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Irena Grosfeld, Claudia Senik-Leygonie, Thierry Verdier, DELTA
Stanislav Kolenikov, Elena Paltseva, RECEP

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: http://www.cepr.org

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ABSTRACT

Dynamism and Inertia on the Russian Labour Market: A Model of Segmentation*

This Paper proposes an explanation of the puzzling coexistence of elements of inertia and dynamism on the Russian labour market using a segmentation model. Risk-averse workers are differentiated according to their productivity. They face a trade-off between wages and access to social services provided by the firm. The most productive workers leave their initial firm, contract on the spot labour market and concentrate in the best performing firms. The model provides a possible interpretation of wage arrears which can be viewed as an element of an implicit contract between firms and less productive workers. We test some of the predictions of the model using a panel dataset containing 13,410 firms, for 1993–1997.

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Irena Grosfeld
DELTA, ENS
48 Boulevard Jourdan
75014 Paris
France
Tel: (00 33 1) 4313 6328
Fax: (00 33 1) 4313 6310
Email: grosfeld@delta.ens.fr

Thierry Verdier
DELTA, ENS
48 Boulevard Jourdan
75014 Paris
France
Tel: (00 33 1) 4313 6308
Fax: (00 33 1) 4313 6310
Email: verdier@delta.ens.fr

Claudia Senik-Leygonie
DELTA, ENS
48 Boulevard Jourdan
75014 Paris
France
Tel: (00 33 1) 4313 6312
Fax: (00 33 1) 4313 6310
Email: senik@delta.ens.fr

Stanislav Kolenikov
RECEP
Potapovsky Pereulok 5
Building 4
101000 Moscow
Tel: (00 7503) 232 3613
Fax: (00 7503) 232 3739
Email: skolenik@recep.glasnet.ru

Elena Paltseva
RECEP
Potapovsky Pereulok 5
Building 4
101000 Moscow
Tel: (00 7503) 232 3613
Fax: (00 7503) 232 3739
Email: epaltseva@recep.glasnet.ru

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NON-TECHNICAL SUMMARY

This Paper proposes a model of the Russian labour market that captures elements of inertia and dynamism. From the rich empirical literature devoted to the Russian labour market, four major 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.

To our knowledge, there is no theoretical explanation of this contrasted picture. We propose a model of segmentation based on uncertainty and 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 chose 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. It is 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 about the productivity of employees. The choices of the workers give 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. In the meantime, however, less productive workers remain in both types of firms.

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 exist jointly 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. The duality that we put in evidence differs from traditional segmentation models (Doeringer and Piore, 1971) which oppose 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.

According to the vision supported by the model, one should observe the following signs of the segmentation process in the former state sector: (i) the employment of the most productive workers should be more sensitive to shocks than the employment of the less productive workers. In other words, the adjustment variable of firms is the employment of high-productivity workers. (ii) In certain cases, wages of low productivity workers should be less sensitive to local labour market conditions than wages of high productivity workers. (iii) One should observe more intra-firm wage dispersion in firms facing positive shocks than in firms facing negative shocks. The former will indeed have more productive workers paid at their marginal productivity while unproductive workers are paid a unique contractual wage.

In order to test some of the predictions of the model we use a panel of 13,410 firms extracted from the Russian enterprise Registry database. We use the variation in the volume of firms' output as a proxy for their idiosyncratic shocks: a firm whose production expands has certainly faced a favourable shock, whereas a firm whose production contracts has probably faced a negative productivity shock. We use the distinction white collar workers/blue collar workers as a proxy for low productivity/high productivity workers (this is in conformity with the stylized facts presented in the Paper, according to which blue collar workers are the most demanded employees, while white collar workers are the less adapted to the new market environment). To be sure, such a distinction does not encompass all characteristics of the employees in terms of their mobility and external opportunities.

As expected, the results show that firms are reacting to their shocks by adjusting the number of blue collar workers rather than the number of white collar workers. Also, the results show that local labour market conditions have significantly more influence on the wages of blue collar workers than on the wages of white collar workers.

