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*Enterprise Restructuring in Russia's
Transition Economy: Formal and Informal
Mechanisms*

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Abstract

This paper examines the nature and scope of enterprise restructuring in Russia using two sources of firm-level data. The first involves a panel of over 2,000 civilian manufacturing firms in Moscow, Tver, Volgograd, Rostov, and Novosibirsk. The second involves data collected from a series of in-depth interviews conducted between 1994 and 1997 with top-level managers in 47 firms located in Moscow, Tver, Nizhny Novgorod, and Novosibirsk. The objective of the paper is threefold. First, we summarize the existing literature on enterprise restructuring, and evaluate the pros and cons of a number of restructuring measures that have been used in studies of privatized firms in Russia and other transition economies. Second, we apply two measures of enterprise restructuring to our data to investigate the extent of variation by industry, ownership structure, and location. Third, we examine in detail the question of whether barter enhances or impedes enterprise restructuring in Russia.

Key Words: transition, enterprise restructuring, barter, Russia

JEL Classification: L2, P42, D21, G32

Enterprise Restructuring in Russia's Transition Economy: Formal and Informal Mechanisms

For Russia's transition from plan to market to succeed, the majority of former state-owned enterprises must restructure their production and financial operations, and adjust the size and composition of their workforce correspondingly.¹ While enterprise restructuring as a key to successful transition is not debated, designing a set of policies that best facilitate enterprise restructuring in Russia, given the economic and political uncertainty, is problematic. Not knowing at the beginning of the transition process which firms are potentially viable, Russian policy makers in 1992 faced two types of errors (Ericson 1996): adopting policies that would permit the continued survival of unviable firms (type I errors); adopting policies that would terminate potentially viable firms (type II errors). Further, no guidelines existed to assist Russian policy makers in determining which type of error would be most costly to the overall transition process.

Constructing measures to gauge the progress of enterprise restructuring in Russia is equally problematic. Data limitations, as well as the institutional and infrastructure changes required by the transition process itself, preclude a variety of traditional measures. Moreover, debate arises over what constitutes enterprise restructuring. For example, Hendley *et al.* (1997) argue that the increasing use of barter transactions among firms in Russia between 1992 and 1996 may signal that privatized enterprises are attempting to sustain socialist production patterns.² If this is true, barter would not be interpreted as a restructuring mechanism, but rather as a bankruptcy delaying tactic for firms without access to cash. Implicitly, barter is seen as fostering a significant number of type I errors. If, however, firms use barter transactions to sustain operations in a cash-constrained world imposed by previous lack of payments at the firm-level and growing monetary restraint at the economy-wide level, the incidence of barter cannot be

¹ For discussion of enterprise restructuring requirements in transition economies, see, for example, Brada (1996), Brada *et al.* (1994), Brada *et al.* (1996), and Frydman *et al.* (1996a, 1996b). For discussion focusing on Russia, see Blasi *et al.* (1997), Dobrinsky (1996), Dolgopyatova *et al.* (1994), Dolgopyatova (1995), Earle *et al.* (1995), Earle and Estrin (1997), Krueger (1995), Linz (1994, 1998), and Linz and Krueger (1996).

² Goskomstat figures reported in the latest OECD survey of Russia (OECD 1997, pp. 114 and 116) indicate that barter as a share of total industrial sales rose from 18% in 1994 to 40% in 1996, and continued to rise in the first half of 1997 (to 45% by April 1997, for example).

interpreted simply as the absence of restructuring. Firms may be producing exactly what buyers want, but the buyers have no cash for payment. From this perspective, barter may perform an important function in Russia's transition — barter permits continued survival of potentially viable firms, and thus enables policy makers to avoid type II errors.

This paper examines the nature and scope of enterprise restructuring in Russia using two sources of firm-level data. The first involves a panel of over 2,000 civilian manufacturing firms in Moscow, Tver, Volgograd, Rostov, and Novosibirsk. The second involves data collected from a series of in-depth interviews conducted between 1994 and 1997 with top-level managers in 47 firms located in Moscow, Tver, Nizhny Novgorod, and Novosibirsk.³ The objective of the paper is threefold. First, we summarize the existing literature on enterprise restructuring, and evaluate the pros and cons of a number of restructuring measures that have been used in studies of privatized firms in Russia and other transition economies. Second, we apply two measures of enterprise restructuring to our data to investigate the extent of variation by industry, ownership structure, and location. Third, we examine in detail the question of whether barter enhances or impedes enterprise restructuring in Russia.

