

# Workers' Heterogeneity and Risk Aversion : a Segmentation Model of the Russian Labour Market.

## Abstract

This paper proposes an explanation of the puzzling coexistence of elements of inertia and dynamism on the Russian labour market. In a context of high uncertainty, risk averse and heterogeneous workers face a trade-off between wages and an insurance against risk offered by the firm. The firm proposes a contract which includes a low monetary wage and the access to social services. Workers choose to accept the contract or to leave the firm. Their choice gives rise to an *ex post* segmentation : the most productive workers leave the firm and concentrate in the most productive firms; the less adapted workers remain in their initial firm where they accept to receive lower wages as a price for security. In this framework, wage arrears can be viewed as an element of an implicit contract between firms and less productive workers. We test the relevance of the model using a panel dataset containing 9 233 Russian firms for 1993 - 1998 as well as a sub-sample for which we have information on firms' wage arrears.

Key words: labour market, segmentation, uncertainty, implicit contracts, social assets, wage arrears, transition, Russia.

JEL classification: C23, D82, J00, L20, P52.

# 1 Introduction

The labour market is part of the often alleged "Russian difference". Compared to other countries such as Poland, the Czech Republic, Hungary, Slovakia or Slovenia, one of the original features of Russia is the relative inelasticity of employment to the level of activity. In Central Europe, employment has generally followed the decline of output. In Russia, the aggregate level of employment has fallen by only 15 percent while output was almost cut by 45 percent between 1991 and 1998 (EBRD, 1999)<sup>1</sup>.

This has been interpreted in two radically opposite ways. On the one side, the apparent irresponsiveness of the labour demand has been attributed to the lack of enterprise restructuring, labour lay-offs being considered as a restructuring measure typical of firms' early adjustment. This interpretation points to the drawbacks of the privatisation strategy, dominated by political objectives, which has transferred the control of enterprises to insiders<sup>2</sup>. Those have poor incentives to restructure and discourage external investors whose property rights are poorly protected (Blanchard and Aghion, 1996, Frydman et al., 1996). Institutional features of the labour market (high separation and hiring costs) are also taken as responsible for the weak incentives to shed labour (Garibaldi and Brixiova, 1998). The unwillingness of local governments to accept high levels of regional unemployment and the related ongoing subsidies and soft budget constraints, also support the *status quo* in terms of labour relations<sup>3</sup>. Finally, Friebel and Guriev (1999) argue that regional mobility and hence restructuring are reduced by the strategy of firms who use social assets to attach the most productive workers.

On the other side, some authors have interpreted the relative stability of employment as a sign that the Russian labour market is highly competitive and flexible (Kapeliushnikov, 1997), "a neo-classical dream" according to Layard and Richter (1994). If labour contracts are adjusted and labour reallocated with no delay in response to various shocks of the transition, it

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<sup>1</sup>For the analysis of the output fall see Blanchard and Kramer (1997), Roland and Verdier (1999) and Calvo and Coricelli (1993). Official figures do not take the shadow economy into account. According to Johnson et al. (1997), the share of the shadow economy in Russia increased from 12 per cent of GDP in 1989 to 41.6 per cent in 1995. By contrast, in Poland the shadow sector declined, according to their estimations, from 15.7% to 12.6% of GDP in the same period of time.

<sup>2</sup>For the description of the Russian privatisation strategy see Boycko et al. (1995).

<sup>3</sup>Gaddy and Ikes (1998) suggest that managers' "relational capital" can be used as a substitute to restructuring.

is natural that the aggregate level of employment remains fairly stable.

Is the Russian economy rigid or highly flexible? Has restructuring not started yet or is it already happening at a fast pace? We believe that each of these two views is relevant to a certain extent, but fails to capture the whole picture of the Russian labour market. To date, there is no theoretical explanation of this contrasted picture of the Russian labour market. The objective of this paper is to propose a model of the Russian labour market that encompasses both elements of inertia and dynamism.

The model is based on the presence of uncertainty, workers' heterogeneity and risk aversion. At the beginning of the period, firms offer their workers a contract which includes a low monetary wage and the access to social services. Workers choose to accept the contract or to leave the firm, depending on their outside opportunities, which in turn depend on their productive characteristics. The contract plays the role of an insurance against the risk faced by workers on the labour market. Firms cannot fire workers and can simply incite them to leave by offering a more or less attractive wage. It is also in the interest of the firm to keep workers with this contract rather than hiring new workers on the competitive market because of the *ex ante* uncertainty about future shocks and the productivity of employees. The choice of the workers gives rise to an *ex post* segmentation of the market whereby the most productive workers leave their initial firm, contract on the spot labour market, and concentrate in the best performing firms. Less productive workers however remain in their initial firm.

This notion of segmentation, or duality, differs from the usual two sector models of transition where firms are contrasted according to their type of ownership, i.e. whether they are privatised or still state owned (Blanchard, 1997). Moreover, both segments of our model jointly exist within the same firm since good firms employ both types of workers. This aspect is to be contrasted with the intersectoral segmentation observed in developing countries (Harris and Todaro, 1970). On the other hand, our framework is related to the literature on labour tying contracts (Bardhan, 1984) that describes rural relations between landowners and peasants in developing economies. In such models, landowners can ensure themselves against climatic and seasonal variations, by proposing low wage long term labour tying contracts to peasants. During peak seasons or high harvest times, they occasionally satisfy their additional labour needs by hiring more workers, with short term contracts, on the spot market. The duality that we put in evidence also differs from traditional segmentation models (Doeringer and Piore, 1971) which op-

pose a primary segment wherein workers are stable and receive contractual compensation and a secondary segment composed of mobile workers paid at a competitive wage. The specificity of our setting is that workers of the primary segment have less demanded qualifications and receive lower wages than workers of the secondary segment.

The next section present the majour stylised facts of the Russian labour market, illustrating more precisely the ambivalence of the Russian labour market. We then try, in section 3, to capture the duality of the Russian labour market in a model of segmentation. Section 4 illustrates this vision using the Russian Enterprise Registry database<sup>4</sup> from which we extract a panel of 9233 firms observed from 1993 to 1998. To our knowledge, this is the largest and most extensive dataset available on Russian enterprises. In this section, we try to check whether the vision of the Russian labour market developed in section 3 is consistent with firm level observations. We also confront an alternative interpretation of the Russian labour market based on turnover costs and the opposition between insiders and outsiders, with the data. Section 5 concludes.

## 2 Salient features of the Russian labour market

From the rich empirical literature devoted to the Russian labour market, four majour features emerge as essential: pervasive labour hoarding, the importance of social assets, mounting wage arrears, and the important mobility of some workers. The first two features can be interpreted as elements of inertia, the last two as elements of flexibility.

### 2.1 Elements of inertia

Pervasive labour hoarding, acknowledged by most Russian firms (Aukutsionek and Kapeliushnikov, 1996)<sup>5</sup>, is obviously associated with the relative inelasticity of employment to the variation in output. Garibaldi and Brixiova (1998) relate the pervasive labour hoarding in Russian firms to labour market

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<sup>4</sup>The information is collected by the Russian Statistical Committee (Goskomstat) on a compulsory and regular basis.

<sup>5</sup>In the survey of enterprises realised by the authors the average level of labour hoarding acknowledged by the firms is 20%.

institutions such as high search and hiring costs and the legislation limiting social plans. In the same spirit, Aukutsionek and Kapeliushnikov (1996) and Commander et al. (1998) underline the political obstacles to lay-offs, such as the reluctance of managers to create conflicts with local governments unwilling to allow large open unemployment<sup>6</sup>, as well as with the employees. Brown (1998) points at information asymmetries and coordination problems which make rational for a given firm to hoard labour when all other firms do and thereby increase hiring costs.