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 State subsidies in order to perform his 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. 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 construction. It 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 the Paper, the real Russian specificity, compared to other transition countries, or to market economies, is the uncertainty associated with the cost of leaving the firm. Uncertainty is more important in Russia because of the weaker institutions and the more fluctuating macroeconomic policy. 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 of the ‘normalization’ of the situation and of the separation of low productivity employees from their firm.

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 1997 (EBRD, 1998)[1].

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 [2]. 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[3]. Finally, Friebel and Guriev (1999) argue in a recent paper 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

[1]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.

[2]For the description of the Russian privatisation strategy see Boycko et al. (1995).

[3]Gaddy and Ikes (1998) suggest that managers' "relational capital" can be used as a substitute to restructuring.

reallocated with no delay in response to various shocks of the transition, it 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 and 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 give 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. In the meantime, however, less productive workers remain in both types of firms.

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 oppose 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[4] from which we extract a panel of 13 410 firms observed from 1993 to 1997. 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)[5], 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 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 un-

[4]The information is collected by the Russian Statistical Committee (Goskomstat) on a compulsory and regular basis.

[5]In the survey of enterprises realised by the authors the average level of labour hoarding acknowledged by the firms is 20%.

willing to allow large open unemployment[6], 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)[7]. 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 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

[6] The law allows local governements 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.

[7] The authors report that about 25% of housing, health and education services to the population were provided by firms.

(and accordingly their wages). For instance, they often impose compulsory, unpaid leaves to their employees. According to Gimpelson and Lippoldt (1997), unpaid leaves had 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[8] survey. 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[9] reached 50 per 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

[8]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.

[9]The turnover rate is calculated as the ratio of hirings and separations over the total stock of employment in a given period.

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[10]. 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).

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, 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

[10]The turnover and replacement rates of blue collar workers are twice as high as those of white collar workers.

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 subperiods 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 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 $Q =$

$Min\{AK, l\}$ where A is a productivity parameter subject to an idiosyncratic shock and distributed in $[\underline{A}, \overline{A}]$ according to a cumulative $H(.)$, with $H(\underline{A}) = 0$ and $H(\overline{A}) = 1$.

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 $[0, \overline{a}]$ according to a cumulative $F(.)$ with $F(\overline{a}) = l_0$. (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[11].

We assume that there is a cost to workers, denoted by σ, of shifting from their initial firm to another firm. The shifting cost σ 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

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

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[12]. During the transition, workers lack information about the nature and the magnitude of these costs. We therefore consider that σ is a random variable distributed on $[0, \overline{\sigma}]$ according to a cumulative $G(.)$ with $G(\overline{\sigma}) = 1$.

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.[13]

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

[12] We assume, for simplicity, that when he quits, an employee looses 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).

[13] In reality, the wages of the workers who decide to remain in the firm are heterogenous. This reflects the legacy of the past and also the possibility for firms to discriminate according to characteristics that are already observable.

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 ω so that an individual with productivity a is paid a total wage of ωa.

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 ω^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 σ. 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:

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

$\phi(y) = y - I(y)$ is then the certainty equivalent income which makes the worker indifferent between going to the competitive labour market and experiencing the risky adjustment cost σ 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 :

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

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

$$\widetilde{L}_1 = \widetilde{L}_1(w, \omega^e) = \int_0^{Min\{a^*, \overline{a}\}} adF(a) = Min\left\{\Phi(a^*(w, \omega^e)), l_0 E(a)\right\}$$

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

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 $Q = Min\{AK, l\}$, only those firms with a labour requirement AK larger than $\widetilde{L}_1$ will want to hire additional labour on the spot market. The *ex post* profit $\Pi(A, \omega^e, \widetilde{L}_1)$ of a given firm thus depends on

the realization of the shock A in the following way[14]

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

Low productivity firms (i.e. with $A < \frac{\widetilde{L}_1}{K}$) are content with their pool of stable workers l_1. On the contrary, high productivity firms (i.e. with $A \geq \frac{\widetilde{L}_1}{K}$) have to hire at the anticipated market wage ω^e, the additional units of labour $(AK - \widetilde{L}_1)$ 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 ω^e of the equilibrium wage on the spot labour market as:

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

with the conditions[15]

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

This expected profit can be rewritten as:

$$\begin{aligned}E\Pi(w,\omega^e) &= \int_{\underline{A}}^{\overline{A}} AK(1-\omega^e)dH(A) + \int_{\underline{A}}^{\frac{\widetilde{L}_1}{K}} \omega^e[AK - \widetilde{L}_1]dH(A) \\ &\quad + (\omega^e - w)\,\widetilde{L}_1 + w\left(\widetilde{L}_1 - l_1\right)\end{aligned}$$

[14] The output good is also the numeraire consumption good and its price is fixed to 1.

