Attaching Workers through In-Kind Payments: Theory and Evidence from Russia

Guido Friebel and Sergei Guriev

External shocks may cause a decline in the productivity of fixed capital in certain regions of an economy. Exogenous obstacles to migration make it hard for workers in those regions to reallocate to more prosperous regions. In addition, firms may devise "attachment" strategies to keep workers from moving out of a local labor market. When workers are compensated in kind, they find it difficult to raise the cash needed for migration. This endogenous obstacle to migration has not yet been considered in the literature. The article shows that the feasibility of attachment depends on the inherited structure of local labor markets: attachment can exist in equilibrium only if the labor market is sufficiently concentrated. Attachment is beneficial for both employers and employees but hurts the unemployed and the self-employed. An analysis of matched household-firm data from the Russian Federation corroborates the theory.

Economies are sometimes hit by massive shocks such as trade liberalization, economic integration or secession, terms of trade collapse, war, and the fall of communism. These events have one thing in common: they dramatically affect the productivity of capital in different sectors. Formerly profitable enterprises,

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sometimes entire industries, decline, and others grow. When industries are localized, resources ought to reallocate across regions in response to such shocks. In particular, one would expect a large relocation of workers. In a perfect world this reallocation should be swift, but in the real world there are important obstacles slowing it down, such as social norms, risk aversion, and underdeveloped housing markets.[1]

There may also be strong endogenous forces that slow labor reallocation. Firms may devise "attachment" strategies to keep workers from moving out of a local labor market. With sunk investment costs, firms want to benefit as much as possible from their depreciating capital and thus need the labor to match it. Firms can attach workers through nonmonetary forms of compensation. When capital markets are imperfect, workers must have cash to finance the costs associated with migration. But when they are compensated through in-kind payments or fringe benefits, they are forced to consume and cannot save the cash needed for migration.

At first glance, it might seem that attachment can work only in monopsonistic local labor markets. Firms ought to compete for workers not only in the level of compensation but also in the type of compensation. By offering cash wages, firms would poach workers from other firms that pay nonmonetary compensation. The model developed to explore this notion shows that it is not true. Attachment can be sustained as a noncollusive equilibrium in an oligopsonistic market provided that the number of firms in the local labor market is sufficiently small. The model shows that attachment is not only good for firms but also good for employees. However, it hurts the unemployed and the self-employed.

The model predicts that too little labor market competition may, through attachment, obstruct labor relocation and the capacity of an economy to adjust to external shocks. It also predicts that too little labor market competition may, through attachment, create an externality for workers in segmented labor markets.

The intuition of the results is as follows. In a two-period model, workers are subject to a productivity shock that may make migration worth their while. The labor market has a given number of jobs, and there are job-specific matching frictions. Worker-firm matches survive for only one period. Whenever a firm opens a vacancy, it faces uncertainty about whether it will be filled. It is this uncertainty about finding a matching worker in the second period that provides the rationale for paying nonmonetary wages in the first period—employers like to retain workers in the local market to keep labor supply thick.

1. See Roland (2000) for a survey of related literature. This article is concerned with the strategies firms undertake to reduce outward mobility in their labor markets. This is related to the problem of attracting workers through in-kind compensation as a safeguard against firm opportunism in the labor market, a topic that has been analyzed in the literature on company towns (see, for instance, the discussion in Williamson 1985). The most important difference in perspective is that no effort is made here to explain why workers would move into segmented labor markets. The question of interest is why they may find it hard to move away.

Employers cannot bind workers to the firm because matches are dissolved after each period. There is an important distinction between this attachment to a market and ties to a specific firm, which have been analyzed before.[2] In this form of attachment an employer's benefit from attaching workers must be shared with its competitors. This creates an externality leading to the collapse of the attachment equilibrium when the number of local employers, N, increases above a certain threshold. A current employer internalizes only $1/N$ of the benefits of attaching the worker, but it bears all the costs. To make a worker accept an attachment contract, the firm must compensate each worker for the foregone option to migrate. This premium is independent of N but the attachment benefits for the current employer are decreasing in N. When the number of firms reaches a certain level, the costs outweigh the benefits, and attachment ceases to be an equilibrium outcome.

The intuition for the welfare results is straightforward. In the attachment equilibrium employed workers create a negative externality for the unemployed. Each worker who accepts an attachment contract makes it harder for the unemployed to find a job in the second period. Attachment decreases total welfare in the local economy unless there is a substantial labor shortage.

In the model presented here, it is the presence of matching frictions that makes attachment desirable for employers. There may be many other reasons why employers prefer more rather than less labor supply. The model does not hinge on the precise motive for attachment. Efficiency wages would lead to similar results regarding attachment as the ones generated in the matching model. It should also be clear that this study is not intended to contribute to the search literature. Rather, it tries to set up a simple model that can generate predictions on how competition between employers—in the form of labor contracts—affects workers' geographic mobility and welfare.

We use data for the Russian Federation in the second half of the 1990s to test the model. Productivity in many regionally concentrated industries has shifted dramatically since the beginning of the transition, with some regions enjoying high growth rates, whereas others have experienced output declines of more than 50 percent (Berkovitz and DeJong 1999). Yet the rate of interregional migration is very low, around 1 percent a year (Goskomstat 2000), even lower than before the transition, when it was roughly 4 percent. Analysis of the Russian data reveals that many workers receive their compensation, fully or in part, in nonmonetary form.

We use the Russian Longitudinal Monitoring Survey (RLMS)[3] to investigate the two main predictions of the model. First, after controlling for personal, firm-level, and regional characteristics, the propensity of workers to leave a

2. See Salop and Salop (1976) for a model of how firms use backlogged wages to reduce worker turnover.

3. For more information on the RLMS, see www.cpc.unc.edu/projects/rlms and Zohoori and others (1998).

region should be an increasing function of the competitiveness of the local labor market. Higher labor market concentration is shown to reduce geographic mobility, a result that is significant and robust to various specifications. An increase in labor market concentration by one standard deviation can reduce the propensity of an individual to leave by up to 3.6 percentage points. Second, after controlling for regional and personal characteristics and the financial situation of firms (another important potential determinant of in-kind payments), the model predicts that in-kind payments should be more frequent in more concentrated local labor markets. We find corroborating evidence using a subset of the RLMS that was matched with firm data.[4] A one-standard-deviation increase in market concentration increases the probability of in-kind payments by at least 3 percentage points. We also discuss why our theory appears better suited than alternative explanations for understanding the regression results.

I. Literature and Implications

This section discusses the literature on the interlinkage of markets and labor tying in developing economies, oligopsony (monopsony) in the labor market, and the Russian economy.

At first glance, the structure of the proposed model bears some resemblance to the literature on interlinked markets: credit market imperfections and reduced labor mobility feature in both. The literature on interlinkages has been motivated by many observations from developing economies in which people often conduct business with the same partners in several markets. Landlords, for instance, not only employ workers but also often provide them with credit, and traders not only buy crops from farmers but also often provide the farmers with seeds or credit to buy seeds.

The literature presents a number of explanations for such bundling (see the survey by Bell 1988). Many explanations build on the idea that interlinking transactions can help overcome agency problems. For instance, when workers have no other collateral than their work, "pure" money lenders have no use for it, whereas farmer/money lenders do.

The model entails no agency considerations, and firms do not interact with workers on more than one market. Rather, firms want to ensure their labor input (in a manner similar to that described by Bardhan 1983, who argues that employers benefit from labor tying because it ensures labor supply in peak times). Firms in the model offer in-kind payments to reduce geographic mobility, and workers are willing to accept in-kind contracts if the value of the provided goods is at least equal to their outside options plus the option value of migrating, which they forgo if they accept in-kind payments. Hence, attachment contracts

4. The authors thank Klara Sabirianova for providing these matched data.

create a surplus for any firm-worker pair. However, as explained before, in-kind payments impose an externality on the pool of unemployed workers.

The question thus arises whether interlinkages, particularly tying, is good for workers.[5] Again, the framework here differs from the existing labor-tying literature in that it considers imperfect competition in the labor market and involuntary unemployment, both important problems in transition and developing economies. The theory underlying the model offers a simple explanation of why tying may be bad for the unemployed but not the employed. In the model sufficient competition thus has an important role: it makes attachment collapse, and it protects the unemployed from welfare losses due to the attachment of employees. These effects are absent in models of labor tying that assume either labor market monopsony (Bardhan 1983) or perfect competition (Mukherjee and Ray 1995).