The reluctance of firms to divest their social assets can also be viewed as an element of rigidity. In the Soviet period, a large amount of social services was provided by firms to their employees. They included housing, catering, kindergartens, clinics, sanatoriums, transportation, sport and vacation resorts, and retirement benefits. These services were proposed at highly subsidized prices by firms which, in turn, used to receive transfers from local government to cover these costs (Commander and Schankerman, 1997)<sup>7</sup>. As the system of social protection has not been reformed, employees are still dependent on their firm for the provision of social services. They can also benefit from the access, inside firms buildings, to subsidised sales of foodstuff and basic consumption goods. Even though firms have been allowed and encouraged to divest social assets, most of them, especially the larger ones, have kept them to a significant extent (Commander et al., 1998). The subsidisation of food and other integrated services also goes on, probably because firms have been able to preserve their relations with the former suppliers without having to pay the increased costs of the new distribution chains. In the context of uncertain outside opportunities, these assets certainly provide incentives to remain in the firm.

## 2.2 Signs of flexibility

In spite of these factors of rigidity, elements of flexibility are also important. For instance, the high variability of wages compensates for the relative stability of employment levels. In average, Russian wages have lost 70 per cent of their purchasing power between 1989 and 1996 (not taking arrears into

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<sup>6</sup>The law allows local governments and trade unions to suspend massive redundancies. The recent bankruptcy law also foresees that any liquidation plan which can be expected to provoke massive lay-offs can be delayed for six months.

<sup>7</sup>The authors report that about 25% of housing, health and education services to the population were provided by firms.

account) while in the same period, in Central European countries, real wages fell by no more than 30 per cent (Garibaldi, Brixiova, 1998). The variability of real wages takes two original forms in Russia.

First, firms frequently adjust the number of working hours of their staff (and accordingly their wages). For instance, they often impose compulsory, unpaid leaves to their employees. According to Gimpelson and Lippoldt (1997), unpaid leaves touched 12 per cent of the employed labour force in 1997, with an average duration of 40 days.

Second, wage arrears constitute another important modality of real wage reduction. Mounting spectacularly since 1994, accumulated wage arrears are reported by Earle and Sabirianova (1998) to have reached 8 billion dollars in 1997, amounting on average to 3 monthly wages in the concerned firms, and touching 62 per cent of the households surveyed by the RLMS<sup>8</sup> survey. Wage arrears (due both by the government and enterprises) have decreased substantially in the last months of 1998 after the devaluation of the ruble but still remain common use throughout the country (*Russian Economic Trends*, 1998(1) ).

Various studies show that the allocation of wage arrears is differentiated across employees and that they tend to fall systematically on the same persons. Desai and Idson (1998) consider that firms use wage arrears as a device to differentiate real wages effectively paid to their employees, in order to preserve the real wage of the best employees, so that each employee gets paid exactly the amount necessary to retain him in the firm. In the same spirit, Earle and Sabirianova (1998) suggest that firms use wage arrears in a discriminating way against the most capital specific employees. Lehman et al. (1998) claim that firms allocate wage arrears to the most stable employees. All these analysis share the idea that wage arrears are used as a differentiation device.

In addition to the adjustment of real wages, recent studies also reveal a significant quantity adjustment on the Russian labour market. In spite of labour hoarding and the attraction of social assets, gross flows of hirings and separations seem to be important on the labour market. As documented by Gimpelson and Lippoldt (1997), the turnover rate of labour<sup>9</sup> reached 50 per

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<sup>8</sup>The Russian Longitudinal Monitoring Survey is a periodic, nationally conducted households survey, launched in 1992, embracing a sample of about 9000 individuals from randomly selected households.

<sup>9</sup>The turnover rate is calculated as the ratio of hirings and separations over the total stock of employment in a given period.

cent in 1997, which is exceptionally high for an economy in transition (the turnover rate was 42 per cent in Poland and 24 per cent in Romania in the same year) and is close to levels typical of OECD countries (60 per cent on average in the OECD, and 67 per cent in the United States).

Labour turnover is dominated by job to job change and by voluntary separations rather than lay-offs which represent less than 8 per cent of the cases of separations (Gimpelson and Lippoldt, 1997). This last feature constitutes another Russian specificity. In other transition economies, lay-offs have been much more frequent.

An important observation is that this high mobility is uneven across employees. Empirical studies show a differentiation of behaviour that opposes very mobile blue collars, and more immobile white collars<sup>10</sup>. Other factors such as qualification, age and local labour market conditions also play a differentiating role. More qualified, younger, urban workers are much more mobile (Gimpelson and Lippoldt, 1997). Studies based on RLMS confirm that blue collar workers are more mobile.

Labour mobility is also differentiated across firms. Smaller firms, and those in better financial situation, have a more active employment policy. They more often use short term contracts and hire younger, more qualified workers (Denisova et al., 1998). By contrast, firms which experience financial difficulties keep their employees for longer periods of time, and employ persons over the retirement age.

### 3 A segmentation model

To our knowledge, there is no theoretical explanation of this puzzling coexistence of dynamism and inertia, even though it has been empirically documented, e.g. by Gimpelson and Lippoldt (1997), Lippoldt and Grey (1997) and Clarke (1998). As noted in the previous section, most of the existing theoretical literature essentially sheds light on workers immobility by analyzing wage arrears, pervasive labour hoarding and the role of social assets. We propose a vision of the Russian labour market which encompasses both the immobility of certain employees and the high mobility of others. In our setting, agents are heterogenous and face a high degree of uncertainty. We show that given the institutional constraints faced by firms and employees,

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<sup>10</sup>The turnover and replacement rates of blue collar workers are twice as high as those of white collar workers.

the latter can enter into two different types of contract. This generates a segmentation of the labour market.

### **3.1 Transition, shocks and uncertainty**

One can think of the transition as a series of exogenous shocks. Some of these shocks are macroeconomic, e.g. credit crunch or aggregate output fluctuations. Some shocks are idiosyncratic. Firm specific demand shocks derive from the change in its trade relations, for instance, the collapse of the CMEA and the disruption of state orders in 1991, the competition of imported goods on the domestic market and the change in consumers demand. Idiosyncratic supply shocks relate to the change in the cost of the inputs used by the firm, for example the large swings in the price of energy. Workers specific shocks concern the fit between their skills and the new requirements of the market.

The pervasiveness of idiosyncratic shocks implies that agents live in a world of uncertainty. For instance, firms ignore whether their managers, employees, organisation, installed capital and production techniques will be adapted to their new competitive environment after the shocks occur. Concerning the quality of their employees, the uncertainty comes from the fact that the skills developed by workers in a context of administrative coordination can prove useless in a decentralised market.

Employees themselves are confronted with uncertainty, which mainly concern the availability and the value of job opportunities on the newly emerging labour market. Another important element of uncertainty is related to the social protection system. When leaving his firm, an employee does not know exactly what level or kind of social services he will be able to find in other firms and at what cost. From the point of view of the employee, a certain level of risk is thus associated with quitting the firm.

We consider that the transition process can be divided into many sub-periods each of which is dominated by a set of shocks. For instance, the aftermath of liberalisation is dominated by the radical change in relative prices, the next period is dominated by the reallocation of resources impulsed by the privatisation, etc. The whole transition process can thus be viewed as a series of shocks which trigger a change in the market valuation of the characteristics of the agents. The important point is that agents have to take decisions and start actions in the beginning of the period, before knowing exactly the nature of the shocks that will affect their characteristics.