[15] When writting the expression of the expected profit $E\Pi(w,\omega^e)$, we implicitely take into account the fact that $\frac{\widetilde{L}_1}{K}$ takes a value between $\underline{A}$ and $\overline{A}$. Obviously, it is never in the interest of a firm to have $\frac{\widetilde{L}_1}{K} > \overline{A}$ since this would mean that the firm hires useless units of labour even under the best productivity shock $\overline{A}$. It could be the case however that $\frac{\widetilde{L}_1}{K} < \underline{A}$. 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 $Min\left\{\frac{\widetilde{L}_1}{K}, \underline{A}\right\}$ For notational simplicity, we focus only on the most relevant case where $\frac{\widetilde{L}_1}{K}$ is larger than $\underline{A}$.

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 $\widetilde{L}_1$ 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 $(\omega^e - w)\,\widetilde{L}_1$ is positive and reflects the labour costs savings for the firm which has hired $\widetilde{L}_1$ units of labour at the contractual wage w rather than at the higher anticipated spot market wage ω^e. Finally the last term $w\left(\widetilde{L}_1 - l_1\right)$ 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:

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

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 ω^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 :

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

for a^* such that $\phi(\omega^e a^*) \geq 0$ and $\widetilde{L}_1 = \Phi(a^*)$[16]. Solving (1), we get an equilibrium threshold $a^* = a^*(\omega^e)$ and correspondingly a tying labour

[16]Note that this equation also holds for the case case where $\frac{\widetilde{L}_1}{K} < \underline{A}$ by simply having $H(\frac{\widetilde{L}_1}{K}) = 0$ in the expression.

contract wage $w = w(\omega^e) = Max\{\phi(\omega^e a^*(\omega^e), 0\}$.[17]

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 $\frac{\tilde{L}_1}{K}$):

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

with $E(A) = \int_{\underline{A}}^{\overline{A}} AdH(A)$ 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 :

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

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

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

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

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 $KE(A) < l_0 E(a) < K\overline{A}$, which we assume to be satisfied, it provides a unique solution $\tilde{L}_1^* \in \left]\underline{A}K, \overline{A}K\right[$.

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

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

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

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

[17] We assume that the second order conditions are satisfied.

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 $\overline{a} = l_0$. Also $H(A) = (A - \underline{A})/\Delta A$ with $\Delta A = \overline{A} - \underline{A}$ with the assumption:

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

In that case

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

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

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

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

and:

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

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:

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

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 ω^* then is established by the following equations:

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

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

This extreme example shows that in some cases, the firm cannot push out as many workers as it wishes. It will thus propose 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 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 σ.

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

This model generates a number of predictions about the structure of the labour market in Russia. First, it predicts an *ex post* segmentation pattern for workers and firms. In bad firms (firms which have a productivity shock A smaller than $A^* = \frac{\tilde{L}_1^*}{K}$), there is a unique set of workers who remain in their initial firms, accept a labour contract and are paid w^* (which can be equal to 0) and enjoy the social asset at no cost. In good firms (firms which have a productivity shock A higher than $A^* = \frac{\tilde{L}_1^*}{K}$) , there are 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 $a \geq a^*$) who are paid according to their market productivity a higher wage $\omega^* a$ on the spot labour market[18].

