hence all in-kind payments are consumed by the worker. Being forced to consume the entire first-period income, the worker does not have the cash to move to Moscow at the beginning of the second period. This attachment of the worker to the firm makes it hence worthwhile for the firm to invest.

On the other hand, attachment comes at some costs for the firm. Agreeing to be paid in kind in the first period, W forgoes the option to leave for Moscow in the second period. The value of this option is not trivial if  $s_1 \geq T$ ; because here the worker can refuse F's first-period offer, receive  $s_1$ ; save cash for moving and receive  $w^H - T$  with probability  $p$  in the second period. Thus, whenever  $s_1 \geq T$ ; attachment is costly since the firm has to compensate the worker for the forgone option to move to Moscow. The firm hence has to compare the benefit of investment which only pays off when W is attached with the cost of attachment. If  $s_1 < T$ ; the worker cannot move anyhow, F does not need to compensate her for restricting her mobility and the cost of attachment is zero.

Summing up the discussion above we establish the first proposition.

**Proposition 1.** The equilibrium if F is a regional monopsonist is as follows.

1. 'Pay-cash': If  $s_1 \geq T$  and  $\theta - 1 < p(w^H - T - R_2)$ , no investment takes place and the worker moves to Moscow in the second period with probability  $p$ . F receives a payoff of  $R_1 - s_1$  in the first period, and an expected second-period payoff of  $(1 - p)(R_2 - s_2)$ . W receives  $s_1$  in the first period, and an expected second-period payoff of  $(1 - p)s_2 + p(w^H - T)$ .

2. 'Attachment': If  $s_1 \geq T$  and  $\theta_i \geq 1 \geq p(w^H_i - T - R_2)$ ; the firm chooses to attach the worker by paying in kind ( $m_1 < T$ ): In this case, the firm invests in the worker ( $I = 1$ ) and the worker stays both periods in the firm. The worker receives  $s_1 + s_2 + p(w^H_i - T - s_2)$ , i.e., his outside option plus the option value of moving to Moscow. F's payoff is  $(R_1 - s_1) + (R_2 - s_2) + (\theta_i - 1) \cdot p(w^H_i - T - s_2)$ .

3. 'Exploitation': If  $s_1 < T$ ; F always attaches the worker by paying in kind ( $m_1 < T$ ). Here, W only receives her outside option  $s_1 + s_2$  and stays both periods in the firm. The firm invests in the worker and receives  $(R_1 - s_1) + (R_2 - s_2) + (\theta_i - 1)$ .

The important lesson of Proposition 1 is that firms will only employ attachment strategies if the net benefit of investing into the worker is not too small compared to the wage gains that the worker can expect if he moves to Moscow. Workers whose expected productivity in Moscow is too large cannot be attached, and consequently the firm pays in cash, but does not invest in them. According to the same logic, one should observe a concentration of in-kind payments to those workers in the firm, whose productivity can be enhanced by an investment, in particular, if in-kind payments involve transactions costs. Notice also the parallel with Earle and Sabirianova (1999) who found that arrears reduce job quits in total, but they increase the transition to self-unemployment. According to our model, one would expect the most productive people quitting the firm in order to raise the cash needed to move, while workers with intermediate productivity would be attached to the firm by in-kind payments, and should not receive too much cash.

Proposition 1 also highlights the importance of W's outside option. If  $s_1$  is very low (case 3), the firm does not face any cost of attachment. On the other hand if  $s_1 \geq T$ , F has to compensate the worker for forgoing her option to move to Moscow and attachment comes at a cost  $p(w^H_i - T - s_2)$ : In the next subsection we endogenize  $s_1$ :

#### 4. The Role of Competition in the Local Labor Market

As discussed before, in many Russian regions, the labor market is rather monopolized. In many regions, there exists only one so-called 'town-shaping' firm, which employs all skilled blue-collar workers. The local outside option in such

a company town is the wage rate for unskilled labor, for instance, subsistence production or retail sales assistantship. On the other hand, in some cases there are indeed more firms that can employ skilled labor. In this case, the relevant local outside option is the wage that the worker can receive in other firms and may be therefore a result of their strategic behavior. In what follows we assume that any other outside opportunity does not suffice to finance the costs of moving.