There is also a small but growing body of literature that uses concepts from industrial organization to analyze labor markets. Boal and Ransom (1997) and Bhaskar and others (2002) show that certain labor market phenomena can be explained only if firms hold market power. Bhaskar and colleagues argue, however, that it is unrealistic to assume conventional monopsony: employers do compete with each other. Somewhat similar to the examples discussed by Bhaskar and others, cases of intermediate competition are of particular interest here. If there is perfect competition, attachment does not pay off. If there is monopsony, attachment is costless—because the worker has no choice, the firm does not need to compensate the worker for the forgone option to migrate. The problem becomes interesting in the case of oligopsony. Like Stevens (1994), this article looks at the provision of training and at poaching in a model with imperfect competition.

Several studies look at interregional migration and the demonetization of worker compensation in Russia. Jarocinska and Wörgötter (2000) and Andrienko and Guriev (2004) show that there are substantial wage differences across regions and yet little interregional mobility. This points to the presence of frictions in the labor market. A few studies have examined demonetization of worker compensation as a source of such frictions. Commander and Schankerman (1997) have analyzed Russian firms' practice of providing social services to their workers. They argue that the absence of a public social security network reduces worker mobility, because workers fear exclusion from firm-provided social services. Their argument applies to mobility in the same labor market, not to mobility across segmented local labor markets. Also, it presumes that firms are worker-controlled. Grosfeld and others (2001) relate the segmentation of the Russian labor market with respect to skills to the provision of fringe benefits. Earle and Sabirianova (2000, 2002) look at wage arrears as an

5. See, for instance Schaffner (1995), who argues that landlords subject workers to "servility" and restrict their information to maintain servile relationships.

equilibrium outcome between firms in a given local labor market. They argue that one firm's decision not to pay wages may be a strategic complement to the decisions of other firms. This article is related to that literature inasmuch as it looks at demonetization as a result of firm strategies, but its focus is different. The other publications do not provide a theory of the impact of market structure on feasibility of demonetization strategies. Nor do they focus on territorial mobility as ours does.

The main interest here is to study how market structure affects territorial mobility and thus the ability of an economy to adjust to shocks. Inherited labor market structures slow the reallocation of labor. As a result, local labor markets remain segmented. Thus, the theory proposed here also contributes to the understanding of regional disintegration in Russia, which has attracted considerable interest in the economics literature. Blanchard and Shleifer (2001) argue that Russia performs poorly in comparison with China because in Russia weak central institutions fail to curb the rent-seeking behavior of regional and local governments. If Tiebout competition were feasible, efforts to recentralize (such as those undertaken by the Putin administration) would not be necessary. Workers who live in concentrated labor markets cannot vote with their feet. These are most likely the workers who are subject to the least efficient local governments. Hence, by undermining Tiebout competition, attachment contributes to regional disintegration. Berkovitz and DeJong (1999) have shown that Russia has "internal borders" erected by regional governments so that they can pursue their political interests. The model shows that labor markets are subject to similar internal borders as product markets.[6]

While Russia is a good testing ground for the theory, attachment seems to be a more general phenomenon, making the theory relevant beyond transition economies. Throughout economic history firms have devised strategies to reduce the territorial mobility of workers. Examples include company towns and the truck system[7] and labor-tying arrangements in rural economies. Paternalism in the Southern states of the United States following the Civil War is another example. Alston and Ferrie (1993, 1999) show that when slaves were freed, rural employers had to cope with high turnover. Southern landlords had to limit competition among themselves to prevent Northern capital from moving to the South. Farmers created a web of social control mechanisms, in-kind payments, services, and protection from racist-inspired violence. They also

6. This is also in line with Ericson's (2000) view of the Russian economy as "post-soviet industrial feudalism." The attachment mechanism posited here shows why quasi-feudal structures in Russia have emerged and how they can be sustained. It is also important to stress that one should be most worried about the welfare of those outside the quasi-feudal arrangements—the unemployed and the self-employed.

7. The truck system was widely used, particularly in the United Kingdom and United States. Workers were obliged to buy their goods in company stores and often became heavily indebted, making it difficult for them to move away (see Hilton 1960).

exerted political power to keep Northern influence out of their labor market. During World War I and following restrictive immigration legislation in the 1920s, as immigration from outside the United States slowed and outmigration of former slaves became a threat, landlords used state legislatures and paternalistic benefits to limit outmigration. This strategic behavior prevailed until production became less labor-intensive, and long-term investments of workers and farmers in the fertility of the soil became less important.

Industrial firms in Russia are experiencing a similar transition, and firms appear to be reacting in a similar way. Kornai (1992) has argued that the dependence of workers on the Communist Party and on their firm was a constituent element of communism. The collapse of communism freed individuals from party dominance. Workers should then have been able to move to where they are most productive, rather than remain where Stalin wanted them (or their parents) to be. But attachment strategies appear to make this reallocation a slow and complicated task.

II. The Model

Consider a local economy with N identical firms and two periods. First-period labor supply is a continuum of workers, normalized to L_1. Second-period labor supply, L_2, is endogenous. Labor contracts cover only the current period.

There is also a geographically distant labor market, the "central" labor market, which is competitive. To find a job there, a worker incurs migration and search costs, T. Labor productivity in the central market is subject to a shock: with probability p, the wage w^m net of the costs of migration exceeds R, the productivity of a worker in the local labor market:

$$w^m - T > R. \tag{1}$$

With probability $1 - p$, the wage in the central market is low (for simplicity, it is assumed to be zero) so that migration does not pay off.

The costs of migration must be paid up front. Thus at the beginning of the second period the worker needs at least T units of cash to migrate. Workers who are unemployed in the first period receive no wages and cannot migrate. The ability to migrate for workers who have a job in the first period depends on their first-period employment contracts. If they agreed on a standard cash contract, they have enough cash to migrate (the cash wage is assumed to exceed T in equilibrium) and receive utility w^c. If they agreed on a contract specifying compensation in non-monetary form—an attachment contract—that provides utility w^a, they cannot migrate. For simplicity, firms are assumed to bear no additional cost of paying salary in-kind relative to a monetary salary that provides an equivalent utility to the worker. This assumption does not affect the main results.

Timing

For the first period, workers and firms are randomly matched, with a worker matched with a firm no more than once. Workers who do not find a match remain unemployed for the first period.[8] For any match the worker and firm bargain individually over wages. Assuming that bargaining is efficient, the joint surplus is maximized by agreeing on either a cash contract or an attachment contract. First-period production takes place, workers and firms receive their payoffs, and all matches dissolve. The unemployed get nothing.

For the second period, workers migrate or not depending on whether migrating pays off for them and whether they have the necessary cash. The remaining workers (including those who were unemployed in the first period) are matched according to the same matching technology. Workers and firms bargain about the second-period wage. Because there are only two periods, attention can be restricted to cash wages. Second-period production takes place, and workers and firms receive their payoffs.

Matching, Bargaining, and Second-Period Labor Supply

Matching is assumed to take place according to a standard matching function (see Petrongolo and Pissarides 2001). The number of successful matches between workers and firms, M, is determined by a matching function with constant returns to scale:

$$M = M(L,J) = J\beta(L/J), \tag{2}$$

with $l = L/J$ denoting the number of workers per job, $\beta(l)$ is the probability that a firm will fill a vacancy, and $\gamma(l) = \beta(l)/l$ is the probability that any given worker will find a job. According to the assumptions above, $\beta(l)$ is an increasing function (approaching 1 as l goes to infinity), and γ is a decreasing function (approaching 0 as l goes to infinity). Thus, $M(L,J) \leq L$ and $M(L,J) \leq J$. We also assume that $\beta(l)$ is concave.[9]

To have a matching technology that is independent of N, frictions are assumed to be job specific. This simplifying assumption allows a focus on the effect of labor market concentration on attachment rather than on the efficiency of matching.[10]

8. The model does not distinguish between the unemployed and the self-employed. To do that, one would have to normalize wages by self-employment income or the unemployment benefit, whichever is larger. For simplicity, all those who are not employed by a firm are referred to as unemployed. Nonetheless, the results extend to the self-employed as long as self-employment income is below the cost of migration.