It is with regard to this third aspect that we rely heavily on the Berliner's (1952, 1956, 1957, 1976, 1988) contribution to understanding enterprise operations and performance. Berliner (1952) was the first to question whether the economic milieu was more important in the Soviet economy in shaping managerial behavior than the incentives which planners structured to motivate managers. Interestingly enough, despite the passage of nearly half a century and the volumes that have been written on the Soviet economy and Soviet enterprise operations, conditions are such in the Russian transition economy that, once again, we are talking at length with "individuals who managed the enterprises in that imperfectly understood system" (Berliner 1952, p. 343) in order to obtain a balanced picture of enterprise operations. That is, a portion of the analysis presented here utilizes in-depth interview results to address the role of barter, not only in day-to-day enterprise operations, but also in enterprise restructuring efforts. In the tradition established by Berliner, our focus here is: How important are overall economic conditions in determining the nature and scope of barter

³ In-depth interviews also were conducted with top-level managers of 55 privatized firms in the Rostov and Volgograd regions between 1994 and 1997. Consequently, these regions were included in the panel data set. However, because of differences in the questionnaire used, interviews results from the firms in Rostov and Volgograd are not included in any of the interview data regression analysis included in this paper.

transactions among Russian firms? The macroeconomic conditions we consider include: supply of loanable funds, tax rates, inter-enterprise debt, inflation, and the incidence of bankruptcy.

Unlike the transition economies of Central and Eastern Europe, Russia's underdeveloped institutional structure, inadequate infrastructure, and lack of commitment to macroeconomic stabilization in the early years of the transformation process put manufacturing firms at a disadvantage, both before and after privatization. Not until 1995, for example, was banking legislation adopted to separate the Central Bank from automatically financing the federal deficit. While inflationary pressures diminished after 1995 as a result of the legislation, commercial lending to the non-financial sector in Russia remained well below that of other transition economies. The most startling data on the "demonetization" of Russia's economy are found in Litwak (1997), who reports that credit to the non-financial sector fell from 20% of GDP in 1993 to 10% of GDP in 1996 — less than half the level found in Poland, Hungary, and Slovenia.⁴

Russian firms, whether they are actively engaged in restructuring or not, are further disadvantaged by corporate tax rates which continue to be set at confiscatory levels.⁵ Moreover, tax regulations frequently are impossible to decipher, often change, and are randomly or arbitrarily enforced (Wallich 1994).

Macroeconomic conditions are partly responsible for the increase in both the stock and flow of inter-enterprise arrears over time (Dallago and Mittone 1996). Growing enterprise arrears have contributed to widespread failure to make wage payments in a timely manner (Standing 1996, Daianu 1997, Lehmann *et al.* 1997).

Despite inflation rates declining from over 50% in 1995 to under 15% in 1997, failure to pay wages has restricted the growth of household savings in Russia (de Melo and Gelb 1996, Gregory and Stuart 1997). Restricted savings, in turn, reduces the supply of loanable funds and precludes the introduction of lower interest rates. On the bright side, perhaps, has been the failure in Russia to enforce the bankruptcy legislation (Clarke 1996, Williams and Wade 1996).

⁴ Litwak (1997) reports that in Poland and Bulgaria, for example, credit to the non-financial sector was 22% and 69% of GDP, respectively, in 1996. Privatized firms in Russia have been further hampered by the fact that commercial lending to manufacturers incorporated only a 3-month time frame, making it wholly inadequate for investment or renovation activities. Thus even a growth in commercial lending to privatized firms might not signal restructuring support.

⁵ More problematic is the fact that payment frequently is required in advance of sales revenues.

We rely on interviews with top-level managers to assess the relative contribution of these macroeconomic conditions in decisions by Russian enterprise managers to engage in barter transactions, as well as their assessments regarding the extent to which barter is used in enterprise restructuring efforts.

To evaluate the extent to which barter enhances or impedes enterprise restructuring in Russia, we also rely on a second element of Berliner's (1952) analysis which has proven essential to understanding Soviet enterprise operations: the distinction between *formal* activities, those governed by the plan, and *informal* activities, those governed by the goals of management — premia, the “quiet life,” for example — which took place outside the plan. We modify Berliner's framework since Russian firms no longer face plan directives. Thus it no longer makes sense to separate formal and informal activities on the basis of whether or not the activity is specified in the plan. We use as a distinguishing factor whether or not the activity requires participation in what Berliner (1952) termed a “web of mutual support.” In the Soviet economy, this “web” included enterprise, ministry, and political officials who worked together to ensure that plan targets were fulfilled, if only on paper. In the Russian economy, the “web of mutual support” appears to include representatives from enterprise and administrative units (local and federal government and other officials), as well as representatives from the banking and protective services⁶ communities.

In our analysis, formal activities do not involve a “web of mutual support.” Rather, formal activities are those that involve a market-like or contractually-based transaction; *quid pro quo*. In the simplest type of transaction, there is simultaneous exchange of the *quid* and the *quo*. A more complicated version involves transactions in which the *quid* and *quo* are separated in time. The latter are more difficult to effect because they generally require explicit third party enforcement.⁷ However, it is the latter transactions that typically are associated with capital market transactions and thus are essential for the creation of wealth and prosperity.

Informal activities involve participation in the “web of mutual support;” that is, informal activities require the explicit cooperation of numerous parties.⁸ What is unique about these informal arrangements is

⁶ Protective services is broadly defined to include both official and unofficial organizations.

⁷ For a more complete discussion, see Olson (1996) and McGuire and Olson (1996).

