

***HOW LATE TO PAY?  
UNDERSTANDING WAGE ARREARS IN RUSSIA***

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## **ABSTRACT**

We organize an empirical analysis of Russian wage arrears around hypotheses concerning factors that create incentives for firms to pay late and for workers to tolerate late payment, both reinforced by a prevalent environment of overdue wages. Our analysis draws upon nationally representative household panel data matched with employer data to show substantial interfirm variation with the probability of arrears positively related to firm age, size, state ownership, and declining performance. Estimation of a constrained multinomial logit model also reveals intrafirm variation related to job tenure and small shareholdings in the firm. Workers tend to have higher arrears in rural regions with low hiring rates, concentrated labor markets, and more prevalent arrears in the past. We argue that wage arrears, unlike wage cuts, have a theoretically ambiguous effect on workers' quit behavior, and we show empirically that the effect varies negatively with the extent of the practice in the local labor market.

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## I. INTRODUCTION

Punctual payment of wage obligations is a standard feature of most employment relationships in developed market economies. Unpaid or late wages may sometimes appear in small start-up companies facing severe liquidity constraints, in bankrupt firms about to be shut down, or in occasional situations of fraud, but most employees can almost always expect to receive their contractual wages on-time, as promised. Perhaps because the phenomena are so unusual, economists have devoted little effort to studying wage delays and defaults, and their absence is taken for granted in human resource and labor economics.

By contrast with the standard practice of punctual payment in market economies, wage arrears have emerged on a massive scale and persisted for several years in Russia and a few of the other postsocialist economies in transition. Although information is incomplete, it appears that the delays in Russian wage payments first became substantial in 1993, and, according to the Russian State Statistical Committee (Goskomstat 1998), the aggregate stock of overdue wages had grown to a total of 50 trillion rubles (around 8 billion dollars U.S.) by the beginning of 1998. Some 66,100 firms were reported to owe their workers back wages, averaging about three monthly salaries per employee. Not only the scale, but also the pattern of arrears has differed from the experience of developed market economies: the problem in Russia is by no means confined to certain industries or unusual situations, but rather is widespread in many sectors, regions, and types of organizations. The state budget was reported to account for about 10 percent of the total at the beginning of 1998, while the rest was spread across the economy, although with particular concentration in some industries and regions. Perhaps most puzzling, Russian wage arrears have been far from temporary, instead continuing and accumulating for several years.

This paper aims to improve understanding of how substantial levels of wage arrears can arise and persist. We begin by noting that a combination of peculiar conditions in Russia has tended to raise the attractiveness to managers of not paying their workers on time. A first set of conditions concerns economic decline and liquidity problems of the Russian economy, emphasized in studies such as Layard and Richter (1995) and OECD (1995), which have viewed wage arrears primarily as a form of wage adjustment. While the severity of the Russian recession has forced firms to cut labor costs, a principal argument in this paper is that wage arrears are not merely a means of adjustment to demand declines or illiquidity. To these factors, we add other firm-level considerations such as the poor monitoring of managerial behavior, the lack of contract enforcement, the crowding out by government borrowing of many financial flows, the effects of worker ownership in privatized firms, and the generalized “culture of nonpayment” (as aptly expressed by Russian President Boris Yeltsin).

A question that is more difficult than why firms adopt the practice of arrears, however, is why workers would accept systematic late payment, remaining for years with their firms despite being owed several months of back wages — as we shall show has occurred in Russia. Among the factors that may limit the responsiveness of labor mobility to arrears are substantial nonwage compensation and poor outside opportunities for workers in many areas, which have been stressed by Lehmann, Wadsworth, and Acquisti (1999). We further argue that arrears have a theoretically ambiguous effect on mobility behavior because of the difficulty for Russian workers to enforce back wage payments if they quit, creating a bonding effect with the current employer. A final argument is that the quit responsiveness to arrears may vary negatively with the level of arrears practiced by other firms operating in the same local labor market; thus the managerial decision to pay wages late can have externalities for competing employers considering a late payment strategy, in that workers are *ceteris paribus* less likely to quit a

firm paying late when other firms in the region also pay late. The resulting strategic complementarity or network externality may create persistence in that a general pattern of wage arrears can be sustained or locked-in on a local level when a critical mass of employers in the area pay wages late.<sup>1</sup>

Section 2, below, develops these conceptual arguments into a set of hypotheses concerning the incentives for firms to pay workers late and for workers to tolerate late payment, hypotheses that we use to organize our empirical analysis of arrears. For the purpose of this research, we have constructed a nationally representative, linked employer-employee database. The data, described in Section 3, are unique in enabling us to identify the specific employer of workers in a household panel (the Russian Longitudinal Monitoring Survey (RLMS) from 1994 to 1996) and, for the subset of those employers in the industrial and agricultural sectors, to link to panel data sets containing most large industrial and agricultural employers in Russia. The data permit us to distinguish between-firm variation from within-firm variation in the incidence and extent of wage arrears, to measure more carefully a number of crucial characteristics of the firm, and to construct reliable indicators of interfirm labor mobility.

Section 4 relates the variation in arrears to a rich set of firm, worker, and regional characteristics. In addition to standard probit and tobit models using our linked and full samples, we employ a constrained multinomial logit model where we distinguish firms according to the fraction of workers paid late and where worker characteristics are permitted to affect only the probability that an individual has arrears in firms that differentiate among workers. With respect to firm characteristics, we analyze industry, ownership, size, age, and measures of performance and liquidity. Regarding the worker, we consider demographic and human capital variables, job tenure, occupation, and worker ownership in the firm. Concerning regional factors, we study economic and financial conditions of the

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<sup>1</sup> Our analysis of institutional lock-in has analogies in the history of technologies (David 1985).

region and the local labor market, including hiring rates, job destruction, employer concentration, and the prevalence of arrears in the local area.

Finally, we investigate the response of individual workers to arrears, focusing on mobility to three employment states: new job, unemployment, and nonparticipation in the labor force. We find support for our hypothesis that the quit propensities of workers in response to late payments are reduced in regions where late wage payments are endemic, suggesting that this reduced responsiveness serves as a mechanism in the self-perpetuation of arrears.

## **II. UNDERSTANDING THE PUZZLE OF WAGE ARREARS**

This section elaborates our hypotheses concerning the factors underlying wage arrears in Russia. Section II.A discusses determinants of the firm's choice of wage arrears, while Section II.B focuses on the mobility responses of workers and the tendency for arrears to persist in many local labor markets. Throughout, we stress factors for which there are measurable counterparts in the data, and Section II.C summarizes the implications of the hypotheses for empirical relationships that can be estimated.

### **A. Factors Influencing the Firm's Choice of Wage Arrears**

Studies of the Russian labor market have generally treated wage arrears as a way for firms to reduce their wage costs. As in other transition economies, Russian firms have faced tremendous shocks to their product and factor markets over the last several years and have come under pressure to reduce output and costs.<sup>2</sup> Delaying wage payments may be a particularly effective cost-reduction mechanism under high inflation. Viewed from the standard paradigm in which some form of wage rigidity is taken

as the cause of involuntary unemployment, arrears have even attracted some implicit or explicit praise for their contribution to the low levels of layoffs and unemployment in Russia. Layard and Richter (1995), for instance, portray wage arrears as a form of “wage flexibility . . . explained by the willingness of workers to accept pay cuts in order to preserve jobs.” In its 1995 survey of the Russian economy, the OECD praised the “remarkable flexibility . . . of real wages” and the use of “wage arrears . . . to finance this employment surplus.”<sup>3</sup>

This line of research has provided some answers to the question why Russian employers may have favored wage cuts over layoffs as an adjustment mechanism, but it is our argument in this paper that it does not explain why many of them have adopted wage delays as a preferred practice. This question is important because, while wage arrears clearly imply a reduction in the effective real wage, they also differ from wage cuts in several important respects, both conceptually and empirically. To begin with, arrears involve uncertainty about the timing and extent of eventual payment; this uncertainty is perhaps a more important welfare consequence of arrears than the effective real wage reduction. They also imply a violation of the labor contract, not a renegotiation, which may have implications for the popular faith in the rule of law in the transition environment. Furthermore, the theoretical implications of arrears for worker quit behavior also differ from those of a simple wage cut, as we discuss in the next section.

Casual empirical observation also suggests differences between wage arrears and cuts. First, Russian workers perceive wage arrears as different from wage cuts, as evidenced for instance by their

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<sup>2</sup> The pressure to cut labor costs has been particularly heavy due to the initial (pre-transition) situation of overstaffing in the industrial enterprises. Commander, McHale, and Yemtsov (1995) contains a discussion. For more information on Soviet labor markets, see Granick (1987).

tendency in opinion polls to rate arrears as a much larger social problem than low wages (Javeline 1999). Moreover, real wages have hardly been rigid in Russia, certainly not in the aggregate and over a sufficient time span, as high inflation has been associated with large increases in nominal wages and drastic declines in real wages during the 1990s. From September 1994 to 1996 (our sample period in the analysis below), for instance, the average nominal wage rose 235 percent while the real wage fell 21 percent. Russian employers were repeatedly agreeing to nominal wage increases and then refusing to pay them. Finally, as we show in our empirical analysis below, the patterns of wage arrears are only moderately related to measures of demand shocks and financial distress, with considerable variation left unexplained. Thus, it is important to search further for additional explanations of wage arrears, particularly ones that treat it as a distinct practice from wage reductions.

Closely related to the notion that financial distress is responsible for wage arrears are accounts that focus on liquidity problems in the Russian economy.<sup>4</sup> According to one version (the one frequently reported by managers to workers), the firm's customers have failed to pay on time, resulting in no money to pay wages. Another version has it that with little external finance available, firms take advantage of the possibility of interest-free loans from their workers. In support of the illiquidity explanations, it is true that wage arrears have risen in tandem with enterprise and tax arrears (Ivanova and Wyplosz 1999). On the other hand, wage arrears are peculiar in that, unlike the other two types of arrears, they are virtually unheard of in market economies. Alfandari and Schaffer (1996) and Clarke (1998b) show that the levels of overdue inter-enterprise debt in Russia have not been particularly

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<sup>3</sup> Desai and Idson (2000), Gimpelson (1998), and Lehmann, Wadsworth, and Acquisti (1999) also analyze wage arrears from the perspective of wage adjustment. Brainerd (1998) studies the evolution of the wage structure in Russia from 1991 to 1994, but does not address the problem of wage arrears, although they were quite sizable by 1994.

high by market economy standards, and tax arrears in OECD countries are of course also far from unknown.

Moreover, the illiquidity story is unsatisfactory for a number of additional reasons. An account relying on unexpected liquidity shocks is inadequate to explain why wage arrears could persist for several years in Russia, as firms have had time to adapt their expectations and to adjust in other ways than by not meeting their contractual obligations to their workers. If the explanation focuses rather on long-run illiquidity in some firms, then the implication is that arrears represent a voluntary loan from workers to their employers. But this interpretation is inconsistent with the fact that arrears involve a violation of the wage contract, not renegotiation, and the expressions of outrage in public opinion polls and through strikes and other protest behavior suggest that workers have not voluntarily agreed to become creditors.<sup>5</sup> A loan also implies some certainty, at least a formal promise, of repayment, but the reality is that receiving back wages in Russia is highly uncertain.<sup>6</sup> Finally, wage arrears are only moderately correlated with measures of illiquidity, as our empirical analysis shows below.

Thus, while it is clear that wage arrears are related to the broader patterns of economic and financial decline in Russia, we argue that arrears in the labor market have a somewhat independent dynamic. The following subsection returns to the issue of worker reactions to arrears and their implications for the regional concentration and persistence of arrears, while in the rest of this subsection

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<sup>4</sup> According to Clarke (1998b), for instance: “The worst non-payment of wages is not found in enterprises which are bankrupt, but in the most prosperous and profitable enterprises in Russia. They do not pay wages not because they cannot afford to pay wages, but because they do not have the live money to pay wages.”

<sup>5</sup> One might ignore worker attitudes and argue that arrears are part of an implicit contract, but there is no evidence of any compensating differentials associated with arrears. To some extent, the issue is semantic, as it is still of interest why implicit contracts should take this peculiar form in Russia, but be otherwise so rare in most of the world.