9. This holds, for instance, if M is a Cobb-Douglas function: $M = AJ^{1-\sigma}L^{\sigma}$ hence $\beta(l) = Al^{\sigma}$. Another standard specification comes from the urn-ball model in Petrongolo and Pissarides (2001): $M = J(1 - e^{-L/J})$, hence $\beta(l) = 1 - e^{-l}$.

10. If matching were firm-specific, at a given number of jobs a decrease in N should make it easier for firms and workers to match. Burdett and others (2001) study the impact of the labor market structure on matching. However, their model does not permit carrying out comparative statics with regard to N in the case of multiunit firms.

After matches have been formed, worker and firm bargain. Without loss of generality, workers and firms are assumed to have equal bargaining power. The number of workers with attachment contracts in the local economy is $q \leq M(L_1, J)$, and the number of workers with cash contracts is $M(L_1, J) - q$. With probability p, workers without attachment contracts leave the region. Hence, second-period labor supply is:

$$L_2 = L_1 - p(M[L_1, J] - q). \tag{3}$$

For simplicity, the number of jobs J is normalized to 1, so that $M(L, J) = \beta(L)$.

Equilibrium

This section shows how the number of attached workers q depends on N, the number of competitors in the market. In the second period, given equal bargaining power, the wage is $w_2 = R/2$, with unemployed workers receiving nothing. The payoff of migrating workers is $w^m - T$. There are $\beta(L_2)$ employed workers. The firm's profit is thus $(1/N)\beta(L_2)R/2$.

There are three possible payoffs when a firm and a worker of mass dl bargain (at $t = 1b$).

If negotiations break down the firm receives 0 + the second-period payoff of $(1/N)\beta(L_2)R/2$ (the firm's first-period profits from other matches are neglected, because those profits do not depend on the outcome of the bargaining with the given worker). The worker receives 0 + the second-period payoff of $[\gamma(L_2)R/2]dl$ (the worker is unemployed and hence cannot migrate). The sum of payoffs when negotiations break down is thus

$$(1/N)\beta(L_2)R/2 + [\gamma(L_2)R/2]\ dl. \tag{4}$$

If the firm and the worker agree on an attachment wage w_1^a, the firm receives a payoff of $(R - w^a)\, dl + (1/N)\beta(L_2)R/2$. The worker receives $w^a dl + [\gamma(L_2)R/2]dl$, and the sum of payoffs is

$$Rdl + (1/N)\,\beta\,(L_2)R/2 + [\gamma(L_2)R/2]\ dl. \tag{5}$$

Equation 4 is subtracted from equation 5, and given equal bargaining power, the attachment wage is then

$$w^a = (1/2)R. \tag{6}$$

If the firm and the worker agree on a cash wage w^c, the firm receives a payoff of $R - w^c dl + (1/N)\beta(L_2 - pdl)R/2$, the worker receives $w^c dl + [(1-p)\gamma(L_2)R/2 + p(w^m - T)]\ dl$, and the sum of payoffs is

$$Rdl + (1/N)\beta(L_2 - pdl)R/2 + [\gamma(L_2)R/2]\ dl + p[w^m - T - \gamma(L_2)R/2]\ dl. \tag{7}$$

Equation 4 is subtracted from equation 7, yielding the cash wage (given equal bargaining power)

$$w^c = (1/2)[R - (1/N)\beta'(L_2)pR/2 - p(w^m - T - \gamma[L_2]R/2)]. \tag{8}$$

Notice that the attachment wage exceeds the cash wage. The worker is compensated for the forgone option of migrating in the future.

The sum of utilities under the attachment contract of equation 5 is larger than the sum when the match breaks up (equation 4). Thus, any match will result in employment. The question remains: when do the worker and the firm agree on an attachment contract rather than a cash contract? Comparison of equations 5 and 7 shows that attachment occurs whenever

$$(1/N)(R/2)p\beta'(L_2) > p[w^m - T - (R/2)\,\gamma\,(L_2)]. \tag{9}$$

Substituting for L_2 into condition 9 yields

$$N < \frac{\beta'(L_2)}{\frac{w^m - T}{R/2} - \gamma(L_2)} = \frac{\beta'\{L_1 - p\beta(L_1) - q\}}{\frac{w^m - T}{R/2} - \{\gamma L_1 - p[\beta(L_1) - q]\}}. \tag{10}$$

PROPOSITION 1. *The number of attached workers decreases with N. In particular*:

- *All workers are attached, that is* $q = M(L_1, J) = \beta(L_1)$, *if*

$$N < N^* = \frac{\beta'(L_1)}{\frac{w^m - T}{R/2} - \gamma(L_1)}. \tag{11}$$

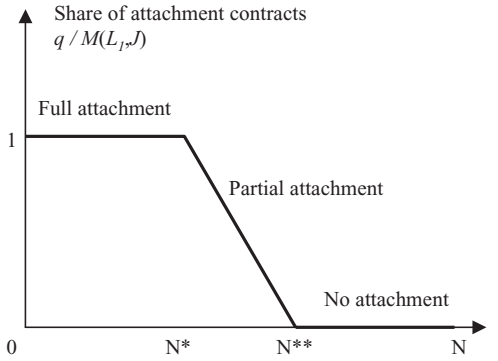
- *A proportion* $0 < q < \beta(L_1)$ *of workers is attached if* $N \in (N^*, N^{**})$, *where*:

$$N^{**} = \frac{\beta'[L_1 - p\beta(L_1)]}{\frac{w^m - T}{R/2} - \gamma[L_1 - p\beta(L_1)]} > N^*. \tag{12}$$

  Here, q solves equation 10 held as equality; q decreases from $\beta(L_1)$ *to 0 as N increases from* N^* *to* N^{**}.
- *No workers are attached; that is,* $q = 0$, *if* $N > N^{**}$.

The intuition for Proposition 1 is as follows (see also figure 1). Given efficient bargaining, any worker-firm match chooses the contract that maximizes the joint surplus. Inspection of equation 9 shows that the value of attachment (the left side of the equation) increases with the impact the attachment of workers has on the firm's probability of filling a vacancy in the second period, $p\beta'(L_1 - p[M(L_1, J) - q])$, and with R, the productivity of labor in the local market. Each firm internalizes only $1/N$ of this attachment benefit, as matches are destroyed in the beginning of the second period (attachment is market specific, not firm specific). However, a worker accepts an attachment contract only when the first-period wage includes compensation for the value of the forgone option to migrate, $p[w^m - T - \frac{R}{2}\gamma(L_2)]$. When N increases, the left side of equation 9 decreases, and the right side remains constant. Ultimately, the cost

FIGURE 1. Share of Attachment Contracts in the First Period in Equilibrium as a Function of Number of Employers in the Local Labor Market, N



of attachment dominates the benefits for the individual firm. This free-riding effect makes attachment collapse.[11]

The model assumes that all firms are symmetric. Suppose instead that firms differ in the stock of capital and therefore in the number of vacancies. Then there will be equilibria in which large firms attach and smaller ones do not. Indeed, the smaller the firm, the larger the free-rider problem. The benefit of attachment per worker is proportional to the firms' employment, whereas the cost of attachment is the same for all firms. Formally, the only change in equation 9 is that $1/N$ is replaced by the firm's share in local employment. Notice that the attachment policies of the larger firms impose a negative externality on the employees of small firms (as well as on the unemployed and the self-employed). The employees of the small firms are not attached and leave with probability p; however, with probability $1 - p$ they stay and have to face tougher competition for jobs in the second period.