⁸ The distinction between formal and informal mechanisms often is unclear. If, to replace obsolete machinery, the manager relies on special connections with banking, tax, or local authorities, or special connections with the

that they lack an explicit enforcement mechanism.⁹ Rather, their success, in fact, their existence depends upon tacit cooperation between the parties involved. Interviews with top-level managers provide evidence to evaluate the extent to which a “web of mutual support” continues to shape day-to-day operations in Russian firms. Interview evidence also sheds light on the extent to which informal activities enhance restructuring efforts in privatized firms.

Our analysis of enterprise restructuring in Russian firms is divided into five parts. In section 1, we summarize and evaluate alternative measures of enterprise restructuring. In section 2, we propose two measures of enterprise restructuring — improvements in labor productivity between 1992 and 1995, and the payment of above-industry-average wages (measured in U.S. dollars) — and describe the two sources of data used in our analysis. For the labor productivity measure, we use firm-level data compiled from business directories published in 1992 and 1995. We construct a panel data set by matching firm-specific registration numbers in both years, and calculate the percentage change in labor productivity over this period.¹⁰ For the above-average wage measure, we use data collected between 1994 and 1997 from 47 privatized firms in Moscow, Tver, Nizhny Novgorod, and Novosibirsk.

Section 3 presents our results. We find that only one-in-five firms in our panel experienced labor productivity gains between 1992 and 1995; only 15% exhibited gains exceeding 25%. We use probit regression analysis to evaluate the extent to which industry, ownership structure, and location in Moscow explain whether or not a firm experienced labor productivity gains. Our results indicate that industry and ownership are important factors, but that location in Moscow has only a marginal effect. With regard to payment of above-industry-average wages, we find that industry has a significant explanatory power, as does location in Moscow and whether or not the firm was leased prior to privatization.

In section 4, we first evaluate the extent to which Berliner’s proposition — economic milieu governs managerial behavior — holds when explaining the role of barter in Russia’s transition economy. Our analysis of whether barter enhances or impedes enterprise restructuring is guided by a revised version of

firm supplying the replacement equipment, the formal mechanism takes on an informal dimension.

⁹For discussion of an alternative view of informal activities, see Clarke (1996).

¹⁰Strictly speaking, not all the firms in the panel are privatized firms. State-owned firms are not immune from the necessity of restructuring, however, and therefore are retained in our sample.

Berliner's formal-informal framework. We find that existing explanations for the growing incidence of barter activities — tax avoidance, maintain status quo — are plausible, but incomplete. An alternative explanation involves liquidity constraints and the prevalence of informal activities and networks.

Section 5 offers summary and concluding comments.

I. Enterprise Restructuring in Russia's Transition Economy

A common theme in the burgeoning literature on transition economies highlights the importance of enterprise restructuring in successfully completing the transformation from plan to market. In its most general specification, enterprise restructuring is described as “the process that enables a firm to operate successfully in a market economy” (Ernst *et al.* 1996, pp. 2-3).¹¹ This process may be initiated by the firm: “pro-active restructuring” (Krueger 1995). It may include activities that ultimately result in resources going to their highest valued use: “positive restructuring” (Jeffries 1996). Earle and Estrin (1996) describe “short-term restructuring” as reductions in the labor, energy and material intensity of production — without offsetting increases in capital intensity — to raise the overall efficiency of enterprise operations. To the extent that restructuring activities initiated by the firm take into account a long-term perspective, that is, are directed toward maximizing the long-run value of the firm, the process is termed “strategic restructuring” (Ernst *et al.* 1996); or “long-run restructuring” if firms undertake investment in new capital to improve production techniques or implement new R&D incentives (Earle and Estrin 1996).

Privatized firms “seeking to change as little as possible while retaining substantial insider control” (Ash and Hare, 1994, p. 633) are categorized as in a “defensive restructuring” mode.¹² The general consensus in the literature is that the duration of transition will be prolonged if firms pursue a “wait and see” strategy with regard to the continued availability of government subsidies — “passive restructuring” (Sutela 1994, Linz and Krueger 1996, Ernst *et al.* 1996), or if the manager exploits the firm's assets for short-term gain — “negative restructuring” (Ellman 1994, Jeffries 1996). In such instances, the overall cost imposed by the transition process will increase.

¹¹ The restructuring process would involve only those firms that were in operation in the former socialist centrally planned economy, regardless of their current ownership structure (state or non-state owned); it would not apply to newly-created private firms (*de novo* firms).

¹² See also Ernst *et al.* (1996) for a discussion of defensive restructuring.

The mechanics of restructuring incorporate a wide range of activities. Blasi *et al.* (1997) list nearly seventy “important numbers on restructuring” (Table 10, pp. 203-205). Perhaps more than anything else, Blasi *et al.* (1997) highlight the fact that the existing literature on enterprise restructuring in transition economies is in anything but agreement when it comes to identifying, much less quantifying, the changes required for former state-owned enterprises to survive in the post-transition economy.¹³ For example, in one of the earliest studies of Russian firms, Commander *et al.* (1993) focus on physical indicators: changes in output and employment, and on financial indicators: enterprise sales and profits, as a measure of the extent of enterprise restructuring. In one of the more recent studies, Earle and Estrin (1997), using data compiled by the World Bank, develop an index of restructuring that aggregates numerous dimensions into a single weighted variable. They use this index, as well as improvements in labor productivity, as a dependent variable to be explained by a variety of independent variables, including ownership structure and industry. An important contribution of their work is the explicit recognition of the endogeneity between restructuring and ownership structure in transition economies.