### 3.1.1 Uncertainty and the firm: productivity shocks

Consider an economy with  $N$  initially identical firms. Each firm has a stock of physical capital  $K$  and employs  $l_0$  workers so that the total labour force is  $L = Nl_0$ . Each worker supplies inelastically one unit of time.

Firms (managers) face two types of changes and uncertainty. The first one concerns supply and demand idiosyncratic shocks that we represent as affecting the production technology. More precisely, we suppose that at the beginning of the period, each firm faces a technology production function  $Q = \text{Min}\{AK, l\}$  where  $A$  is a productivity parameter subject to an idiosyncratic shock and distributed in  $[\underline{A}, \bar{A}]$  according to a cumulative  $H(\cdot)$ , with  $H(\underline{A}) = 0$  and  $H(\bar{A}) = 1$ .

The second type of uncertainty faced by the firms relates to the productivity of their employees. We consider that workers learn their potential productivity (or units of efficient labour they are able to provide)  $a$  at the beginning of the period. This, however, remains private information to them, and the firm only knows that the skills of her workers are distributed in  $[0, \bar{a}]$  according to a cumulative  $F(\cdot)$  with  $F(\bar{a}) = l_0$ . (A particular case that we will use in the sequel is the uniform distribution on  $[0, l_0]$ ). It is important to stress that  $a$  is not to be taken as the technical productivity of the employee but rather as a measure of his relative adaptation to the new requirements of the market. The informational asymmetry concerning this parameter stems from the fact that firms have only been able to observe their employees in the task they used to perform before the shock. They ignore how they will fit a new environment, new tasks etc. The employee, however, knows his characteristics and is thus able to anticipate his performance in the new environment.

### 3.1.2 Uncertainty and the employees: the role of social assets

As observed in section 2.1, socialist firms used to provide various social services to their employees out of social assets they had at their disposal. Generally, one may think of any non pecuniary benefits provided by firms to their workers as a part of an employment package. We suppose that all firms have a stock  $S$  of social assets built up before the transition which can still be used at little cost during the transition process<sup>11</sup>.

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<sup>11</sup>The cost of providing social services is low because the fixed cost of social assets has already been paid in the past, and because the firm continues to receive subsidies from

We assume that there is a cost to workers, denoted by  $\sigma$ , of shifting from their initial firm to another firm. The shifting cost  $\sigma$  can be interpreted in a narrow sense, as the search cost that an employee who leaves his firm must assume in order to find a new provider of the social services he needs, or, in a more general sense, as the cost of changing workplace. It reflects the adjustment cost of moving from one location to another, the cost of adapting to a new environment and the possible mismatch between the social services provided by another firm and the needs of a particular worker. The last element implies that the cost will depend on the relative "worker specificity" of the social assets provided by the firm. For social provision of housing, health care, child care, education, training and leisure goods, the specificity can be quite high and probably depends on the length of service of the worker in his initial firm<sup>12</sup>. During the transition, workers lack information about the nature and the magnitude of these costs. We therefore consider that  $\sigma$  is a random variable distributed on  $[0, \bar{\sigma}]$  according to a cumulative  $G(\cdot)$  with  $G(\bar{\sigma}) = 1$ .

For simplicity, we assume that each worker consumes a unit of social services (which can be seen as a minimum consumption or social protection level) and that the uncertainty he faces relates to the effort needed to access this unit consumption level.

### 3.1.3 Timing

Agents have to take certain decisions at the beginning of the period. The timing of the sequential process of revelation of information is as follows. First, workers learn their own productivity level  $a$ . Second, firms, before observing their shock and without knowing the exact productivity of each individual, propose to their initial workers a (more or less implicit) contract  $(w, s)$  composed of a fixed wage  $w$  and the provision of the social services  $s$ .<sup>13</sup>

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various levels of the government. For a discussion of the reason why these assets are not taken in charge by the government itself, see Commander and Schankerman (1997).

<sup>12</sup>We assume, for simplicity, that when he quits, an employee loses access to the social assets of his firm. In reality, some workers retain access to some of the social assets of their initial firm. This is the case, in particular, for housing (Commander and Schankerman, 1997).

<sup>13</sup>In reality, the wages of the workers who decide to remain in the firm are heterogeneous. This reflects the legacy of the past and also the possibility for firms to discriminate according to characteristics that are already observable.

We assume, in conformity with the stylized facts of section 2.1, that some institutional constraints hinder layoffs and that voluntary separations dominate workers' outflows. The firm can thus simply incite workers to leave (or to stay) by offering them a more or less attractive contract (through the level of the contractual wage  $w$ ).

Workers can accept or reject the offer. If they accept the contract, they stay in the firm and enjoy the social assets of the firm. If they reject the offer, they have to make a living outside their initial firm by finding a job on the competitive labour market.

At a third stage, the productivity  $a$  of all workers is revealed to all agents in the economy (becomes common knowledge) and firms also learn their own idiosyncratic productivity shock  $A$ . After the shock, each firm can go to the spot labour market to hire more workers to maximise its profits. Because on the spot market all characteristics have been revealed, firms now offer a wage per efficiency unit of labour  $\omega$  so that an individual with productivity  $a$  is paid a total wage of  $\omega a$ .

### 3.1.4 Preferences

Each worker has a utility function  $u(c, s)$  defined on the two types of goods of this economy: the consumption good  $c$  (taken as the numeraire) and the social services  $s$ . As already noted, for simplicity, we consider that the consumption of the social services is essential and that the social services are supplied inelastically to each individual at the value  $s = 1$ . Therefore, the relevant utility function can be rewritten as  $u(c) = u(c, 1)$ . Workers are risk averse and  $u(c)$  is a Von Neuman Morgestern utility function with  $u'(c) > 0$  and  $u''(c) < 0$ .

## 3.2 Labour contracts

Denote by  $\omega^e$  the expectation of the wage paid per efficiency unit of labour on the spot market. Then it is clear that a worker will accept the contract at the first stage if and only if :

$$u(w) \geq \int_0^{\bar{\sigma}} u(\omega^e a - \sigma) dG(\sigma)$$

This means that the utility level he receives under the contract is higher than the expected utility he would receive by leaving the firm and facing the uncertainty related to the provision of social services. As workers are risk averse, they are ready to pay an insurance premium (accept a low wage  $w$ ) in order to avoid the outside uncertainty associated with the shifting cost  $\sigma$ . It is useful to define this insurance premium  $I(y)$  that a worker with income  $y$  is ready to pay to avoid the uncertainty associated with shifting from his initial firm to another one as:

$$u(y - I(y)) = \int_0^{\bar{\sigma}} u(y - \sigma) dG(\sigma)$$

$\phi(y) = y - I(y)$  is then the certainty equivalent income which makes the worker indifferent between going to the competitive labour market and experiencing the risky adjustment cost  $\sigma$  and staying in the initial firm without this uncertainty. Clearly :  $\phi'(y) > 0$  and  $\phi(y) < y$ .