The results are robust to relaxing the assumption that all first-period matches are dissolved. Suppose that the first-period matches are destroyed only with probability λ. Then the firms can in principle offer long-term contracts to economize on search frictions in the second period. In the absence of firm-specific investment the contracts will specify the second-period wage just to cover the second-period option. Also, because it is unrealistic to assume

11. The equilibrium in Proposition 1 is unique for a given N. This follows from the concavity of $\beta(l)$. If $\beta(l)$ were convex and $\gamma(l)$ declined sufficiently slowly with l, $N^* > N^{**}$ then, the structure of the equilibrium would be as follows: (1) if $N < N^{**}$, there exists a unique equilibrium with full attachment $q = M(L_1, J)$; (2) if $N \in (N^{**}, N^*)$, there exist at least three equilibria: a stable equilibrium with full attachment, $q = M(L_1, J)$; a stable equilibrium without attachment $q = 0$; and at least one unstable equilibrium with partial attachment with q solving equation 10; (3) if $N > N^*$, there exists a unique equilibrium without attachment, $q = 0$.

commitment on the worker's part, long-term contracts alone cannot protect firms from losing workers to the central labor market (equation 1). To attach workers, firms have to rely on in-kind contracts. Simple calculations yield the condition for the attachment equilibrium

$$(\lambda/N)(R/2)p\beta'(L_2) > p[w^m - T - (\lambda R/2)\gamma(L_2)] - (1-\lambda)\,[pR + (R/2)\gamma(L_2)], \quad (13)$$

which becomes equation 9 as $\lambda \to 1$.

Also, firms' commitment to long-term contracts is limited in an environment with high volatility, financial constraints, and high discount rates. Bertrand (2004) shows that import competition reduces U.S. firms' ability to stick to implicit contracts that shield workers from market volatility; financial pressures make it harder to respect long-term wage commitments. Denisova and others (1998) refer to court statistics to show that even under formal labor contracts Russian firms managed to get away with delaying wage payments for months. Under conditions of double-digit inflation, wage arrears were equivalent to renegotiating wages downward. The workers won 95 percent wage arrears lawsuits against firms, but the court rulings were almost never enforced.

The results are also robust to changes in the allocation of bargaining power. If the worker gets $\alpha < 1$ percent of the joint surplus, then condition 10 becomes:

$$N < \frac{\beta'(L_2)}{\frac{w^m - T}{(1-\alpha)R} - \frac{\alpha}{(1-\alpha)}\gamma(L_2)}. \quad (14)$$

The properties of equilibrium do not change even if the worker has no bargaining power ($\alpha = 0$); the only difference is that the attached workers do not benefit from attachment. In the unlikely case where the worker has full bargaining power ($\alpha = 1$), attachment never occurs—the benefit of attachment is trivial, and so is the right side of equation 10.

One can also analyze the case where the bargaining power is endogenous to local labor market conditions, with the worker's bargaining power α decreasing in unemployment and increasing in N. This would strengthen the results. Indeed, the effect of unemployment on bargaining power provides the firm with even stronger incentives to attach workers to increase its surplus in the second period. The link between labor market competition and bargaining power also works in the same direction: as the number of firms increases, attachment becomes even less likely as the firm expects to appropriate a lower share of returns to attachment.

Welfare

Because of the assumptions of efficient bargaining and equal allocation of bargaining power between worker and firm in a match, it is clear that workers who are employed in the first period and firms cannot lose from attachment.

However, the unemployed of the first period suffer as a result of attachment. A proportion p of the workers with attachment contracts would migrate if they had cash contracts instead. Under attachment, they stay and reduce the probability that the unemployed will find a job in the second period. Thus, the fact that employed workers accept attachment contracts imposes an externality on the unemployed.[12]

How does the local economy as a whole fare under attachment? Consider the sum of the utilities (for clarity, the assumption that J is normalized to 1 is dropped here):

$$(15)\quad S = RM(L_1, J) + RM(L_1 - p[M(L_1, J) - q], J) + (w^m - T)p[M(L_1, J) - q].$$

The derivative with respect to q is

$$(16)\qquad \partial S/\partial q = -p(w^m - T) + pR\beta'(L_1 - p[M(L_1, J) - q]).$$

Equation 16 shows that attachment decreases welfare only if unemployment in the second period is sufficiently high: $L_2/J > l^*$, where

$$(17)\qquad \beta'(l^*) = \frac{w^m - T}{R}.$$

This result reveals the welfare implications of attachment. Attachment is beneficial to the local economy because it increases matching efficiency, but it is costly because potentially mobile workers forgo the option to earn higher wages outside. The beneficial effect is more important if there is a shortage of workers in the second period (if L_2/J is low). The cost of attachment is high if there is high unemployment (L_2/J is high), however, because the marginal worker has only a small effect on the efficiency of matching and each worker's local expected payoff is very low.[13]

If workers and firms could write enforceable debt contracts, it would be possible for firms from the central labor market to finance workers' migration from the local labor market. However, because workers have no collateral and indentured servitude contracts cannot be enforced, such contracts would be infeasible: the worker would default on the debt after arriving in the central labor market. Entry of firms would be a second possibility. However, although the capital costs of incumbent firms is sunk, new entrants would have to pay a fixed cost, which, if high enough, would prevent firms from entering.

12. This is similar to Rama and Scott (1999), where the dominant firm's employment decisions also have a negative effect on outsiders (small firms): downsizing the monopsony increases the pool of people looking for jobs in the local labor market, thereby suppressing wages and local demand.

13. The formally more correct expression of a social planner's problem would be to maximize welfare by choosing whether to ban attachment. The results here show that banning attachment increases welfare if there is high unemployment in the second period.

Finally, matching frictions is not the only reason firms might like to attach workers. In an alternative model based on efficiency wages, greater local labor supply makes it cheaper rather than easier for firms to fill their vacancies.[14]

III. Applying the Model to Russia

This section describes the Russian labor market in the second half of the 1990s and presents regression results using Russian data, including potential alternative explanations and counterarguments.

Characteristics of the Russian Labor Market

Several features of the Russian labor market are important to this analysis.

Demonetization of Workers' Compensations. In the Soviet Union firms provided a wide range of nonmonetary benefits to their workers, including hospitals, housing, childcare, and education. By presidential decrees all assets related to the provision of such services had to be transferred to municipalities, but firms still provide some social services. In concentrated local labor markets firms own up to 85 percent of the social assets (Healey and others 1998). A survey of 93 enterprises reports that firms even invest in new types of facilities to provide fringe benefits (Tratch and others 1996). A recent survey of 400 firms confirms widespread ownership of social assets and investment in new ones (Haaparanta and others 2003). Even more striking, a survey of 200 firms shows that in-kind substitutes for wages were on the rise (Biletsky and others 1999). In 1991, 3 percent of surveyed firms provided in-kind payments; by 1998, 27 percent did.

In-kind payments are a novel phenomenon, but the provision of fringe benefits could be attributed to the behavioral inertia of paternalistic managers. However, a survey of managers of 142 enterprises by the Russian Center for Public Opinion Research (VCIOM 1997) indicates that the provision of fringe benefits follows the strategic patterns highlighted in the model: only 37 percent of respondents continued to run the social assets of their firm because of Soviet traditions, whereas 51 percent did so to retain workers. Juurikkala and Lazareva (2004) show that provision of social survices reduces employee turnover.

Besides the fringe benefits Russian workers in the second half of 1990s saw an explosion of explicit in-kind payments.[15] As discussed in Clarke (2000), wages (and wage arrears) were commonly paid in the firms' outputs, food, and even manure (McMahon 2001). The widespread demonetization of the

14. These and other results mentioned but not reported in the article are available from the authors.

15. This article does not discuss the decline of in-kind wages in recent years. As the 1998 meltdown drove real interest rates down, the barter economy disappeared and in-kind transactions became more costly for firms. That in turn raised the cost of in-kind employee compensation. According to the RLMS data, the level of in-kind compensation has been declining steadily since 2000.

economy reduced the transaction costs of barter exchange for the firms, but the cost remained high for the workers. As Clarke (2000) argues, workers who were paid in kind were effectively forced to withdraw from the market economy and to engage in barter exchange.

LOW MOBILITY ACROSS REGIONS AND LABOR MARKET SEGMENTATION. There are huge productivity differences across regions in Russia, which would be expected to result in a massive reallocation of workers. Heleniak (1999), for instance, estimates the the stock of potential migrants from the Russian north alone at 2 million people. But during the decade of transition, interregional migration in Russia remained fairly constant at about 1 percent a year (Andrienko and Guriev 2004, based on official data). This is surprisingly low, considering that migration rates were at about 4–5 percent before transition.

