Should I Stay or Can I Go?
Worker Attachment in Russia*

Guido Friebel† and Sergei Guriev‡

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†IDEI, Toulouse, SITE, CEPR and WDI. Email: Guido.Friebel@hhs.se.

‡New Economic School, Moscow, CEPR and WDI. Email: sguriev@nes.ru

Abstract

Reallocation of workers from obsolete sectors to more profitable ones is among the most important challenges for many former centrally planned economies on their road towards a market economy. Due to the Stalinist mode of industrialization, this problem has an important regional dimension: geographical mobility is required to reallocate labor from regions dominated by industries in decline to more prosperous areas. In Russia, however, labour market segmentation does not appear to decline. In this paper we argue that the very existence of inherited monopsonistic or oligopsonistic local labour market structure can obstruct workers' ability to migrate. We analyze a model in which firms have an incentive to 'attach' their workers, that is to restrict their ability to migrate decreasing workers' outside option and increasing rents. While the rationale for attachment is straightforward, the key to the feasibility of attachment lies in the existence of cash constraints. We argue that the widespread use of in-kind wages and wage arrears in Russia may be explained as an attachment strategy of firms: paying wages in non-monetary forms makes it hard for workers to raise the cash needed for quitting the region. There are two main results of the model. First, attachment can only exist, if there are not too many firms on the local labour market. Second, attachment involves a risk of worker exploitation, i.e., the attached workers are not compensated for their forgone option to migrate. Data of the Russian Longitudinal Monitoring Survey (RLMS) support our theory. Controlling for personal and regional characteristics, workers' propensity to leave a region decreases with the degree of concentration of the local labour market.

1 Introduction

Reallocation of workers from obsolete sectors to more profitable ones is among 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 contrast to market economies, firms in socialist economies did not locate according to efficiency considerations. Rather, location decisions were guided by perceived or real requirements of the military, and Stalin's commitment to swiftly develop economically backward regions. Many transition economies have thus inherited highly segmented local labour markets from the past. Often, local labour markets are dominated by one or few large firms; large proportions of the workforce live in regions hosting industries in decline. Unless capital moves to where labour is, workers should have to migrate in order to correct misallocations and to ensure labour supply for new industries with higher productivity.

However, labour market segmentation does not appear to decline, at least not in Russia, the largest transition economy. According to data from the Russian Ministry of Labor, the interregional differentials in the ratios between vacancies and unemployment, for instance, have increased rather than decreased over the period 1992-95. Reallocation across regions is barely taking place. While in Poland 12% to 26% of excess job reallocation took place across regions, interregional reallocation in Russia only accounts for 0% to 5% in the same period of time.[1] It is hence not surprising that skilled workers have become a scarce resource in more prosperous regions, constraining the growth potential of profitable firms, as a survey of Russian industrial firms shows: 32% of firms have difficulties finding skilled blue collar workers.[2]

In this paper we argue that the very existence of monopsonistic or oligopsonistic local labour markets can obstruct workers' ability to migrate. Put differently: there is an important link between the inherited market struc-

[1] For the definition of excess job reallocation, and more information on labour market segmentation, see 3.2.

[2] Longitudinal Survey of Russian Industrial Enterprises, referred to in Denisova et al. (1998).

ture of local labour markets and reallocation of labour. In Section 2, we analyze a model in which firms have an incentive to 'attach' their workers, that is to restrict their ability to migrate. The rationale for attachment is that ensuring that workers cannot migrate affects their outside option, and thus the rents enterprises can acquire in wage negotiations. There are two main results of the model. First, attachment can only exist, if there are not too many firms in the local labour market. Second, attachment involves a risk of worker exploitation, i.e., the welfare of attached workers is lower than the welfare of workers who can migrate.

While the rationale for attachment is straightforward, the key to the *feasibility* of attachment lies in a peculiarity of transition economies, namely, the existence of cash constraints. Modern labour contracts cannot stipulate slavery-like relationships, but cash constraints make attachment feasible. Since migration involves transportation and search costs, and workers usually have no collateral, they must dispose of a certain amount of cash in order to be able to migrate. By compensating workers in non-monetary forms such as in-kind payments and fringe benefits, rather than cash payments, firms can impose forced consumption on workers. If the goods and services offered are non-tradables or their transformation into cash involves substantial transaction costs, workers will find it hard or impossible to save the cash needed to finance the costs associated with migration.

At the first glance one may conjecture that attachment is only feasible in monopsonistic local labour markets, since firms should compete in the type of compensation they offer. The model, however, shows that this in general is not the case. Rather, attachment can be sustained as a non-collusive equilibrium outcome in an oligopsonistic market, provided the number of firms in the local labour market is sufficiently small. The reason is that firms have a common interest of retaining workers on a local labour market. However, beyond this number, all firms pay cash, and attachment breaks down, resulting in more outmigration. In a nutshell, our model shows that attachment through non-monetary compensation can be understood as a public good for local firms, which breaks down due to the incentive of firms to free-ride on others.

In Section 3, we apply our theory to the case of Russia. We first establish

two stylized facts: a) there is an increasing tendency of Russian firms to compensate workers in non-monetary forms such as fringe benefits and in-kind payments; b) segmentation of local and regional labour markets prevails and labour does not appear to reallocate across segmented markets. We then investigate data from the Russian Longitudinal Monitoring Survey in order to test the main prediction of the model: Controlling for personal and regional characteristics, workers' propensity to leave a region should be an increasing function of the degree of competitiveness of the local labour market. We find that indeed higher labour market concentration reduces geographical mobility, a result which appears to be robust against various specifications, and of significant magnitude. An increase of concentration by one standard deviation can reduce the propensity of an individual to leave by up to 9%.

Section 4 discusses the contribution of our theory to the literature. We first look at the implications of worker attachment for our understanding of the Russian economy, and also on the functioning of monopsonistic labour markets in more general terms. In particular, we highlight some interesting parallels from economic history.

2 A model of worker attachment

Our model looks at a local labour market with N firms and one worker (W, 'she').[3] All players are risk-neutral and maximize the sum of their payoffs in the first period and in the second period. There is no discounting. At the beginning of the game, the worker has no savings. There is also a central labour market, the functioning of which we blackbox. The potential wage the worker can obtain there is common knowledge. W needs cash to migrate to the central labour market, i.e. migration is only possible, if she received a cash wage in the first period. We show that there is a cutoff number of firms in the local labour market up to which all firms offer non-monetary (attachment) contracts in the first period. Beyond this cutoff, firms offer cash contract and workers migrate in the second period.

[3] Appendix 2 contains a discussion of the model with continuum of workers.

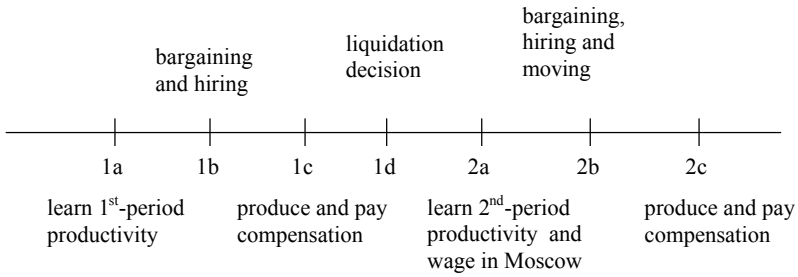

Figure 1: Timing.

2.1 Timing

The timing is shown in the Fig.1.

The first period comprises $t = \{1a, 1b, 1c, 1d\}$, the second period $t = \{2a, 2b, 2c\}$. All firms are *ex ante* identical. The productivity of the worker in firm i at time $t = 1, 2$ is $R_i^{(t)}$, which is distributed over $[\underline{R}, \overline{R}]$ with c.d.f $G(R)$. W's potential productivities are independent over time and across firms. If W is not employed by a firm, she receives a self-employment income $s < \underline{R}$.