Given our assumption on the distribution of  $a$ , all workers with a productivity level  $a$  smaller than the threshold

$$a^*(w, \omega^e) = \frac{\phi^{-1}(w)}{\omega^e}$$

accept the contract of their initial firm. Hence, the number of workers who want to remain in their initial firm is  $l_1 = l_1(w, \omega^e)$  given by :

$$l_1 = l_1(w, \omega^e) = \text{Min} \{F(a^*(w, \omega^e)), l_0\}$$

After revelation of the workers' productivity to the firm, each firm, through a contract  $w$ , disposes of an amount of efficient contractual labour  $\tilde{L}_1$  given by:

$$\tilde{L}_1 = \tilde{L}_1(w, \omega^e) = \int_0^{\text{Min}\{a^*, \bar{a}\}} a dF(a) = \text{Min} \{\Phi(a^*(w, \omega^e)), l_0 E(a)\}$$

with  $E(a) = \frac{1}{F(\bar{a})} \int_0^{\bar{a}} a dF(a)$   
and  $\Phi(a^*) = \int_0^{a^*} a dF(a)$ .

### 3.2.1 Firms' expected profits and optimal labour contract.

After realization of its idiosyncratic productivity shock, each firm considers if it wishes to employ more labour on the spot market. Given the Leontieff technology of production  $Q = \text{Min}\{AK, l\}$ , only those firms with a labour requirement  $AK$  larger than  $\tilde{L}_1$  will want to hire additional labour on the spot market. The *ex post* profit  $\Pi(A, \omega^e, \tilde{L}_1)$  of a given firm thus depends on the realization of the shock  $A$  in the following way<sup>14</sup>

$$\begin{aligned}\Pi(A, \omega, \tilde{L}_1) &= AK - wl_1 && \text{when } A \leq \frac{\tilde{L}_1}{K} \\ &= AK - wl_1 - \omega^e(AK - \tilde{L}_1) && \text{when } A > \frac{\tilde{L}_1}{K}\end{aligned}$$

Low productivity firms (i.e. with  $A < \frac{\tilde{L}_1}{K}$ ) are content with their pool of stable workers  $l_1$ . On the contrary, high productivity firms (i.e. with  $A \geq \frac{\tilde{L}_1}{K}$ ) have to hire at the anticipated market wage  $\omega^e$ , the additional units of labour ( $AK - \tilde{L}_1$ ) needed to maximise their profits after the realization of their productivity shock  $A$ .

From this we can compute the expected profits of a firm as a function of the labour tying contract  $w$  it proposes and the expectation  $\omega^e$  of the equilibrium wage on the spot labour market as:

$$E\Pi(w, \omega^e) = \int_{\underline{A}}^{\frac{\tilde{L}_1}{K}} [AK - wl_1] dH(A) + \int_{\frac{\tilde{L}_1}{K}}^{\bar{A}} [(1 - \omega^e)AK - wl_1 + \omega^e \tilde{L}_1] dH(A)$$

with the conditions<sup>15</sup>

$$l_1 = l_1(w, \omega^e) \text{ and } \tilde{L}_1 = \tilde{L}_1(w, \omega^e)$$

<sup>14</sup>The output good is also the numeraire consumption good and its price is fixed to 1.

<sup>15</sup>When writing the expression of the expected profit  $E\Pi(w, \omega^e)$ , we implicitly take into account the fact that  $\frac{\tilde{L}_1}{K}$  takes a value between  $\underline{A}$  and  $\bar{A}$ . Obviously, it is never in the interest of a firm to have  $\frac{\tilde{L}_1}{K} > \bar{A}$  since this would mean that the firm hires useless units of labour even under the best productivity shock  $\bar{A}$ . It could be the case however that  $\frac{\tilde{L}_1}{K} < \underline{A}$ . In that case, the upper (resp. lower) bound of the first (resp. second) integral on the LHS of this equation would have to be replaced by  $\text{Min}\left\{\frac{\tilde{L}_1}{K}, \underline{A}\right\}$ . For notational simplicity, we focus only on the most relevant case where  $\frac{\tilde{L}_1}{K}$  is larger than  $\underline{A}$ .

This expected profit can be rewritten as:

$$E\Pi(w, \omega^e) = \int_{\underline{A}}^{\bar{A}} AK(1 - \omega^e)dH(A) + \int_{\underline{A}}^{\frac{\tilde{L}_1}{K}} \omega^e[AK - \tilde{L}_1]dH(A) \\ + (\omega^e - w)\tilde{L}_1 + w(\tilde{L}_1 - l_1)$$

The first term reflects the expected profit flows of the firm if there were only spot market contracts. The second term is negative and reflects the excess cost, evaluated at the spot market wage, of hiring  $\tilde{L}_1$  efficient units of labour under the labour contract when the firm faces a low productivity shock and that *ex post*, it needs only  $AK$  units of labour. This term accounts for the labour hoarding evoked in section 2.1. The third term  $(\omega^e - w)\tilde{L}_1$  is positive and reflects the labour costs savings for the firm which has hired  $\tilde{L}_1$  units of labour at the contractual wage  $w$  rather than at the higher anticipated spot market wage  $\omega^e$ . Finally the last term  $w(\tilde{L}_1 - l_1)$  can be either positive or negative and depends on the shape of the distribution of workers' skills. It reflects the fact that under the labour tying contract, the firm pays the same wage  $w$  to all workers who accept the initial contract, regardless of their productivity (which cannot be observed at this stage). Hence the firm may pay a wage rate in excess of their productivity to some of the less productive workers. But alternatively, it may underpay those relatively productive workers who have chosen to remain in the firm. In aggregate terms, the effect on the wage bill will depend on how the productivity level  $a$  of workers who remain in the firm is actually distributed.

It is a simple matter to see that:

$$\frac{\partial E\Pi}{\partial \tilde{L}_1} = \omega^e \left( 1 - H\left(\frac{\tilde{L}_1}{K}\right) \right); \quad \frac{\partial E\Pi}{\partial l_1} = -w; \quad \frac{\partial E\Pi}{\partial w} = -l_1$$

The problem of the firm is then to choose  $w$  in order to maximise its expected profits  $E\Pi(w, \omega^e)$ . The solution of this problem gives the optimal labour tying wage  $w(\omega^e)$  as a function of the expected spot market wage  $\omega^e$ . It is actually more convenient to rewrite the profit function in terms of the threshold level  $a^* = a^*(w, \omega^e)$ , taking into account that  $w = \phi(\omega^e a^*) \geq 0$ , and to consider the firm's choice in terms of  $a^*$ . The first order condition for an interior solution writes :

$$\frac{dE\Pi}{da^*} = \omega^e \left( 1 - H\left(\frac{\tilde{L}_1}{K}\right) \right) a^* F'(a^*) - \phi(\omega^e a^*) F'(a^*) - \omega^e F(a^*) \phi'(\omega^e a^*) = 0 \quad (1)$$

for  $a^*$  such that  $\phi(\omega^e a^*) \geq 0$  and  $\tilde{L}_1 = \Phi(a^*)$ <sup>16</sup>. Solving (1), we get an equilibrium threshold  $a^* = a^*(\omega^e)$  and correspondingly a tying labour contract wage  $w = w(\omega^e) = \text{Max}\{\phi(\omega^e a^*(\omega^e)), 0\}$ .<sup>17</sup>

### 3.3 Spot labour market equilibrium.

Let us now describe the spot (short term contract) labour market equilibrium. The total labour demand on this market is simply the total demand emanating from the firms which have experienced a good productivity shock (i.e.. a shock  $A$  higher than  $\frac{\tilde{L}_1}{K}$ ):

$$L^d = \int_{\frac{\tilde{L}_1}{K}}^{\bar{A}} [AK - \tilde{L}_1] dH(A) = K \left[ E(A) - \Psi\left(\frac{\tilde{L}_1}{K}\right) - \frac{\tilde{L}_1}{K} + \frac{\tilde{L}_1}{K} H\left(\frac{\tilde{L}_1}{K}\right) \right]$$

with  $E(A) = \int_{\underline{A}}^{\bar{A}} AdH(A)$  and  $\Psi(x) = \int_{\underline{A}}^x AdH(A)$ .