[18] *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

According to the vision supported by the model, one should observe the following signs of the segmentation process in the former state sector : (i) The employment of the most productive workers should be more sensitive to shocks than the employment of the less productive. In other words, the adjustment variable of firms is the employment of high-productivity workers. (ii) In certain cases, in particular in the simple example developed in section 3.4, wages of low productivity workers should be less sensitive to local labour market conditions than wages of high productivity workers. (iii) One should observe more intra-firm wage dispersion in firms facing positive shocks than in firms facing negative shocks. The former will indeed have more high productivity workers paid at their marginal productivity while low productivity workers are paid a unique contractual wage. In the following section, we try to check whether a large sample of Russian industrial firms confirms the first two predictions. The last prediction cannot be directly verified using our database.

4 Empirical analysis

In order to test the predictions of the model, one would ideally like to use a sample combining information on individuals (labour supply side) and firms (demand side)[19]. In spite of some attempts to match these two types of information (Earl and Sabirianova, 1998), no such data set is available. We use

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 $\overline{a}$. 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.

[19]Empirical studies of the Russian labour market usually hinge on the households surveys such as the RLMS (Russian Longitudinal Monitoring Survey) which is a periodic, nationally conducted households survey, launched in 1992, embracing a sample of about 9000 individuals from randomly selected households. 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 (ese Gimpelson and Lippoldt, 1997), the declarations do not include any economic information about the firms. More fragmented

the Russian enterprise Registry data base, collected by the Russian Statistical Committee (Goskomstat) on a compulsory and regular basis, in order to study jointly firms' economic performance and labour dynamics, even if it is clear that this source is far from satisfactory. >From this data set, we have extracted a panel of 13 410 firms observed between 1993 and 1997. Among other indicators, the panel contains information about the value of output, number of employees, wage fund, type of property, region and product codes of each firm[20]. 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[21]. 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. This information allows for a limited and indirect verification of the model, as it does not distinguish workers according to their individual productivity, and does not include gross flows of hirings and separations.

We use the variation in the volume of firms' output as a proxy for their idiosyncratic shocks : a firm whose production expands has certainly faced a favourable shock, whereas a firm whose production contracts has probably faced a negative productivity 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 collars" (production related) and "white collars" (non production related) in each

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.

[20] For the description of the registry data base see Brown and Brown (1997).

[21] We also dropped firms belonging to the Ministry of Internal Affairs and to Ministries of Culture, Health, Environment and Education.

firm. In conformity with the stylized facts presented in section 2.2, we assume that blue collar workers are the most demanded employees, while white collar workers are the less adapted to the new market environment. 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, we can take it as an acceptable approximation of the differences between employees in terms of mobility and external opportunities.

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 collars 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 collars that are trained to use it, which creates the excess demand for qualified workers.

In the following regressions, we try to find tracks of the segmentation of the market between blue collars and white collars, assuming that the former are the high productivity group and the latter the least productive.

4.1 Employment and shocks

Table 1 compares the sensitivity of the employment of white collar versus blue collar workers, to shocks. In order to control for sectoral and regional specificities, we include as explanatory variables, the average growth rate of employment in the firm's industry and region[22].

As expected, 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 when regressions are estimated by OLS or fixed effects and when we separate the sample between firms with increasing and decreasing output.

[Table 1 about here]

[22]The average growth rates are calculated on the basis of our sample, without the restrictions imposed for the construction of the panel.

These results suggest that firms are indeed adjusting to their shocks by variating the number of blue collars rather than white collars. Ideally, one would like to find that the variation in the number of low productivity workers is independent from the shocks of the firm (i.e. a non significant parameter). The imperfection of the categories (white/blue collar workers) used to account for the productivity or adaptation of workers is probably responsible for the significance of the coefficient.

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. The reason is usually 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, this cannot be taken as the explanation since, as noticed in section 2.1, labour layoffs are extremely rare and separations are essentially voluntary.

4.2 Wages and the local labour market

In certain cases, in particular in the example of section 3.2, we expect the wages of blue collar workers to be more sensitive to the local labour market conditions than the wages of white collar workers. Table 2 presents the test of this prediction. The real wage growth of blue collar workers and white collar workers are regressed on the respective average real wage growth in the region and in the industry. The results show that local labour market conditions have significantly more influence on the wages of blue collar workers than on the wages of white collar workers. In particular, the coefficient of regional wage growth is twice as strong for blue collar workers as for white collar workers.