At $t = 1a$, W and the firms learn the productivity of the worker in each firm in the first period. Without loss of generality, we will assume that firms are indexed in the descending order of their first-period productivity: $R_1^{(1)} \geq R_2^{(1)} \geq ... \geq R_{N-1}^{(1)} \geq R_N^{(1)}$.

At $t = 1b$, W and the firms bargain over the first-period compensation package which may include non-monetary components. The firm's bargaining power is $\alpha \in (0, 1)$. The bargaining framework we consider is described in subsection 2.3. Contracts cover only one period, that is, there is no commitment for long-term contracts.

At $t = 1c$, if the worker is employed, she produces and gets her compensation according to the contract signed at $t = 1b$.

At $t = 1d$, firms decide simultaneously about whether or not to liquidate a fixed proportion of their assets. In case a firm decides to liquidate part of its assets, it receives a one-shot payoff of L, which can be interpreted as the revenue of selling capital in the market, or as a reduction of fixed costs.

By the same token, the expected second-period marginal productivity of the worker in the firm decreases by a fixed amount γ, that is the worker's productivity is now drawn from $[\underline{R}-\gamma, \overline{R}-\gamma]$, rather than $[\underline{R}, \overline{R}]$. We will solve for symmetric Nash equilibria allowing for mixed strategies.

At the beginning of the second period ($t = 2a$), all players observe W's productivities in local firms. The wage on the central labour market is known to be w^M.

At $t = 2b$, the worker may migrate to the central labour market provided that she holds enough cash to cover the transportation costs T, i.e. if her first-period wage entailed a cash payment of at least T. In case the worker does not migrate, firms and worker bargain about the second-period contract.

At $t = 2c$, production occurs and wages are paid.

2.2 Assumptions

A1. $s < \underline{R} - \gamma < \overline{R} - \gamma < w^M - T < \underline{R} < \overline{R}$: A local firm can match the wage on the central labour market if it does not liquidate its assets. If the liquidation occurs, the firm cannot compete with the wage in the central market, but is still a better match than the local self-employment option.

A2. $s < T < \underline{R}$: Self-employment does not provide enough cash to move. Local employers can pay a wage in the first period that provides enough cash to move in second period.

A3. $\alpha\left[ER - (\overline{R} - \gamma)\right] < L < \alpha\left[ER - s\right]$: It does not pay off for local firms to liquidate the assets if the worker's outside option is local self-employment. On the other hand, firms prefer to liquidate if there are very many local competitors even if all of them have liquidated their assets. Here $ER = \int_{\underline{R}}^{\overline{R}} R dG(R)$ is the expected marginal productivity of the worker in a local firm.

We are now ready to solve the model by backward induction.

2.3 Second-period wage determination

At $t = 2b$, after firms have decided whether or not to liquidate part of their assets, and after W's productivities with local firms have been observed, workers choose whether to stay or to migrate. If W has cash in excess of or equal to T, and her expected wage in Moscow net of transportation costs is higher than the local productivity, she migrates and does not engage in bargaining with any of the local firms. Otherwise, she bargains with the firms about the second-period wage.

We first look at the case where the worker does not have enough cash. The worker observes her marginal productivity in each firm $R_i^{(2)}$. Let us denote j_k the firm with k-th highest second period productivity:

$$j_1 = \arg\max_i R_i^{(2)},\ j_2 = \arg\max_{i \neq j_1} R_i^{(2)}, ...,\ j_N = \arg\min_i R_i^{(2)}.$$

Hence, $\{j_1, j_2, .., j_N\}$ is a permutation of $\{1, 2, .., N\}$ such that $R_{j_1}^{(2)} \geq R_{j_2}^{(2)} \geq ... \geq R_{j_N}^{(2)}$.

We consider the following bargaining game. The most productive firm makes the worker a take-it-or-leave-it offer. In case the worker does not accept the firm's offer, she contacts the second-most productive firm and receives its offer and so on. There is no wage-posting, i.e., firms cannot commit themselves to wages promised. Hence, W relies on her rational expectation of the outcome of wage renegotiation. The worker's bargaining power is $1 - \alpha$. Firm j_1 and the worker bargain on the division of the joint surplus. If they do not agree, the firm has zero payoff and the worker receives $w_{j_2}^{(2)}$, the wage the worker would receive upon entering negotiations with firm j_2. Therefore, the joint surplus is $R_{j_1}^{(2)} - w_{j_2}^{(2)}$. The firm receives $\alpha(R_{j_1}^{(2)} - w_{j_2}^{(2)})$, while W receives $w_{j_1}^{(2)} = w_{j_2}^{(2)} + (1-\alpha)(R_{j_2}^{(2)} - w_{j_2}^{(2)}) = (1-\alpha)R_{j_2}^{(2)} + \alpha w_{j_2}^{(2)}$.

Wage w_{j_2} is the outcome of similar bargaining between W and firm j_2. Hence, $w_{j_2}^{(2)} = (1-\alpha)R_{j_2}^{(2)} + \alpha w_{j_3}^{(2)}$. Carrying out N iterations, yields:

$$w_{j_1}^{(2)} = (1-\alpha)R_{j_1}^{(2)} + (1-\alpha)\alpha R_{j_2}^{(2)} + ... + (1-\alpha)\alpha^{N-1}R_{j_N}^{(2)} + \alpha^N s. \quad (1)$$

W accepts the offer of firm j_1 and is paid $w_{j_1}^{(2)}$.[4] The firm gets $R_{j_1}^{(2)} - w_{j_1}^{(2)}$. Obviously, the wage increases in the outside option s, in the worker's bargaining power $1-\alpha$, and in N, the number of firms on the local market. An important implication of (1) is that if all firms shrink, so that all R_i decrease by γ, the worker's payoff decreases by $(1-\alpha^N)\gamma$ while each firm's expected rent goes down by $\alpha^N\gamma/N$.

If W has the cash required for migration, only the firms that keep their assets can compete for hiring the worker. Suppose that there are k such firms, i.e: $R_{j_1}^{(2)} \geq R_{j_2}^{(2)} \geq ... \geq R_{j_k}^{(2)} \geq w^M - T \geq R_{j_{k+1}}^{(2)}$.

Then the wage of the 'non-attached' worker is:

$$w_{na}^{(2)}(k) = (1-\alpha)R_{j_1}^{(2)} + (1-\alpha)\alpha R_{j_2}^{(2)} + ... + (1-\alpha)\alpha^{k-1}R_{j_k}^{(2)} + \alpha^k(w^M - T). \tag{2}$$

If all firms have liquidated their assets ($k=0$) and W has enough cash to move, there is no point in bargaining. W migrates, receiving a payoff of $w^M - T$, while all local firms receive nil.

2.4 Liquidation decision

We now consider the subgame that takes place at $t = 1d$. The decision to keep or liquidate assets depends on the first-period contract. The first Lemma looks at firms' liquidation decisions when W received enough cash to move. (All proofs are provided in the Appendix. V_{na}^W represents the 'non-attached' worker's payoff; V_{na}^F the payoff of any firm if the worker is not attached.)

Lemma 1 *Suppose that the worker has enough cash to migrate in the second period. Under Assumptions A1-A3, there exists only one Nash equilibrium in the liquidation subgame. In this equilibrium, all firms liquidate their assets,*

[4] Firms' inability to credibly post their wages is very important. W's wage paid by the most productive firm j_1 may be below her second highest productivity $R_{j_2}^{(2)}$. Therefore, if the second best employer j_2 posted a wage $\tilde{w}_{j_2} \in (w_{j_1}^{(2)}, R_{j_2}^{(2)})$, W would move to j_2 and receive a positive surplus $R_{j_2}^{(2)} - \tilde{w}_{j_2}$. But, since there is no commitment for posted wages, an assumption that fits the experience in transition economies well, the wage will be bargained down to $w_{j_2}^{(2)}$.

and W leaves in the second period, receiving $V_{na}^W(N) = w^M - T$, while each firm receives a payoff of $V_{na}^F(N) = L$.