The total labour supply is the total number of efficient units of labour emanating from the workers who have rejected the initial contract :

$$L^s = \int_{a^*}^{\bar{a}} adF(a) = l_0 E(a) - \tilde{L}_1$$

with  $E(a) = \frac{1}{F(\bar{a})} \int_0^{\bar{a}} adF(a)$

The equilibrium spot labour market is given by  $L^d = L^s$  which gives the following condition to be satisfied by  $\tilde{L}_1$ :

$$l_0 E(a) = K \left[ E(A) - \Psi\left(\frac{\tilde{L}_1}{K}\right) + \frac{\tilde{L}_1}{K} H\left(\frac{\tilde{L}_1}{K}\right) \right] \quad (2)$$

It is easy to see that the right hand side of this equation is an increasing function of  $\frac{\tilde{L}_1}{K}$ . Under the assumption  $KE(A) < l_0 E(a) < K\bar{A}$ , which we assume to be satisfied, it provides a unique solution  $\tilde{L}_1^* \in ]\underline{AK}, \bar{AK}[$ .

The labour market equilibrium  $\{\tilde{L}_1^*, a^*, \omega^*, w^*\}$  is then characterized recursively by (2) and

$$\tilde{L}_1^* = \Phi(a^*) \quad (3)$$

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<sup>16</sup>Note that this equation also holds for the case where  $\frac{\tilde{L}_1}{K} < \underline{A}$  by simply having  $H\left(\frac{\tilde{L}_1}{K}\right) = 0$  in the expression.

<sup>17</sup>We assume that the second order conditions are satisfied.

$$\omega^* \left( 1 - H\left(\frac{\tilde{L}_1^* - \underline{A}}{K}\right) \right) a^* F'(a^*) - \phi(\omega^* a^*) F'(a^*) - \omega^* F(a^*) \phi'(\omega^* a^*) = 0 \quad (4)$$

$$w^* = \text{Max}\{\phi(a^* \omega^*), 0\} \quad (5)$$

As it is difficult to characterise the solution completely with general distribution functions, we consider in the next section a simple example with uniform distributions for workers' skills and firms' productivity, and a constant absolute risk aversion of workers.

### 3.4 A uniform distribution example.

We have  $F(a) = a$ , and  $\bar{a} = l_0$ . Also  $H(A) = (A - \underline{A})/\Delta A$  with  $\Delta A = \bar{A} - \underline{A}$  with the assumption:

$$K \frac{\bar{A} + \underline{A}}{2} < l_0 \frac{\bar{a}}{2} < K \bar{A}$$

In that case

$$l_1 = a^*(w, \omega^e); \quad \tilde{L}_1 = \frac{(a^*(w, \omega^e))^2}{2}$$

The equilibrium  $\{\tilde{L}_1^*, a^*, \omega^*, w^*\}$  is characterized by:

$$l_0 \frac{\bar{a}}{2} = K \left[ \frac{\bar{A} + \underline{A}}{2} + \frac{1}{2\Delta A} \left(\frac{\tilde{L}_1^*}{K}\right)^2 + \frac{\underline{A}^2}{2\Delta A} - \frac{\underline{A}}{\Delta A} \frac{\tilde{L}_1^*}{K} \right]$$

$$\omega^* \left( 1 - \frac{\tilde{L}_1^*}{\Delta A K} \right) a^* - \phi(\omega^* a^*) - \omega^* a^* \phi'(\omega^* a^*) = 0 \text{ with } \phi(\omega^* a^*) \geq 0$$

and:

$$w^* = \text{Max}\{\phi(\omega^* a^*), 0\}$$

One interesting particular case is the case of a constant absolute risk aversion utility function for workers (i.e..  $u(C) = u_0 - e^{-\gamma C}$ ). In that case, it is easy to see that:

$$\phi(y) = y - \frac{1}{\gamma} \text{Log} \left[ \int_0^{\bar{\sigma}} e^{\gamma \sigma} dG(\sigma) \right] = y - I$$

The insurance premium  $I(y) = I$  is independent from  $y$ .



From this, it is easy to see that the first order condition (1) writes:

$$\omega^* \left( 1 - \frac{\tilde{L}_1^*}{\Delta AK} \right) a^* - (\omega^* a^* - I) - \omega^* a^* = 0 \text{ with } \omega^* a^* \geq I$$

As is clear from this equation, one cannot have the first order condition satisfied at an interior solution. Therefore  $\omega^* a^* = I$  and  $w^* = 0$ . Firms offer, in that extreme case, a zero wage to the workers who choose the labour contract.

The spot market wage  $\omega^*$  then is established by the following equations:

$$l_0 \frac{\bar{a}}{2} = K \left[ \frac{\bar{A} + A}{2} - \frac{1}{2\Delta A} \left( \frac{\tilde{L}_1^*}{K} \right)^2 + \frac{A^2}{2\Delta A} - \frac{A}{\Delta A} \frac{\tilde{L}_1^*}{K} \right]$$

with  $\tilde{L}_1^* = \frac{(a^*)^2}{2}$  and  $\omega^* = \frac{1}{\gamma a^*} \text{Log} \left[ \int_0^{\bar{\sigma}} e^{\gamma\sigma} dG(\sigma) \right]$

This extreme example shows that in some cases, the firm proposes a zero contractual wage (which is the minimum it can fix). Even at this zero wage, some employees will accept the contract and remain in the firm. This is because, given their low productivity or adaptation to the labour demand, they are better off keeping the access to the social assets of the firm than receiving the positive competitive wage  $\omega^* a$  of the spot market but facing the risk associated with the shifting cost  $\sigma$ .

### 3.5 Implications of the model for the segmentation of the labour market

According to the logic of the model, one should expect to observe an *ex post* segmentation pattern for workers and firms. Bad firms (firms whose productivity shock  $A$  is smaller than  $A^* = \frac{\tilde{L}_1^*}{K}$ ), would only retain low productivity workers, i.e. those who would accept the labour contract, would be paid  $w^*$  (which can be equal to 0) and would enjoy the social assets at no cost. In good firms (firms which have a productivity shock  $A$  higher than  $A^* = \frac{\tilde{L}_1^*}{K}$ ), there would be two types of workers: 1) low productivity workers (i.e. with  $a < a^*$ ) who accept the labour contract  $w^*$  and the provision of social assets with no uncertainty; 2) high productivity workers (i.e. with  $a \geq a^*$ ) hired

by the firm on the spot labour market and paid according to their market productivity a higher wage  $\omega^*a$ <sup>18</sup>.

In the next section, we try to confront the vision of the Russian labour market segmentation suggested by the model with the available empirical evidence. More specifically, we try to check whether we can find some signs of the type of adjustment predicted by the model by observing a large sample of Russian industrial firms. We also try to confront an alternative theory with the data. In particular, we test whether firms' wage setting behaviour is consistent with a model of insiders.

## 4 Empirical analysis

In order to check whether the vision of the labour market suggested by the model is consistent with empirical observation, one would ideally like to have information on individual labour supply and firm labour demand<sup>19</sup>. One

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<sup>18</sup>*De novo* private firms may employ only high productivity workers since their employment policy is not determined by the inherited pool of less productive workers. We only consider the pool of firms and employees who are present throughout the period. Workers who leave their firm for the newly created private sector are excluded from this picture. In terms of our model, they can be viewed as having a productivity  $a$  greater than  $\bar{a}$ . Moreover, we do not consider the possibility that workers can have a second job in the hidden economy although this is an important part of the Russian reality. In the framework of our model, the only difference between a job on the spot market and on the shadow labour market is that on the latter, the worker can both keep his job in his original state firm and use its social assets and get a better wage in the shadow economy. We simply assume that there is a limit to the amount of time that the firm would let the worker take out for working on the shadow market, and we approximate this time to zero.