<sup>6</sup> Even this could be part of an implicit contract extended to include risk-sharing, with repayment of back wages contingent on future firm performance. It is hard to imagine workers voluntarily accepting such an arrangement under any circumstances, much less so in the nontransparent environment of Russia, where workers would face insurmountable difficulties in observing performance and enforcing such an agreement.

we discuss additional factors—in addition to declining performance and liquidity problems—that may affect the incentives of firms to pay wages late: fiscal policies and soft budget constraints, poor corporate governance and managerial self-dealing, and worker ownership arising from the Russian privatization process.

Taking each of these in turn, some aspects of Russian fiscal policies may have increased wage arrears as firms have sought to reduce tax payments or extract subsidies. In general, high tax rates, on both wages and profits, give firms an incentive to hide cash, and the lack of effective enforcement and accounting transparency in Russia has made it easier for them to do so. Paying wages may attract the tax collector's attention, particularly since Russian enterprises are legally permitted to use only a single bank account for all types of payments; thus nonpayment of wages may be useful to signal inability to make tax payments.<sup>7</sup> In a similar vein, arrears may result from attempts by enterprises to extract subsidies from the state (a speculation that appears in a number of articles, e.g., Alfandari and Schaffer [1996]), especially by firms with close ties to federal or local governments or those with greater bargaining power.

Related to the subsidy-extraction game is the problem of soft budget constraints, inherited from the socialist regime.<sup>8</sup> Under central planning, firms could request additional funds for wages in order to meet their output targets, thus they had a tendency to “over-fulfill” their wage and employment quotas.<sup>9</sup> After planning broke down and firms were free to make employment and wage decisions, this tendency may have translated into reluctance to layoff redundant employees and in excessive wage promises to

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<sup>7</sup> Hendley *et al.* (1997) make similar points with respect to barter deals between firms.

<sup>8</sup> Kornai (1992) contains an extensive discussion of soft budget constraints in the socialist and transition economies.

<sup>9</sup> This was pointed out by an anonymous referee. The degree to which such requests were granted is a matter of some debate; see, e.g., Granick (1987), pages 57–59.

workers, with the hope that the state would provide bailouts, as it sometimes has (although not usually in explicit response to arrears).

An additional aspect of fiscal policies was the frequent sequestration of budgetary funds by the Ministry of Finance in order to reduce the federal budget deficit in the early and mid 1990s. According to the Institute for the Economy in Transition (1994, p. 35), for instance, every expenditure line in the fourth quarter of the 1993 federal budget was sequestered by 20 percent. High inflation and political gridlock led to this unorthodox macroeconomic policy, which resulted in unpaid bills at defense contractors and late wages of bureaucrats, teachers, and health care providers.<sup>10</sup> Sequestration may explain high arrears under state ownership and in particular sectors of the economy, but by itself it cannot account for the broader phenomenon.

A second aspect of the Russian environment relevant for understanding wage arrears is poor monitoring of managers, particularly in the large state-owned and recently privatized companies. It is frequently alleged that managers have engaged in massive asset diversions, which would have had the indirect effect of impoverishing their companies (thus making them less capable of paying their wage bill), but such actions may have also involved the direct theft of funds intended for the workers. A further incentive for the diversion of wages may have been the large borrowing of the Russian government to finance an out-sized budget deficit. Short-term treasury bills were offered at extremely high interest rates (varying from 30 to 150 percent during the 1994–1996 period of rather low inflation and mostly fixed exchange rates). Thus, by postponing some payments, managers stood to earn enormous returns—on their workers' money.

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<sup>10</sup> See also Gimpelson (1998).

A final set of considerations influencing managerial wage arrear decisions concerns the massive worker ownership that arose from the Russian privatization process. One implication of worker ownership could be a greater willingness of workers with equity stakes to help their firms out of a liquidity crisis, making a voluntary “loan” as discussed above. An alternative possibility is that managers may have used wage arrears to force their (even more liquidity-constrained) employees to sell their shares shortly after the latter became shareholders—a phenomenon that is frequently alleged to have taken place and for which there is some anecdotal evidence.<sup>11</sup>

We summarize the testable hypotheses emerging from this discussion in Section II.C below.

## **B. Mobility, Persistence, and Local Labor Markets**

None of the factors we have discussed above—neither the economic depression and illiquidity, the fiscal policies, the poor monitoring of managers, nor worker ownership—provides a satisfactory explanation for two particularly puzzling aspects of wage arrears in Russia: persistence over time and variation across regions, regularities which we document below. Accounting for these regularities requires consideration of worker responses to arrears. In particular, we focus on workers’ mobility responses: how mobility is attenuated, promoting persistence, and how mobility varies geographically, contributing to regional variation.

Previous researchers have pointed out that worker quits in response to arrears could be reduced by a lack of outside opportunities (Layard and Richter 1995; Lehmann, Wadsworth, and Acquisti 1999). If workers’ alternatives are poor—because of high migration costs and few local options—then the firm may be able to exploit their low bargaining power and reduce their quasi-rents,

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<sup>11</sup> This evidence includes press reports and our own case studies of firms. A well-developed description is the ISITO (1998) case study of the Novokuibyshevsk Oil and Chemical Plant.

particularly in the many “one-company towns” and “mono-industrial cities” remaining from the planning period in Russia.<sup>12</sup> Layard and Richter (1995) also argue, that sluggish quit behavior in Russia may result from the desire of workers for continued access to fringe benefits, production facilities, and possible opportunities for pilferage at the enterprise.

While these considerations apply equally to wage cuts and wage arrears, we argue that there is also an important difference in worker responses to these two actions. While both effectively lower wages, tending to raise quits, arrears also result in an upward tilt of the wage-tenure profile. If the worker expects at least some of the back wages to be paid in the future, this deferred compensation effect provides an incentive to remain longer with the employer, and overall the effect of arrears on quits is therefore theoretically ambiguous.<sup>13</sup> Furthermore, the incentive not to quit is greatly strengthened by an institutional consideration peculiar to Russia, namely that court enforcement (and any other type of third-party enforcement available to workers) is so weak that a worker who quits a job generally loses forever any chance to recover any of the back-wages owed (or at least goes to the end of the queue, behind current employees).

Thus, the tilting of the earnings-tenure profile together with the lack of contract enforcement, the market power of many employers, and the nature of local labor markets in Russia serve to moderate workers’ quit behavior and to increase the incentives of firms to use wage arrears. The negative

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<sup>12</sup> Geographic mobility of labor in Russia is reduced by registration requirements (and large fees in cities such as Moscow), information problems, poorly functioning housing markets, and liquidity problems of workers. Mitchneck and Plane (1995) discuss internal migration in Russia.

<sup>13</sup> See, for instance, Salop and Salop (1976) for a discussion of firm use of delayed payment contracts in order to reduce quits. The case of tilted earnings profiles to elicit effort is explored by Lazear (1979 and 1981) and Akerlof and Katz (1989), among others. Pencavel (1972), Flinn (1986), and Topel and Ward (1992) analyze the role of the level of wages for worker quit behavior.

feedback mechanism of worker quitting that would normally eliminate the practice is reduced, and wage arrears may spread rapidly and persist over longer periods of time than they would otherwise.

Moreover, the incentives to use arrears are enhanced by the externalities conveyed from the wage arrear strategy followed by other employers: if one employer increases arrears, this is likely to reduce the quits from other employers in response to their own arrears. If workers are unsure they would be paid on time at a new job, then they are less likely to respond to a late payment by quitting to search or even to take up a new employment offer. Even firms that have good prospects and that want to expand their operations and hire additional workers may not be able to make credible promises of on-time payment because of the volatility of the environment, the nonverifiability of their prospects, and their incentives (understood by workers) to reduce costs by opportunistically delaying payment once the worker has signed on. Migration to a region where employers typically do pay on time is both very costly and full of uncertainties. Non-employment may become more attractive for some workers, but it is not an option for everyone.

Thus, the consequences of paying workers late to ease financial problems or to cut labor costs are likely to be quite different when most other firms, are doing so than when no others do, particularly those operating in the same local labor market. This interaction may lead wage arrears to be self-sustaining, so that they persist even if their original cause is removed.

### **C. Empirical Implications**

Our overall approach in this paper is to treat wage arrears as the outcome of rational managerial decisions, conditioned by characteristics of workers, firms, and the regional environment. Wage arrears, in our view, are not the inevitable result of liquidity shocks nor are they simply a way of

adjusting real wages downward (although they may be related to both illiquidity and demand problems). The foregoing discussion has suggested a number of specific hypotheses related to managerial incentives and worker responses. Here we summarize the empirical hypotheses that we address in subsequent sections of the paper.

A first issue concerns the appropriate level of analysis: the firm, the individual worker, or the interaction of both. Nearly all prior research on arrears has used individual data, despite the emphasis on firm-level factors of financial distress and liquidity problems. Even if regressions on individuals show an apparent association between arrears and attributes of workers, this might be only a reflection at the fact that worker and firm characteristics are correlated and thus that inferences about the impact of worker attributes could be spurious. The issue is not just about proper specification, however: it also bears directly on our hypothesis that firms respond to the costs and benefits associated with alternative strategies concerning the timing of their wage payments. If liquidity constraints constitute the only or the primary factor determining arrears, then one would expect only rarely to find cases where some employees are paid and others are not. Nor would one expect to find systematic reasons for preferring to pay certain employees rather than others. Our analysis of intrafirm variation in arrears is therefore relevant for the hypothesis that Russian managers do in fact consider alternative wage arrear strategies.

Analyzing intrafirm variation in arrears is also important for evaluating the possibility that workers systematically sort themselves across firms according to the preferences of the former and the costs of the latter. The sorting hypothesis suggests that relatively mobile workers with high disutility from arrears (due to high rates of time discount and risk aversion) will more likely move to firms with low arrears. This implies that the distribution of firms according to the fraction of employees subject to arrears should move over time towards a bimodal distribution, with a decrease in the fraction of firms

engaged in intrafirm differentiation. For this purpose as well, we combine individual and firm-level data sets in our empirical analysis below.

The dearth of empirical evidence at the firm level is particularly important for the hypotheses of firm performance and liquidity determinants of arrears. The only previous analysis using microdata on firms is Alfandari and Schaffer (1996), and they find only a weak relationship between the stock of overdue wages and some measures of performance at the time of their survey—mid 1994 which was before the arrears crisis spread much more widely (as we show below).<sup>14</sup> Our empirical analysis below provides evidence of the relationship of arrears with firm-level measures such as employment and output growth, profitability, liquidity, and productivity.

In addition to firm performance and liquidity, Section 2.A discussed other firm-level factors possibly affecting arrears: soft budget constraints stemming from the legacy of the socialist system and possibilities for managerial self-dealing resulting from poor corporate governance. Unfortunately for our purposes, tax evasion, subsidy-seeking, and the hiding and diversion of funds are themselves not directly observable, but they may be correlated with some measurable characteristics of firms. Opportunities for such actions, for instance, vary with the industry of the firm, as strategic sectors may be more likely to receive subsidies or tax exemptions, while sectors with valuable assets may be particularly prone to asset-stripping. Ownership may also be important, as state-owned firms are possibly less well monitored and more predisposed to seek subsidies—or more successful in the attempt—than are private firms. A further distinction must be made according to whether the firm is “old” (inherited from

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<sup>14</sup> The performance measures include a subjective dummy variable for the survey response that the firm was “usually a profit maker” and measures of the changes in employment, output, and capacity utilization, while the measure of the magnitude of wage arrears is highly ambiguous, and it does not correspond to the standard measure in Russia, which is the cumulative stock of arrears. Enterprises have also been analyzed by Clarke (1998a) and Gimpelson and Lippoldt (1996) in several case studies.

the socialist regime) or new private, “*de novo*” (founded since reforms began in the late 1980s): here our hypothesis is that new private firms are less likely to be able to obtain subsidies and more likely to have effective managerial monitoring, while old firms may suffer from the inherited expectation that they may be bailed out if they promise excessive wages. We also hypothesize that subsidy-seeking and therefore use of arrears may be positively correlated with the size and employment share of a firm in its local labor market, as the threat of layoffs raises bargaining power with the local authorities. We report tests of these relationships below.