The intuition of this Lemma is that, if W has enough cash to migrate, the relevant outside option is $w^M - T$, rather then s. Since the cake firms and W bargain about shrinks when W has an option to migrate, it is worthwhile for the firms to cash in L by liquidating their assets.

We now look at the branch of the game tree where W is 'attached' (i.e. does not have enough cash to move). We will show that for small N, all firms may decide to keep their assets in equilirium. To solve for the Nash equilibrium in the liquidation subgame, we first need to compute the expected second-period payoffs of firms and W.

Suppose that W is attached and all firms keep their assets. Then the second period productivities are drawn from $[\underline{R}, \overline{R}]$. The expected second-period wage equals

$$\overline{w}(N) = E_{R_1^{(2)}} E_{R_2^{(2)}} ... E_{R_N^{(2)}} \left[(1-\alpha) \sum_{k=1}^{N} R_{j_k}^{(2)} \alpha^{k-1} + \alpha^N s \right]. \tag{3}$$

Apparently, this function increases with N. The expected wage in case of monopsony is $\overline{w}(1) = (1-\alpha)ER + \alpha s$, the perfectly competitive labor market pays W the marginal product of labor $\overline{w}(\infty) = \overline{R}$.

At the time firms decide whether or not to liquidate some of their assets, they are identical in respect to their second-period productivity. Thus, each firm considers its expected rents, provided that it turns out to be the best local match for W:

$$\overline{J}(N) = E_{R_1} E_{R_2} ... E_{R_N} \left[R_1 - (1-\alpha) \sum_{k=1}^{N} R_{j_k} \alpha^{k-1} - \alpha^N s \middle| R_1 > \max_{i \neq 1} R_i \right]. \tag{4}$$

One can easily check that $\overline{J}(N)$ decreases with N. If there is only one firm, its expected rent is $\overline{J}(1) = \alpha(ER - s) > L$, but higher competition among employers drives their rents down to zero $\overline{J}(\infty) = 0$.

Firms make liquidation decisions rationally expecting the outcome of second-period bargaining. The following Lemma determines the liquidation decisions in Nash equilibrium as a function of N provided W is attached. It also states the equilibrium payoffs of firms $V_a^F(N)$, and the payoff of the attached worker $V_a^W(N)$ as a function of N.

Lemma 2 *Provided W is attached, the equilibrium in the investment subgame is unique and can be characterized as follows. There exist $N^* < N^{**} < \infty$ such that:*

1. *If $N \leq N^*$, all firms keep their assets. The worker receives $V_a^W(N) = \overline{w}(N)$, while each firm has an expected payoff of $V_a^F(N) = \overline{J}(N)$. Here N^* solves $\overline{J}(N^*) = L$.*

2. *If $N \in [N^*, N^{**}]$, firms liquidate their assets with probability $\pi(N)$, which is increasing in N, $\pi(N^*) = 0$, $\pi(N^{**}) = 1$. W's payoff is $V_a^W(N) = \sum_{n=0}^{N} C_N^n \ (1-\pi(N))^n(\pi(N))^{N-n} w(n,N)$. Here $C_N^n = \frac{N!}{n!(N-n)!}$; $w(n,N)$ is the expected wage given that n firms keep their assets and $N-n$ liquidate. The firm's expected payoff is $V_a^F(N) = L + (\pi(N))^{N-1}\left(\overline{J}(N) - \gamma\alpha^N/N\right)$.*

3. *If $N \geq N^{**}$, firms liquidate their assets with probability 1. W's payoff is $V_a^W(N) = \overline{w}(N) - \gamma(1-\alpha^N)$. The firm's expected payoff is $V_a^F(N) = L + \left(\overline{J}(N) - \gamma\alpha^N/N\right)$.*

The Lemma establishes that up to a cutoff level of N^*, it pays off for firms not to liquidate their assets. Maintaining all assets allows them to have a larger payoff provided they are the best local match. However, this payoff decrease in N, and beyond N^*, they randomize between maintaining and liquidating some of their assets, which reduces their payoffs if they happen to be able to hire the worker, but provides them with a certain payoff of L. With competition increasing even further (beyond N^{**}), firms prefer to liquidate with probability 1.

2.5 First-period bargaining

In the first period, the best match for the worker is firm 1 (by definition, $R_1^{(1)} \geq R_2^{(1)} \geq ... \geq R_N^{(1)} > s$). W bargains with firm 1 about level and

composition of her compensation $\{m_1^{(1)}, x_1^{(1)}\}$, $m_1^{(1)} + x_1^{(1)} = w_1^{(1)}$. If the parties agree on an attachment contract with a monetary part $m_1^{(1)} < T$, the firm receives $R_1^{(1)} - w_1^{(1)} + V_a^F(N)$ and the worker receives $w_1^{(1)} + V_a^W(N)$. If the contract provides the worker with enough cash to move $m_1^{(1)} > T$, then the firm gets $R_1^{(1)} - w_1^{(1)} + V_{na}^F(N)$ and the worker gets $w_1 + V_{na}^W(N) = w_1^{(1)} + w^M - T$. Therefore attachment maximizes the joint surplus if and only if

$$V_a^F(N) - V_{na}^F(N) \geq w^M - T - V_a^W(N). \tag{5}$$

Condition (5) holds for all firms, since they are *ex ante* identical with regard to the second period. Therefore, the worker will expect the same *type* of compensation in all firms, whether they are more or less productive in the first period. Indeed, suppose that (5) holds and firm 1 offers in-kind contract but firm 2 promises wage in cash. If $w_1^{(1)} - w_2^{(1)}$ is less than the value of the option to leave in the second period (the right hand side of (5)), then the worker would prefer firm 2. The problem is that the firm 2 cannot commit to pay wage in cash. Once the worker left 1, firm 2 will renegotiate the contract: since (5) holds, attachment maximizes joint surplus. Therefore either (5) holds and all firms pay in kind or (5) does not hold and all firms pay in cash.

Proposition 1 *The equilibrium in the game with N local employers is as follows.*

1. *W is hired in the first period by the employer with the highest productivity.*

2. *Attachment occurs in equilibrium if and only if condition (5) holds.*

Corollary 1 *If $N \geq N^{**}$, there is no attachment in equilibrium.*

Corollary 2 *If*

$$w^M - T - \overline{w}(N^*) > 0 \tag{6}$$

then attachment occurs in equilibrium if and only if $N < N^*$ *and*

$$\overline{J}(N) - L \geq w^M - T - \overline{w}(N). \tag{7}$$

Corollary 3 *If (6) does not hold then there exists such* $\overline{N} \in (N^*, N^{**})$ *that attachment occurs in equilibrium whenever* $N \leq \overline{N}$.

The Proposition implies that competition in the local labor market makes the attachment less likely to happen. The first corollary states that attachment is only feasible at $N < N^{**}$.

The other two corollaries describe two different rationales for attachment. If condition (6) holds, attachment takes away the worker's option to leave in the second period. The option has a positive value, therefore the worker would prefer a lower cash wage in the first period to a higher non-monetary compensation. For attachment to happen, the firm's benefit of attaching the worker (the left-hand side in (7)) must be greater than the value of the option to go that the worker sacrifices by accepting the attachment contract (the right-hand side in (7)).

The second case where (6) does not hold, shows that attachment can occur even if firms liquidate with a positive probability. In the mixed strategy equilibrium, firm are indifferent between keeping their assets and liquidating. On the other hand, the worker prefers lower probability of liquidation since her wage is higher if the firm keeps its assets. In this case the worker also benefits from the attachment and does not need a compensation for accepting in-kind payments.