<sup>19</sup>Empirical studies of the Russian labour market usually hinge on the households surveys such as the RLMS. On the labour demand side, data on hirings and separations are collected by the Goskomstat, through mandatory regular reporting by medium and large size enterprises which cover over 75% of total employment. However, in addition to other drawbacks (see Gimpelson and Lippoldt, 1997), the declarations do not include any economic information about the firms. More fragmented information is also available. A number of case studies are realized by Russian institutions (the Institute of Comparative Labour Studies and the IMEMO : Institute of International Economic Relations ), the OECD and the World Bank (see Denisova et al., 1998). Surveys of many enterprises are also conducted on a regular basis. The "Russian Economic Barometer ", TACIS-ACE program of the European Commission, managed by a team of IMEMO, regularly polls the managers of a panel of 251 firms. More occasionally, the VCIOM (All Russian Public Opinion Center), the ILO (International Labour Office) or the Russian Labour Flexibility Survey conduct surveys of enterprises.

would also like to observe gross flows of hirings and separations. Unfortunately, the available data does not satisfy these requirements.

First, in spite of some attempts to match individual information on labour supply and labour demand (Earle and Sabirianova, 1998), it is impossible to build an extensive dataset of this type. Second, there is no information on gross employment flows at the level of enterprises available to date.

In the absence of the ideal data set, we use the Russian Enterprise Registry data base, collected by the Russian Statistical Committee (Goskomstat) on a compulsory and regular basis. This data has the advantage to include information on firms' economic performance and labour dynamics. From this data set, we have extracted a balanced panel of 9 233 firms observed between 1993 and 1998. Among other indicators, the panel contains information about the value of output, the number of employees, the wage fund, the type of property, the region and product codes of each firm<sup>20</sup>. We have eliminated observations with inconsistent data and restrained the sample to those firms for which we had non-zero non-missing output, employment, and wage bill. We also eliminated parts of consolidated firms, mergers, subsidiaries, spun-offs and new entries. The descriptive statistics of the sample are presented in Table A1 in the Appendix.

Our purpose is to confront the vision of the labour market suggested by the model with the information contained in the Registry. In particular, we want to check whether firms adjust to their productivity shocks by varying the employment of high productivity workers. This would lead to the formation of a stagnant pool of low productivity workers in firms with adverse productivity shocks, and the concentration of high productivity workers into firms with favourable productivity shocks.

In the following regressions, we take the variation in firms' real output as a proxy for their idiosyncratic total factor productivity shock. The rationale is that a firm whose production expands (resp. decreases) has certainly faced a favourable (resp. unfavourable) shock.

Although in the model the productivity of the employees follows a continuous distribution, the *ex post* segmentation opposes two categories of workers: the high productivity group whose parameter  $a$  is above the threshold  $a^*$ , and the low productivity group under  $a^*$  (recall that  $a^*$  is the threshold that triggers the decision to quit the firm or stay). In the Registry data, the distinction is made between the number and wage fund of "blue collar workers"

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<sup>20</sup>For the description of the registry data base see Brown and Brown (1997).

(production related) and "white collar workers" (non production related) in each firm. To be sure, such a distinction does not encompass all aspects of high-productivity versus low-productivity workers. However, because of the existing empirical evidence quoted in section 2.2 (notably in footnote 10), we can take it as a rough approximation of the differences between employees in terms of mobility and external opportunities. We thus assume that blue collar workers are the most demanded employees, while white collar workers are the less adapted to the new market environment.

It may come as a surprise that blue collar workers are the most demanded employees as opposed to white collar workers (Gimpelson and Lippoldt, 1997). In a Western economy, white collar workers would be thought to be more qualified and adaptable. But in post socialist economies, white collar workers might just have the wrong skills. People specialised in administration and management tasks may have been formed to the needs of the former system (e.g. they could have a comparative advantage in relations with the plan organs and the administration of the branch ministry) and be poorly suited to the new tasks of a market environment. It may also be that there remains some complementarity between the installed capital and the blue collar workers that are trained to use it, which creates the excess demand for qualified workers. There is also evidence (Gimpelson and Lippoldt, 1997) that white collar workers in the former state sector are elder than blue collar workers. This also explains their lesser adaptability.

To be sure, in the model all types of workers are perfect substitutes whereas blue and white collar workers are usually not considered to be so. However, in a period of profound organizational change, it is reasonable to assume that the initial skills and specialisation of workers loose part of their significance and just result in large productivity gaps between different types of workers.

Another problem is that the model assumes that employers cannot observe *ex ante* the productivity or adaptability of their workers. (If the firm could observe *ex ante* the exact productivity of each worker, it would offer her the exact contractual wage necessary to retain her in the firm). How is this consistent with the distinction between blue and white collar workers, two eminently observable categories? One answer is that the firm does not know *a priori* which is the most adaptable category. Moreover, inside each category, the firm cannot observe the exact productivity of a given worker. It thus has to compose with a certain degree of uncertainty concerning the adaptability of its workers.

Keeping all these reserves in mind, and in the absence of a better tool, in the following regressions, we try to find tracks of the segmentation of the market between blue and white collar workers, assuming that the former are more productive and the latter less productive.

## 4.1 Employment and shocks

Table 1 compares the sensitivity of the change in employment of white versus blue collar workers to shocks. In order to control for sectoral and regional specificities, we systematically include as explanatory variables, the average growth rate of employment in the firm's industry and region<sup>21</sup> as well as time and size dummies.

The regressions pooling all firms (columns 1 and 2) show that the response of the growth rate of employment of blue collar workers to shocks is significantly stronger than that of white collar workers. The same result is obtained whether regressions are estimated by OLS (panel A) or fixed effects (panel B). Firms do seem to be adjusting to shocks by varying more their stock of blue collar workers.

Of course, ideally, one would like to find that the variation in the number of low productivity workers (white collar workers) is independent from the shocks of the firm (i.e. one would like to obtain a non significant parameter). The fact that the coefficient is significant is certainly due to the imperfection of the categories (white/blue collar workers) used to account for the productivity or adaptation of workers.

In order to capture the asymmetry between "good" and "bad" firms (with favourable or negative shocks), we divide the sample in two parts: firms with increasing/decreasing employment. In the logic of the model indeed, firms hire new workers only if their total factor productivity increases beyond a certain threshold (namely:  $A > \frac{\tilde{L}}{K}$ ). Hence, the asymmetry between "good" and "bad" firms may be best captured by the opposition between firms whose employment rises and firms whose employment falls. Consequently, we introduce this distinction in the regressions.

The results (columns 3 to 6) show that the employment of blue collar workers is more dependent on shocks than that of white collar workers. It turns out that in the case of firms whose shock is favourable enough to

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<sup>21</sup>The average growth rates are calculated on the basis of the whole sample, without the restrictions imposed for the construction of the panel.

trigger net hirings, the variation in the number of white collar workers is independent from the shock (the coefficient is not significant). In the case of a negative shock, the employment of blue collar workers decreases almost twice as strongly as the employment of white collar workers. These observations support the idea that in the case of a positive shock, firms hire blue collar workers rather than white collar workers. Production related workers leave "bad" firms and are hired by "good" firms. Non production-related workers are significantly less responsive to shocks, in particular good shocks. Of course, as already noticed, our hypothesis would be more precisely tested if we could observe gross flows of hirings and separations. In the absence of such data, we have to consider net hirings as a proxy for gross hirings.