While most discussion of arrears has focused on firm-level explanations, our discussion has suggested that individual characteristics of workers may also matter. In addition to investigating firm-level variables, our empirical work therefore considers worker characteristics that may be used by management for systematically differentiating among employees in assigning wage arrears. First, we consider worker characteristics that may affect the firm’s costs of the worker quitting, including both the probability of a quit and the costs of replacement: gender, schooling, age, job tenure, and occupation.<sup>15</sup> A key hypothesis is that managers take into account turnover costs associated with these variables in allocating arrears within the firm. We particularly focus on job tenure, as a proxy for firm-specific human capital, to test whether managers consider workers’ mobility responses to arrears. To investigate whether worker turnover is associated with systematic sorting over time—such that high arrears firms become dominated by low mobility workers and low arrears firms by high mobility workers—we also test whether the tenure effect has declined over time; our mobility analysis takes up this issue more directly, as described below.

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<sup>15</sup> These variables may also reflect discrimination in arrears, for instance on the basis of age or gender.

The discussion in Section 2.A also contained implications for the possible impact of worker ownership on wage arrears. If arrears represent voluntary loans from worker-owners to their firms, then this would imply a positive association between the size of the worker's stake and the probability and magnitude of the wages he/she is owed (controlling for other factors). On the other hand, if arrears involve a violation rather than a renegotiation of the contract, then the relationship between ownership and arrears should be negative, at least at higher ownership levels (where the employee could conceivably begin to exercise some influence over company payment practices). There might still be a positive relationship at low levels of ownership if wage arrears have been used by managers seeking to force their employees to sell their small stakes shortly after becoming shareholders. Thus, examining the association of arrears with employee ownership at lower and higher levels provides us with some leverage for distinguishing the whether arrears look more similar to voluntary loans or contractual violations; within the latter, a particular concentration of arrears at low levels of ownership would be consistent with their use to forced employees to sell their shares.

Next, we turn to regional characteristics. We have argued that workers' quit behavior in response to arrears is influenced by local labor market conditions, and we analyze measures of the unemployment rate, the hiring behavior of other employers, the degree of employer concentration, and whether the firm is located in an urban area. Firms with local labor market power (for instance, monopsonists in the many one-company towns of Russia) would be less likely to fear that arrears could lead to a large loss of employees. Other aspects of regional performance may be important to control for, including measures of income and liquidity. A hypothesis that we have emphasized is that the extent of arrears in a firm's local labor market may tend to raise the firm's use of arrears, as this serves to attenuate the quit responsiveness of workers. This implies that wage arrears may be strategic

complements across firms.<sup>16</sup> We implement our test using the lagged level of arrears in the local labor market. Finally, the argument that arrears are enabled by worker survival strategies that include extensive subsistence agriculture provides an alternative rationale for expecting lower arrears in urban areas, where opportunities for such activities are more limited than they are in rural areas. Our empirical work examines these relationships.

Finally, our discussion suggests some testable hypotheses concerning worker quit behavior. We have argued that arrears have an ambiguous impact on labor mobility: by lowering wages and increasing job insecurity they tend to raise it, but by tilting upward the expected wage-tenure profile they tend to reduce it. Moreover, the quit response to arrears should be reduced by local labor market arrears, as workers are loathe to change jobs when payment is also unreliable on potential new jobs. On the other hand, workers may find unemployment or nonparticipation in the labor force more attractive states when arrears are endemic in the local labor market. If workers have been sorting themselves systematically across firms according to their disutility from arrears, then the quit response to arrears should be declining over time. We also examine the effect of other local labor market characteristics (such as the regional unemployment rate) and an indicator for urban area to proxy opportunities for other jobs and in subsistence agriculture. Firm size is included both because of the systematic relationship between size and quit behavior in most settings and because in the Russian case this variable also proxies the size of fringe benefits. Other worker characteristics that may affect quit behavior (including demographic characteristics, schooling, current contractual wage) should be controlled for, and we do so in our empirical analysis below.

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<sup>16</sup> This hypothesis is formally modelled and tested in Earle and Sabirianova (2000).

### **III. DATA: DOCUMENTING THE PATTERNS AND PERSISTENCE OF WAGE ARREARS**

Official information on wage arrears in Russia is limited to aggregate time series of the reported cumulative overdue wage debts in certain sectors of the economy. Over the period covered by our analysis—1994 to 1996—only three series (for the aggregate industrial, construction, and agricultural sectors) are available. Although the increase in the stock of arrears is plain from these figures, one can learn little, even for the three sectors, about the degree to which the group of affected workers is the same or has changed over this period and about the extent to which the increase involves a larger number of affected workers or a worsened condition for those previously affected. The aggregate data also do not permit, of course, any analysis of the association of wage arrears with other variables.

This section first describes the sources of our data, the samples we employ, and the measures of wage arrears available to us. Next we analyze the growing magnitude and the persistence of arrears over the period autumn 1994 to autumn 1996. Finally, we examine the variation of arrears with respect to individual, firm, and regional characteristics.

#### **A. Data Sources**

Our principal data source is an annual household panel survey, the Russian Longitudinal Monitoring Survey (RLMS), based on the first national probability sample drawn in the Russian Federation.<sup>17</sup> The panel structure permits us to examine the persistence and intertemporal effects of wage arrears, but, unfortunately, the original RLMS data suffer from a number of crucial limitations for

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<sup>17</sup> See Swafford *et al.* (1997). The RLMS data contain results of two longitudinal surveys: 1992–1993 (rounds 1–4) and 1994–1996 and 1998 (rounds 5–8). We restrict our attention in this paper to rounds 5–7, because no information on wage arrears is available from rounds 1–4 and because there is a two-year lag between rounds 7 and 8 (no survey was conducted in 1997), since our econometric specification relies on a one-year lag in a key variable of interest (local labor market arrears).

our purposes. To start with, the RLMS contains rather little information on firm-specific and region-specific characteristics that may be important for wage arrears: only crude measures of ownership, the size of the enterprise, the year when the enterprise was established, and a few regional indicators are available. No information on the performance or even on the industry of the firm employing the worker-respondent is included in the original, published data. Nor from these data can the researcher identify firms for which the sample contains multiple respondents, which would permit an analysis of intrafirm variation in arrears. Finally, mobility is difficult to measure in the original data because of inconsistencies in the job tenure variable (a common problem in household surveys) and ambiguity in the explicit question on job-changing.<sup>18</sup>

For these reasons, we have extended the original data in a number of ways. First, we have used information provided by most working respondents on their employers (but not included in the published data set) to identify individual firms and the industries in which they operate.<sup>19</sup> An important side-benefit of this was the discovery that respondents working at the same enterprise sometimes provided different answers to questions about their firm. We have cleaned the original firm variables such as size and ownership to make them consistent within firms and across years. For most cases, we were also able to code the industry in which the respondent works—a variable that was not available to previous researchers—and to ensure the consistency of this information as well.<sup>20</sup> A further important benefit of identifying the specific employer was to enable us to construct reliable measures of job

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<sup>18</sup> The question permits a “yes” answer both to job changes within firms and to movements across employers. Similar interpretation problems arise in the PSID in the U.S.A. See Topel (1991), Brown and Light (1992), and McCue (1996).

<sup>19</sup> This information is available in one or more of the string variables consisting of the responses to questions concerning the nature of the respondent’s employer and job.

<sup>20</sup> Some ambiguities of classification prevented us from coding industry for all jobs, but we were able to code 4,826 respondents of 4,896 employed in 1994, 4,526 of 4,575 employed in 1995, and 4,348 of 4,383 employed in 1996.

mobility. We can distinguish job-to-job movements from intrafirm mobility as well as from movements to other labor force states. These distinctions are critical in our analysis of the labor supply effects of arrears.

In addition, we extended our information on the characteristics of firms by matching information on firms from the 1993–1996 Goskomstat Registries of Enterprises and the 1995–1996 Balance Sheets to employees working for firms in the respective year.<sup>21</sup> These matched data sets enable us to analyze wage arrears as a function of firm-specific characteristics such as ownership (according to the Goskomstat categories), performance (measured as change in output, employment, and profitability), and several measures of liquidity.

Finally, we have drawn on several sources to construct regional variables representing characteristics that may be correlated with arrears. The measures include regional labor market characteristics and general economic performance and liquidity, which we have calculated from the Goskomstat Registry of Enterprises and Balance Sheets or drawn from various publications of the Goskomstat. These variables are described in greater detail where they enter the analysis in Section IV, below.

## **B. Samples for Analysis**

We employ three samples in the analysis below. First, to examine the impact of arrears on workers' labor supply decisions and to investigate several types of determinants, we use the full sample of employee-respondents in the RLMS: only self-employed, unemployed, and non-participants in the labor force are excluded (together with observations for which some variables have missing values).

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<sup>21</sup> The Goskomstat Registries are annual censuses of large and medium-sized industrial and agricultural firms, while the Balance Sheets contain a subset of the Registry firms plus some larger firms in the service sector.

We refer to this sample as the “full sample” below. There are 13,271 person-year observations on employees providing an answer to the question on wage arrears (4,716, 4,389, and 4,166 in 1994, 1995, and 1996, respectively).

Second, as discussed above, we have fairly detailed information on firm performance for a subset of the full sample, that is for employees in firms that we were able to match to the Goskomstat Industrial and Agricultural Registries and Balance Sheets. This sample, which we call the “matched sample” is particularly useful for investigating the relevance of certain firm characteristics, particularly performance and liquidity, on the probability and magnitude of arrears. For the Industrial and Agricultural Registry data, we were able to match 4452 employee-year observations to 899 firms across the three years (about an 81.5 percent match rate in industry and 89 percent match rate in agriculture), while for the Balance Sheets, 3,328 employee-year observations could be matched to 712 firms for the three years.

Finally, we also define a separate “restricted sample” consisting of 3626 employee-years observations at 243 firms, where we observe at least four employed respondents in a given year. The purpose of this sample is to permit us to analyze the extent to which arrears vary within firms as well as across them and to estimate the impact of the separate determinants of the intrafirm versus the interfirm variation. The requirement for inclusion in the sample of a minimum of four employees was determined on the basis of the trade-off between sample size and the reliability of the intrafirm results: the smaller the minimum size the larger the sample but the less precise are the statements that can be made about intrafirm variation. We did investigate alternative minima, such as three, five, or six employees, and the results we present in Section IV.A below were qualitatively very similar under these alternative sample rules.

The three samples have rather different characteristics. While the full sample is representative of the entire employed Russian population and the matched sample is representative of industrial and agricultural employees (with partial representation of services) the restricted sample tends to consist of employees of firms that are relatively large in their local labor market. In general, compared with the full sample, individuals in the matched sample are more likely to be employed in firms of mixed and domestic private ownership and in firms founded before 1988, to own small numbers of shares in the employer, to be less-well-educated, and to have longer job tenure. The restricted sample respondents are more likely to live outside the urban areas and to work in agriculture relative to both of the other two samples, but they are also more likely to be found in manufacturing jobs, to be male, and to be less well-educated relative to the full sample.

### **C. Measures of Arrears**

Measuring wage arrears faces several problems. In theory, one would like to measure the worker's present discounted loss due to wage delays, taking into account the timing of past payments and the risk premium associated with the uncertainty of the timing (and probability) of future payment. Such a measure would require detailed information on the wage payment history of each worker and on his/her discount rate and expectations concerning future payment. In practice, payments of wages and repayments of back wages tend to be highly irregular, creating high volatility in the actually paid monthly wage relative to the promised or contractual wage.<sup>22</sup> Furthermore, detailed records on the entire histories of wage payments and repayments are hardly kept or reported.

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<sup>22</sup> Thus, the RLMS variable corresponding to the reported wage received in the previous month, which has been used by many researchers as though it were a standard wage measure, need bear little relationship to the contractual wage or to the average wage received over some longer period.

The prevalent practice of accounting for arrears—in individual firm balance sheets, in official Russian statistics, and in the minds of workers—is rather to sum the cumulative debt of the firm to a worker, without regard to the timing of when the debts were incurred. Workers tend to think of their arrears as this stock expressed as the number of overdue monthly salaries that they are owed. Associated with this concept of the level of arrears is the standard practice of paying debts in the order in which they are incurred. For example, consider a worker with three months of arrears in October of some year. If he/she is paid one monthly salary at the end of October, this payment is treated as the July wage, and arrears are considered to remain unchanged at three months. If he/she instead receives 2.5 monthly salaries at the end of October, this is considered payment for July, August, and half of September, and arrears decline to 1.5 months. If he/she receives nothing, then arrears are recorded as rising to four months.<sup>23</sup>

With this background, let us turn to the RLMS measures of arrears. A first question asks whether the respondent is owed money by his or her employer, which has not “for various reasons” been paid on time. The answer to this question, which we define as a dummy variable ARRDUM (1 = yes, 0 = no), provides an indicator concerning the incidence of arrears.