At $N = 1$, (7) becomes $L < \left[ER - (w^M - T)\right]$. The attachment can therefore occur for a broad range of parameter values that satisfy A1-A3. E.g. take $s = 0$, $\alpha = 0.3$, $\gamma = 2$, $L = 0.2$, $w^M - T = 3.9$, $\underline{R} = 4$, $\overline{R} = 5$, $G(R) = R - 4$ (uniform distribution). Then $N^* \in (2, 3)$, $N^{**} \in (3, 4)$, attachment occurs at $N < 3$, i.e. both in case of monopsony and duopsony; while if there are three or more employers, cash contracts prevail in equilibrium, and the worker leaves the region.

2.6 Discussion of results

The key to the main result — feasibility of attachment hinges on the number of firms on a local labour market — lies in the impact the worker's second-period cash holding has on firms' liquidation decisions. Liquidation involves the following tradeoff: On one hand, it yields a certain payoff, but on the other hand, it reduces the expected productivity of the worker, i.e., it makes the surplus, the firm and the worker bargain about, shrink. The second determinant of the surplus' size is the worker's outside option. If the worker has some cash, the relevant outside option is to migrate to the central labour market providing (net of the migration costs) a higher utility then the local self-employment option. A1-A3 state that if migration is the relevant outside option, the part of the surplus that the firm can acquire in wage bargaining is not large enough to cover the revenue that the firm can cash in when liquidating the assets.

The choice of firms which type of contract to offer in the first period is based on the following tradeoff. An attachment contract involves that each firm has an equal chance of $1/N$ to hire the worker in the second period and to cash in some rents. A cash contract, on the other hand, may be cheaper, because the worker has a preference for cash, since only cash allows her to migrate in the second period. We have shown that the expected second-period rent of each (*ex ante* identical) firm decreases in N: first, since the probability to hire the worker in the future decreases; second, because the expected rent, contingent on hiring the worker depends negatively on N. If competition is high, the expected rents are not sufficiently large to compensate for the discount the firm receives when offering cash. Consequently, beyond a certain level of competition, firms always offer cash contracts.

It is important to notice that attachment may involve exploitation, i.e., attached workers forgo the benefits of migration without being compensated for it. Consider the case where (6) holds. Comparing the worker's payoff in the attachment equilibrium with the payoff she would get in the absence of cash constraints makes this point clear. Assume for a moment that the worker can borrow against her future wages in the central labor market. Then in the second period the worker will have an outside option of $w^M - T$;

local firms will liquidate, and the worker will indeed leave the local labour market. Her two period payoff will therefore be $w_1 + w^M - T$. On the other hand in the presence of the cash constraints, the worker only gets $w_1 + \overline{w}(N)$. Since $\overline{w}(N) < \overline{w}(N^*) < w^M - T$, attachment actually reduces the worker's welfare. Why does competition between firms not prevent exploitation? Apparently, expecting that the firm 1 offers an in-kind contract, firm 2 would promise a cash contract in order to be able to hire the worker. But the worker would rationally expect that the promised cash wage will be renegotiated to non-monetary compensation: if condition (7) holds for firm 1, it also holds for firm 2. Firm 2 will also know that firm 3 will not be able to hire the worker by promising cash since firm 3 will also prefer attachment in equilibrium. Since the self-employment income s is too low to save for moving, in the attachment equilibrium the worker is not compensated for her outside option.

One way to prevent exploitation is to raise the bargaining power of the worker (e.g. through unions). An increase in $1-\alpha$ results in a higher $\overline{w}(N)$, hence (6) is less likely to hold. If bargaining power of the worker is high enough, the attachment may still occur but would not involve exploitation.

3 The Russian labour market

In this subsection, we discuss two constituting elements of the Russian labour market, which our theory reconciles. First, we present some facts on the widespread use of non-monetary compensation in modern Russia. Second, we look at the lacking interregional mobility and the resulting perpetuated labour market segmentation. Third, we present results of empirical analysis of the RLMS data.

3.1 Non-monetary compensation

In the Soviet Union, firms provided a wide range of non-monetary benefits to their workers, including hospitals, housing, rest houses, child care, catering and education. Cash wages being subject to rigid regulations, the quantity and quality of fringe benefits was an important instrument to attract workers. The magnitude of these fringe benefits was substantial. Commander

and Jackman (1997) find in a 1992 survey among Russian firms that social benefit provision accounted for 35% of total labour costs.

A number of presidential decrees stipulated that all assets related to provision of such services had to be transferred to municipalities, but in general, firms have not discontinued the provision of social services. In particular in local labour markets in which few firms control most of the employment, firms own up to 85% of the social assets [Healey et al. (1998)]. Tratch et al. (1996) report in a survey of 93 enterprises that from 1991 to 1995, 65% of enterprise-owned kindergartens were closed down, while 80% or more of other establishments (such as hospitals, restaurants) were preserved. Moreover, firms even established new types of facilities or transformed existing ones. 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.

A more recent survey of 200 enterprises by Biletsky et. al. (1999)[5] shows that the provision of services has only slightly decreased. The first table shows that sharp drops only occured in construction of new housing and concerning kindergarten services. The second table, presenting the percentage of firm employing workers in activities related to the provision of goods and services corroborates the impression.

Biletsky 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 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).

We believe that the provision of fringe benefits and in-kind payments is not due to behavioural inertia of paternalistic managers, but rather follows the strategic patterns we have highlighted in our model. A survey [VCIOM (1997)] among top managers and executives of 142 enterprises confirms this

[5]We are grateful to David Brown and John Earle for providing us with data from their survey.

	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 1: Percentage of firms providing different types of fringe benefits, Biletsky et al (1999).

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

Country	1993	1994	1995	1996	1997
Bulgaria	—	—	0.30	0.02	0.01
Poland	—	0.14	0.20	0.12	0.26
Romania	—	—	0.08	0.22	0.01
Slovenia	—	0.17	0.18	0.29	0.01
Estonia	—	0.03	0.16	0.14	0.27
Russia	0.01	0.00	0.00	0.05	0.00

Table 3: Fraction of excess job reallocation resulting from employment shifts between regions. Source: Faggio and Konings (1999).

view: only 37% of the respondents 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.

3.2 Labour market segmentation and the lack of interregional mobility

As a consequence of soviet-style industrialization, the Russian labour market was, at the outset of transition, highly segmented. Employment on local labour markets was often concentrated in one or very few large plants. With Russia entering economic transition, a productivity and income gap emerged between Moscow, St Petersburg, and some of the western regions on one hand, and the Far North, the southern and eastern periphery (the so-called 'Red Belt') on the other hand (see Berkovitz and DeJong (1999)). One would thus expect massive reallocation of workers across regions.[6] However, as the Table 3 shows, this is not the case.[7]

The high degree of labour market segmentation can also be seen from the regional variation in job opportunities, measured in the ratio of unemployed

[6] Heleniak (1999) estimates the potential for migration from Russian North at 2 mln. people.

[7] The table reports the share of excess job reallocation that occurs across regions in total excess job reallocation. Excess job reallocation equals the difference between job turnover and net job flows. We are grateful to Jozef Konings for providing us with the figures for Russia which are calculated on the basis of the Russian Enterprise Registry Longitudinal Dataset.

	1993	1994	1995	1996	1997
Bryansk oblast	58	158	58	62	84
Vladimir oblast	18	28	34	46	38
Moscow City	4	3	3	2	1
Ryazan oblast	24	28	48	42	48
Tula oblast	6	15	18	31	32

Table 4: Ratio of unemployed over vacancies in the Central economic region, Goskomstat, own calculations.

over vacancies. We use Goskomstat data, and look at this indicator on two levels. First, on the level of the 'economic regions', the ratio for the Central Region was roughly 8 in 1993, increasing to 13 in 1996, but dropped to its initial level in 1997. Looking at the same index for the Eastern Siberian Region, we find that the ratio grew steadily from 18 in 1993 to 76 in 1997. It is not too surprising that reallocation of labour is difficult across the huge economic regions, some of which are larger then the largest Western European countries. However, it is striking that the unemployed-over-vacancies ratios *within* economic regions vary to a comparable extent. The next table presents the respective figures for four administrative regions, and the City of Moscow, all of which belong to the Central Region, the most developed and densely populated economic region.