[Table 1 about here]

To be sure, the higher responsiveness of production related workers to output variation is not a surprising result *per se*. It is a common observation of the literature on labour market. It is usually due to the fact that production related workers are a more easily "divisible" resource, whereas accountants, clerks etc. perform tasks that are much less dependent on the level of activity of the firm, hence their lower elasticity to output. However, in the case of Russia, such an explanation would be hard to combine with the empirical evidence presented in section 2.1, which shows that labour layoffs are extremely rare and separations are essentially voluntary.

## 4.2 Wages and productivity gains

It could be argued that the observed lower mobility of white collar workers is due to their higher dynamic adjustment costs - a frequent motive of labour hoarding. White collar workers could be associated with higher turnover costs because their capital is more firm specific, whereas production related workers are more easily substitutable. This would give the former greater bargaining power inside the firm. Hence, white collar workers should be able to use this power in order to capture a larger share of firm productivity gains.

Empirically, one should thus observe that the wages of white collar workers are more sensitive to firm productivity shocks than those of blue collar workers. In order to confront this view with our dataset, we estimate a wage equation, distinguishing between blue and white collar workers. We regress the variation of wages on labour productivity growth, controlling for regional and industry specific wage increases. As shown in Table 2, the wages of blue

collar workers are significantly more sensitive to productivity shocks than those of white collar workers. These results thus suggest that the position of white collar workers inside the firm is not stronger than that of blue collar workers. As we will see in the next section, this result is supported by the observation of the allocation of wage arrears.

[Table 2 about here]

## 5 An interpretation of wage arrears

In the framework of our model, it is possible to interpret pervasive wage arrears as an element of the contract between firms and employees. Russian firms are indeed constrained by two types of institutional limits. The first one is the difficulty to fire workers. The second is the influence of the official wage schedule (*razriad*). In the public sector, individual wages are based on the official minimum wage multiplied by a coefficient reflecting the formal qualification of the employee. In the private sector, wage setting is in principle free from this constraint. In fact, it is highly influenced by the wage schedule prevailing in the public sector (Denisova et al., 1998). This implies that it is difficult for a firm to pay openly different nominal wages to formally identical employees. In such a context, firms may use wage arrears as a device to differentiate the real wages effectively paid to their employees ( i.e. in terms of the model, to differentiate contractual wages from market competitive wages).

Low productivity workers tend to receive low wages and are discriminated compared to productive workers<sup>22</sup>. A low level of effectively paid wage, set in the framework of an implicit contract, can result in systematic and recurrent wage arrears being directed towards the low productivity workers. Wage arrears can thus be viewed as part of an implicit contract between employees and the firm. In this view, wage arrears are fully anticipated. We believe indeed that it is not realistic that wage arrears come as a surprise to employees when they systematically touch the same individuals, period after period.

According to our interpretation, wage arrears are more than a simple re-

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<sup>22</sup>It is simple to see that at the threshold level, the initial contractual wage is inferior to the competitive market wage ( $w^* < \omega^* a^*$ ) because of the shifting cost.

flection of firms' financial situation <sup>23</sup>. They are not an *ex post* adjustment of wages to an observed performance ; on the contrary, they are partly determined *ex ante* by the firm together with the nominal wage proposed in the contract. Under this view, the term  $\omega^* \tilde{L}_1^* - wl_1$  can be interpreted by an outside observer as the total wage arrears in a given firm. It reflects the difference between the total wage bill  $\omega^* \tilde{L}_1^*$  which would have to be paid on the spot market for the  $l_1$  "unproductive" workers inside the firm and the actual wage bill  $wl_1$  paid to these workers. Under this interpretation, wage arrears should be higher in firms where low-productivity workers are more numerous since these workers are the main recipients of arrears.

Are the enterprise data consistent with this interpretation? To look at this issue, we use a sub-sample of the Goskomstat Registry for which we have balance sheets of the enterprises, including information on cumulated wage arrears ("overdue wage payments") for 6370 enterprises in 1996, 2928 firms in 1997 and 2569 firms in 1998. (The descriptive statistics of the sample are presented in Table A2 in the Appendix). As far as we know, wage arrears have not been analysed until now using such a large firm level data base. In order to use fully this cross section information we pool together the observations of the various years and constitute an unbalanced panel. We regress the ratio of wage arrears to the wage fund on the share of white collar workers in total firms' employment controlling for firms' profitability, size, year of observation and regional unemployment. The results are presented in Table 3.

[Table 3 about here]

Table 3 shows that wage arrears depend not only on firms' performance measured by profitability (defined as the ratio of profits to output), but also on the weight of white collar workers in total employment: they are significantly higher in firms who employ more white collar workers. This is consistent with our view that wage arrears are predominantly addressed to the less productive employees, proxied by white collar workers.

The positive and significant coefficient of regional unemployment shows that the labour contract is influenced by the local labour market conditions:

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<sup>23</sup>Alfandari and Schaffer (1996) find that wage arrears are not correlated with firms' performance. They interpret wage arrears as a device used by managers to extract subsidies from the government. On the other hand, Earle and Sabirianova (1998) consider that wage arrears reflect firms' bad performance ( firms survive by accumulating payments arrears instead of going bankrupt).



the employees accept lower wages (of which wage arrears are an integral part) if the prospects outside the firm are bad. It should be noted that large firms have more wage arrears than small and medium ones (column 1). This can be explained by the fact that large firms have more social assets (section 2.1) hence more white collar workers ready to accept the contract.

Another way of interpreting wage arrears in relation with the model, is to suppose an implicit contract which stipulates that in case of difficulties, wage arrears will be imposed on low productivity workers. Empirically, this implies that wage arrears imposed on white collar workers increase more when the firm's performance is low. In order to check this proposition, we re-run the regression after dividing the sample in two groups: firms with increasing/decreasing employment. (Recall that according to the model, a positive (resp. negative) shock triggers a rise (resp. a fall) in employment). It turns out that indeed, wage arrears increase more with the share of white collar workers when firms are affected by an adverse shock. It is noticeable that for the sub-sample of firms with increasing employment, the size variables are not significant anymore; this is consistent with the fact that the relation between wage arrears and the weight of white collar workers is much stronger in firms with an adverse shock (decreasing employment).

The fact that wage arrears increase with the number of white collar workers could again be interpreted, alternatively, as the sign that white collar workers are a dominant group inside the firm and collude in order to impose wage arrears over blue collar workers: in this respect, the more numerous they are, the more powerful they are. However, this interpretation is (again) inconsistent with the results of section 4.2 that white collar workers do not seem to have insider power, as shown by the lower sensibility of their wages to productivity gains.

## 6 Conclusion

This study has shown that the Russian labour market is increasingly divided into a stagnant pool of less productive people, and a dynamic segment of mobile, more productive workers employed in firms with relatively good performance. More productive workers contract on the competitive segment of the labour market, whereas less productive workers engage in contractual relationships with firms, that are similar to risk insurance contracts whereby employees exchange security against reduced real wages.