#### 4.1. The Setup

Suppose that there are  $N$  firms in the region.  $W$ 's productivity in each of the firms is  $R_t^i$ ;  $i = 1, \dots, N$ , at period  $t$ :  $R_t^i$  is a random variable distributed independently over time on the support  $[\underline{R}; \bar{R}]$  with a distribution function  $G(\cdot)$ : The timing is similar to one in the monopsony case.

First period:

1. Everyone observes  $W$ 's productivity in each firm in the first-period  $R_1^i$ . Each firm  $F^i$  offers  $W$  a contract  $f m_1^i; x_1^i$ g.
2.  $W$  chooses whether to accept one of the contracts or become unemployed:
  - a) Upon accepting firm  $i$ 's offer,  $W$  receives  $m_1^i$  in cash and  $x_1^i$  in kind; firm  $i$  receives  $R_1^i - m_1^i - c(x_1^i)$ . Other firms receive nil.
  - b) If the worker chooses to be unemployed, she receives  $s_1 = \underline{R}$ ; the firms receive nil.
3. Each firm chooses whether to invest  $I^i = f0; 1$ g in worker's productivity. This adds  $\circ I^i$  to the worker's second period productivity if and only if  $W$  is hired by firm  $i$  in the second period. The cost of investment is  $I$ :

Second period:

1. Firms and the worker observe  $R_2^i$  and  $W$ 's wage in Moscow which is  $w^H$   $\circ T + \bar{R}$  with probability  $p$  and  $w^L < T + \underline{R}$  otherwise.
2. Each firm  $i$  offers a second-period contract  $f m_2^i; x_2^i$ g:
3. The worker chooses between three options:
  - a) Move to Moscow, receive  $w_j - T$ ; all local firms receive nil.

- b) Accept the offer of firm  $i$ : Firm  $i$  receives  $(R_2^i + \theta I^i) - I^i - (m_2^i + x_2^i)$ ;  
 $W$  receives  $m_2^i + x_2^i$ ;
- c) Become unemployed: Worker receives  $s_2 = \underline{R}$ ; the firms receive nil.

Some comments are in order before we turn to solving the game. Apparently, in each period the worker is employed by the firm with the highest  $R_t^i$ , or moves to Moscow or remains unemployed. Without loss of generality we can enumerate firms in order of their first-period productivity:  $R_1^1 > R_1^2 > \dots > R_1^N$ . The firm that hires  $W$  in the first period will be firm 1, and the reservation wage is determined by the productivity of firm 2.

We assume that productivities are uncorrelated over time. Hence, the firm that hires the worker in the first period has no advantage over other firms in the second period. Thus even if firm 1 manages to attach the worker to the region by paying in kind, it will enjoy the benefits of attachment only with probability  $1/N$ . If paid in kind, the worker cannot leave for Moscow in the second period, but can go to another local employer. Payments in kind serve as a device to restrict interregional mobility but fail to limit the interfirm mobility in the local labor market.

When designing the compensation package to offer to  $W$  in the first period, firm  $i$  has to weigh the cost of attaching the worker via in-kind payments with the benefits. The costs of attachment depend on other firms' offers. If they offer enough cash to go to Moscow in the second period ( $m_1^j > T$ ), firm  $i$  has to pay  $W$  the option value. If all firms offer in-kind payments, the worker will be never able to leave for Moscow, and the cost of attachment fall to zero.

We will keep all the Assumptions A.1-A.3. Assumption A.1 takes the form  $w^H \geq T + \bar{R}$ ;  $w^L < T + \underline{R}$ . Assumption A.2 is modified (without loss of generality) to  $s_1 = s_2 = \underline{R} < T$ :

#### 4.2. Solving for the equilibrium

We first study the investment subgame. At the end of the first period,  $N$  firms simultaneously decide whether or not to invest. We allow mixed strategies, i.e., each firm chooses a probability of investment  $\mu_i \in [0; 1]$ :

After the investment choices are made, the firms observe each other's produc-

tivities and make their bids. In case the worker cannot or does not want to go to Moscow, she is hired by the firm with the highest  $R_2^i$ : This firm offers a wage set at the level of the second highest  $R_2^i$ :