Soviet-style industrialization resulted in geographic concentration of industrial activity, and local employment was often concentrated in one or very few large plants. Goskomstat (2000) data show that since the outset of transition, labor market segmentation has steadily increased. Consider the ratio of unemployed people to vacancies by economic regions and administrative regions (oblasts). In the Central Region the ratio was roughly 8 to 1 in 1993, increasing to 13 to 1 in 1996, and dropping again to 8 to 1 in 1997. In the Eastern Siberian Region the ratio grew from 18 to 1 in 1993 to 76 to 1 in 1997. More striking, the ratios vary dramatically even within economic regions and across the smaller oblasts, as shown by a comparison of four administrative regions and Moscow, all in the Central Region, the most developed and densely populated economic region (table 1). The difference between Moscow and Ryazan oblast, for example, increased between 1993 and 1997, and by 1997 the ratio was 48 times higher in Ryazan than in Moscow. Also, Andrienko and Guriev (2004) discuss evidence on the lack of convergence across oblasts in both real income and unemployment during 1990s.

SCOPE FOR MIGRATION. Why are workers from Ryazan, a town barely 200 km from Moscow, not moving to the capital? An obvious answer is that migration may not be worth the cost. A rough estimate of the costs of migration suggests

TABLE 1. Ratio of Unemployed to Vacancies in the Central Economic Region

Region	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

Source: Authors' calculations based on official Goskomstat data for respective years.

that this may indeed be the case. We collected data on rents, transportation costs, and monthly salaries in rubles for up to 10 occupations for 28 Russian towns and cities, using job advertisements in newspapers in October 2000.[16] A simple back-of-the-envelope calculation for Moscow and Ryazan indicates that there is scope for migration, in particular for qualified workers. However, the associated costs (due to relatively high rents in Moscow and registration and moving expenses) are substantial—half a year to a year's wages in Moscow—and they must be paid up front. With Ryazan salaries not much above the minimum living standard, the in-kind payments are a serious if not an insurmountable obstacle to migration.

Data and Empirical Results

The model implies two empirical predictions. More competition in a local labor market should result in more migration and in reduced frequency of nonmonetary compensation for workers.

In the absence of micro migration data, data are taken from the RLMS, a representative data set on Russian households. The RLMS is not a panel data set, but interviews in round VI (winter 1995/96) and round VII (winter 1996/97) were conducted in the same dwellings. For respondents who had moved between the two rounds, interviewers were supposed to find out about their new residence, provided they had not left the community. Former respondents who had left the community were not followed up. The analysis uses data on working age individuals who were employed during round VI.

For both hypotheses the main independent variable is a labor market competition index, *CR4*, which represents the percentage of the labor force employed by the four largest employers in the local labor market, constructed using Goskomstat's Registry of Russian Industrial Enterprises (the annual census of Russian enterprises) for 1995. A larger *CR4* is tantamount to more concentration (less competition) in the labor market.

From the RLMS's 38 primary sampling units, or communities, individual communities were defined so that each is a local labor market. Where the primary sampling unit is a standalone urban or rural settlement, concentration was calculated at the level of the sampling unit. Where the primary sampling unit is a part of a large city, concentration was calculated for the citywide labor market rather than the district labor market. This is consistent with a casual understanding of commuting distance in Russia.

DOES HIGHER LABOR MARKET CONCENTRATION RESULT IN LESS MIGRATION? The dependent variable *move* takes a value of 0 if an interviewed individual in round VI lived in the same community in round VII and a value of 1 if interviewers were unable to find that individual in the same community in round VII. The

16. The full list is available from the authors.

category *move* = 1 thus also includes nonrespondents and people who died between the two rounds, meaning that it is an imperfect measure of regional mobility.[17]

Control variables were also drawn from the RLMS: personal characteristics, job characteristics, household characteristics, and proxies for subjective well-being (for instance, satisfaction with life, intention to change job or to move away from a community). We collected additional information on the economy of each community. All nominal variables were deflated by a local consumer price index (CPI) that uses price information on 25 basic goods from the RLMS and weighs them according to the Goskomstat methodology. Descriptive statistics for the most important variables are shown in table 2. (See the appendix for definitions of the variables used.)

We ran regressions with all potentially interesting personal, household, and job characteristics, but results are presented only for variables that are jointly significant. Table 3 reports on the results for various probit specifications for *move*. The results show the marginal effect of a change in the respective independent variable on an individual's likelihood of moving (computed at the average value of the respective variable). The first specification includes dummy variables for the primary sampling unit and provides a useful benchmark. Because *CR4* is a linear combination of primary sampling unit dummy variables,

TABLE 2. Descriptive Statistics, RLMS Round VI

Variable	Number of Observations	Mean	SD	Minimum	Maximum
move	4961	0.17	0.38	0	1
hhincome, def	5302	0.46	0.55	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	0.49	0.49	0	1
married	5286	0.72	0.45	0	1
aprent	5285	0.054	0.23	0	1
nkids7-18	5302	0.73	0.88	0	7
CR4	5302	0.59	0.29	0.07	1
inkind	4036	0.084	0.28	0	1
cash_cl	1134	0.08	0.32	0	1.89
cash_sales	849	0.009	0.024	0	0.42
c6bank	5119	1.06	0.24	1	2
c6telphp	4489	35.99	22.91	0.2	98
c6roads	5122	1.87	0.66	1	4
wantmove	5302	0.087	0.28	0	1

Source: Authors' calculations based on data from RLMS rounds VI (1995/96) and VII (1996/97) and Goskomstat Registry of Russian Industrial Enterprises for 1995 and 1996.

17. According to Goskomstat, the mortality rate in Russia was roughly 1.5 percent in 1995. Thus sample distortion due to nonrespondents is more substantial than that due to mortality.

TABLE 3. Probit (d*F*/d*x*) Estimations for *Move*, RLMS round VI

Variable	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5
hhincome	0.021*	0.031***	0.003	0.003	0.033***
	(0.011)	(0.012)	(0.006)	(0.005)	(0.013)
jobsyr	−0.001*	−0.002**	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
edyrs	0.003	0.006**	−0.002	−0.001	0.005*
	(0.002)	(0.003)	(0.001)	(0.001)	(0.003)
age	−0.002***	−0.002**	−0.001*	−0.001**	−0.002***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
male	0.061***	0.058***	0.007	0.004	0.058***
	(0.008)	(0.009)	(0.007)	(0.006)	(0.009)
married	−0.027	−0.030*	0.004	0.003	−0.031*
	(0.018)	(0.017)	(0.007)	(0.006)	(0.018)
aprent	0.374***	0.255***	0.021	0.018	0.317***
	(0.060)	(0.085)	(0.025)	(0.022)	(0.075)
nkids7–18	−0.0115	−0.016*	0.003	0.001	−0.014
	(0.010)	(0.009)	(0.004)	(0.004)	(0.010)
Primary sampling unit dummy variables	significant				
Regional dummy variable		significant	significant	significant	significant
CR4		−0.123***	−0.037**	−0.035**	−0.109**
		(0.043)	(0.017)	(0.016)	(0.047)
cash_cl			−0.256*		
			(0.114)		
cash_sales				−10.095**	
				(0.043)	
c6bank					0.020
					(0.045)
c6telphp					−0.001
					(0.001)
c6roads					−0.035**
					(0.016)
Number of observations	3819	3819	828	806	3252
Log likelihood	−1461	−1552	−930.5	−870.4	−1262
Pseudo-R^2	0.135	0.082	0.140	0.163	0.102

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 1 percent level.

Note: Numbers in parentheses are standard errors adjusted for clustering at the primary sampling unit level (specifications 1, 2, 5–7) or at the firm level (specifications 3 and 4). See text for details.

Source: Authors' calculations based on data from RLMS rounds VI (1995/96) and VII (1996/97) and Goskomstat Registry of Russian Industrial Enterprises for 1995 and 1996.

specification 2 replaces the primary sampling unit dummy variables with the respective *CR4* and controls for the eight large economic regions, including a special dummy variable for Moscow.