The implications of this segmentation phenomenon in terms of restructuring are ambiguous. On the one hand, it reflects some adjustment of the industrial sector, namely dynamic employment policy of some firms and efficient reallocation of the most productive workers. On the other hand, if restructuring means reducing overmanning, then the process is far from being completed in Russia. There is a risk that this stagnant segment exerts an eviction effect on the dynamic sector, in particular if it receives subsidies from the local (or State) government in order to perform this role of social protection. The presence of social assets in former State firms also increases the entry cost of *de novo* firms. De facto, many newly created private firms do propose social services to their employees (Estrin et al., 1995). This constraint certainly slows down the development of the new private sector.

This peculiar segmentation of the labour market is due to the weakness of the institutional environment. The segmentation of the Russian labour market is above all linked to the high level of uncertainty that surrounds the perspectives of workers and firms. In terms of the model presented in section 3, the real Russian specificity, compared to other transition countries, or to market economies, is the uncertainty associated with the shifting cost  $\sigma$ . We believe that uncertainty is more important in Russia because of the weaker enforcement of the law and weaker credibility of the regime change. Firms' budget constraint is not as hard in Russia as in Central European countries. This is reflected by the uninterrupted government subsidies and, above all, by the generalised payments arrears that characterise the Russian economy (inter-enterprise arrears, bank arrears, tax arrears and wage arrears, see Perotti, 1998, Earle and Sabirianova, 1998, Ivanova and Wyplosz, 1998). The weakness of the State and of the rule of law and the slow pace of institution building in Russia shorten the time horizon of agents and weaken the quality of their expectations.

The reduction of uncertainty thus constitutes a key condition for overcoming the segmentation of the labour market. This implies the creation of a social protection system independent of the firms, and providing reliable services in terms of quantity and quality. Alleviating the irreversibility and uncertainty attached to employees' decisions would help unlocking the situation. The risk attached to separations would be reduced if, as in China (Fan et al., 1998), employees of the state sector who find new jobs in the private sector could come back to their initial job during a certain period.

Training and qualification programs can also improve the opportunities of employees on the labour market, and facilitate separations. Let us recall

that the blue collar workers currently seem to enjoy better job opportunities than white collar workers. This is due to the peculiar skills of white collar workers who are better suited to the old system of bureaucratic coordination than to the new market environment, as well as to resilient technical complementarities between the installed physical capital and qualified workers. This situation might not be durable. It could indeed be reversed as soon as firms start replacing their old capital and investing in new technologies, and when white collar workers are adequately trained.

## References

Alfandari G. and Schaffer M.E., 1996, "Arrears in the Russian Enterprise Sector", CERT Discussion Paper n°96/8.

Aukutsionek S. and Kapeliushnikov R., 1996, "Labour Hoarding in Russian Industry", *The Russian Economic Barometer*, 5(2).

Bardhan P., 1984, *Land, Labor and Rural Poverty: Essays in Development Economics*, Oxford University Press

Blanchard O., 1997, *The Economics of Post-Communist Transition*, Oxford : Clarendon Press.

Blanchard O. et Aghion P. 1996, "On Insider Privatization", *European Economic Review*, 40, 759-766.

Blanchard O. and Kramer M., 1997, "Disorganization", *Quarterly Journal of Economics*, 62 (4).

Boycko M., Shleifer A. and Vishny R., 1995, *Privatizing Russia*, Cambridge Massachussets : MIT Press.

Brown D., 1998, "Infrequent Bankruptcy, Asymmetric Information, and Excess Labour in the Russian Economy", SITE Working Paper n° 135.

Brown A.N. and Brown D., 1997, "Firms and Industries in Transition: An Examination Using Economy-wide Panel Data on Industrial Firms in Russia", prepared for the Organizational Change in Transition Economies Workshop at The William Davidson Institute at the University of Michigan Business School.

Calvo G. and Coricelli F., 1993, "Output Collapse in Eastern Europe: The Role of Credit", *IMF Staff Papers*, 40, 35-52.

Clarke S., 1998, "New Forms of Labour Contract and Labour Flexibility in Russia", Center for Comparative Labour Studies, University of Warwick, Mimeo.

Commander S. and Schankerman M., 1997, "Enterprise Restructuring and Social Benefits", *E.B.R.D. Working Paper* n° 22.

Commander S., Lee U., Tolstopiatenko A., 1998 "Social Benefits and the Russian Industrial Firm" in Commander S., Fan Q., Schaffer M. (eds.), *Enterprise Restructuring and Economic Policy in Russia*, World Bank.

Denisova I., Friebel G. and Sadovnikova E., 1998 "Internal Labour Markets and Human Resources Policies : an Account from the Existing Surveys", RECEP

Desai P. and Idson T., 1998, "To Pay or not to Pay : Managerial Decision Making and Wage Withholding in Russia", Columbia University, Mimeo.

Doeringer P. and Piore M., 1971, *Internal Labour Markets and Manpower Analysis*, Lexington.

Earle J.S. and Sabirianova K., 1998, "Understanding Wage Arrears in Russia", RECEP Mimeo.

E.B.R.D., 1999, *Transition Report*.

Fan, G., Lunati M. and O'Connor D., 1998, "Labour Market Aspects of State Enterprise Reform in China", OECD Development Center Technical Papers n° 141.

Friebel G. and Guriev S., 1999, "Why Russian Workers Do Not Move: Attachment of Workers Through In-Kind Payments", mimeo, RECEP.

Frydman R., Pistor K. and Rapaczynski A., 1996, "Investing in Insider-Dominated Firms: a Study of Voucher Privatization Funds in Russia", in Frydman R., Gray Ch. and Rapaczynski A., (eds.), *Corporate Governance in Central Europe and Russia*, Budapest: CEU Press.

Gaddy C. and Ikes B.W., 1998, "To Restructure or not to Restructure: Informal Activities and Enterprise Behavior in Transition", Mimeo.

Garibaldi P. and Brixiova Z., 1998, "Labour Market Institutions and Unemployment Dynamics in Transition Economies", *IMF Staff Papers*, 45 (2), pp 269-308.

Gimpelson V. and Lippoldt D., 1997, "Labour Turnover in the Russian Economy", in *Labour Market Dynamics in the Russian Federation*, OECD Proceedings.

Goskomstat, 1998, *Statistical Yearbook*.

Harris J. and Todaro M., 1970, "Migration, Unemployment and Development: A Two Sector Analysis", *American Economic Review*, 60, 126-143.

Ivanova N. and Wyplosz C., 1998, "Arrears : the Tide that is Drowning Russia", paper presented at the conference "Economic and Social Reform in Russia : a European - Russian Dialogue", Moscou, RECEP, September.

Johnson S., Kaufmann D. and Shleifer A., 1997, "The Unofficial Economy in Transition", *Brookings Papers on Economic Activity*, 2. pp.159-239.

Kapeliushnikov R., 1997, "Job Turnover in a Transitional Economy : the Behaviour and Expectations of Russian Industrial Enterprises" in *Labour Market Dynamics in the Russian Federation*, OECD Proceedings.

Layard R. and Richter A., 1994, "Russian Unemployment", Paper presented at the IIASA conference, Luxemburg, June.

Lehmann H., Wadsworth J. and Acquisti A., 1997, "Crime and Punishment: Employment, Wages and Wage Arrears in the Russian Federation", mimeo, October.

Lippoldt D. and Grey A., 1997, "Labour Market Dynamics in the Russian Federation : an Introduction and Overview" in *Labour Market Dynamics in the Russian Federation*, OECD Proceedings.

Perotti E.C., 1998, "Inertial Credit and Opportunistic Arrears in Transition", *European Economic Review*, 42, 1703-1725.

Roland G. and T. Verdier, 1999, "Transition and the Output Fall", *Economics of Transition*, 7 (1).

*Russian Economic Trends*, 1998 (1).