Denote  $D(N)$  the expected second-period benefit of any firm in case the worker is attached to the region. It equals the expected difference between this firm's productivity and the maximum productivity of other firms, provided that in the second period, the firm is the most productive one on the regional market. Since the distribution function of the maximum of several random values is a product of the distribution functions of these random variables, we can write:

$$D(N) = E \left[ \max_{i \in I} R_2^i - \max_{j \in I} R_2^j; 0 \right] = \int_{\underline{R}}^{\bar{R}} dG^{N-1}(r) \int_r^{\bar{R}} (R - r) dG(R) \quad (4.1)$$

W's expected payoff in case of attachment is the expected productivity of the second most productive local employer:

$$R_2^{II}(N) = E \left[ \max_i R_2^i - D(N) \right] = \int_{\underline{R}}^{\bar{R}} R dG^N(R) - D(N) \quad (4.2)$$

We can compute the worker's and firm's expected second-period payoffs  $\Theta^W(N)$  and  $\Theta^F(N)$ . Abstracting from integer problems, the following lemma can be derived.

**Lemma 1.** If the worker is attached, the equilibrium in the investment subgame is unique and can be characterized as follows. There exist real numbers  $N^*$  and  $N^{**}$ ;  $N^* < N^{**}$  such that:

1. If  $N \leq N^*$ , all firms invest and receive  $\Theta^F(N) = D(N) - 1$ ; while W receives  $\Theta^W(N) = \phi + R_2^{II}(N)$ ;
2. If  $N \in (N^*, N^{**})$ , all firms choose not to invest and get  $\Theta^F(N) = D(N)$ : W receives  $\Theta^W(N) = R_2^{II}(N)$ ;
3. If  $N \geq N^{**}$  then firms invest with probability  $\mu(N)$ , which decreases with N: The worker's payoff is  $\Theta^W(N) \in (R_2^{II}(N); \phi + R_2^{II}(N))$ : The firm's expected payoff is  $\Theta^F(N) \in (D(N) - 1; D(N))$ : The expression  $\Theta^W(N) + \Theta^F(N) - R_2^{II}(N) - D(N)$  decreases with N from  $\phi - 1$  at  $N = N^*$  to 0 at  $N = N^{**}$ .

The proof is provided in the Appendix.

The Lemma states that investment is the less likely, the more intensive competition is. The intuition is that in equilibrium, each firm expects to hire the worker with probability  $1/N$ : Therefore, returns to investment are roughly  $\propto 1/N$  and investment can only occur if there are few firms around. Although the worker is attached to the region, investment may not occur at all or only with some probability, because each single firm cannot expect to keep the worker for sure.

Let us now turn to the first stage of the game. Given Proposition 1, we would expect three types of equilibria to occur: equilibria with exploitation, with attachment, and without payments in kind. In the latter, all firms would offer cash wages in the first period and the probability to invest is low. In the exploitation equilibria all firms would offer in-kind payments in the first period such that  $W$  does not have any option to go to Moscow in the second period. Therefore, the first-period employer does not need to pay  $W$  the option value. In the attachment equilibrium, firm 1 pays in kind and attaches worker while other firms offer first-period wages in cash so that firm 1 has to pay  $W$  the value of option to move in the second period.

**Proposition 2.** Assume that  $s_1 < T$ . The equilibrium in the game with  $N$  local employers is as follows.

1. If the following inequality holds

$$[\omega^W(N) + \omega^F(N)]_i [R_2^{II}(N) + D(N)] > p[w^H_i - T]_i [R_2^{II}(N) - D(N)] \quad (4.3)$$

there is only an 'exploitation' equilibrium. Every firm offers a compensation package with payments in kind  $m_1^i < T$ .  $W$  receives  $R_1^2$  in the first period and  $\omega^W(N)$  in the second period.