A comparison of specifications 1 and 2 in table 3 shows only slight differences. The positive sign for monthly household income, deflated by the local CPI, is in line with the theory that highlights the importance of liquidity constraints to moving decisions. After controlling for personal and job characteristics, individuals with higher income should be less willing to leave. Thus the positive sign suggests that the liquidity effect of a higher income dominates the income effect.[18] Longer tenure in the firm (*jobsyr*) makes workers less mobile, a fact that can be reconciled with the presence of relation-specific human capital. Education, measured in years (*edyrs*), influences moving decisions positively. Older and married people move with lower probability as do people with children ages 7–18. Men have a higher propensity to move, as do individuals living in rented flats.[19]

The major lesson from specification 2 is that as predicted, higher labor market concentration as measured by *CR4* has a large negative impact on individuals' moving decisions: a one standard deviation (0.29) increase in *CR4* results in a 3.6-percentage-point decrease in an individual's probability of moving. Given that in the sample, *move* = 1 holds for only 17 percent of surveyed individuals, the impact of labor market concentration is important.

Does Higher Local Labor Market Concentration Increase the Probability of In-Kind Payments? The dependent variable used to investigate this prediction is binary information on whether a person received in-kind payments.[20] Specification 1 in table 4 shows that although most personal characteristics have no significant impact, *CR4* has a significant positive impact on the occurrence of in-kind payments—in line with the theory.

It could be argued that firms that are more cash-constrained may be forced to pay wages in nonmonetary form (*inkind*) and that firm liquidity is correlated with *CR4*. We have explored this using matched worker-firm data for a subset of individuals from the RLMS. We have used two proxies for the financial constraints facing a firm: *cash_cl*, defined as the ratio of cash holdings of a firm at the time of the survey (end 1995) divided by the firm's current liabilities

18. It would have been preferable to look at the *stock* of household savings, but that information is not available in the RLMS. Regressions are reported for household income rather then for individual salaries, because the former is a better measure of liquidity. Nonetheless, regressions were also run with monthly salary; the respective coefficient is positive and significant as well.

19. This can be interpreted as a sign that people who move more often prefer to live in rented flats rather then to own their home (or to live in company dormitories). However, apartment rental is also a potential proxy for the cash individuals hold, because in Russia rental flats are usually of higher quality and more expensive than the other forms of housing.

20. The magnitude of these payments is unknown. Information is also unavailable on the potential provision of social services that are considered to be of a larger magnitude than in-kind payments.

TABLE 4. Probit (d*F*/d*x*) Estimations for *Inkind*, RLMS Round VI

Variable	Specification 1	Specification 2	Specification 3	Specification 4
hhincome	0.003	0.003	0.004	0.000
	(0.009)	(0.015)	(0.022)	(0.012)
jobsyr	−0.000	0.000	0.001	−0.000
	(0.000)	(0.001)	(0.001)	(0.000)
edyrs	−0.005***	−0.004	−0.005	−0.004**
	(0.002)	(0.002)	(0.003)	(0.002)
age	−0.000	0.000	−0.000	−0.000
	(0.001)	(0.001)	(0.001)	(0.001)
male	0.016	−0.001	0.001	013
	(0.009)	(0.011)	(0.016)	(0.10)
married	−0.027	−0.001	−0.001	−0.004
	(0.018)	(0.018)	(0.025)	(0.012)
aprent	0.003	0.001	0.001	044*
	(0.010)	(0.025)	(0.036)	(0.024)
nkids7-18	−0.015***	0.015*	0.020*	0.016*
	(0.005)	(0.009)	(0.012)	(0.006)
Regional dummy variables	significant	significant	significant	significant
CR4	0.093**	0.101**	0.148**	0.064**
	(0.029)	(0.049)	(0.067)	(0.032)
cash_cl		−0.393**		
		(0.132)		
cash_sales			−0.914	
			(0.689)	
c6bank				0.037***
				(0.011)
c6telphp				0.009
				(0.023)
c6roads				0.000
				(0.000)
Number of observations	3910	948	891	3318
Log likelihood	−1062	−272	−269	−869
Pseudo-R^2	0.062	0.152	0.140	0.079

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 1 percent level.

Note: Numbers in parentheses are standard errors adjusted for clustering at the primary sampling unit level (specifications 1 and 4) or at the firm level (specifications 2 and 3). See text for specification details.

Source: Authors' calculations based on data from RLMS rounds VI (1995/96) and VII (1996/97) and Goskomstat Registry of Russian Industrial Enterprises for 1995 and 1996.

at the same date, and *cash_sales*, defined as the ratio of cash holdings to annual sales. Though these variables restrict the sample to fewer than 1,000 individuals, and thus the results should be interpreted with caution, the results do support the proposed theory (the third and fourth columns in table 3 and the second and third columns in table 4). Both *CR4* and *cash_cl* have the expected

signs and are statistically significant, whereas *cash_sales* has the expected sign but is not significant. The influence of *CR4* on *inkind* increases slightly with the inclusion of these variables, but the main point is that concentration affects the probability of in-kind payments positively—providing additional support for the theory. The regression also shows that personal characteristics have a negligeable effect on the occurrence of nonmonetary compensation.

ADDITIONAL REGRESSIONS. The mobility variable is of rather low quality. *Move* = 1 contains both migrants and nonrespondents. Direct identification was impossible, but a round VI question on whether respondents intended to move in the following 12 months proved to be a good predictor of *move* = 1: the probability was 42 percent for those who had indicated an intention to move and 15 percent for the rest of the sample. Specification 6 in table 3 shows the results when individuals who did not intend to move but had *move* = 1 were removed from the sample, because they are more likely to be nonrespondents.[21] The results show a lower magnitude for *CR4*, but it remains significant, and the explanatory power more than doubles, compared with specification 5.

Specification 7 reports the results for a subsample of individuals who had reported in round VI that they intended to move. The coefficient for *CR4* is significant and very large, but because the sample size shrinks to 292 individuals, care must be taken not to overinterpret the results. The determinants of the intention to move were also estimated (results are not reported here). The intention to move was not found to depend on in-kind payments (controlling for income, apartment rental, and so on). Mobility was found to depend on *inkind*, controlling for intention to move.

We have run regressions with different additional controls and on different sub-samples. In all cases, the results were similar to those already discussed. Among others, we have looked at alternative measures of income, such as individual wages rather than household income. To control for liquidity at a more aggregated level, we used the ratio of per capita monetary income, deflated by the minimum living standard in the region, as well as deflated per capita bank deposits in the region. To control for potential size effects, we investigated separately regressions for small and large towns and when Moscow and St. Petersburg were dropped from the sample. Other regressions were run separately for towns with high and low concentrations (with *CR4* above and below 0.5). We also ran the regressions controlling for occupations (nine occupations as classified by RLMS), but they turned out be insignificant and had no effect on the relationship between *CR4* and mobility.

21. If these individuals are not counted as migrants, the share of those who leave falls to 4 percent, which is comparable to the official national average for gross outgoing mobility (2.1 percent). Moreover, the data set is biased in favor of migration because it consists of the potentially most mobile category of people. Also, the data set covers nonregistered mobility, which is said to be quite large.

Finally, the effect of in-kind payments on outmigration was estimated in various specifications: separately, jointly with concentration, a two-stage least squares (*inkind* instrumented by *CR4*), and a system of seemingly unrelated equations. In all specifications in-kind payments negatively influence outmigration, and in almost all specifications the coefficient is significant.

Whenever the effect of both *inkind* and *CR4* on *move* is studied, the coefficient for *CR4* decreases in absolute value, but it remains significant. This implies that in-kind payments are only one of the channels through which *CR4* influences outmigration. Other potential channels are wage arrears and fringe benefits. The results for regressions with wage arrears were also similar to those already reported. Yet even wage arrears and in-kind payments together do not fully explain the effect of concentration on outmigration. This hints at the importance of fringe benefits, for which the RLMS does not collect data. Juurikkala and Lazareva (2004) use data from a different survey to show that ownership of social assets by firms reduces employee turnover—consistent with the predictions here.

EVIDENCE FROM SUBSEQUENT RLMS ROUNDS. The main regressions refer to RLMS rounds VI and VII. Data from round V could not be used because of triple-digit inflation in 1995. Using subsequent rounds is also problematic for a number of reasons. First, firm-level data were available only for round V. Second, there are no data on the variable for intention to move (*wantmove*). This question was dropped from round IX onward, and the intervals between rounds VII and VIII and between rounds VIII and IX were increased to two years from the one year between rounds VI and VII.