The Sequence of Enterprise Restructuring

One possible explanation for the lack of clear consensus about what constitutes enterprise restructuring in transition economies is that “restructuring” means different things at different points in the transition process. In the initial stage of transition, enterprise managers were concerned primarily with finding their market niche, and re-orienting their assortment and improving their product quality in order to meet the needs of customers within that niche. In some cases, this required relatively minor changes in

¹³ Examining the experience of 75 large Polish firms in 1991 and again in 1992, Pinto, Belka and Krajewski (1993) rely heavily, although not exclusively, on financial variables as indicators of restructuring. Their study differentiates firms according to levels of profit, with “AAA” firms having positive after-tax profits, “AA” firms having positive pre-tax profits, and “A” rated firms having negative gross (pre-tax) profits. They find that firms in the chemicals and food industries were more likely to be rated “AAA,” while firms in machine tools and steel were more likely to have negative gross profits -- an “A” rating. Bleka *et al.* (1994) surveyed 200 Polish firms in 1993. Their analysis utilizes physical changes in output and employment as the measure of restructuring, although they also provide information on after-tax profit margins and investment as a percentage of sales as additional indicators of restructuring. Estrin *et al.* (1995), in a comparative study of firms in Czechoslovakia, Poland and Hungary, emphasize profits per sales and export per sales as indicators of enterprise restructuring. Their study also utilizes less quantifiable measures of restructuring, such as whether or not the firm has adopted a short-run and/or long-run business plan.

production assortment.¹⁴ However, as inflation raged, links with former customers and suppliers were ripped apart. Discovering and developing one's niche was no easy task. A small number of firms found their original assortment appropriate to current demand conditions. Some firms elected to expand the production of goods that accounted for less than 10% of their pre-transition assortment. Others initiated a number of low-cost service and production activities quite unrelated to their main assortment. Managers successful in identifying their market niche during this first phase of restructuring were able to demand cash payment (and frequently prepayment) from customers. Access to cash (1) enabled these firms to adopt formal mechanisms for enterprise restructuring, (2) permitted more reliable wage payments, which in turn enabled these firms to retain their skilled labor, and (3) provided a source of investment funds.

Firms proceeding to the second phase of restructuring increasingly directed their efforts towards process improvement (efficiency gains) and cost reductions. Cost reductions took a number of forms. By 1995, managers' reluctance to eliminate redundant workers subsided, as did their desire to provide the full complement of social services offered during the Soviet regime (Lehmann *et al.* 1997, Linz 1998, Schaffer 1995, Standing 1996). Employment levels and the firm's wage bill in inflation-adjusted rubles fell correspondingly.¹⁵

Cost reductions were not limited to labor, however. As prices for energy, water and other raw materials — many of which were still subject to government control — moved closer to world market levels, managers sought to reduce or conserve energy use by reorganizing their production processes. In many instances this required firms to reconfigure their physical operations, but the net result appeared in lower per unit costs, driven in large part by lower materials handling costs. Tracking these gains required changes in both the managerial and accounting systems.

¹⁴ Changes in assortment are somewhat broadly defined in this analysis to include not only new or different products, but also improvements in quality of existing products that yield essentially new products. Firms initially positioned rather closely to their market niche included, among others, a dairy processing plant and a bakery, both of which developed several new products; a brewery that had a good reputation prior to privatization, a furniture company, a company that assembled hydraulic hoses, and a metallurgical plant that produced pipes for oil extraction. Examples of firms not so well-positioned abound, however. In our sample, these firms were located in the machine building and electronics industries, for example. Firms engaged in defense-related production are viewed as a separate category: their niche was well-defined, but their buyer, in effect, disappeared, leaving them with few legal options.

¹⁵ Moscow firms exhibited the most dramatic workforce downsizing. For discussion, see Linz and Krueger (1996) and Linz (1997).

Successful internal restructuring did not guarantee the firm's financial or market position. Arbitrary and generally corrupt governmental interference, especially by local officials, impeded day-to-day operations, as well as long-term strategic planning. In Russia, it was not unusual to hear of local officials frequently, and unilaterally, altering the terms of the firm's lease. Nor was it unusual to hear managers recount numerous delays or denials regarding permits for the construction of new facilities. Local authorities "sat" for months or years, leveraging their ownership position by demanding bribes and/or delaying payment for services rendered. Moreover, successful internal restructuring may be viewed to some extent as a miracle, given Russia's confiscatory and egregious tax policy. The bewildering array of loopholes contribute not only to the capricious behavior of government officials, but also to rather bizarre arrangements by Russian firms to simply meet their wage bill and other expenses in a timely manner. Most striking are the barter deals managers arrange to generate cash to pay wages and taxes, as well as the barter transactions necessary to acquire the requisite materials and energy. Firms not in close proximity to final consumers, or firms without routine access to cash, typically acquired trading debt (*vekseli*), and/or extended their participation in the informal sector.