2. If (4.3) does not hold, the equilibrium is a 'pay-cash' one: Both firms 1 and 2 offer cash wages in the first period. The worker receives  $R_1^2$  in cash in the first period and leaves the region in the second period with probability  $p$  so that her expected second period payoff is  $p(w^H_i - T) + (1 - p)R_2^{II}(N)$ :

Proposition 2 establishes two non-trivial facts. First, for each  $N$  there can only be one equilibrium. Second, there cannot be any attachment equilibrium

without exploitation. In the first period, the worker's outside option is  $R_1^2$  which may be greater than  $T$ : The worker, however, does not receive the value of the forgone option of moving to Moscow because no firm offers a cash wage in the first period. Whenever (4.3) holds, each firm expects to invest and therefore benefits from worker's attachment to the region. No firm has an interest to deviate and pay cash, because in this case, investment would not pay off. Although we consider a non-cooperative game, in the equilibrium firms behave as they were to collude in order to keep the worker from leaving.

The important implication of Proposition 2 is that exploitation disappears with competition. Indeed, if  $N_1 > N^{**}$ ; no investment occurs and the left-hand side of (4.3) is trivial while the right hand side is positive. The exploitation equilibrium can only occur when firms invest with non-trivial probability which happens only in local labor markets which are not 'too competitive'.

## 5. Empirical Support

### 5.1. Data and Empirical Strategy

Our empirical analysis focusses on the prediction that workers who receive in-kind payments should be less mobile. In order to investigate this proposition, we use data of the Russian Longitudinal Monitoring Survey (RLMS).<sup>9</sup> In round #6 of the survey (1995), individuals were asked whether they planned to move in the coming 12 months. In round #7, one year later, the interviewers verified whether or not the individuals of round #6 were still living at the same place. Table 5.1 provides an overview.

It should be noted that the data do not allow to detect where a given person has moved. However, since all individuals who have moved to another region are contained in category (1) of Table 5.1, the data allow to examine what distinguishes this group from the other groups, and in particular what role in-kind payments play for the ability of individuals to move.

It is interesting to note the characteristics of those persons who uttered an intention to move, compared to the entire population who responded to the survey. They were rather male than female, rather young, less subject to wage arrears,

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<sup>9</sup>More information about the RLMS is available at [www.cpc.unc.edu/rfms](http://www.cpc.unc.edu/rfms)



Group	Frequency	Percent
'No' (0)	7315	92.63
'Yes'(1), among which	582	7.37
- have not moved (1a)	327	4.14
- have moved (1b)	255	3.23
Total	7897	100

Table 5.1: Responses to the question: Do you plan to move in the next 12 months?

and in general, optimistic about the future. Moreover, many of them were skilled blue collar workers, and positive about ...nding a new and better job upon moving. In other words, people who intend to move belonged to the skill group that according to surveys is in highest demand on Russian labor markets, i.e., who have interesting outside options and know about their chances.

In order to ...nd out what keeps these workers from actually moving, we carry out the following steps. We ...rst run a probit estimation, where the dependent variable is the fact of having moved, and the independent variables are personal characteristics and some controls. In order to check the robustness of our results, we then try to control for the particularities of the group of persons who wanted to move, compared to those who did not intend to do so.

## 5.2. Probit Estimation

We carry out probit estimates for the pool of people in group (1).<sup>10</sup> The dependent variable move equals 1, if a person has moved, and 0 if they did not. We regress move against a number of variables, listed in the Appendix.

It turns out that only the variables inkind (0, if no in-kind payments were made, 1 otherwise) and jobsyr (job experience in years) are signi...cant, and that both variables reduce the probability of an individual to move. The results of probit estimation with these signi...cant variables are presented in the Table 5.2. Payments in kind decrease the probability to move by 19 per cent.

<sup>10</sup>We do not consider the entire subsample of people who have moved in order to reduce the risk of including people in the sample who have not moved because of economic reasons, but have rather changed their fat, died etc. Put differently, people who uttered an intention to move should be considered more likely candidates for a conscious decision taken on economic grounds.

	dF/dx	Coefficient	Std.Error	z	P>z	$\bar{x}$
inkind	-0.19	-0.53	0.28	-1.9	0.059	0.07
jobsyr	-0.016	-0.039	0.008	-5.1	0.000	6.7

Table 5.2: Probit estimates for move (349 observations).

### 5.3. Controlling for wage differentials

An alternative explanation for the above result is that in-kind payments may be a compensation for lower cash wages, for instance, provided by firms that are cash-constrained. To make sure that the reduced probability to move of those individuals who receive in-kind payments is not due to such a compensating effect, one should consider the total salary, i.e. monetary wages plus value of in-kind payments. Unfortunately, the data set does not contain sufficient information about the value of received in-kind payments.<sup>11</sup> Hence, we need to find a proxy for total wages in order to check the robustness of our result.