The magnitude of arrears, which we call ARRMOS, can be measured using a second RLMS question: “For how many months has this money not been paid to you?” That this variable refers to the stock concept, the number of overdue monthly wages, has been verified in our interviews with Russian accountants, managers, and workers. An alternative interpretation of ARRMOS could be the duration of outstanding debt, but this actually produces the same measure as the stock of arrears, once one

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<sup>23</sup> One reason for this practice is that firms pay no interest or penalties on wage arrears, nor are they indexed. Thus all that matters for accounting purposes is the total debt.

understands the accounting practice of paying wage debts in the order incurred; moreover, any other duration interpretation is almost meaningless in an environment where wage payments are highly irregular, since it would be unclear precisely *which* instance of late payment the question would then be referring to.

We have also checked the consistency of ARRMOS and other information in the data set using the following procedure. Partly in order to conduct this check and partly to obtain better wage information, we have added a question to the 1998 RLMS concerning the worker's *wage*, the amount due under the contract. This variable can be compared to the ratio of the RLMS measure for the money stock of overdue wages to ARRMOS. The contractual wage should precisely equal this ratio only under the following conditions: if the nominal wages of each individual had been completely constant over the period of arrears; if there had been no part-month arrears (because ARRMOS is coded as a natural number, a positive integer); and if there were no measurement error in any of these three variables. Despite the stringency of these conditions, we find exact equality in 925 cases out of 2,270 for which the ratio can be calculated. In 66.3 percent of the cases, the two figures differ by no more than 25 percent. The deviations are explicable in terms of changing nominal wages, part-month arrears, and measurement and recall error. But the interpretation that ARRMOS represents the length of time since a wage payment was missed cannot account for this close correspondence.<sup>24</sup> Because of the possibility of some errors in the stock measure ARRMOS, however, we have calculated most of our estimates using both ARRMOS and ARRDUM, finding strong consistency between the patterns in the measures of the intensity and incidence of arrears.

With respect to ARRDUM, table 1 shows that about 40 percent of respondents reported they were owed overdue wages at the survey dates in 1994 and 1995, with a rise to about 60 percent in 1996.<sup>25</sup> The unconditional mean of ARRMOS was also roughly constant at 1.1 months in 1994 and 1995, then jumping in 1996 together with a pronounced rightward shift in the distribution of this variable. If the proportion of workers with two or more months of arrears was about 25 percent in 1994 and 1995, it had increased to nearly 44 percent by late 1996. Conditional on having arrears, the expected magnitude rose from 2.75 to about 3.3 months. Clearly the overall increase in arrears reflects both a spreading of the contagion to previously unaffected workers and a worsened condition for those already suffering.

Table 1 also provides strong evidence of state dependence in arrears, here defined simply as the conditional probability that an individual will be owed money in a particular year, conditional that is on having reported arrears in prior years. For instance, the probability of having arrears in 1995 was more than twice as great for individuals experiencing arrears in 1994 as for those who did not. The probability of having arrears in 1996, conditional on having arrears in both 1994 and 1995, was nearly 90 percent. Similar findings apply to the conditional mean of ARRMOS, conditional on the prior year's ARRMOS. Among respondents with over 6 months of arrears in 1995, the mean number of months was 7.69 in 1996. Again, the data appear to reflect both a widening and a deepening of the arrears crisis over this period.

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<sup>24</sup> One potential source of ambiguity might arise from the practice of paying workers in-kind, frequently in the goods produced by the company. The standard practice, however, is for workers to formally accept (by signature) such in-kind payments in lieu of cash, so that neither the firm nor the workers should confuse them with arrears.

<sup>25</sup> This trend is consistent with Goskomstat's aggregate figures (based on enterprise reports).

#### **D. Variation in Wage Arrears**

Table 2 exploits our rich set of variables to examine the heterogeneity in the incidence and magnitude of wage arrears for a set of firm and employee characteristics in the RLMS from autumn 1996. The average incidence (mean of ARRDUM) and magnitude (mean of ARRMOS) of arrears were both much higher in rural than urban areas, and there was substantial variation among localities. While the table includes arrears statistics for the six major regions of Russia, we also illustrate the variation with some “selected locations,” showing some districts (Russian *raiony*) with very low arrears and some with very high, nearly universal arrears. The results for the city of Moscow, where 28.6 percent of employees were owed money and the mean (ARRMOS) was 0.6 months, mostly reflects arrears of the federal government.

Variation across industries was also large, with the highest rate in agriculture and in some industrial sectors (shown under “selected industries”), particularly machine building and defense (“military complex”), as well as in services financed through the state budget (education and health). In a new and rapidly developing sector like banking, however, arrears were very small at this time. Arrears vary strongly with size, showing a much lower incidence and average magnitude in firms with fewer than 50 employees.

The table also reports the variation in arrears across different forms of ownership, drawn from Goskomstat Registry information in the case of industrial and agricultural employees and computed otherwise from the answers of the RLMS respondents. With respect to the latter, we coded employees providing a positive response to a foreign ownership question always as foreign, employees answering positively only to the question about state ownership as “state,” employees answering positively only to the question about domestic private owners as “domestic private,” and those responding positively to

both the state and domestic private ownership question as “mixed ownership” (generally privatized). We created a separate category for former state-owned and collective farms, including those transformed into new legal forms (generally agricultural partnerships and closed joint stock companies). The data show the highest incidence and magnitude of arrears in this category of agricultural collectives, followed by mixed and state-owned firms, while they are lowest—although still not negligible—in domestic private and foreign firms.

Arrears also vary strongly with the employer’s founding date, defined on the basis of a question posed to worker-respondents in the RLMS. Employees of firms founded before the beginning of *perestroika* (1988) were much more likely to have arrears in 1996 than those founded subsequently, although the problem was significant even among the latter, sometimes called *de novo* firms. In fact, the data show that some of the *de novos* were themselves state-owned (usually by local governments). Even among genuine, privately owned start-ups, however, it is not surprising to find some arrears, since the start-up sector tends to be highly volatile in any economy. The difference in Russia is that it is the old, established sectors and government agencies where wage arrears are the greatest problem.

Table 2 also displays the variation of arrears in 1996 across a number of personal characteristics. Men tended to have a slightly higher probability and magnitude of arrears than do women. Concerning age, arrears were lowest in the youngest (under 30) age group, perhaps because of the relatively low mobility costs of this group. Arrears are generally negatively related to the level of schooling and positively related to job tenure. Even new employees, those with tenure less than one year, have a 50 percent rate of arrears, however.<sup>26</sup>

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<sup>26</sup> The implied arrears-tenure relationship (also obtained in Lehmann, Wadsworth, and Acquisti 1999) could be spurious if an employer has incurred arrears in the past but more recently has tended to pay wages on-time.

The table also shows the variation in arrears with respect to ownership by the employee-respondent, based on RLMS questions on share ownership in the employer and on the percentage of company shares owned. Because of the different nature of ownership in the agricultural collectives, we distinguish these from other ownership types when large stakes are involved.<sup>27</sup> As rather few employees report more than 1 percent ownership, however, we have pooled together all responses of one percent or greater within the agricultural and non-agricultural groups. The data suggest a non-monotonic arrears-ownership relationship in non-agricultural firms, with the highest incidence and magnitude among small shareholders (those owning less than 1 percent) and the lowest among larger shareholders (1 percent or greater), with non-employee-owners in between. With respect to agricultural firms, however, the large shareholders show higher values for both ARRDUM and ARRMOS.

Finally, concerning variation across occupations, employees of the armed forces experience almost universal arrears. The armed forces employees in the sample are not ordinary enlisted soldiers and conscripts but rather service workers and officers residing off the military bases, as the RLMS sample did not include bases. Among civilian employees, craft workers and operators and assemblers tend to experience the highest rates, while managers have the lowest, although the rate is high even for this occupation.

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Unfortunately, the data (particularly on the timing of arrears) are insufficient to permit us to assess the quantitative importance of this possibility, but we do provide evidence, in Section IV.1 below, of intrafirm variation in arrears unrelated to tenure.

<sup>27</sup> A possible explanation might be the nature of the privatization and cooperative transformation process in agriculture, which generally resulted in equal division of ownership and closed legal forms, unlike other sectors where managers generally acquired disproportionate stakes and the legal form was usually open (a legal requirement in the State Privatization Program).

## **IV. ECONOMETRIC RESULTS**

Our discussion in Section II brought out several hypotheses concerning factors that may give rise to wage arrears, and in this section we provide evidence on these hypotheses. Section IV.A employs the restricted panel sample to analyze intrafirm versus interfirm variation in arrears and, applying fixed-effect and constrained multinomial logit models, to estimate the impact of worker, firm, and local labor market characteristics on the probability and magnitude of arrears. Section IV.B uses the full employed sample and the matched employer-employee sample and reports the estimates of probit and tobit regressions on worker characteristics, a variety of measures of firm and regional performance, and local labor market characteristics. Section IV.C reports estimates of mobility functions, including job-to-job movements and transitions to unemployment and nonparticipation in the labor force, with wage arrears and the regional wage arrears environment included among the determinants.

### **A. Intrafirm Variation in Arrears: Estimates from the Restricted Sample**

This subsection exploits restricted sample information on the identity of the firm for which individuals are employed to focus on the extent to which arrears appear to be a firm-specific variable or whether there is intrafirm heterogeneity in the experience of arrears. Our first step is to study the frequency distribution of the proportion of individuals subject to arrears in what we have called the “restricted” RLMS sample, and table 3 presents a frequency distribution of firms categorized by the fraction of employees reporting they are owed wages. The frequency distribution across firms of the fraction of employees subject to arrears reveals some mass points at 0 and 1, which have 13 and 73 firms, respectively, in 1996. That only 8.0 percent of respondents in this special subsample are

employed in firms with a zero level of arrears is indeed remarkable, although it no doubt reflects some bias: as discussed in Section III.B, individuals in the restricted sample have a higher probability of arrears and they tend to live away from urban centers and work for old, state-owned firms in manufacturing and agriculture.

But still more interesting is that close to half the firms in the subsample lie at an intermediate point between 0 and 1, a proportion that stayed relatively constant over the three years in the sample, with only a slight increase in 1996 despite the large expansion of arrears in that year. The absence of any tendency for the distribution to become bimodal at the extremes (where either no workers or all workers have arrears) also provides evidence against the hypothesis of systematic sorting of workers across firms. While firm characteristics may be important determinants of arrears, these results suggest that an explanation is required for significant levels of intrafirm variation as well.

To examine further the separate contributions of firms and regions to overall variation in arrears, table 4 reports the results of OLS and fixed-effect estimation of the magnitude of wage arrears (ARRMOS) using the full-panel restricted sample. The specification reported in the first column uses only individual characteristics as independent variables (plus year effects), and it is similar to regressions reported by other researchers using an earlier version of the same RLMS we employ, but, as we noted above, with no ability to identify multiple employees of a single firm and with little information on the firm's characteristics.

The OLS estimates show a positive impact on arrears of male gender and job tenure, significant greater arrears of operators and elementary (unskilled) occupations relative to crafts workers. When firm or region fixed effects are included, the gender effect is attenuated, but the significance of tenure is enhanced, thus providing some evidence that models based on variation only across individuals may be

misspecified. Comparing the adjusted  $R^2$  across the models, it appears that the individual characteristics add comparatively little explanatory power, once either firm or region effects are included. About half the variation across workers is accounted for by the firm-fixed effects (adjusted  $R^2 = 0.484$ ), while the individual characteristics appear to have little significance as a group. It is also notable, however, that the region effects together have more explanatory power (in terms of  $F$ -statistic) than do the firm effects. This suggests that regional variation may be almost as important as firm variation in determining wage arrears.<sup>28</sup>

To investigate simultaneously the role of individual and firm characteristics, we use the restricted sample to estimate a constrained multinomial logit (CMNL) model of the incidence of wage arrears (ARRDUM). The CMNL specification permits individual characteristics—demographic variables, job tenure, and share ownership—to enter as determinants of the probability of a worker in a given firm has arrears, while a different set of firm characteristics affect the firm’s arrears behavior. The dependent variable takes on four outcome categories, depending on the answers of the individual respondent and of the other respondents who have the same employer:  $Y_i = 1$  if no respondent employed by this firm reports arrears;  $Y_i = 2$  if some respondents in the firm report arrears but respondent  $i$  does not;  $Y_i = 3$  if some respondents in the firm have arrears and respondent  $i$  does; and  $Y_i = 4$  if all respondents employed by this firm have arrears.