One may wonder why workers from say Ryazan, a town situated two hundred kilometers away from Moscow, are not moving to the capital? The most obvious answer to this question is: because migration may not be worth the costs.

To look at this argument, we have tried to estimate the costs and benefits of internal migration. Monthly salaries in Roubles were collected from 28 Russian towns and cities for up to ten occupations as well as rents and transportation prices. The source of this information are job advertisements in newspapers in October 2000. The full list is available on request; we here only report the data for Moscow and Ryazan, since we believe that the difficulties associated with migration increasing in the distance.

The last column presents the differences in monthly income deflated by

	Ryazan	Moscow	Moscow, deflated	Difference, Ryazan rubles
Policeman	500-1200	2400-2600	1807-1958	607-1458
Secur. guard	700-1500	2900-3400	2184-2560	684-1860
Car mechanic	1500-2300	5000	3765-3765	1465-2265
Painter	1000-1500	5400-6000	4066-4518	2566-3518
Accountant	1100-1250	4200-6000	3163-4518	1913-3418
Driver	1500-2000	4150-5800	3125-4367	1125-2867
Foreman	2000-4000	8300-10000	6250-7530	2250-5530

Table 5: Salary differentials between Moscow and Ryzan, October 2000. Reported are monthly salaries in current rubles. The exchange rate was 28 rubles/USD. Official statistics estimate consumer prices to be 32.8 per cent higher in Moscow than in Ryazan: the minimum living standard (calculated as the cost of 25 goods basket) is 664 rubles in Ryazan and 882 rubles in Moscow.

the regional CPI. The costs of moving consists of first, differences in rents. The monthly rent for a one room flat (bottom range) is 900 rubles in Ryazan, compared to 2000-3000 Roubles in Moscow. Moreover, a Moscow City passport ('registration'), is needed; a temporary registration costs approximately 2000 rubles for half a year. The fixed cost of moving that includes train ticket and shipment of furniture is another 2000 rubles. Provided that a worker migrating to Moscow finds a job immediately, he or she would be able to break even within couple of months. However, the opportunity costs associated with searching a job must also be taken into account. Assuming a 6 months search-period, a painter would break even after one and a half year (6 months of searching plus one year of earning a real wage three times higher than in Ryazan). Thus it appears that there is scope for migration, but the associated costs must be paid upfront requiring a substantial amount of cash for migration (the fixed costs of moving plus the cost of paying high rent during the search period).

The second potential explanation for low interregional migration may be due to lacking flexibility of Russian workers, i.e. excessively high costs

of adapting to new environments. The evidence contradicts this argument. Turnover rates in Russia are high, in the same range as the ones in Poland, and much higher then in Bulgaria and Romania for instance, but churning is almost exclusively local [Gimpelson and Lippoldt (1999)]. As Kapeliushnikov (1999) notices, workers are very flexible but they change 'bad' jobs for 'bad' jobs (this is also consistent with evidence in Smirnych and Wörgötter (1999) who show that changing jobs does not give Russian workers a better wage).

3.3 Empirics

To our knowledge, there is no dataset that would allow a direct test of our model. However, the 'Russian Longitudinal Monitoring Survey' (RLMS), a representative data set on Russian households, contains some information that is useful for an analysis of the impact of local labour market concentration on individual moving decisions. While due to data quality, some caveats apply, the evidence we find appears in line with our theory.

3.3.1 Data

The RLMS is not a panel data set.[8] However, interviews in Round VI (winter 1995/96) and Round VII (winter 1996/97) were conducted in the same dwellings. In case surveyed persons had moved, interviewers were supposed to find out about their new residence, provided they had not left the community.[9] This allows to construct an, albeit imperfect, variable capturing geographical mobility.

We only consider individuals aged between 16 and 60 who had a job in Round VI. We are interested in the relationship between the dependent variable '*Move*', and the independent variable '*CR4*'. *Move* takes a value of nil if an individual interviewed in Round VI happened to live in the same community in Round VII. The variable takes a value of one, if the interviewers were not able to find an individual in the same community he

[8] For more information on the RLMS, see: http://www.cpc.unc.edu/projects/rlms.

[9] The RLMS is supposed to be representative at the national level. The interviews have been conducted in 38 communities. Persons who left their community have not been followed up.

or she dwelled in during Round VI. Unfortunately, $Move = 1$ also entails non-respondents, and people who deceded between Rounds VI and VII. Thus, *Move* represents an imperfect measure for regional mobility.[10]

CR4 represents the percentage of the labor force employed by the largest four employers on the respective local labour market. In constructing this variable, we have considered all large and medium-sized firms submitting statistics to Goskomstat, the Federal Committee of Statistics of the Russian Federation.

We also use a host of control variables from the RLMS: personal characteristics, like age, gender, education, whether or not individuals had secondary jobs; primary job characteristics, e.g., wages and wage arrears, in-kind payments, job tenure, number of subordinates; household characteristics, e.g. size and structure of the household, total income of the household, apartment ownership. We also used proxies for the subjective well-being of individuals, like the self-assessed economic rank, satisfaction with life, intention to change job or to move away from a community. Moreover, we use information about the economy of the so-called 38 'Primary Sampling Units' (PSUs), the communities where people were surveyed. We have deflated all nominal variables by a local CPI that uses price information of 25 basic goods from the RLMS, and weighs them according to the Goskomstat methodology. Appendix 3 lists all the variables we have looked at.

3.3.2 Main Results

Table A (Appendix 3) presents the results of different probit specifications for *Move*. While we have run regressions with all potentially interesting personal, household and job characteristics, we present only those variables that are jointly significant. Table B presents their descriptive statistics. To make the results of regressions easily interpretable, we report the marginal effect of a change in the respective independent variable on an individual's likelihood to move (computed at the average value of the respective variable). The first specification includes 38 dummies for the PSUs and provides a

[10] According to Goskomstat, the mortality rate in Russia was roughly 1.5% in 1995. Thus we believe that the sample distortion due to non-respondents is more substantial than the one due to mortality.

useful benchmark. Since PSUs and *CR4* are perfectly correlated, we cannot include both in the same regression. In spec. 2, we thus replace the PSU dummies with the respective *CR4*, and control for the eight large, economic regions that are roughly equivalent to the definition of the super-regions, the 'Presidential Districts', including a special dummy for Moscow.

Comparing spec. 1 and spec. 2, we note that the explanatory power decreases without PSUs, but signs, magnitudes and statistical significance of the coefficients in the two specifications do not differ much. The positive sign of monthly household income (the first variable), deflated by the local CPI, is in line with our theory that highlights the importance of liquidity constraints on moving decisions.[11] People with longer tenure in the firm tend to be less mobile, a fact that can be reconciled with the presence of relation-specific human capital. Education, measured in years, influences moving decisions positively. Older and married persons tend to move with lower probability, while men have a higher propensity to move. The dummy indicating whether an individual lives in a rented flat exerts strong positive influence on the moving decision. This can be interpreted as a sign that people who move more often prefer to live in rented flats, rather then in their own flats (or company dormitories). However, the fact of renting an apartment is also a potential proxy for the cash individuals hold, since in Russia, flats rented on the market are usually of higher quality and more expensive. As expected, having children in the age between 7 and 18 has a negative impact on moving decisions. Any other household variable does not affect the decision to move.