The total wage is the sum of the observed cash wage and the unobserved value of in-kind payments. We shall estimate the following equation:

$$\ln \text{wage} = c + a^0 x^0 + b \text{inkind} \quad (5.1)$$

Equation (5.1) is based on a standard Mincerian wage equation, enhanced by some controls and regional dummies, and the last term representing the value of in-kind payments. The equation's constant is  $c$ ;  $a^0$  represents the vector of coefficients to be estimated,  $x^0$  is a vector of personal characteristics and controls, and  $b$  is the coefficient for the binary variable `inkind`. Table 2 (cf. the Appendix) reports the estimation results for a) the entire population, b) the group of people who did not intend to move (0), and the group of people who intended to move (1).

We find that for members of group (0),  $b = 0.23$ , i.e., in-kind payments compensate for 23% of cash wages. While the estimations appear to fit group (0) rather well, it is noteworthy that the results for group (1) differ to some extent.

<sup>11</sup>While the questionnaire includes an item on the value of in-kind payments, only few respondents provide this information, probably due to tax reasons.

	dF/dx	Coefficient	Std.Error	z	P>z	$\bar{x}$
inkind	-0.22	-0.62	0.35	-1.7	0.084	0.07
jobsyr	-0.016	-0.044	0.011	-3.5	0.000	6.9
delta	0.022	0.056	0.094	0.6	0.550	-.05

Table 5.3: Probit estimates for move controlling for wage differentials (259 observations).

First, the variables concerning experience, and in-kind payments are statistically significant for group (0), but not for group (1). Second, the constant for group (1) is larger. Thus it appears that wage formation for the group of people intending to move follows a different mechanism than the one the reference group is subject to.

To carry out a robustness check with respect to compensating in-kind payments, we hence compute the total wage a member of group (1) with given characteristics would receive, if he or she were member of group (0). We label this would-be wage fitted; consisting of a fitted monetary component and a fitted in-kind component. By using the coefficients of the estimations for group (0), we not only control for potentially compensating in-kind payments, but do also correct for the somehow different mechanism of wage formation of group (1). We introduce an additional variable for the difference between the actual monetary wage and fitted:

$$\text{delta} = \text{lgwage}_i - \text{fitted} \quad (5.2)$$

Table 5.3 presents the estimation results for the probit estimates including delta. Clearly, delta is not statistically significant, and the coefficient for inkind are not affected considerably. We hence conclude that our main result, in-kind payments restrict mobility, is robust.

## 6. Conclusion

This paper has made two points. First, Russian firms may deliberately constrain the mobility of workers through attachment strategies, i.e., the provision of fringe benefits and in-kind payments. Second, while attachment strategies may allow investments that would not be carried out with high interregional mobility, there

is a risk that it is used to exploit workers, and this risk is the more substantial, the less competitive the respective regional labor market is.

It is interesting to relate the implications of our analysis to the evidence on another typical institution of the Russian labor market, the non-payment of wages. Earle and Sabirianova (1999) analyze the determinants of wage arrears and find that controlling for firm characteristics firms are more likely not to pay wages to their workers if other firms in the same region have accumulated wage arrears. They conjecture that the reason for this fact could be multiple equilibria on regional labor markets, i.e., there are regions in a “good” equilibrium in which wages are paid, while in other regions, firms coordinate on the non-payment of wages. In contrast, we highlight that the degree of competition on regional labor markets may be the driving force, a prediction which is empirically testable. According to our model, one should expect that in regions in which there are only few firms, in-kind payments should be more prevalent and there should be less migration to other regions, compared to regions the labor market of which is more competitive.