Coefficients on individual characteristics are constrained to equal zero for the impact on the probability of the choice between outcomes 1 and 4 and the sum of outcomes 2 and 3. With category 4 defined as the reference group, this implies that the individual characteristics are constrained to have

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<sup>28</sup> These models are nested, because firms in this sample are located in single regions (the restricted sample contains only single-location firms). An  $F$ -test of the statistical significance of adding firm dummies to the region dummies is

zero effects on the choice of category 1 and they are constrained to sum to zero for the choices of outcomes 2 and 3. The firm characteristics are unconstrained since they may affect not only the choice between “none,” “all,” and “some” employees having arrears, but also the fraction of the “some” and thus the probability that the respondent is among the “some.” To be precise, the contribution to the likelihood function of an individual  $i$  in category  $j$  is

$$P(Y_i = j | X_i; Z_i) = \frac{e^{X_i' b_j + Z_i' g_j}}{1 + \sum_{k=1}^3 e^{X_i' b_k + Z_i' g_k}},$$

where  $X_i$  is a vector of individual characteristics,  $Z_i$  is a vector of firm and regional characteristics,  $b_j$  and  $g_j$  are vectors of coefficients, varying with the four alternative outcomes, and the coefficients for the reference outcome 4 ( $b_4$  and  $g_4$ ) are normalized to zero. The constraints we impose are that  $b_1 = 0$  and  $b_2 + b_3 = 0$ .

$Z_i$  is specified to include the firm ownership, sector of the economy, and locational characteristics of the firm, such as lagged value of the fraction of individuals in the region who reported overdue wages,  $ARRREG_{t-1}$ , a dummy for urban areas, six regional categories, and the regional hiring rate.  $ARRREG_{t-1}$  is measured from the RLMS respondents of the worker’s local district in the previous year, in order to avoid possible simultaneity bias in its impact on the current probability of having arrears. The hiring rate is taken from Goskomstat (1996) and pertains to medium and large firms in each region (subject of the Russian Federation or *oblast*). As discussed in Section III.B, the restricted sample used in this analysis consists mostly of large agricultural and manufacturing firms, which limits our ability to identify detailed industry effects, and there are no *de novo* or foreign firms in the restricted sample whatsoever. We have, however, been able to identify more detailed categories of domestic

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also highly significant, indicating important interfirm as well as inter-regional sources of variation.

ownership/legal forms than was possible for the full sample, where we had to rely in some cases on the workers' reports on their firms' ownership. In this restricted sample analysis, we include the following categories of ownership/legal form: state, municipal, open joint stock, agricultural coops and partnerships, and close joint stock, of which the open joint stock represents predominantly privatized firms.

The means and standard deviations of these variables are included in table 5, which also reports the results of maximum likelihood estimation on the restricted sample, 1995–1996 panel (1994 is excluded because of the lagged variable). Characteristics of the local labor market are estimated to have substantial effects.  $ARRREG_{t-1}$  shows a very strong negative influence on the probability that the worker reports any of the dependent variable outcomes relative to the reference outcome of all respondents having arrears. The estimated impact grows steadily in magnitude moving from category 4 to 1. The urban dummy and regional hiring rate have inverse effects, increasing the probability of not having arrears for the firm and the individual worker.

Concerning ownership/legal form, municipal firms are least likely to show intrafirm variation in arrears, followed by agricultural coops and partnerships. A partial arrear policy, where some employees are paid and others are not, appears to be most common in federal SOEs (state-owned enterprises). The probability of intrafirm variation also rises with firm size, which is nonmonotonically related to the dependent variable categories, increasing most the probability of outcome 2, followed by outcome 3, then outcome 4 and outcome 1. Size may reflect heterogeneity, more plants or assembly lines, which might make it easier to discriminate among workers in late payments.

With respect to individual characteristics, the only significant variables are employee ownership, where owners of less than one percent are more likely to be singled out for arrears, and some

occupational dummies, where the intrafirm differences are quite large. For all other individual characteristics, the coefficients are imprecisely estimated, although some of these results may be attributable to the peculiarities of the restricted sample.

A final analysis we conduct with the restricted sample is to ask whether the tendency of firms to engage in intrafirm differentiation varies with ARRREG. We have hypothesized that workers' quit responses to their own arrears depends on the local labor market arrears ARRREG. If ARRREG is high, therefore, then employers have less reason to fear quits in response to arrears and they may simply pay everyone late, when there is a reason for them to do so. If ARRREG is low, however, firms may be more careful in allocating arrears and thus be more likely to adopt differentiated strategies across workers. This conjecture receives support from a computation by region of the share of firms that differentiate internally. Comparing this share in regions with ARRREG above and below the median, we find that employers in low ARRREG regions are more likely to engage in intrafirm differentiation: in 1996, 68 percent of individuals in below-median ARRREG regions had outcomes 2 and 3 (intrafirm differentiation), while the same was true for only 47 percent of those in above-median ARRREG regions.

In summary, the results in this subsection provide some initial evidence on several of our hypotheses: that some employers do differentiate among workers, paying some on time and others late; that, when they do differentiate, small shareholdings increases the likelihood of not being paid; and that employers respond to the situation in their local labor market, including the extent of arrears in their area, when choosing to use arrears themselves.

But this analysis also has some weaknesses, particularly in the nature of the sample and in the available information on the firms included. It is difficult to assess how the sample biases, discussed in

Section III.B, may affect the findings, but certainly the bias towards one-company towns in the restricted sample suggests the desirability of exploring regional characteristics in the full sample, which we turn to next, in Section IV.B. Moreover, we have no measures of firm performance and liquidity in the restricted sample; to estimate the impact of these variables on wage arrear behavior we investigate a matched worker-firm sample in Section IV.C. Finally, despite the appeal of the CMNL specification for our problem, we cannot use this method to examine the magnitude as well as the probability of arrears; therefore we switch to a more conventional probit and tobit analysis in the next section.

### **B. Regional and Firm Performance Determinants: Estimates from the Full and Matched Samples**

To draw inferences about the whole population and to examine the impact of a broader set of regional and firm characteristics, we estimate the determinants of wage arrears using the full and matched samples in this section. We begin by offering basic probit and tobit specifications for the full sample. Then we consider several alternative measures of regional economic performance and local labor market characteristics, and we employ the matched sample to study the impact of firm performance and liquidity.

Results from estimating the basic specifications are presented in table 6, Panel A. The data show substantial variation across more detailed industries than we were able to examine using only the restricted sample in the previous subsection. The lowest levels of arrears appear in the reference category of trade and commerce and the highest in construction, machine building, the military-industrial complex, and health and education services.<sup>29</sup> The estimated firm size coefficient is strongly positive, showing that while large firms are more likely to engage in intrafirm discrimination in the allocation of

arrears (as we found in the previous section), they are also associated with a higher probability and level of arrears overall.

Concerning firm ownership, the incidence and magnitude of wage arrears are estimated to be lower in state-owned, mixed, domestic private and foreign firms, relative to agricultural collectives (the omitted category), but the differences among these groups are rather smaller than they were in our analysis of the unconditional means in table 2, above. *De novo* firms have significantly lower arrears, with an estimated average of nearly one month less than old firms.

Turning to individual characteristics, the main systematic findings are, first, that job tenure has a positive estimated impact on both ARRDUM and ARRMOS. The magnitudes of the effects are not large: 10 years longer tenure increases the probability of arrears by only three percent, *ceteris paribus*, and raises ARRMOS by less than two weeks (the point estimate is 30 percent of one month). Second, as before, the occupational variation in arrears is striking: managers are estimated to have a 38 percent lower probability and three months shorter ARRMOS than employees of the armed forces, with craft workers roughly in the middle between them.

With respect to share ownership by the employee-respondent in his/her employer, the full sample results conform closely to the bivariate analysis of Section III.D: small shareholdings tend to raise the probability and magnitude of arrears, relative to no ownership, while large shareholdings (greater than or equal to 1 percent) in non-agricultural firms are estimated to have no effect on arrears. The positive relationship of arrears with low levels of share ownership is consistent with the hypothesis that managers use arrears to try to buy shares from workers, while the finding of reduced arrears at

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<sup>29</sup> There is also large variation across the six large regions (not shown in the table to save space), with the lowest rates and magnitudes in the Central region, and the highest in the Northwestern region and Siberia.

higher levels of ownership suggests that most wage arrears do not represent voluntary loans from workers to their firm (since larger shareholdings are presumably associated with some possibilities for influencing managerial actions). The higher mean of *ARRMOS* for larger shareholdings in agriculture suggests, however, that in these firms a voluntary loan mechanism may in fact be at work.

The final set of variables in table 6, Panel A are the characteristics of the local labor market. In this basic specification, we include the same variables as in the multinomial logit specification: the regional hiring rate, an urban dummy, six regional categories, and regional arrears  $ARRREG_{t-1}$ . A larger hiring rate and urban location are estimated to reduce arrears, while  $ARRREG_{t-1}$  raises them: a 10 percentage point increase in the previous year's incidence of wage arrears is estimated to raise the probability of arrears in the current year by 9.4 percent, and to increase the expected amount by about 0.74 month. This strong response to the local wage arrear environment is consistent with our argument about the existence of externalities across firms, such that a firm's benefit-cost ratio of using wage arrears increases in the prevalence of wage arrears on the local labor market.<sup>30</sup>

With respect to the tenure effect, which may be interpreted as suggesting that workers with greater mobility costs may be singled out for arrears by the firm, the question arises whether such behavior varies with the local labor market. If outside opportunities are good, then firms may be less inclined to allocate arrears to longer tenured workers, since they run a greater risk of losing their specific skills. To address this issue, Panel B of table 6 examines whether the tenure effect varies across urban and rural locations. Interacting the two variables produces a negative estimated coefficient, suggesting that tenure matters less in urban than rural areas, although the interaction is statistically significant only at

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<sup>30</sup> The  $ARRREG_{t-1}$  impact and statistical significance is highly robust to including random effects at the district level and to controlling for clustering by district.

the 10 percent level, an only in the tobit equation. This result suggests that the local labor market may indeed affect the intrafirm allocation of arrears.

A final analysis of the tenure result (not shown in the table) is motivated by the possibility of systematic sorting of workers across firms. When arrears first begin, firms concerned about turnover costs should be cautious to allocate arrears with respect to workers' mobility responsiveness, but once workers have sorted themselves by these responses, there is less need for the firm to differentiate among employees in allocating arrears. To test this whether the impact of tenure declines, we add an interaction of the tenure variable with a year 1996 dummy to the table 6 specification. The estimated coefficient on the interaction term, however, is positive (although small and statistically insignificant), which is inconsistent with sorting during the sample period.<sup>31</sup>

In table 7, we employ the matched sample to examine the impact of alternative measures of firm performance and liquidity and of regional performance and local labor market conditions on ARRMOS. We estimate four alternative specifications, adding the alternative measures in each of these four categories to all the covariates from table 6. At the same time, we examine the robustness of the effect of lagged local labor market arrears  $ARRREG_{t-1}$  to the inclusion of these possibly correlated variables.

The measures of firm performance and liquidity in these specifications include the past-year changes in labor productivity, employment and output, the unit cost, profitability relative to output, the current ratio (current assets/current liabilities), liquidity ratio ( $[(\text{current assets} - \text{stocks}) / \text{current liabilities}]$ ), and the export-output ratio.<sup>32</sup> The estimated specifications including the first three show that all of them

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<sup>31</sup> We also extended the analysis back to 1994, dropping  $ARRREG_{t-1}$  from the specification for this purpose. Adding interaction terms with year 1995 and year 1996 dummies again produced no evidence of sorting.