Thus, depending upon the time frame under which we are observing privatized firms in transition economies, we are likely to see very different behavior directed towards restructuring. Comparisons across firms at different stages in the restructuring process, compounded by the relative mix of formal and informal restructuring mechanisms employed by the firm at any given time, may lead researchers and policy makers alike to draw inappropriate inferences about a firm's restructuring activities or potential for survival in the post-transition environment.

Evaluating Alternative Measures of Enterprise Restructuring

If enterprise restructuring is viewed from the most general perspective — "the process that enables a firm to operate successfully in a market economy" (Ernst *et al.* 1996, pp. 2-3), then undertaking the task of restructuring requires that privatized firms assess the extent to which their output mix deviates from that of a similar firm in a market economy. In addition, firms would be required to make a relative assessment of their stock of managerial and physical capital, as well as its flexibility, or asset specificity.¹⁶ Finally,

¹⁶ Williamson (1985) defines asset specificity as the inflexibility of a factor of production.

restructuring efforts cannot be undertaken independent of the realities of external pressures on the privatized firm — competition (foreign and domestic) and the threat of bankruptcy.

Formal restructuring mechanisms include a variety of physical and financial ingredients that must combine to enable privatized firms to operate successfully in a market economy. If, as is generally assumed, the privatized firm's output mix deviates significantly from that of a similar firm operating in a developed market economy, then the most recognizable manifestation of restructuring will be evident in assortment changes, including, but not limited to, changes in product quality.¹⁷ Indeed, this study considers restructuring to be most fundamentally a task of assortment alterations, and the associated changes in managerial and financial practices necessary to effect and sustain changes in the firm's physical production. Of course, assortment changes require countless modifications in the firm's internal operations, and are no doubt linked to the firm's ownership arrangements, or corporate governance structure, as well.

Given the complexity associated with the mechanics of restructuring, transforming any signal of restructuring into a continuous dependent variable is both conceptually and practically difficult. Simple calculations of the percentage change in output falls far short of providing any meaningful measure of restructuring. One need only look at the power or fuel industries as a case in point. The absence of output declines does not signal that these firms are able to compete effectively in a market economy. Nor is it the case that metallurgical firms experiencing a 50% production decline in their steel pipes are avoiding any "pro-active" restructuring activities.

The difficulty of identifying a single continuous dependent variable that captures the extent of enterprise restructuring rises exponentially when one is tasked with making a comparison of restructuring behavior among firms in different industries. For example, it was common and necessary for privatized firms in the food industry to add literally hundreds of products to their assortment, while for a machinery firm, the introduction of perhaps a single new product of sufficiently high quality and design could, in principle, constitute equally successful "pro-active" restructuring. Consequently, a dependent variable that simply counts the number of new products would fail to capture these industry differences.

Productivity improvements are assumed to be highly correlated to restructuring efforts. While

¹⁷ See Ericson (1996) for a concise exposition of this view.

capital productivity measures are plagued by centrally-determined price adjustments for capital and market-determined price adjustments for output, and labor productivity measures are distorted by firm's over-stating their true employment figures, the latter frequently has been used as a measure of enterprise restructuring (Basu *et al.* 1997, Earle and Estrin 1997, Earle 1997, Kajzer 1995, Lizal and Svejnar 1997). To date, these studies have not clearly specified whether the restructuring was "pro-active," that is, managers were downsizing by choice, or "passive," workforce downsizing was simply the outcome of employees electing to leave the firm for better opportunities elsewhere. In the realm of physical measures of restructuring,¹⁸ however, improvements in labor productivity appear to be the least problematic.

Financial measures of performance offer a second means of capturing the extent of enterprise restructuring because they permit comparisons across privatized firms in disparate industries. Profitability, or some similar measure of financial viability, is an obvious candidate. Unfortunately, access to a firm's financial balance sheet is rare. Managers are reluctant or refuse to show their profit records to outsiders. Those that do may misreport their true profits. Moreover, because few managers are familiar with western definitions of profits that include the opportunity cost and depreciation of fixed capital, even if they reported what they believed to be their firm's profit, it is unlikely that the figure would correspond to a traditional (western) interpretation. Finally, even if managers were to report true economic profits accurately, profit is not a perfect proxy for restructuring. Firms with monopoly power or relatively short time horizons may be able to temporarily raise prices and make substantial short term profits that are unsustainable in the medium to longer run. Furthermore, the existence of profits does not enable one to distinguish between a privatized firm that holds a monopoly position and elects to pursue a "passive restructuring" strategy from a firm that is "pro-actively restructuring" but situated in a more competitive market.