Nonelethless, basic specifications were estimated for rounds VII–X. Table 5 reports the cross-section results from those rounds as well as an estimation of the Cox proportional hazard model for migration. To make the results comparable across rounds, household income was deflated using a regional price index rather than a price index at the primary sampling unit level. Price data at the primary sampling unit level are very incomplete, so it is not feasible to construct an index that would be consistent over time. Table 6 reports results for in-kind payments. The results are similar, although in two later rounds the coefficient on *CR4* is marginally insignificant.

Alternative Explanations

The fact that *CR4* negatively affects the likelihood of outmigration and at the same time positively affects the likelihood of in-kind payments corroborates the theory. Several alternative explanations and counterarguments are discussed next.

First, other theories could also predict that migration would decrease with labor market concentration. The observed impact of labor market concentration on mobility could be owing to firms' greater market power in more concentrated

TABLE 5. Proit (d*F*/d*x*) Estimations for *Move*, RLMS rounds VI–X

Variable	VI	VIII	VII	IX	X	Cox[a]
hhincdef	0.149***	3.930**	3.082*	1.523**	0.586*	1.322***
	−0.049	−1.833	−1.685	−0.644	−0.356	−0.134
jobsyr	−0.002	−0.002**	−0.001	−0.002*	−0.002***	−0.003
	−0.001	−0.001	−0.001	−0.001	−0.001	−0.003
edyrs	0.001	0.003	0.008**	0.005**	0.002	0.003
	−0.001	−0.003	−0.004	−0.002	−0.003	−0.005
age	−0.003***	−0.002**	−0.003***	−0.002*	−0.001**	−0.006***
	−0.001	−0.001	−0.001	−0.001	−0.001	−0.002
male	0.140***	0.139***	0.107***	0.084***	0.073***	0.311***
	−0.015	−0.013	−0.011	−0.012	−0.009	−0.046
married	−0.075***	−0.071***	−0.082***	−0.069***	−0.061***	−0.014
	−0.022	−0.022	−0.017	−0.018	−0.016	−0.056
aprent	0.218***	0.132*	0.199***	0.206***	0.093***	0.355***
	−0.073	−0.079	−0.057	−0.051	−0.033	−0.077
nkids7	−0.057**	−0.057***	−0.036	−0.056***	−0.013	−0.084
	−0.027	−0.021	−0.026	−0.016	−0.019	−0.052
CR4	−0.166*	−0.199*	−0.219**	−0.158	−0.146	−0.706**
	−0.086	−0.104	−0.093	−0.124	−0.09	−0.317
Regional dummy variable	significant	significant	significant	significant	significant	significant
Number of observations	4074	3761	3739	3797	4198	19569
Log likelihood	−2525	−2313	−2094	−1892	−1809	
Pseudo-R^2	0.092	0.080	0.096	0.109	0.083	

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 1 percent level.

[a]A Cox proportional hazard model for the risk that *move* = 1.

Note: Numbers in parentheses are standard errors adjusted for clustering at the primary sampling unit level. See text for details.

Source: Authors' calculations based on data from RLMS rounds VI–X.

TABLE 6. Profit (d*F*/d*x*) Estimations for *Inkind*, RLMS rounds VI–X

Variable	VI	VIII	VII	IX	X
hhincdef	−0.055**	−2.586*	−2.509	−2.001***	−0.927***
	−0.025	−1.499	−1.649	−0.369	−0.213
jobsyr	0.000	0.000	−0.001	0.000	−0.001
	−0.001	−0.001	−0.001	−0.001	−0.001
edyrs	0.001	−0.009***	−0.008***	−0.006***	−0.006***
	−0.001	−0.002	−0.002	−0.002	−0.002
age	0.000	0.000	0.003***	0.000	0.001
	−0.001	−0.001	−0.001	0.000	0.000
male	0.018**	0.037**	0.026**	0.023**	0.023***
	−0.009	−0.016	−0.013	−0.009	−0.008
married	0.004	−0.011	−0.017	0.006	−0.016*
	−0.013	−0.014	−0.012	−0.007	−0.008
aprent	0.029	−0.034	0.028	−0.01	0.000
	−0.026	−0.023	−0.027	−0.013	−0.014
nkids7	0.006	0.007	−0.023	−0.001	0.004
	−0.009	−0.008	−0.017	−0.011	−0.01
CR4	0.071**	0.116**	0.137**	0.126***	0.093***
	−0.031	−0.051	−0.067	−0.032	−0.023
Regional dummy variables	significant	significant	significant	significant	significant
Number of observations	3915	3595	3446	3493	3870
Log likelihood	−1076	−1224	−1371	−906	972
Pseudo-R^2	0.055	0.101	0.097	0.157	0.117

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 1 percent level.

Note: Numbers in parentheses are standard errors adjusted for clustering at the primary sampling unit level. See text for details.

Source: Authors' calculations based on data from RLMS rounds & VI–X.

labor markets. Employers' market power may result in lower wages, making migration harder to finance. When wages are regressed on *CR4* and relevant controls, the effect of concentration is indeed negative, significant, and quite large: in various specifications individual wages decrease by 0.4 to 0.5 percent when *CR4* increases by 1 percent. Empirically, however, this explanation can be distinguished from that presented in this article because *CR4* is found to affect mobility controlling for income (either household income, as in table 3, or individual wages) and because our theory also predicts the effect of labor market concentration on the composition of wages, which is consistent with the evidence (table 4). To reinforce that argument, mobility was also regressed on both *inkind* and wages with relevant controls but excluding *CR4*. The results support the proposed theory, although the alternative explanation fails in some specifications: the coefficient on *inkind* is always negative and significant, whereas the effect of wages is not significant after controlling for willingness to move.

Second, higher rates of labor market concentration might be correlated with higher product market concentration. Then, when *CR4* is high, there are more rents that can be shared between managers and workers, which all else being equal makes current employment more attractive. As mentioned, however, the evidence is not consistent with this explanation: a higher concentration of market power results in lower rather than higher wages.

Third, there may be economies of scale in the provision of fringe benefits such as hospitals, housing, and schools. Then, a higher *CR4* could be an indicator of better provision of fringe benefits that compensate for potentially lower monetary wages. One could, in principle, test this theory, which would predict low outflows and high inflows for concentrated local labor markets (whereas the theory proposed here predicts both low outflows and low inflows). Population changes on the local level are not available, but survey evidence suggests that workers are not very keen to move into local labor markets with high concentration, whereas many want to leave but do not have the financial means to do so.[22] The impact of living standard proxies that are not highly correlated with *CR4* was explored to examine this argument: the availability of bank services, the quality of telecommunication services, and the quality or roads in the primarly sampling units (specification 5 in table 3). Although these variables matter, they reduce the magnitude and significance of the results for *CR4* only marginally.

IV. Concluding Remarks

In the theory of attachment presented here, low migration arises endogenously owing to the strategic behavior of oligopsonistic firms. The attachment contracts that emerge in concentrated local labor markets are beneficial for firms and employees but impose a negative externality on the unemployed. The theory fits Russia in the second half of the 1990s, when many local labor markets were oligopsonistic, worker compensation was demonetized, and migration was low. In line with the theory an analysis of household and firm data shows that higher labor market concentration decreases the outflow of workers and increases the occurrence of in-kind payments.

There are several implications for the Russian economy, but the theory is also of a more general nature. In particular, it points to a path dependency with respect to the structure of labor markets. Regional disparities may remain in economies facing large shocks because a few firms dominate the labor market, not only because of exogenous frictions.

22. In a survey of students and disabled, unemployed, and retired individuals residing in Russia north, 54–68 percent (for various categories) responded that they would be willing to leave the region, but only 3–11 percent said that they would have sufficient financial means to cover the migration costs fully or partially (Heleniak 1999).

APPENDIX: EMPIRICAL ANALYSIS

The following list describes the key variables used in the regression analysis.