<sup>32</sup> We have calculated all of these variables from our firm data, explained in Section IIIA. The current ratio and liquidity ratio are standard balance sheet indicators for firm liquidity. Current assets include stocks, accounts receivable, short-term financial investments, cash and other current assets. Stocks include raw materials, low-value

have strong negative impacts on ARRMOS, while unit cost has a positive effect. All the liquidity measures have negative effects. Among these firm-level variables, the impact of employment change is especially strong, suggesting that declining firms tend to have much larger arrears than those that are growing. Nonetheless, further analysis of the sample shows arrears exist even in firms with expanding employment, arrears are quite common: in 1996, 54.2 percent of the sample employed in firms expanding more than 10 percent over the previous year (a total of 179 workers) had wage arrears.

Table 7 also includes alternative measures of regional economic performance and liquidity: retail trade per capita (included to proxy liquidity since retail transactions are generally carried out in cash), gross regional product per capita, the percentage of loss-making firms, and the average solvency ratio (share of equity and reserves in total assets). The first three are Goskomstat variables pertaining to the region, while the last we have calculated for the district. All four variables are statistically significant, with estimated effects in the expected directions.

The measures of local labor market conditions in the table include the regional hiring rate, the share of the firm's employment in the local labor market (defined for the municipality), the district job destruction rate in industry, and the industrial employment concentration (Herfindahl index) in the district. The first variable, obtained from the Goskomstat, is estimated to have a negative impact on ARRMOS, while the other variables, which we calculated from our data, have a positive impact. Moving from completely dispersed employment concentration (Herfindahl index = 0) to one completely concentrated raises by estimated level of ARRMOS by almost exactly three months, a result which is also quite close to the estimated impact of the firm's employment share. The concentration results

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and short-term assets, work in progress, and finished products in inventory. Current liabilities include loans, accounts payable, and other current liabilities.

suggest that workers' outside alternatives affect the firm's use of arrears, although they are also consistent with higher bargaining power of such firms in attempting to extract subsidies from the local government.

Finally, table 7 also shows the results for  $ARRREG_{t-1}$  in each of these specifications. Although the magnitude varies somewhat with the sample size and controls, the estimated impact of past local arrears is uniformly large and highly statistically significant.<sup>33</sup> Thus, while these results provide substantial evidence of the importance of firm and regional performance and liquidity in affecting arrears, they also show that firms' wage arrears policies are influenced by local labor market conditions, including the wage arrears decisions of other firms. The robustness of the result implies that our measure of  $ARRREG_{t-1}$  is not proxying for some third variable. This supports our argument that regional arrears tend to be self-perpetuating, as enterprise managers mimic the arrears behavior of other firms in their area.

### **C. Wage Arrears and Worker Mobility**

This section reports our investigation of the consequences of arrears for worker mobility. We have shown that wage arrears appear to be self-perpetuating at the regional level, but what is the mechanism by which they are sustained? Why do workers not respond by quitting? In Sections II.C and II.D, we argued that wage arrears may encourage workers to remain with the current employer, depending on their evaluation of the probability they will be paid in the future and the opportunities available to them.

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<sup>33</sup> We also estimated "kitchen sink" regressions with all of these regional controls, and still the impact of  $ARRREG_{t-1}$  is positive, large, and highly statistically significant.

Like other studies of labor mobility in Russia, we are able to measure employment status at one-year intervals for respondents remaining in the panel, and our strategy is to examine the relationship between wage arrears in year  $t-1$  ( $ARRMOS_{t-1}$ ) and employment status in year  $t$ .<sup>34</sup> But our analysis also differs from previous studies in several respects: First, we exploit our knowledge of the individual's employer to construct reliable measures of job-to-job transitions. Second, we examine transitions to unemployment and out of the labor force, motivated similarly by the differential impact wage arrears may have on the attractiveness of these destinations. Finally, we analyze the impact not only of the individual worker's wage arrears, but how the worker's response varies with the presence of arrears in the region. Our chief hypothesis is that quit rates to new jobs in response to arrears ( $ARRMOS$ ) should be reduced by widespread arrears in the local labor market ( $ARRREG$ ), and that this reduced responsiveness is a mechanism that can reinforce the local practice of late payment.

For these purposes, we estimate the mobility model using a multinomial logit specification, but with  $ARRMOS_{t-1}$ ,  $ARRREG_{t-1}$ , and their interaction as added regressors. To illustrate the importance of the local labor market arrears on worker decisions, we report separate model specifications with and without the interaction term. These are shown in Panels A and B, respectively, of table 8. In both specifications, the data imply that job-to-job mobility is reduced by rural location, higher regional unemployment, larger firm size, female gender, age, tenure and the contractual wage, all of which is consistent with standard theory and empirical regularities concerning labor mobility in other countries (e.g., Topel and Ward 1992).<sup>35</sup>

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<sup>34</sup> Desai and Idson (2000) and Lehmann, Wadsworth, and Acquisti (1999) have analyzed the impact of arrears on the probability of job-changing using the tenure variable in the RLMS (discussed in Section III.A, above).

<sup>35</sup> The reported results use the monthly *contractual* wage, computed as follows: for workers with arrears, the ratio of total back wages to the number of monthly wages owed, and for workers with no arrears, the actual wage.

Concerning the effect of a worker's arrears, Panel A shows the estimates from the specification excluding the  $ARRREG_{t-1}$ , where  $ARRMOS_{t-1}$  is estimated to raise the probability of quitting to another job only very slightly, and the estimated coefficient is statistically insignificant. This suggests little if any responsiveness of workers to their own arrears.

When the local arrears measure  $ARRREG_{t-1}$  and the interaction of this variable with  $ARRMOS_{t-1}$  are added to the specification, however, the results in Panel B of the table show that worker job-to-job mobility responsiveness to  $ARRMOS_{t-1}$  is a function of the level of  $ARRREG_{t-1}$  (arrears in the region). The interaction effect implies that  $ARRMOS_{t-1}$  has essentially no impact on quits in regions where arrears are about average (where  $ARRREG_{t-1} = 0.6$ ); in better regions (where  $ARRREG_{t-1} < 0.6$ )  $ARRMOS_{t-1}$  has a positive impact, and in worse regions (where  $ARRREG_{t-1} > 0.6$ ) it has a negative impact on job-to-job transitions. The effects of a worker's arrears on transitions to unemployment and out of the labor force are similarly estimated to be negatively related to  $ARRREG_{t-1}$ , suggesting that the attractiveness of these destinations is also because of high arrears in unemployment benefits and pensions. The main effect of  $ARRREG_{t-1}$  is also to lower the probability of quitting to a new job, thus the effect of local arrears on reduced labor reallocation works through two channels: an absolute reduction and a lowered responsiveness of workers to  $ARRMOS_{t-1}$ .

Panel C of table 8 shows the results from a similar specification, but where we have interacted the urban dummy with  $ARRMOS_{t-1}$ . Again the results show that the responsiveness of workers to their own arrears varies with the local labor market. The effect of  $ARRREG_{t-1}$  in this specification is large, negative, and highly significant.

Finally, we may again investigate the hypothesis of sorting, this time through direct observation of worker behavior. If workers are sorting, then we should observe initially high quit responsiveness to

arrears, followed by decline. When the specification is amended to permit time variation  $ARRMOS_{t-1}$ , however, we find no significant changes in worker responses. This result (not shown in the table) is inconsistent with sorting during our sample period.

## V. CONCLUSION

In this paper, we have used a nationally representative matched firm-worker data set to provide evidence that the patterns and persistence of wage arrears in Russia are the result of a peculiar set of factors that have given employers incentives to pay workers late and that have encouraged workers to accept late payment. Our analysis demonstrates the existence of substantial intra-firm as well as inter-firm variation in arrears in all three years of the sample, suggesting that managers are not reluctant to differentiate among workers and that there has been little systematic sorting of workers across firms, at least during our sample period. We have found that the intrafirm variation in arrears tends to be systematically related to such worker characteristics as job tenure, occupation, and small shareholding—less than 1 percent—in the firm. The finding that arrears are lower for workers owning greater percentages of the firm's stock is suggestive that late wage payment is better thought of as contract violation rather than renegotiation, that it is generally involuntary rather than voluntary from the worker's point-of-view.

We have also shown that the degree to which firms use arrears is negatively associated with measures of firm and regional performance and liquidity, and with forms of private ownership and recent founding date of the firm, while it is positively associated with our measures of local labor market concentration (monopsony power). Unlike wage arrears in Western countries, where late payment may occasionally and temporarily occur because of unexpected liquidity problems, particularly in start-up

firms, wage arrears in Russia are much more common in the older, larger, more established enterprises, and they have persisted over several years. In seeking an explanation for this anomaly, we have developed the key result that the regional wage-arrear environment has substantial impacts on the expected probability and magnitude of late wage payments, even when controlling for the gamut of individual, firm, and regional characteristics.

The persistence of wage arrears requires that workers somehow tolerate them, and we have argued conceptually that the effect of delayed wages on an employee's mobility is ambiguous and shown empirically that this effect varies with the extent of arrears in the local labor market: the probability of a worker quitting in response to late wages is positive in regions with low wage arrears, but negative in regions where they are high. These results suggest that wage arrears may be strategic complements for firms operating in the same local labor markets.

Finally, we would observe that our analysis of wage arrears in Russia demonstrates the usefulness of studying transition economies for understanding economic institutions more generally. The practice of paying wages on time has received little attention in standard models of the employment relationship, probably due to the fact that punctual payment is the norm in market economies. This norm may be attributable to the strength of court enforcement (including well-functioning bankruptcy procedures) and the importance of reputational considerations for firms operating in relatively stable labor markets and economic environments. The transition economies, however, show us that late payment may represent an alternative norm, and we have provided evidence of the conditions affecting the choice between on-time and late payment. Perhaps most interesting is our evidence of the possibility of a self-reinforcing mechanism that could tend to make arrears in wage payments persist, namely through the negative impact of local labor market arrears on employees' quit responses to their

own arrears. We hope that our analysis of Russian wage arrears contributes to raising awareness of the many dimensions of employment contracts in a wide variety of economic contexts, and that it heightens appreciation of the web of institutions that support contracting in the labor market.

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**Table 1**  
**Incidence, Magnitude, and State Dependence of Wage Arrears**

	<i>Sample</i>	<i>Expected Probability and Magnitude of Wage Arrears</i>		
		<i>1994</i>	<i>1995</i>	<i>1996</i>
<b><i>ARRDUM (dummy)</i></b>				
Unconditional Mean ( $ARRDUM_t$ )	Full cross-section	0.405 ( <i>N</i> =4,716)	0.419 ( <i>N</i> =4,389)	0.599 ( <i>N</i> =4,166)
Mean ( $ARRDUM_t \mid ARRDUM_{t-1} = 1$ )	Panel for <i>t</i> , <i>t</i> -1	...	0.683 ( <i>N</i> =1,402)	0.838 ( <i>N</i> =1,399)
Mean ( $ARRDUM_t \mid ARRDUM_{t-1} = 0$ )	Panel for <i>t</i> , <i>t</i> -1	...	0.268 ( <i>N</i> =1,890)	0.453 ( <i>N</i> =1,754)
Mean ( $ARRDUM_t \mid ARRDUM_{t-1} = 1$ and $ARRDUM_{t-2} = 1$ )	Panel for <i>t</i> , <i>t</i> -1, <i>t</i> -2	...	...	0.887 ( <i>N</i> =776)
<b><i>ARRMOS (number of overdue monthly wages)</i></b>				
Unconditional Mean ( $ARRMOS_t$ ) (in months)	Full cross-section	1.10 ( <i>N</i> =4,668)	1.11 ( <i>N</i> =4,312)	1.92 ( <i>N</i> =4,050)
Unconditional Distribution ( $ARRMOS_t$ )				
$ARRMOS = 0$	...	0.603	0.594	0.415
1 month	...	0.149	0.156	0.149
2-3 months	...	0.164	0.170	0.250
4-6 months	...	0.055	0.054	0.134
>6 months	...	0.029	0.026	0.053
Mean ( $ARRMOS_t \mid ARRMOS_t > 0$ )	$ARRMOS_t > 0$	2.75 ( <i>N</i> =1,861)	2.73 ( <i>N</i> =1,760)	3.27 ( <i>N</i> =2,381)
Mean ( $ARRMOS_t \mid ARRMOS_{t-1}$ )	Panel for <i>t</i> , <i>t</i> -1	...	( <i>N</i> =3,199)	( <i>N</i> =3,017)
Where $ARRMOS_{t-1} = 0$	...	...	0.49	1.07
1 month	...	...	1.27	2.11
2-3 months	...	...	2.13	3.30
4-6 months	...	...	3.27	4.94
>6 months	...	...	4.51	7.69