One might wonder about other reasons why firms pay in kind rather than in cash. Clearly, firms’ cash constraints may be an important factor to explain why firms would want to provide workers with their own output rather than in cash, but they cannot explain the fact that firms offer a wide range of goods that they do not produce themselves and the provision of which may be rather expensive. According to the same logic, it may be the case that some firms provide fringe benefits, because they have inherited capital like hospitals and kindergartens that allow to provide services to workers that (due to market imperfections) may have a higher value to the workers than the costs of providing them. This is however not consistent with the fact that even start-up businesses provide fringe benefits, although they do not have any such capital. A second fact speaks against this argument. As noted in Section 2, the only kind of service the provision of which has been cut down substantially are kindergartens. This fits very well with the fact that the workers who, according to the RLMS are most prone to leave, and also very important for the firm, are young males, arguably a group who cares less about this kind of service than others.

Before concluding, we would like to highlight that worker attachment is not

just another institution of what Ericson (1999) calls 'Industrial Feudalism'. Rather, there are many interesting parallels between the strategies used by Russian firms today, and comparable institutions that have emerged throughout economic history. For instance, only recently economists have discussed the potential 'job-lock' through employer-provided health care. It has been argued [cf. Madrian (1994)] that worker mobility is reduced when the portability of health insurance is limited. Alston and Ferrie's (1993) paper on paternalism in the former confederate states of the USA after the Civil War is another case in point. Their (non-formal) argument is similar to ours. Farmers in the US South were providing in-kind payments and protection from racist violence in order to reduce the mobility of farm-workers, which in turn facilitated long-term investments of workers and farmers in the fertility of the soil. Our paper highlights that attachment may facilitate the creation of surplus, but in the absence of a sufficient degree of local competition it also involves the risk of exploitation of workers by firms.

Attachment also appears to have played an important role in the the 'truck system' in the UK, particularly relevant in the 19th century. Hilton (1960) provides interesting evidence about this system, in which the consumption of some goods is somehow tied to the employment contract. One of the prevailing contemporary explanations of the truck system was that firms attempted to restrict their hirelings' mobility through the debt that they would accumulate vis-à-vis company stores. Particularly interesting is Hilton's comparison of the use of the truck system in two industries in which labour demand was very different. While in the nail industry, workers had low skills, and would have to fear unemployment when quitting the firm or being laid off, colliers were rather skilled workers with attractive outside options. It appears that employers in the nail industry abused the truck system in many ways, in particular, to reduce the real wages of their workers. In colliery, the truck system was less prevalent and appears to have mainly been used as a way to give wage advances, restricting the risk of workers' alcohol abuse. It appears that competition on the demand side of the labour market protected colliers from exploitation through the truck system, in a way similar to the effect that a sufficient degree of competition on the local labour has in our model.

Additional research is needed in order to understand in more general terms

under which conditions institutions as the ones above emerge and are sustainable, and what the welfare implications of attachment are. The next step of our research will consider a general equilibrium model that highlights the tradeoff between the potential benefits of endogenous regional segmentation - investments may be carried out that would not in the presence of high mobility -, and their costs - workers who are locked in may be exploited, and the labour market becomes less flexible.

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## Appendix

Proof of Lemma 1. We compute firm  $i$ 's expected returns to investment, given the optimal investment behaviour of all other firms:

$$\Phi_i(H) = \int_{r_i-1}^{r_i+1} dH(r) \int_{\underline{R}}^{\bar{R}} ((R + \theta_i r)_+ - (R_i - r)_+) dG(R) \quad (6.1)$$

Here  $H(\cdot)$  is the cumulative distribution function of  $\max_{j \in i} (R_2^j + \theta^j)$ ; the maximum productivity of other firms. Denote  $\Phi_k$  the returns to investment of one firm if  $k$  other firms invest and  $N - 1 - k$  do not invest. In this case,  $H(r) = H_{k;N}(r) = G^k(r - \theta) G^{N-k-1}(r)$ . Therefore,  $\Phi_k(N) = \Phi_i(H_{k;N})$ : Lemma 2 establishes the relationship between the distribution function  $H$  of the maximum productivity of other firms and the returns to investment: if maximum productivity of other firms increases in terms of first-order stochastic dominance, then returns to investment decrease. This fact implies that  $\Phi_k(N)$  decreases both in  $N$  and  $k$ : Hence  $\Phi_{N-1}(N)$  also decreases in  $N$ :

Let us introduce  $N^*$  and  $N^{**}$ :

$$\Phi_0(N^{**}) = \Phi_{N-1}(N^*) = 1: \quad (6.2)$$

Apparently,  $1 < N^* < N^{**}$ :