The major lesson from spec. 2 is that as predicted by our theory, higher labour market concentration as measured by *CR4* has a negative impact on

[11] We have also run regressions with monthly salary rather than household income and found the coefficient to be positive and significant as well. Since controlling for personal and job characteristics, one should expect that individuals with higher income should be less interested in leaving, the positive sign suggests that the liquidity effect of a higher income dominates. It is also interesting that the coefficient is larger for low-income individuals than for higher incomes. We report regressions with household income rather then individual salaries since we believe the latter to be a better measure of liquidity, and many of the salary observations are missing. While it would have been preferable to look at the stock of household savings, such information is not available in the RLMS.

individuals' moving decisions, the magnitude of which is substantial: when *CR4* increases by one standard deviation (.29), an individuals probability to move decreases by 4 percent points. Given that in our sample, only 18% of the surveyed individuals happen to have $Move = 1$, we believe this impact to be important.

3.3.3 Alternative explanations, additional evidence

One could argue that firm-specific factors may affect geographical mobility in a non-strategic way, and that they may be correlated with local concentration indices. In concentrated local markets, firms may be more sensitive to shocks and liquidity constraints may force them to pay wages in non-monetary forms. In order to control properly for this explanation, one would want to look at matched firm-individual data allowing to verify whether cash-constrained firms have a larger propensity to compensate their workers in a non-monetary way. However, with the available data, we can only control for liquidity on a more aggregated level. We have looked at three variables: first, the ratio of per capita monetary income deflated by the minimum living standard in the region (oblast); second, the per-capita deposits in the regional 'Sberbanks' (the savings and loans banks), deflated in a similar way; third, the average shares of barter in local firms' sales. Spec. 3 reports the results for the first of these variables, which happens to provide the best fit.[12] Clearly, the coefficients for *CR4* remain negative and significant.[13]

Another alternative explanation for the observed negative empirical relationship between labour market concentration and mobility goes as follows. For the sake of the argument, let us assume that higher rates of labour market concentration are correlated with higher product market concentration. Then, when *CR4* is high, there are more rents that can be shared

[12] The effect of the second variable is similar. The effect of the third one is insignificant, which may be due to the fact that the barter survey only included a few hundred firms an is thus not regionally representative.

[13] One should however be careful to overinterpret this result, since *CR4* is negatively correlated with the first two demonetization indices. A regression we have run shows that they jointly explain roughly 23% of the variation of *CR4*. (All non-reported regressions are available on request.)

between managers and workers, which *ceteris paribus* makes current employment more attractive. In order to control for this explanation, we have regressed wages on *CR4* and relevant controls.[14] We have found that the effect of *CR4* on salaries is negative, significant and quite large: in different specifications, individual wage decreases by .4 to .5% when *CR4* increases by 1%, indicating that this explanation can be rejected.

The third explanation builds on potential economies of scale in the provision of fringe benefits like hospitals, housing, schools etc. Then, a higher *CR4* would be an indicator for better provision of fringe benefits that more then compensate potentially lower monetary wages. Looking at inflows into local labour markets, one could, in principle, test this theory. While our theory predicts both low outflows and low inflows from concentrated local labour markets, the above explanation would predict low outflows and *high* inflows. Unfortunately, we have not been able to identify population changes on the local level. However, anecdotal evidence seems to suggest that workers are not very keen to move into local labour markets with high concentration, but that there are many people who would like to leave, but do not have the financial means to do so.[15]

Since *CR4* may be correlated with many characteristics of the PSU's local economy, we have looked at the effect of living standard proxies that are uncorrelated with CR4. In spec. 4, the additional independent variables are first, the availability of bank services; second, the quality of telecommunication services; and third, the quality or roads in the PSUs. While these variables matter, they reduce magnitude and significance of *CR4* only marginally.

As noted before, observing $Move = 1$, we cannot distinguish non-respondents from persons who moved out from the community. However, one can use the fact that in Round VI, subjects were asked whether they intended

[14] Regression results are available on request.

[15] In a survey of students, disabled, unemployed and retired individuals residing in Russian North, 54 to 68% (for various categories) responded that they would be willing to leave the region but only 3-11% said that they would have sufficient financial means to cover the migration costs fully or partially (Heleniak (1999)). While the surveyed categories are apparently the most cash constrained ones, the magnitude of the problem is striking.

to move in the course of the following 12 months. It turns out that an individual's intention to move in Round VI is a good predictor for having $Move = 1$ in Round VII. The respective probability is 42% for those who intended to move vs 15% for the rest of the sample. We have thus, for spec. 5 (Table A), removed individuals from the sample who did *not* intend to move, but had $Move = 1$ in Round VI, since we believe them to be more likely non-respondents. The respective regression attributes a lower magnitude to *CR4*, but it remains significant, and the explanatory power more then doubles, compared to spec. 4.[16] Finally, we would like to respond to yet another potential alternative explanation arguing that non-monetary compensation, and thus attachment, may depend on personal characteristics rather then on the outcome of strategic interaction between firms. While we do not have any information about fringe benefits, which represent the bulk of non-monetary compensation, the RLMS contains a dummy for in-kind payments in the month preceding the interview date. Table C shows the results of a probit regression where the dependent variable is the dummy for in-kind payments, and the independent variables are those that we have used in the preceding regressions. Again, *CR4* turns out to be significant, while most of the other variables have insignificant or very weak effects.

4 Concluding remarks

We have argued that firms may not only have an incentive to restrict the mobility of workers, but also the means to do so. Though the model has been inspired by modern Russia, we believe that it has features that are of a more general interest. Two conditions must be satisfied in order for attachment to be feasible. First, workers must be cash-constrained; second, labour markets must be concentrated. These conditions are satisfied in some transition economies, but there are also other cases, in particular from economic history that provide interesting parallels. In what follows we discuss what our theory

[16] We have also run a regression on the subsample of individuals who intended to move in Round VI (Table A, spec.6). In this subsample the coefficient for *CR4* happens to be significant and very large (.29), but we would not want to overinterpret the result, since the sample size shrinks to 292 individuals.

contributes to our understanding of the Russian labour market, the Russian economy in more general terms, and the functioning of unregulated labour markets.

To our knowledge, our analysis of non-monetary compensation as a strategic tool for firms to reduce the mobility of workers, is novel. There is a related literature that looks at labour relations in Russia. Commander and Schankermann (1997) argue that the absence of a social security network reduces workers' mobility, since they fear exclusion from firm-provided social services as a consequence. Their argument applies however only for mobility in the same labour market, and presumes that firms are worker-controlled and not willing to sell their services to outsiders. Grosfeld et al. (1999) relate the segmentation of the Russian labor market to the provision of fringe benefits. However, they rather look at segmentation according to skills, and do not consider the strategic interaction between firms and its impact on migration. Earle and Sabirianova's (1998) analysis of wage arrears looks at the strategic interaction between firms, but does not consider the impact of wage arrears on the ability to migrate.

In more general terms, our theory contributes to some important issues of the Russian economy. In as much as we highlight the risk of worker exploitation in concentrated labour markets, our model complements Ericson's (1999) concept of the Russian economy as a 'post-soviet industrial feudalism', in which firms seek to make their workers dependent on the management. Second, it has been argued that the Russian economy suffers from of 'internal borders' that are erected by regional governments pursuing their particular political interests [Berkovitz and de Jong (1999)]. As our model shows, labour mobility may be subject to similar internal borders, constraining the capacity of the Russian economy to grow, since labour reallocation is hampered. Finally, the Russian government has identified regional disintegration as one of the major culprits of economic weakness. Blanchard and Shleifer (2000) have accordingly argued that the disappointing transition experience of Russia in comparison to China may be due to weak central institutions who fail to obstruct rent-seeking behaviour of regional and local governments. One might argue that recentralisation would not be a necessity if workers could 'vote with their feet'. However, as our model shows,

the availability of the cash required for quitting the region is subject to the labour market structure inherited from the past.