This is in line with the logic of the model whereby blue collar workers are more sensitive to external opportunities (their wage follows more closely the local market alternative wage) and less dependent on the social assets provided by their initial firm. In the model, they are less frequently willing to accept the initial contract offered by the firm.

[Table 2 about here]

5 An interpretation of wage arrears

In the framework of our model, pervasive wage arrears can be interpreted 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 reflects 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 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. We suggest that firms use wage arrears as a device to differentiate the real wages effectively paid to their employees, i.e. to differentiate contractual wages from market competitive wages.

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. Many low productivity workers therefore tend to receive low wages and are discriminated compared to productive workers. 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 independent of the financial situation of the firms [23]. They are not an *ex post* adjustment of wages to an observed performance ; on the contrary, they are 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

[23] 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).

total wage bill $\omega^* \widetilde{L}_1^*$ 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. From equations (3), (4) and (5), it is easy to see that, as ω^* and a^* do not depend on the *ex post* realised productivity value A of a typical firm, this term $\omega^* \widetilde{L}_1^* - wl_1$ is also independent from the realization of A. Hence, under this interpretation, wage arrears should not depend on the idiosyncratic realisation of firms' productivity shocks. Wage arrears should however be higher in firms where low-productivity workers are more numerous since these workers are the main destination of arrears.

Are the enterprise data consistent with this interpretation? In a subsample of the Goskomstat Registry that includes balance sheets of the enterprises, we have information on cumulated wage arrears ("overdue wage payments") for 6722 enterprises in 1996 and 3109 enterprises in 1997. (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 present separate regressions for 1996 and 1997. The results are presented in Table 3.

[Table 3 about here]

Table 3 shows that wage arrears are independent from firms' performance measured by profitability (defined as the ratio of profits to output). This also confirms that wage arrears are significantly higher in firms who employ more white collar workers[24]. This is consistent with our view that wage arrears are predominantly addressed to the less productive employees, proxied by white collar workers.

The fact that the coefficient of regional unemployment is positive and significant is consistent with the assumption that the labour contract is influenced by the local labour market conditions: 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. 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.

[24] We obtained similar results when the endogenous variable was defined as wage arrears per employee instead of the share of wage arrears in the firm's wage fund.

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 the access to social services 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 State subsidies 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 construction. 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 σ. We believe that uncertainty is more important in Russia because of the weaker institutions and the more fluctuating macroeconomic policy. Firms' budget constraint is not as hard in Russia as in Central European countries. This is attested by the continuation of 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 of the "nor-

malization" of the situation, and of the separation of unproductive employees from their firm. This means that a social protection system independent of the firms, and providing reliable services in terms of quantity and quality should be created. In order to deal with the risk aversion of employees, it is also possible to try to reduce the irreversibility of the separations. In China, for instance (Fan et al., 1998), a recent decree allows employees of the state sector who find new jobs in the private sector, to come back to their initial job if they wish, during a period of two years. Any policy of this type, that alleviates the irreversibility and uncertainty attached to employees' decisions would certainly help unlocking the situation.

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 could be misleading if it were interpreted as 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.

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Table 1 : Employment of blue collar/white collar workers and the output shock, 1993-1997

	Change in the nunmber of blue collar workers	Change in the number of white collar workers	Change in the number of blue collar workers	Change in the number of white collar workers
	OLS		fixed effects	
Output growth	0.119 /0.001/	0.085 /0.002/	0.088 /0.002/	0.064 /0.003/
Intercept	0.029 /0.002/	0.165 /0.006/	0.169 /0.009/	0.435 /0.014/
N	53526	53526	53526	53526
R^2	0.186	0.177	0.115	0.189

Notes : Standard errors in parentheses. Estimations include average employment growth in the region and in the (two digit) industry, time and size dummies (3 size levels were used, with two thresholds at 200 and 1000 employees). In testing the null hypothesis that the coefficients of the output growth in the regressions for the change of the number of blue collar workers and white collar workers are equal, the value of the F-statistics is 214.72.