A third candidate for measuring restructuring, sometimes lumped into the financial indicators category, is the share of new product sales to total sales. As this fraction grows, one would conclude that the firm is successfully progressing in restructuring efforts. This measure does little, however, to distinguish between firms engaged in "passive restructuring" and firms that introduced new products (pro-active

¹⁸ We note Richard Ericson's point that, regardless of whether labor is measured in number of employees or worker units, if output is measured in rubles rather than units of production, labor productivity improvement is not strictly a physical measure of enterprise restructuring.

restructuring) which did not immediately gain market acceptance. Moreover, because of the relative ease of adding new products, this measure is biased in favor of firms in the food industry, for example, in comparison to firms in machine building or chemicals. In addition, the share of sales of new products fails to take into account improvements in the quality of existing products. Quality improvement is a restructuring strategy which perhaps will have the most immediate and/or greatest impact on the firm's financial position. More problematic for our purposes, however, is the fact that managers of privatized firms have been reluctant, to date, to provide the figures which relate quality improvements or the proportion of new product sales to their financial bottom line.

Managers of privatized firms will respond to queries about wages. As with profits, however, average wages may be higher in firms with monopoly power, making wages as problematic as profits an indicator of financial success or "pro-active" restructuring. Moreover, short time horizons and the quasi-syndicalist ownership structure of the privatized firms may cause managers to elect to pay higher wages rather than to allocate funds to investment. Paying above-industry-average wages, however, is not sustainable over time without pro-active restructuring or monopoly power.

II. Enterprise Restructuring: Methodology and Data

Based on the dual criteria of data availability and the desire to compare restructuring across industries, we use improvements in labor productivity and the payment of above-industry-average wages as our measures of enterprise restructuring. We first calculate the percentage change in labor productivity by industry, using productivity improvements exceeding 25% as our measure of "pro-active" restructuring.¹⁹ This simple measure gives a general idea of the number of firms responding in some concrete way to the transition process.

Regression analysis is used to evaluate the relative effect of industry, ownership structure, and location (Moscow) on the variation in labor productivity improvements across firms within and between industries. In an OLS regression, the dependent variable is percentage change in average labor productivity. Dummy variables for industry and 1995 ownership structure are included on the right hand side. In a probit

¹⁹ We are not claiming that "pro-active" restructuring efforts, as measured by labor productivity improvements in excess of 25%, will necessarily guarantee post-transition survival of the firm. We are simply trying to get an idea of the number of firms that may be "pro-active" in their restructuring activities.

**Table 1: Civilian Manufacturing Firms in Russia: Industry Distribution,
Panel Data Set**

Industry	Novosibirsk		Rostov		Volgograd		Tver		Moscow		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Power	1	0.43	--	--	8	2.52	11	2.90	16	2.33	36	1.76
Fuel	4	1.74	43	9.93	5	1.57	12	3.17	2	0.29	66	3.22
Ferrous/nonferrous metallurgy	4	1.74	--	--	2	0.63	1	0.26	5	0.79	12	0.59
Machine building	--	--	85	19.63	55	17.30	55	14.51	286	41.69	481	23.51
Chemicals	5	2.17	8	1.85	13	4.09	8	2.11	34	4.96	68	3.32
Wood/forestry/pulp/paper	44	19.13	27	6.24	43	13.52	62	16.36	30	4.37	206	10.07
Construction materials	23	10.00	37	8.55	25	7.86	14	3.69	31	4.52	130	6.35
Light industry	26	11.30	46	10.62	22	6.92	84	22.16	116	16.91	294	14.37
Food industry	110	47.83	166	38.34	128	40.25	113	29.82	91	13.27	608	29.72
Printing	11	4.78	17	3.93	17	5.35	18	4.75	56	8.16	119	5.81
Miscellaneous	2	0.87	4	0.92	--	--	1	0.26	19	2.77	26	1.27
Total	230	100	433	100	318	100	379	100	686	100	2,046	100

Source: Calculated from firm-level data provided in *BusinessMap 93: Industry in Russia*, and *Biznes-Karta 95*, select volumes, (Moscow: Business Information Agency, 1993, 1995).

regression, the dependent variable is one if the firm experienced productivity gains, and zero otherwise. In both specifications, the regression is run for each region where more than thirty observations are available.²⁰

We use the payment of above-industry-average wages as a second measure of enterprise restructuring. Once again, regression analysis is used to evaluate the relative effect of industry, ownership structure and location on the variation in average wages across firms.

If enterprises are using mostly formal mechanisms of restructuring, then these two measures of enterprise restructuring will be highly correlated, especially after 1994. Firms experiencing labor productivity improvements are more likely to sustain high wage payments. However, to the extent that enterprises are using informal methods of survival and restructuring, especially barter, then wages and productivity measures are likely to diverge. Payment of above-average wages requires cash; improvements in productivity may not.