There are many interesting parallels between the strategies used by Russian firms today, and institutions that have emerged throughout economic history. Alston and Ferrie's (1993) paper on paternalism in the former confederate states of the USA after the Civil War is an interesting case in point. 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 contemperaneous 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.

Finally, there is also a body of literature that looks at the functioning of labour markets when firms enjoy market power. Here, it has been asked what can protect workers from being exploited in the absence of regulation (cf. the surveys of Boal and Ransom (1997) and Fishback (1998)). Besides 'voice', i.e. organized labour, the literature identifies two forces — 'exit' (migration) and competition. Our theory points out the relationship between these forces: the availabilty of the exit option is contingent on having the cash needed for migration, which, in turn, depends on competition. Thus, if workers are cash constrained and local labour markets are oligopsonistic, the organization of the workforce may be the only safeguard against exploitation.

5 Appendices

5.1 Appendix 1. Proofs

PROOF OF LEMMA 1. Let us prove that the firm is always better-off liquidating rather than keeping its assets.

Consider firm 1's decision if $K-1$ other firms choose to keep their assets. If firm 1 liquidates the assets, it gets only L. If firm 1 keeps the assets, it gets

$$E_{R_1}E_{R_2}...E_{R_K}\left[R_1-(1-\alpha)\sum_{k=1}^{K}R_{j_k}\alpha^{k-1}-\alpha^K(w^M-t)\middle| R_1>\max_{k=2,...,K}R_k\right]. \tag{8}$$

This function decreases with K, therefore the benefit of keeping the assets is below its value at $K=1$, i.e. $\alpha(ER-(w^M-T))<\alpha(ER-(\overline{R}-\gamma))<L$ (see A1,A3).

■

PROOF OF LEMMA 2. Let us find the optimal strategy of firm 1 given that all other firms keep their assets. If firm 1 keeps its assets, its expected second period payoff is $\overline{J}(N)$. If firm 1 liquidates its assets, its expected second period payoff is 0. On the other hand, it gets the liquidation value of L. Therefore the firm will choose to keep its assets if and only if $\overline{J}(N)\geq L$. Therefore the equilibrium where all firms choose to keep the assets is only sustainable if $\overline{J}(N)\geq L=\overline{J}(N^*)$. On can easily check that $\overline{J}(N)$ is a decreasing function of N (see (4)). Therefore $\overline{J}(N)\geq L$ is equivalent to $N\leq N^*$.

To prove the second statement, let us just notice that in the fully mixed strategy equilibria $0<\pi(N)<1$, the firms are indifferent between keeping or liquidating the assets. Therefore their payoff can be calculated as their payoff in case they liquidate which is $L+\pi^{N-1}(N)\left(\overline{J}(N)-\alpha^N\gamma/N\right)$. The probability $\pi(N)$ is such that each firm is indifferent whether to keep or liquidate given that other firms liquidate with probability $\pi(N)$.

The firm 1's returns to keeping the assets increase with probability of other firms liquidating and decrease with number of competitors $N-1$.

Since in all fully mixed equilibria firms' returns to keeping the assets are exactly 0, $\pi(N)$ must be an increasing function.

Suppose that all other firms liquidate with probability one. Then if the firm also liquidates, it gets $L + \left(\overline{J}(N) - \alpha^N \gamma/N\right)$. If it keeps the assets, it gets the worker with probability 1. The wage equals

$$(1-\alpha)ER + (1-\alpha)\alpha E_{R_1}..E_{R_{N-1}} \sum_{k=1}^{N-1} \alpha^{k-1}(R_{j_k}^{(2)} - \gamma) + \alpha^N s =$$
$$= (1-\alpha)ER + \alpha\left[\overline{w}(N-1) - \gamma(1-\alpha^{N-1})\right].$$

The firm therefore obtains the rent $\alpha\left[ER - \overline{w}(N-1) + \gamma(1-\alpha^{N-1})\right]$. It prefers to liquidate the assets whenever $L + \overline{J}(N) \geq \alpha[ER - \overline{w}(N-1) + \gamma(1 - \frac{N-1}{N}\alpha^N)]$. According to A3, this inequality holds for large N. Indeed, at $N = \infty$ it becomes $L \geq \alpha\left[ER - \overline{R} + \gamma\right]$. Therefore there exists such N^{**} that for all $N \geq N^{**}$ all firms liquidate their assets.

■

Proof of Proposition 1. Suppose that (5) holds. Then it is common knowledge that if the worker goes to firm N, she will be offered an attachment contract: the joint surplus in case of attachment is $V_a^F(N) + V_a^W(N) + R_N^{(1)} - s$ is greater than one in case of cash contract $V_{na}^F(N) + w^M - T + R_N^{(1)} - s$; the worker's outside option is s which is not sufficient for breaking the attachment. Similarly, if the worker goes to firm $N-1$, both will know that the worker's outside option is $w_N^{(1)} = s + (1-\alpha)(V_a^F(N) + V_a^W(N) + R_N^{(1)} - s)$ paid *in kind*. Since (5) holds, the joint surplus of firm $N-1$ and the worker is greater in case of attachment and firm $N-1$ should also offer an in-kind contract. Making another $N-2$ iterations, we obtain that firm 1 will offer an attachment contract. Hence the worker will be attached in equilibrium.

Similarly, if (5) does not hold, every firm will offer cash contract.

■

5.2 Appendix 2. Sketch of a model with a continuum of workers

Consider a version of the model above where instead of one worker we have a continuum of workers with total mass normalized to 1. The wage deter-

mination and assumptions are all the same. The only difference is that in each period, firms bargain with workers separately. All workers are identical, their productivities are uncorrelated. (In a symmetric equilibrium, all firms end up hiring the same number of workers.)

5.2.1 Liquidation game with a continuum of workers

When the firms take liquidation decisions they already know how many workers are able to leave the region. Denote $\xi \in [0,1]$ the share of attached workers.

Lemma 3 *If ξ workers are attached, the equilibrium in the liquidation characterized as follows.*

1. *If $N \leq N^*$ and $\xi \in [\xi^*(N), 1]$ all firms keep their assets. Here*

$$\xi^*(N) = 1 - \frac{\overline{J}(N) - L}{(w^M - T - s)\alpha^N / N} \tag{9}$$

   The attached workers get $V_a^W(N) = \overline{w}(N)$, the non-attached workers get $V_{na}^W(N) = \overline{w}(N) + (w^M - T - s)\alpha^N$. Each firm gets $V_\xi^F(N) = \overline{J}(N) - (1-\xi)(w^M - T - s)\alpha^N / N$.

2. *There exists such $\xi^{**}(N) \leq \min\{\xi^*(N), 1\}$ that if $\xi \in [\xi^{**}(N), \xi^*(N)]$, then firms liquidate their assets with probability $\pi(\xi, N)$, which is increasing in N and decreasing in ξ. The firm's expected payoff is $V_\xi^F(N) = L + \pi^{N-1}(N)(\overline{J}(N) - \alpha^N \gamma / N)$. The function $\xi^{**}(N)$ increases with N, and $\xi^{**}(N^{**}) = 1$.*

3. *If $\xi \leq \xi^{**}(N)$, firms liquidate their assets with probability 1. The attached workers get $V_a^W(N) = \overline{w}(N) - \gamma(1-\alpha^N)$, the non-attached workers get $V_{na}^W(N) = w^M - T$. Each firm gets $V_\xi^F(N) = (1-\xi)\left(\overline{J}(N) - \gamma\alpha^N / N\right)$.*

5.2.2 Attachment with continuum of workers

In the first period, a worker of mass $d\omega$ bargain with a firm i_1 (the best match for the worker in the first period) about the level of compensation w_{i_1} and composition of compensation $\{m_{i_1}, x_{i_1}\}$, $m_{i_1} + x_{i_1} = w_{i_1}$. If the parties agree on a contract with a monetary part $m_{i_1} < T$, the firm gets

$(R_{i_1}^{(1)} - w_{i_1})d\omega + V_{\xi+d\omega}^F(N)$ and the worker gets $(w_{i_1} + V_a^W(N))d\omega$ where ξ is the share of the attached workers to be determined from the equilibrium conditions. We will refer to such a contract as an 'attachment contract'. If the contract provides the worker with enough cash to move $m_{i_1} > T$, then the firm gets $(R_{i_1}^{(1)} - w_{i_1})d\omega + V_\xi^F(N)$ and the worker gets $(w_{i_1} + V_\xi^F(N))d\omega$. Therefore attachment maximizes the joint surplus if and only if

$$\partial V_\xi^F / \partial \xi \geq V_{na}^W(N) - V_a^W(N) \tag{10}$$

Again, condition (10) is the same for all firms and all workers. Therefore a worker is again offered the same *type* of compensation in all firms.