Table 2 : Wages of blue collar workers and white collar workers and the local labour market, 1993-1997

	Blue collar workers' wage growth	White collar workers' wage growth	Blue collar workers' wage growth	White collar workers' wage growth
	OLS		fixed effects	
Average real wage growth in the industry	0.724 /0.009/	0.698 /0.011/	0.686 /0.012/	0.645 /0.014/
Average real wage growth in the region	0.529 /0.018/	0.350 /0.022/	0.515 /0.020/	0.304 /0.025/
Intercept	0.002 /0.006/	0.021 /0.007/	-0.106 /0.018/	-0.184 /0.022/
N	53504	53504	53504	53504
R^2	0.288	0.174	0.302	0.174

Notes : Standard errors in parentheses. Estimations include size and time dummies. In testing the null hypothesis that the coefficients of wage in the industry is the same for blue collar workers and for white collar workers, the value of the F-statistics is 5.04. In testing the null hypothesis that the coefficients of wage in the region is the same for blue collar workers and for white collar workers, the value of the F-statistics is 63.03

Table 3 : The determinants of wage arrears (ratio wage arrears/wage fund)

	1996	1997
Profitability	-0.000 /0.000/	0.000 /0.000/
Share of white collar workers in total employment	0.091 /0.025/	0.93 /0.060/
Small	-0.045 /0.007/	-0.062 /0.017/
Medium	-0.036 /0.005/	-0.034 /0.010/
Regional unemployment	0.232 /0.085/	0.834 /0.189/
Intercept	0.052 /0.030/	-0.056 /0.070/
N	6722	3109
R^2	0.126	0.098

Notes : Standard errors in parentheses. Industry and regional dummies included. Profitability is defined as ratio profit/output.

ANNEXE

Table A1: Panel 1993-1997, 13410 observations.

Mean values (standard deviations)

	1993	1994	1995	1996	1997
growth rate of employment	-	-0.104 (0.181)	-0.090 (0.183)	-0.071 (0.196)	-0.135 (0.247)
growth rate of employment of productive workers	-	-0.112 (0.201)	-0.097 (0.205)	-0.104 (0.210)	-0.131 (0.279)
growth rate of employment of unproductive workers	-	-0.070 (0.191)	-0.069 (0.205)	0.032 (0.329)	-0.173 (0.439)
growth rate of real output	-	-0.610 (0.624)	-0.332 (0.540)	-0.355 (0.553)	-0.238 (0.681)
growth rate of real wage	-	-0.346 (0.515)	-0.435 (0.327)	-0.034 (0.329)	0.046 (0.301)
growth rate of real wage for productive workers	-	-0.355 (0.540)	-0.461 (0.367)	-0.034 (0.386)	0.036 (0.409)
growth rate of real wage for unproductive workers	-	-0.315 (0.560)	-0.404 (0.411)	-0.080 (0.490)	0.041 (0.566)
number of firms with increasing real output		1171	2688	2531	4517
number of firms with increasing employment		2829	3422	3834	2628
number of firms with positive profit	12470	10814	10211	6808	5081

Notes: Growth rates are defined as first differences of logarithms. Nominal output are deflated by monthly industry-specific (five-digits) producer price index.

Table A2: Sample with wage arrears.

Mean values (standard deviations)

	1996	1997
number of observations	6722	3109
growth rate of employment	-0.017 (0.184)	-0.109 (0.236)
growth rate of employment of productive workers	-0.052 (0.179)	-0.097 (0.255)
growth rate of employment of unproductive workers	0.095 (0.358)	-0.160 (0.383)
growth rate of real output	-0.258 (0.462)	-0.125 (0.575)
growth rate of real wage	0.008 (0.316)	0.078 (0.255)
growth rate of real wage for productive workers	0.022 (0.400)	0.057 (0.367)
growth rate of real wage for unproductive workers	-0.047 (0.494)	0.106 (0.482)
ratio of accumulated wage arrears to wage fund	0.155 (0.168)	0.202 (0.264)
number of firms with increasing output	1438	1283
number of firms with increasing employment	2687	706
number of firms with positive profit	4980	1594

Notes: Growth rates are defined as first differences of logarithms. Nominal output are deflated by monthly industry-specific (five-digit) producer price index.