No-investment equilibrium exists if and only if  $\Phi_0(N) > 1$  or  $N > N^{**}$ : In this equilibrium, each firm expects to get  $D(N)$  and the worker gets  $R_2^I(N)$ :

Similarly, the equilibrium where all firms invest exists if and only if  $\Phi_{N-1}(N) > 1$  i.e.  $N < N^*$ : The firms' expected rent is  $D(N) - 1$  while the worker's is  $R_2^I(N) + \theta$ :

The analysis of the mixed strategy equilibrium is more complicated. Each firm invests with probability  $\frac{1}{4}$  and returns to investments are equal to the cost of investment

$$\sum_{k=1}^{N-1} C_{N-1}^k \Phi_k(N) \left(\frac{1}{4}\right)^k \left(1 - \frac{1}{4}\right)^{N-1-k} = 1: \quad (6.3)$$

Denote the solution to this equation  $\frac{1}{4}(N)$ : One can easily check that  $\frac{1}{4}(N) \in [0; 1]$  exists if and only if  $N \in [N^*; N^{**}]$ ;  $\frac{1}{4}(N)$  decreases with  $N$ ; and  $\frac{1}{4}(N^*) = 1$ ;  $\frac{1}{4}(N^{**}) = 0$ :

Thus, the mixed strategy equilibrium exists for all  $N \geq 2$  ( $N^a; N^{aa}$ ): In this equilibrium, each firm invests with probability  $\frac{1}{2}(N \geq 2; 0; 1)$ : Firms get expected payoffs

$$\pi^F(N) = \sum_{k=1}^{N-1} C_{N-1}^k \frac{1}{2}^k (1 - \frac{1}{2})^{N-1-k} \int_{i-1}^{Z+1} d^h G^k(r_i^\circ) G^{N-k-1}(r) \int_{\underline{R}}^{iZ} [R_i r]_+ dG(R) \quad (6.4)$$

The worker's expected payoff is

$$\pi^W(N) = \sum_{k=1}^{N-1} C_{N-1}^k \frac{1}{2}^k (1 - \frac{1}{2})^{N-1-k} \int_{i-1}^{Z+1} r d^h G^k(r_i^\circ) G^{N-k-1}(r) \int_{\underline{R}}^{iZ} \pi^F(N):$$

Lemma 2. The functional  $\psi(H)$  in (6.1) is monotonic with regard to the distribution function  $H(\cdot)$ : if  $H(r) \geq H(r)$  for all  $r$  then  $\psi(H) \geq \psi(H)$ :

Proof. Computing the payoff if there is no investment yields:

$$\int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} (R_i r) dG(r) = E R_i \int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} (R_i r) dG(r):$$

Integrating by parts, we obtain,  $E R_i \int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} G(R) dR$ : Similarly

$$\int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} (R_i^\circ + r) dG(r) = E R_i^\circ \int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} G(R_i^\circ) dR:$$

Therefore

$$\psi(H) = \int_{i-1}^{Z+1} d^h G^k(r) \int_{\underline{R}}^{iZ} (G(R) - G(R_i^\circ)) dR \quad (6.5)$$

The inside integral  $\int_{\underline{R}}^{iZ} (G(R) - G(R_i^\circ)) dR$  is an increasing function of  $r$ . Therefore if  $H$  dominates  $H$  in terms of first-order stochastic dominance  $H(r) \geq H(r)$  then  $\psi(H) \geq \psi(H)$ : ■

List of variables:

- <sup>2</sup> lgwage (the log of the last monthly wage)
- <sup>2</sup> male (dummy, equals one if male)
- <sup>2</sup> boss (dummy, equals one if the person has subordinates)
- <sup>2</sup> edyrs (years spent on education)
- <sup>2</sup> expir (years of work experience, approximate value defined by age - years of education)
- <sup>2</sup> sqexpir (the square of expir)
- <sup>2</sup> inkind (dummy, equals one if person received in-kind payments in the last month)
- <sup>2</sup> regionn (regional dummies, according to Table 1 in the Appendix)
- <sup>2</sup> jobsyr (number of years spent in the ...rm).