There can be three kinds of equilibria. First, there are 'full-attachment' equilibria with $\xi = 1$. Second, there can be ´no-attachment' equilibria with $\xi = 0$. Third, there can be 'partial attachment' equilibria with $\xi = \widehat{\xi} \in (0, 1)$ workers being attached.

Proposition 2 *The equilibrium in the game with N local employers is as follows.*

1. *The equilibrium without attachment always exists. There are no equilibria with either partial or full attachment if* $N \geq N^{**}$.
2. *If (6) holds and* $N \leq N^*$, *partial attachment equilibrium with* $\widehat{\xi} = \xi^*(N)$ *exists.*

Again, attachment only occurs in the concentrated local labor markets. The model may have multiple equilibria. If no worker is attached, attaching an additional worker does not pay off: it will not suffice to create incentives for keeping the assets. On the hand, if $\xi^*(N)$ workers are attached, liquidation may be avoided.

5.3 Appendix 3. List of Variables and Tables

1. Personal characteristics
    - male (dummy, equals one if male)

- married (dummy, equals one if the person is married)
- edyrs (years spent on education)
- age (age in years)
- i6adpdjb (has another job)

2. Life satisfaction

   - wantmove (dummy, equals one if person wants to move in the coming year)
   - i6econrk (economic rank)
   - i6satlif (life satisfaction)

3. Household characteristics

   - hhincome (household income)
   - aprent (dummy, equals one if the person rents his/her housing)
   - hhsize (size of the household)
   - nkids7 (number of children aged below 7 in the household)
   - nkids7-18 (number of children aged 7-18 in the household)
   - numwork (number of working adults in the household)

4. Job characteristics

   - wgmln (the last monthly monetary wage in million rubles)
   - jobsyr (number of years spent in the firm)
   - inkind (dummy, equals one if person received in-kind payments in the last month)
   - arr (dummy, equals one if person had wage arrears in the last month)
   - boss (has subordinates)

5. Geographical characteristics

- PSU (primary sampling unit, 38 communities represented in the sample)
- CR4 (labor market concentration ratio at the PSU level: the share of four biggest employers in the total employment in the PSU)
- region (regional dummies for eight regions: Moscow and StPetersberg, Central and Central Blacksoil region, North and Northwest, Volga, East Siberia and Far East, North Caucasus, Western Siberia, Urals)
- mon2min (average per capita monetary income deflated by minimum living standard in the oblast, 1995)
- dep2min (average per capita savings deflated by minimum living standard in the oblast, 1995)

6. Mobility characteristics

   - move (dummy, equals one if person is not found in the same community next year)

7. Community characteristics

   - c6bank (availability of bank offices)
   - c6telphp (phone lines per 100 people)
   - c6roads (quality of roads)
   - c6electr (electricity)
   - c6waters (water supply)
   - pschool (availability of schools)
   - phealth (availability of healthcare)
   - garbg (availability of centralized garbage collection)

Table A: Probit (dF/dx) estimations for Move

Move	Spec.1	Spec.2	Spec.3	Spec.4	Spec.5	Spec.6
hhincome	.021*	.031***	.034***	.033***	.006*	-.016
	(.011)	(.012)	(.012)	(.013)	(.004)	(.052)
jobsyr	-.001*	-.002**	-.002**	-.001	-.001**	-.135**
	(.001)	(.001)	(.001)	(.001)	(.000)	(.006)
edyrs	.003	.006**	.005**	.005*	.000	-.007
	(.002)	(.003)	(.003)	(.003)	(.001)	.15
age	-.002***	-.002**	-.002**	-.002***	-.001***	-.003*
	(.001)	(.001)	(.001)	(.001)	(.000)	.002
male	.061***	.058***	.058***	.058***	.011***	.101**
	(.008)	(.009)	(.009)	(.009)	(.004)	.044
married	-.027	-.030*	-.030*	-.031*	.004	-.008
	(.018)	(.017)	(.018)	(.018)	(.006)	(0.088)
aprent	.374***	.255***	.248***	.317***	.297***	.477***
	(.060)	(.085)	(.087)	(.075)	(.065)	(.080)
nkids7-18	-.0115	-.016*	-.016*	-.014	.000	.021
	(.010)	(.009)	(.009)	(.010)	(.004)	.046
PSU dummies	sign.					
reg.dummies		sign.	sign.	sign.	sign.	sign.
CR4		-.123***	-.121***	-.109**	-.034**	-.293**
		(.043)	(.046)	(.047)	(.014)	(.120)
mon2min			-.030			
			(.026)			
c6bank				.020	-.008	.214
				(.045)	(.014)	.142
c6telphp				-.001	-.000	-.003*
				(.001)	(.000)	.002
c6roads				-.035**	-.010	-.149**
				(.016)	(.007)	.067
observations	3819	3819	3819	3252	2857	292
pseudo R^2	.135	.082	.085	.102	.238	.183

*** 1%; ** 5%; * 10%; S.E.s in parentheses adj. for clustering at the PSU level

Table B: Descriptive statistics

Variable	Obs	Mean	Std.dev.	Min	Max
move	4961	.17	.38	0	1
hhincome, def	5302	.46	.55	0	6.18
jobsyr	4101	8.62	8.67	1	44
edyrs	5288	12.19	2.78	0	27
age	5302	43.83	12.32	20	60
male	5302	.49	.49	0	1
married	5286	.72	.45	0	1
aprent	5285	.054	.23	0	1
nkids7-18	5302	.73	.88	0	7
CR4	5302	.59	.29	.07	1
inkind	4036	.084	.28	0	1
mon2min	5302	1.96	.96	1.1	5.49
c6bank	5119	1.06	.24	1	2
c6telphp	4489	35.99	22.91	.2	98
c6roads	5122	1.87	.66	1	4
wantmove	5302	.087	.28	0	1

Table C: Probit (dF/dx) estimations for Inkind

Inkind	Spec. 1	Spec. 2
hhincome	.003	.000
	(.009)	(.012)
jobsyr	-.000	-.000
	(.000)	(.000)
edyrs	-.005***	-.004**
	(.002)	(.002)
age	-.000	-.000
	(.001)	(.001)
male	.016	.013
	(.009)	(.010)
married	-.027	-.004
	(.018)	(.012)
aprent	.003	.044**
	(.010)	(.024)
nkids7-18	-.015***	.016**
	(.005)	(.006)
regional dummies	sign.	sign.
CR4	.093**	.064**
	.029	(.032)
c6bank		.037***
		(.011)
c6telphp		.009
		.023
c6roads		.000
		.000
observations	3910	3318
pseudo R^2	.062	.079

*** 1%; ** 5%; * 10%;

standard errors in parentheses,

adjusted for clustering at the PSU level

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