Data Description

We use two sources of data in our analysis of the nature and scope of enterprise restructuring, as measured by improvements in labor productivity and the payment of above-average wages. The first is a panel data set constructed by matching firm-specific registration numbers for a subset of firms listed in the 1992 and 1995 business directories published by a privately-owned firm in Moscow (Business Information Agency 1993, 1995). These 18-volume directories are based on Goskomstat data, and include only civilian manufacturing firms in Russia. Given the time and financial constraints associated with obtaining the information and putting it into computer accessible files, our analysis here is limited to just over 2,000 firms located in five subregions: Novosibirsk, Rostov, Volgograd, Tver, and Moscow.²¹ These data will be used to measure changes in labor productivity between 1992 and 1995.²²

²⁰ The lack of output data for firms in Novosibirsk resulted in this region being dropped from our regression analysis.

²¹ The panel data set is restricted to those firms which remained in the same industry in 1992 and 1995 (the industry code did not change) and to those firms which did not divide into multiple units (that is, the registration number applies to a single firm in 1992 and a single firm in 1995). These five regions were selected to maximize the comparability with the regions included in the interview survey.

²² For each firm, average labor productivity is calculated by dividing volume of output by the number of workers. In a separate study based on these data (Linz 1997), a Cobb-Douglas production function was found to have the highest explanatory power in relating firm-level output volume to inputs of capital and labor. In the C-D functional form, marginal productivity of labor can be calculated using the coefficient on labor times the average

**Table 2: Distribution of Firms By Ownership Structure:
Panel Data Set**

Ownership	Novosibirsk		Rostov		Volgograd		Tver		Moscow		Total	
	1992	1995	1992	1995	1992	1995	1992	1995	1992	1995	1992	1995
State	165	57	403	123	282	107	343	148	518	223	1711	658
Lease	27	1	6	4	8	2	14	1	71	17	126	25
Cooperative	2	--	16	1	25	--	10	--	13	--	66	1
Collective	29	36	--	4	1	12	10	22	13	42	53	116
Joint stock	6	132	8	212	1	129	1	155	44	378	60	815
Joint venture	--	--	--	--	--	1	--	--	8	2	8	2
Private/other	1	1	--	41	--	54	1	49	1	22	3	167
Totals	230	227	433	385	317	307	379	375	668	684	2027	1784

a Includes all firms that report ownership structure in each year.

Source: Calculated from firm-level data provided in *BusinessMap 93: Industry in Russia*, and *Biznes-Karta 95*, select volumes, (Moscow: Business Information Agency, 1993, 1995).

Table 1 provides a distribution of firms by industry for each of the five regions. As seen in Table 1, nearly one-quarter of the firms in the panel data set are in machine building; about 30% are in the food industry.

Table 2 reports the ownership structure of the firms in the panel. The impact of Russia's mass privatization program is evident in these data. Overall, state-owned firms accounted for just over 84% of the firms reporting ownership structure in 1992; only 37% of those reporting ownership structure in 1995 were state-owned. The percentage of joint stock companies rose from about 3% in 1992 to 46% in 1995.²³ The proportion of leased firms fell from 6.2% of the total in 1992 (126 of 2,027 firms reporting ownership structure) to 1.4% in 1995 (25 of 1,784 firms reporting ownership structure). Cooperatives all but disappeared in this panel.

The impact of Russia's transition from plan to market on mean workforce size in numerous manufacturing sectors is summarized in Table 3.²⁴ In most industries other than power, mean workforce size fell between 10% and 25%. The main exception is the construction materials industry in Moscow: mean workforce size rose by more than 50%. Employment expansion occurred on a much smaller scale in the fuel industry in Novosibirsk (30%), the ferrous/nonferrous metallurgy industry in Volgograd (4%), and the food industry in Tver (2%).

Average wage data were obtained from in-depth interviews with top-level managers in the privatized firms participating in the survey project. In this analysis, we include a total of 47 firms located in Moscow, Tver, Nizhny Novgorod, and Novosibirsk.²⁵ A total of seventy-eight separate interviews were conducted

product of labor; that is, marginal product is proportional to average product.

²³ Information is not provided in the business directories about the ownership distribution of the firm's stock. Thus we are unable to distinguish between firms where managers hold a large fraction of shares from firms which have a significant share of "outsiders" (non-employees) holding stocks or sitting on the Board of Directors. Since these data refer to mid-1995, it is unlikely that any of the firms would be characterized as having a large outside blockholder. Our interview results suggest that this phase in the ownership structure -- emergence of large blockholders -- was only coming in to play in mid-1995.

²⁴ Employment data are listed as number of people employed by the firm. It is likely that these numbers exceed the number of people actually working at the firm. Firms experience tax and other advantages associated with maintaining high level of employment, and to the extent that firms delay wage payments or place workers on unpaid leave, there was little cost to keeping surplus workers on the books.

²⁵ All interviews included in this portion of our analysis were conducted by Gary Krueger. Many of the firms also appear in the business directories, but are not necessarily included in the panel data set.