Notes:  $ARRDUM_t = 1$  if an employed respondent reports overdue wages on his/her primary job, 0 if no wages are overdue in year *t*.  $ARRMOS_t$  = number of monthly wages reported overdue by an employed respondent in year *t*. Sample sizes are shown in parentheses for number of valid responses for  $ARRDUM$  and  $ARRMOS$ , respectively; sample sizes vary primarily due to attrition and replacement in the RLMS panel, and secondarily because of missing values for some respondent

**Table 2**  
**Sample Composition and Wage Arrears, by Characteristics (1996)**

	<i>Distribution</i>	<i>ARRDUM</i>	<i>ARRMOS</i>		<i>Distribution</i>	<i>ARRDUM</i>	<i>ARRMOS</i>
Rural Areas	1,123	0.744	3.059	Firm Age			
Urban Areas	2,886	0.545	1.512	Old (founded before 1988)	1,394	0.687	2.229
Regions				<i>De Novo</i> (founded after 1987)	609	0.381	1.064
Northern West	429	0.611	1.971	Gender			
Central Region	991	0.447	1.223	Female	2,088	0.576	1.693
Volga	679	0.666	2.417	Male	1,921	0.628	2.196
North Caucasus	485	0.656	2.168	Education			
Urals	606	0.634	1.662	Elementary School	535	0.669	2.436
Siberia	819	0.672	2.445	Secondary School	1,046	0.624	2.067
Selected Locations				Vocational School	594	0.596	1.921
Moscow City	255	0.286	0.598	Technical School	967	0.609	1.929
Orehovo-Zuevski District, Moscow Obl	23	0.043	0.217	University	867	0.525	1.479
Surgutski District, Tyumen Region	127	0.323	0.579	Age			
Uvarovski District, Tambov Region	67	0.851	3.197	< 30 years	957	0.557	1.715
Kurinski District, Altai Krai	97	0.959	6.175	30-50 years	2,369	0.615	1.995
Sectors				51+ years	683	0.612	2.021
Manufacturing	1,085	0.626	1.948	Tenure			
Agriculture	460	0.824	4.335	< 1 year	808	0.499	1.315
Services	2,464	0.548	1.523	1-10 years	1,941	0.592	1.968
Selected Industries				>10 years	1,260	0.679	2.279
Machine-Building	292	0.726	2.605	Employee Owns			
Military Complex	112	0.688	2.205	No Shares	3,200	0.591	1.796
Retail Trade	241	0.270	0.609	<1%	458	0.659	2.339
Banking	42	0.095	0.429	≥1% Nonag	100	0.420	1.526
Education	407	0.695	1.859	≥1% Ag	22	0.864	5.500
Firm Size (no. of employed)				Occupations			
<50	976	0.484	1.412	Managers	144	0.458	1.478
50-200	749	0.676	2.088	Professionals	591	0.574	1.593
200-1000	925	0.695	2.640	Technicians	655	0.580	1.602
>1000	729	0.646	2.041	Clerks	276	0.518	1.602
Firm Ownership				Service Workers	405	0.526	1.291
Agricultural Collective	324	0.818	4.418	Craft Workers	748	0.663	2.228
State-Owned	2,010	0.625	1.820	Operators/Assemblers	677	0.659	2.474
Mixed Ownership	841	0.636	2.025	Elementary Occupations	463	0.605	2.272
Domestic Private	728	0.420	1.286	Armed Forces	50	0.920	3.940
Foreign	75	0.427	0.973	<i>N</i>	<i>4,009</i>	<i>4,009</i>	<i>3,903</i>

Note: The table shows the mean values of *ARRDUM* and *ARRMOS* for each group. The sum of the numbers of observations for some categories does not equal the number of observations in the total sample due to the presence of missing values.

**Table 3**  
**Frequency Distribution of Firms by the Fraction of Employees with Arrears**  
(restricted sample, by year)

<i>Fraction of Employees in Firm Subject to Wage Arrears</i>	<i>1994</i>		<i>1995</i>		<i>1996</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
0	30	17.0	29	16.6	13	8.0
0.01-0.20	16	9.0	16	9.1	9	5.5
0.21-0.40	19	10.7	15	8.6	15	9.2
0.41-0.60	18	10.2	23	13.1	20	12.3
0.61-0.80	22	12.4	34	19.4	14	8.6
0.81-0.99	18	10.2	18	10.3	19	11.7
1	54	30.5	40	22.9	73	44.8
<i>Total</i>	<i>177</i>	<i>100</i>	<i>175</i>	<i>100</i>	<i>163</i>	<i>100</i>

Note: *N* = number of firms. For each year, the sample is restricted to respondents working in a firm that employs at least four respondents.

**Table 4**  
**Wage Arrears Equation with Firm- and Region-Fixed Effects**  
(restricted sample, 1994-96 Panel)

<i>Dependent Variable =</i> <i>ARRMOS<sub>t</sub></i>	<i>OLS Estimates</i>	<i>Region Fixed-Effect Estimates</i>		<i>Firm Fixed-Effect Estimates</i>	
		(1)	(2)	(1)	(2)
Male	0.493*** (4.025)	...	0.254** (2.399)	...	-0.013 (-0.129)
Schooling (years)	-0.044 (-1.406)	...	-0.005 (-0.191)	...	-0.001 (-0.055)
Age (years)	0.006 (1.061)	...	0.010* (1.939)	...	0.013*** (2.678)
Tenure (years)	0.013* (1.797)	...	0.019*** (2.871)	...	0.013** (2.355)
Occupations (omitted: Craft Workers)					
Managers	0.308 (0.754)	...	-0.202 (-0.517)	...	0.131 (0.419)
Professionals	0.187 (0.829)	...	-0.035 (-0.168)	...	-0.186 (-0.966)
Technicians	0.128 (0.761)	...	-0.353** (-2.391)	...	-0.217 (-1.572)
Clerks	0.251 (1.112)	...	-0.259 (-1.485)	...	-0.304* (-1.899)
Service Workers	-0.011 (-0.046)	...	-1.072*** (-4.089)	...	-0.201 (-0.830)
Operators/Assemblers	0.631*** (4.125)	...	0.224* (1.763)	...	0.096 (0.842)
Elementary Occupations	1.236*** (6.144)	...	0.302* (1.732)	...	-0.193 (-1.167)
Constant	1.370*** (3.333)	1.901*** (25.112)	1.227*** (3.356)	1.829*** (27.125)	1.289*** (4.075)
<i>F</i> -statistics:					
Firm Dummies ( <i>n</i> =221)	...	...	...	F(220,3172) = 15.157	F(220,3161) = 14.559
Region Dummies ( <i>n</i> =41)	...	F(40,3352) = 30.151	F(40,3341) = 29.699	...	...
Adjusted <i>R</i> <sup>2</sup>	0.039	0.264	0.283	0.484	0.490

Notes: *t*-Statistics, reported in parentheses, are computed using robust standard errors. \*\*\* – significant at the 1% level, \*\* – significant at the 5% level; \* – significant at the 10% level. Year dummies for 1995 and 1996 are included, but not shown. *N*=3,395 (number of respondents).

**Table 5**  
**Determinants of Inter- and Intra-Firm Variation in Wage Arrears**  
(constrained multinomial logit estimates, restricted sample, 1995-96)

<i>Independent Variables</i>	<i>Dependent Variable Outcomes (Reference: All have wage arrears)</i>						<i>Mean [s.d.]</i>	
	<i>No respondent in firm has wage arrears</i>		<i>Some have arrears, but "not me"</i>		<i>Some have arrears, and "yes me"</i>			
ARRREG <sub>t-1</sub> (local arrears)	-7.217***	(-7.634)	-3.063***	(-5.704)	-0.809*	(-1.724)	0.474	[0.191]
Urban (dummy)	0.915***	(2.621)	0.692**	(2.435)	0.620**	(2.526)	0.556	[0.497]
Regional Hiring Rate (%)	0.228***	(6.380)	0.191***	(6.935)	0.088***	(3.649)	23.188	[4.650]
log (Firm Size)	-0.136	(-1.578)	0.122**	(1.992)	0.093*	(1.706)	7.000	[1.759]
Firm Ownership/Legal Form (omitted: federal state firms)								
Municipal Firms	1.505***	(3.531)	-1.574***	(-4.488)	-1.260***	(-4.086)	0.087	...
Open Joint Stock Companies	1.244***	(3.252)	0.059	(0.223)	-0.258	(-1.032)	0.429	...
Ag Coops and Partnerships	-0.515	(-1.329)	-0.852***	(-3.243)	-0.769***	(-3.671)	0.184	...
Closed Joint Stock Companies	0.332	(0.797)	0.150	(0.536)	-0.317	(-1.277)	0.099	...
Male	0	...	0.028	(0.396)	-0.028	(-0.396)	0.575	...
Schooling (years)	0	...	-0.011	(-0.704)	0.011	(0.704)	11.108	[2.439]
Age (years)	0	...	-0.002	(-0.568)	0.002	(0.568)	39.345	[10.990]
Tenure (years)	0	...	-0.003	(-0.797)	0.003	(0.797)	10.048	[9.528]
Employee Owns (omitted: no shares)								
<1%	0	...	-0.154**	(-1.986)	0.154**	(1.986)	0.199	...
≥1% Nonag	0	...	0.047	(0.184)	-0.047	(-0.184)	0.013	...
≥1% Ag	0	...	-0.215	(-0.717)	0.215	(0.717)	0.016	...
No Information	0	...	-0.343***	(-3.265)	0.343***	(3.265)	0.102	...
Occupations (omitted: craft workers)								
Managers	0	...	0.643***	(3.098)	-0.643***	(-3.098)	0.023	...
Professionals	0	...	0.271**	(2.016)	-0.271**	(-2.016)	0.068	...
Technicians	0	...	0.257**	(2.430)	-0.257**	(-2.430)	0.133	...
Clerks	0	...	0.254**	(1.954)	-0.254**	(-1.954)	0.070	...
Service Workers	0	...	0.557***	(3.358)	-0.557***	(-3.358)	0.042	...
Operators/Assemblers	0	...	0.091	(1.134)	-0.091	(-1.134)	0.264	...
Elementary Occupations	0	...	0.051	(0.448)	-0.051	(-0.448)	0.146	...
Constant	-4.573***	(-3.060)	-3.301***	(-2.909)	-1.723*	(-1.730)	...	...
	<i>N</i> = 2,219		Wald $\chi^2(63)$ = 956.88		Pseudo <i>R</i> <sup>2</sup> = 0.180			

Notes: *t*-Statistics, reported in parentheses, are computed using robust standard errors. \*\*\*-significant at the 1% level, \*\*-significant at the 5% level, \*-significant at the 10% level. The sample is restricted to respondents employed in a firm with at least four employee-respondents. Other controls included are 3 sectors, 6 region categories, and a year dummy. The MNL individual characteristic coefficient estimates are constrained to be zero for the choice between dependent variable categories 1 and 4, and they are constrained to be equal in magnitude and opposite in sign for the choice of categories 2 and 3, versus the omitted category 4.