- **Personal characteristics**: *male* (dummy variable, equals 1 if male); *married* (dummy variable, equals 1 if the respondent is married); *edyrs* (years spent on education); *age* (age in years).
- **Intention to move**: *wantmove* (dummy variable, equals 1 if respondent indicates the intention to move in the coming year).
- **Household characteristics**: *hhincome* (household income); *aprent* (dummy variable, equals 1 if the respondent rents housing); *nkids 7–18* (number of children ages 7–18 in the household).
- **Job characteristics**: *jobsyr* (number of years spent in the firm); *inkind* (dummy variable, equals 1 if respondent received in-kind payments in the last month); *arr* (dummy variable, equals 1 if respondent had wage arrears in the last month).
- **Employer characteristics**: *cash_cl* (ratio of firm's liquid assets to current liabilities as of December 31, 1995), *cash_sales* (ratio of firm's liquid assets as of December 31, 1995, to annual sales for 1996).
- **Geographic characteristics**: *PSU* (primary sampling unit, 38 communities represented in the sample); *CR4* (labor market concentration ratio at the primary sampling unit level: the share of four biggest employers in the total employment in the primary sampling unit); *region* (regional dummy variables for eight regions: Moscow and St. Petersberg, Central and Central Blacksoil region, North and Northwest, Volga, East Siberia and Far East, North Caucasus, Western Siberia, and Urals).
- **Respondent absent from primary sampling unit in round VII**: *move* (dummy variable, equals 1 if person is not found in the same community next year).
- **Community characteristics**: *c6bank* (availability of bank offices); *c6telphp* (phone lines per 100 people); *c6roads* (quality of roads).

REFERENCES

Alston, L., and J. Ferrie. 1993. "Paternalism in Agricultural Labor Contracts in the US South: Implications for the Growth of the Welfare State." *American Economic Review* 83(4):852–76.

———. 1999. *Paternalism and the American Welfare State: Economics, Politics and Institutions in the US South, 1865–1965*. Cambridge: Cambridge University Press.

Andrienko, Y., and S. Guriev. 2004. "Determinants of Interregional Labor Mobility in Russia: Evidence from Panel Data." *Economics of Transition* 12(1):1–27.

Bardhan, P. 1983. "Labor Tying in a Poor Agrarian Economy." *Quarterly Journal of Economics* 98(3):501–14.

Bell, C. 1988. "Credit Market and Interlinked Transactions." In H. Chenery and T. N. Srinivasan, eds., *Handbook of Development Economics*, vol. 1. Amsterdam: North-Holland Elsevier.

Berkovitz, D., and D. DeJong. 1999. "Russia's Internal Border." *Regional Science and Urban Economics* 29(5):633–49.

Bertrand, M. 2004. "From the Invisible Handshake to the Invisible Hand? How Import Competition Changes the Employment Relationship." *Journal of Labor Economics* 22(4):723–66.

Bhaskar, V., A. Manning, and T. To. 2002. "Oligopsony and Monopsonistic Competition in Labor Markets." *Journal of Economic Perspectives* 16(2):155–74.

Biletsky, S., D. Brown, J. Earle, I. Komarov, and K. Sabirianova. 1999. "Inside the Transforming Firm: Report on a Survey of Manufacturing Enterprises in Russia." Upjohn Institute for Employment Research, Kalamazoo, Mich.

Blanchard, O., and A. Shleifer. 2001. "Federalism with and without Political Centralization: China versus Russia." IMF *Staff Papers* 48(4):171–80.

Boal, W., and M. Ransom. 1997. "Monopsony in the Labor Market." *Journal of Economic Literature* 35(1):86–112.

Burdett, K., S. Shi, and R. Wright. 2001. "Pricing and Matching." *Journal of Political Economy* 109(5):1060–85.

Clarke, S. 2000. "The Household in a Non-Monetary Market Economy." In P. Seabright, ed., *The Vanishing Ruble: Barter Networks and Non-Monetary Transactions in Post-Soviet Societies*. Cambridge: Cambridge University Press.

Commander, S., and M. Schankerman. 1997. "Enterprise Restructuring and Social Benefits." *Economics of Transition* 5(1):1–24.

Denisova, I., G. Friebel, and E. Sadovnikova. 1998. "The Russian Labor Market: Urgent Needs for Reform." *Russian Economic Trends* 7(2):9–14.

Earle, J., and K. Sabirianova. 2000. "Equilibrium Wage Arrears: Theoretical and Empirical Analysis of Institutional Lock-in." William Davidson Institute Working Paper 321. Ann Arbor, Mich.

———. 2002. "How Late to Pay? Understanding Wage Arrears in Russia." *Journal of Labor Economics* 20(3):661–707.

Ericson, R. 2000. "The Post-Soviet Russian Economic System: An Industrial Feudalism?" In Tuomas Komulainen and Iikka Korhonen, eds., *Russian Crisis and Its Effects*. Helsinki: Kikimora.

Friebel, G., and S. Guriev. 2000. "Why Russian Workers Do not Move: Attachment of Workers through In-kind Payments." CEPR Discussion Paper 2368. Center for Economic Policy and Research, Washington, D.C.

Goskomstat. 2000. *Socialnoe Polozhenie i Uroven Zhizni v Rossii* [Social Situation and Living Standards in Russia]. Moscow (in Russian).

Grosfeld, I., C. Senik-Leygonie, T. Verdier, S. Kolenikov, and E. Paltseva. 2001. "Workers' Heterogeneity and Risk Aversion: A Segmentation Model of the Russian Labor Market." *Journal of Comparative Economics* 29(1):230–56.

Haaparanta, Pertti, Tuuli Juurikkala, Olga Lazareva, Jukka Pirttila, Laura Solanko, and Ekaterina Zhuravskaya. 2003. "Firms and Public Service Provision in Russia." Working Paper 40. Center for Economic and Financial Research, Moscow.

Healey, N., V. Leksin, and A. Shvedov. 1998. "Privatisation and Enterprise-Owned Social Assets." *Russian Economic Barometer* 7(2):18–38.

Heleniak T. 1999. "Migration from the Russian North during the Transition Period." World Bank Social Protection Discussion Paper 9925. World Bank, Washington, D.C.

Hilton, G. 1960. *The Truck System*. Cambridge: Heffer.

Jarocinska, E., and A. Wörgötter. 2000. "Regional and Sectoral Skill Premia in Russia." Working Paper. Institute for Advanced Studies, Vienna.

Juurikkala, T., and O. Lazareva. 2004. "The Role of Social Benefits in the Employment Strategies of Russian Firms." Helsinki School of Economics.

Kornai, J. 1992. *The Socialist System: The Political Economy of Communism*. Princeton, N.J.: Princeton University Press.

McMahon, C. 2001. "Idea to Pay Docs Manure Offers Whiff of Russian Reality." *Chicago Tribune*, May 31.

Mukherjee, A., and D. Ray. 1995. "Labor Tying." *Journal of Development Economics* 47(2):207–39.

Petrongolo, B., and C. Pissarides. 2001. "Looking into the Black Box: A Survey of the Matching Function." *Journal of Economic Literature* 39(2):390–431.

Rama, M., and K. Scott. 1999. "Labor Earnings in One-Company Towns: Theory and Evidence from Kazakhstan." *World Bank Economic Review* 13(2):185–209.

Roland, G. 2000. *Transition and Economics: Politics, Markets and Firms*. Cambridge, Mass.: MIT Press.

Salop, J., and S. Salop. 1976. "Self-Selection and Turnover in the Labor Market." *Quarterly Journal of Economics* 90(3):619–27.

Schaffner, J. 1995. "Attached Farm Labor, Limited Horizons and Servility." *Journal of Development Economics* 47(2):241–70.

Stevens, M. 1994. "A Theoretical Model of On-the-Job Training with Imperfect Competition." *Oxford Economic Papers* 46(4):537–62.

Tratch, I., M. Rein, and A. Wörgötter. 1996. "Social Asset Restructuring in Russian Enterprises: Results of a Survey in Selected Russian Regions." In OECD, *The Changing Social Benefits in Russian Enterprises*. Paris: Center for Co-operation with the Economies in Transition.

VCIOM (Russian Center for Public Opinion Research). 1997. *Monitoring Obschestvennogo Mnenia: Ekonomicheskie i Socialnye Peremeny* [Monitoring Public Opinion: Economic and Social Change]. Various issues, Moscow (in Russian).

Williamson, O. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Zohoori N., T. Mroz, B. Popkin, E. Glinskaya, S. Lokshin, D. Mancini, P. Kozyreva, M. Kosolapov, and M. Swafford. 1998. "Monitoring the Economic Transition in the Russian Federation and Its Implications for the Demographic Crisis—the Russian Longitudinal Monitoring Survey." *World Development* 26(11):1977–93.