**Table 6**  
**Determinants of Wage Arrears** (full sample, 1995-96)

*Panel A*

	<i>Probit Estimates</i>		<i>Tobit Estimates</i>		<i>Mean [s.d.]</i>	
	<i>(ARRDUM)</i>		<i>(ARRMOS)</i>			
	<i>dF/dX</i>	<i>z</i>	<i>Coeff.</i>	<i>t</i>		
ARRREG <sub>t-1</sub> (local arrears)	0.935***	(19.266)	7.361***	(20.450)	0.423	[0.182]
Urban (dummy)	-0.035*	(-1.701)	-0.347**	(-2.296)	0.697	...
Regional Hiring Rate (%)	-0.008***	(-3.403)	-0.051***	(-2.856)	23.102	[4.517]
Industries (omitted: Trade/Commerce)						
Energy/Fuel	0.103**	(2.195)	1.029***	(2.850)	0.039	...
Machine Building	0.308***	(8.101)	2.779***	(9.623)	0.088	...
Military Complex	0.227***	(4.596)	2.082***	(5.615)	0.032	...
Other Durables	0.206***	(5.277)	1.684***	(5.696)	0.091	...
Non-Durables	0.073*	(1.933)	0.853***	(2.870)	0.068	...
Agriculture	0.197***	(4.098)	3.291***	(9.416)	0.133	...
Transportation	0.077**	(1.990)	0.931***	(3.124)	0.069	...
Construction	0.349***	(9.366)	2.738***	(9.799)	0.069	...
Health/Education	0.266***	(7.991)	1.921***	(7.436)	0.165	...
Other Services	0.161***	(4.894)	1.656***	(6.463)	0.146	...
log (Firm Size)	0.018***	(3.976)	0.094***	(2.759)	5.359	[2.163]
Firm Ownership (omitted: Ag Collective)						
State-Owned	-0.109**	(-2.518)	-0.539*	(-1.861)	0.466	...
Mixed Ownership	-0.152***	(-3.243)	-0.592*	(-1.859)	0.244	...
Domestic Private	-0.153***	(-3.176)	-0.500	(-1.509)	0.176	...
Foreign	-0.145**	(-2.044)	-0.579	(-1.131)	0.017	...
Firm Age (omitted: Old)						
De Novo	-0.112***	(-4.774)	-0.948***	(-5.281)	0.155	...
No Information	-0.043***	(-2.856)	-0.323***	(-2.878)	0.459	...
Individual Characteristics						
Male	0.022	(1.358)	0.377***	(3.105)	0.468	...
Schooling (years)	0.008**	(2.172)	0.028	(1.088)	11.683	[2.566]
Age (years)	-0.001	(-0.851)	-0.002	(-0.426)	39.343	[11.546]
Tenure (years)	0.003***	(3.527)	0.030***	(4.784)	8.792	[9.283]
Employee Owns (omitted: No Shares)						
<1%	0.037*	(1.699)	0.282*	(1.739)	0.135	...
≥1% Nonag	0.025	(0.606)	0.278	(0.872)	0.033	...
≥1% Ag	0.052	(0.570)	1.774***	(2.980)	0.007	...
No Information	0.019	(0.683)	0.347*	(1.682)	0.066	...
Occupations (omitted: Craft Workers)						
Managers	-0.179***	(-4.494)	-1.169***	(-3.721)	0.041	...
Professionals	-0.093***	(-3.142)	-0.359	(-1.620)	0.144	...
Technicians	-0.073***	(-2.843)	-0.313	(-1.637)	0.173	...
Clerks	-0.099***	(-3.106)	-0.479**	(-2.003)	0.071	...
Service Workers	-0.049	(-1.583)	-0.230	(-1.001)	0.089	...
Operators/Assemblers	-0.019	(-0.875)	-0.195	(-1.220)	0.179	...
Elementary Occupations	-0.027	(-0.956)	-0.059	(-0.294)	0.107	...
Armed Forces	0.200*	(1.925)	1.806***	(2.672)	0.005	...
Year96	0.198***	(14.956)	1.564***	(15.926)	0.487	...
Constant	-0.390***	(-3.575)	-4.016***	(-4.882)	...	...
<i>N</i>		6,898		6,731	...	...
$\chi^2(42)$		1,367.26		2,191.43	...	...
Pseudo $R^2$		0.1832		0.0898	...	...

**Table 6 (continued)**

<i>Panel B</i>				
	<i>Probit Estimates</i> ( <i>ARRDUM</i> )		<i>Tobit Estimates</i> ( <i>ARRMOS</i> )	
	<i>dF/dX</i>	<i>z</i>	<i>Coeff.</i>	<i>t</i>
<i>ARRREG</i> <sub><i>t</i>-1</sub> (local arrears)	0.932***	19.195	7.332***	20.354
Urban (dummy)	-0.017	-0.692	-0.186	-1.041
Tenure (years)	0.005***	3.085	0.043***	4.362
Urban*Tenure	-0.002	-1.334	-0.019*	-1.692
<i>N</i>	6,898		6,731	
$\chi^2(43)$	1,366.66		2,194.29	
Pseudo <i>R</i> <sup>2</sup>	0.1834		0.0899	

Notes: *t*-Statistics, reported in parentheses, are computed using robust standard errors. \*\*\*-significant at the 1% level, \*\*-significant at the 5% level, \*-significant at the 10% level. In Panel A, regional controls (6 categories) are included but not shown. Panel B includes the same control variables as panel A.

**Table 7**  
**Effects of Alternative Measures of Firm and Regional Performance on Arrears**  
(tobit estimates, matched worker–firm sample, 1995–96)

<i>Alternative Firm Performance Measures</i>	<i>Mean, [s.d.]</i>	<i>Specifications</i>			
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<i>Measures of Firm Performance</i>					
Change in Labor Productivity, log (LPR <sub><i>t</i></sub> /LPR <sub><i>t-1</i></sub> )	0.586 [0.596]	-0.412** (-2.259)	...	...	...
Change in Employment, log (EMP <sub><i>t</i></sub> /EMP <sub><i>t-1</i></sub> )	-0.030 [0.171]	...	-2.744*** (-4.849)	...	...
Change in Output, log (OUT <sub><i>t</i></sub> /OUT <sub><i>t-1</i></sub> )	0.593 [0.569]	...	...	-1.138*** (-5.277)	...
Cost per Unit Output (COST <sub><i>t</i></sub> /OUT <sub><i>t</i></sub> )	1.048 [0.451]	...	...	...	2.171*** (11.082)
<i>Measures of Firm Liquidity</i>					
Profitability (PROFIT <sub><i>t</i></sub> /OUT <sub><i>t</i></sub> )	-0.045 [0.514]	-1.323*** (-7.845)	...	...	...
Current Ratio	1.265 [1.005]	...	-0.516*** (-4.269)	...	...
Liquidity Ratio	0.559 [0.776]	...	...	-0.304** (-2.125)	...
Export per Output (EXPORT <sub>94</sub> /OUT <sub>94</sub> )	0.093 [0.211]	...	...	...	-1.440** (-2.742)
<i>Measures of Regional Performance and Liquidity</i>					
Retail Trade Turnover per Capita (million rubles)	4.001 [2.914]	-0.067* (-1.875)	...	...	...
Gross Regional Product per Capita (million rubles)	11.983 [7.472]	...	-0.068*** (-3.682)	...	...
Percentage of Loss-Making Firms	42.810 [13.161]	...	...	0.043*** (3.563)	...
Average Solvency Ratio	0.835 [0.665]	...	...	...	-0.401*** (-3.076)
<i>Measures of Labor Market Conditions</i>					
Regional Hiring Rate (%)	22.491 [4.144]	-0.085** (-2.437)	...	...	...
Share of Firm Employment in the Local Labor Market	0.070 [0.184]	...	2.743*** (3.394)	...	...
Job Destruction Rate in Industry	0.089 [0.040]	...	...	7.909** (3.563)	...
Industrial Employment Herfindahl Concentration Index	0.180 [0.133]	...	...	...	2.998*** (4.014)
ARRREG <sub><i>t-1</i></sub> (local arrears)		6.649*** (9.918)	5.662*** (7.541)	4.885*** (5.928)	7.291*** (11.374)
<i>N</i>		2,061	1,410	1,425	2,491
Pseudo <i>R</i> <sup>2</sup>		0.107	0.089	0.088	0.103
$\chi^2$		870.5	436.3	435.8	1,073.85

Notes: \*\*\*–significant at the 1% level, \*\*–significant at the 5% level, \*–significant at the 10% level. *t*-statistics are reported in parentheses; standard deviation is reported in square brackets. Each row of the table shows the result of estimating the impact of a measure of firm and regional performance on wage arrears, using the same specification as those in table 6, except for the use of alternative measures of firm and regional performance. As in table 6, other controls included (but not shown here), are ARRREG<sub>*t-1*</sub> (regional arrears), urban, region and industry dummies, log of firm size, firm ownership, firm age, gender, education, age, tenure, employee ownership, occupational categories, and a year dummy. Sample is restricted to employees in the matched worker–employee sample.

**Table 8**  
**The Impact of Wage Arrears on Labor Mobility**  
(multinomial logit estimates, full sample, 1994–1996)

	<i>Mean</i> <i>[s.d.]</i>	<i>Job-to-Job</i> <i>Transition</i>	<i>Transition to</i> <i>Unemployment</i>	<i>Transition to</i> <i>OLF</i>
<i>Panel A</i>				
ARRMOS <sub><i>t</i>-1</sub>	1.264 [2.309]	0.021 (1.006)	0.055 (1.504)	0.038 (1.587)
Urban (dummy)	0.683 [0.465]	0.811*** (6.414)	0.581** (2.528)	0.140 (0.952)
Regional Unemployment Rate <sub><i>t</i>-1</sub> (%)	8.364 [2.065]	-0.081** (-2.418)	0.099* (1.893)	0.029 (0.831)
Log (Firm Size) <sub><i>t</i>-1</sub>	5.351 [2.156]	-0.121*** (-5.349)	-0.114*** (-2.606)	-0.123*** (-4.034)
Male	0.461 [0.499]	0.541*** (5.439)	0.470*** (2.722)	-0.274** (-2.130)
Schooling <sub><i>t</i>-1</sub>	11.639 [2.600]	0.021 (1.089)	-0.078** (-2.379)	-0.123*** (-5.434)
Age <sub><i>t</i>-1</sub>	39.733 [11.394]	-0.015*** (-3.520)	-0.026*** (-3.027)	0.036*** (4.863)
Tenure <sub><i>t</i>-1</sub>	9.307 [9.371]	-0.070*** (-8.207)	-0.051*** (-3.198)	-0.003 (-0.401)
Monthly Wage <sub><i>t</i>-1</sub> /1,000,000	0.594 [0.790]	-0.231*** (-3.209)	-0.162 (-1.027)	-0.615*** (-2.464)
Year95	0.476 [0.499]	0.128 (1.227)	0.059 (0.338)	0.145 (1.122)
Constant		-0.809** (-1.977)	-2.404*** (-3.138)	-2.285*** (-3.818)
	<i>N</i> = 6,097	$\chi^2(45) = 494.33$	Pseudo <i>R</i> <sup>2</sup> = 0.0794	
<i>Panel B</i>				
ARRMOS <sub><i>t</i></sub>	1.264 [2.309]	0.137*** (2.638)	0.229*** (3.168)	0.176*** (2.912)
ARRREG <sub><i>t</i>-1</sub>	0.425 [0.182]	-0.707* (-1.897)	-0.507 (-0.768)	0.539 (1.196)
ARRMOS <sub><i>t</i>-1</sub> *ARRREG <sub><i>t</i>-1</sub>	0.679 [1.458]	-0.206** (-2.002)	-0.328** (-2.377)	-0.250** (-2.363)
Urban	0.683 [0.465]	0.671*** (4.860)	0.444* (1.948)	0.153 (0.987)
	<i>N</i> = 6,097	$\chi^2(51) = 524.06$	Pseudo <i>R</i> <sup>2</sup> = 0.0821	
<i>Panel C</i>				
ARRMOS <sub><i>t</i>-1</sub>	1.264 [2.309]	-0.010 (-0.270)	-0.051 (-0.881)	0.026 (0.866)
ARRREG <sub><i>t</i>-1</sub>	0.425 [0.182]	-0.930*** (-2.654)	-0.880 (-1.433)	0.198 (0.460)
ARRMOS <sub><i>t</i>-1</sub> *Urban	0.609 [1.508]	0.078* (1.734)	0.192*** (2.811)	0.030 (0.651)
Urban	0.683 [0.465]	0.582*** (3.876)	0.194 (0.803)	0.126 (0.749)
	<i>N</i> = 6,097	$\chi^2(51) = 526.30$	Pseudo <i>R</i> <sup>2</sup> = 0.0819	

Notes: *t*-Statistics, reported in parentheses, are computed using robust standard errors. \*\*\* – significant at the 1% level, \*\* – significant at the 5% level, \* – significant at the 10% level. The sample is restricted to respondents employed in 1994-95. In panel A, regional controls (6 categories) are included but not shown. Panels B and C include region and year dummies, local unemployment rate, log of firm size, age, gender, education, tenure, and monthly contractual wage. The dependent variable takes on four categories: 1 = employed, did not change previous job; 2 = employed, changed job; 3 = transition to unemployment; 4 = transition to out-of-labor-force. The omitted dependent variable category =1 (did not change job).