Table 3: Mean Workforce Size:^a Panel Data Set

Industry	Novosibirsk		Rostov		Volgograd		Tver		Moscow	
	1992	1995	1992	1995	1992	1995	1992	1995	1992	1995
Power	552	576	--	--	1685	1682	389	428	604	745
Fuel	512	669	1931	1679	1320	1262	201	150	1677	1586
Ferrous/nonferrous metallurgy	215	215	--	--	1798	1878	355	266	528	359
Machine building	--	--	1729	1649	1494	1056	812	751	1666	1135
Chemicals	172	150	1162	1466	2926	2354	706	462	611	526
Wood/forestry/pulp/paper	140	130	350	409	186	140	340	330	522	453
Construction materials	344	272	268	226	431	381	314	263	694	1061
Light industry	456	447	953	793	1160	888	420	366	936	880
Food industry	203	186	244	244	212	190	120	123	811	745
Printing	141	118	120	112	116	111	135	119	476	275
Miscellaneous	--	--	301	236	--	--	--	--	735	495

^a Includes only those firms reporting workforce size in both years.

Source: Calculated from firm-level data provided in *BusinessMap 93: Industry in Russia*, and *Biznes-Karta 95*, select volumes, (Moscow: Business Information Agency, 1993, 1995).

with these firms between 1994 and 1997; fifteen firms were included in the interviews in three or more years, nine firms were interviewed in all four years. Table 4 summarizes the basic sample characteristics and their changes over time. As seen in Table 4, more than 80% of the firms in this sample had been privatized. These firms range in size from 200 to 5,000 employees, with a relatively stable management team. Over the course of the four years, the firms in this sample tended towards a greater degree of private ownership, a smaller workforce, more turnover among management personnel, with incoming managers likely to have received some training in western business school programs offered in Moscow (or locally) or executive development seminars.

A comparison of this sample with the distribution of firms by branch in Soviet industry in 1990 is provided in Table 5. As seen in Table 5, our sample of firms provides an adequate coverage of Russian industrial branches, but tends to over-represent machinery and the chemical industries, by 4% and 6%, respectively. Firms in energy, and wood/wood products are under-represented in our sample. Given the extent to which inclusion in the sample was based on connections with local expeditors, most surprising is the closeness of our sample in the food, light and construction materials branches compared to their shares in Soviet industry. Also evident in Table 5 is the tendency for firms in our sample to be larger, as measured by average number of employees, than Soviet norms for comparable firms.

III. Empirical Results

How many firms in our panel experienced labor productivity improvements exceeding 25% between 1992 and 1995; that is, meet our criteria for “pro-active” restructuring? Of the 617 firms that provided sufficient information to make the calculation, only 88 firms exhibited labor productivity gains in excess of 25%. If this sample of firms in Moscow, Tver, Rostov, Volgograd and Novosibirsk reflects a broader population of civilian manufacturing firms in Russia, this result suggests that less than 15% of the firms in Russian industry were engaged in “pro-active” restructuring prior to 1996.

Table 6 presents the results of our calculations of the percentage changes in workforce size and volume of output.²⁶ These results underscore the workforce downsizing that occurred in the manufacturing

²⁶ Because output is measured in current rubles, the 1992 output figures were multiplied by 171.66, the price index calculated for price information reported for “all industry” in *Russia in Figures* (Moscow: Goskomstat, 1996). Figures published in *Tsenyi v Rossii* (Moscow: Goskomstat, 1996), pp. 152-153, allowed us to calculate the percentage change in price between 1992 and 1995 by industry: power, 163%; fuel, 138%; ferrous metallurgy

Table 4: Enterprise Sample Description

	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>
Number of Interviews:	25	22	32	15
Ownership:				
State	5	4	4	2
Joint stock (In process)	2	0	0	0
Privatized Since 1992	16	14	20	10
Previously Leased	2	4	8	2
Employment:				
< 200 people	2	2	3	1
201 - 1000	7	9	13	5
1001 - 5000	10	11	13	8
5001 - 10,000	4	0	3	1
> 10,000	2	0	0	0
Industry:				
Machinery	5	5	10	4
Chemicals/petrochemicals	3	2	3	2
Construction materials	2	1	3	0
Energy	1	0	0	0
Metals	0	0	1	0
Light/consumer	6	5	7	5
Food	5	8	6	4
Managers:				
Years worked*				
< 2 years	0	2	1	2
2 - 5	2	4	4	2
6 - 10	5	3	8	3
> 11 years	15	12	13	5
Average # years	18.4	16.0	15.2	14.3
Received Western Training	3	5	7	3

* Work history not available for all managers.

Table 5: Comparisons of Soviet Industry and Enterprise Sample

Branch	Soviet Industry			Enterprise Sample		
	Number of Enterprises	Share of Soviet Industry (percent)	Average Workforce Size (1990)	Number Firms	Share of Sample (percent)	Average Workforce Size (1990)
Machinery/ metal working	9,209	22	1,638	12	26	5,525
Construction materials ¹	4,125	10	530	5	10	1,308
Fuels and electric power	2,403	6	1,069	1	2	12,000
Chemical and petrochem ¹	1,094	3	1,856	4	9	4,627
Wood and wood products ¹	5,525	13	489	1	2	200
Light industry	8,532	21	546	10	21	1,769
Food industry	9,981	24	297	11	23	468
Metals	713	2	2,890	1	2	3,000
Total	41,582²			47		

Source: *Narodnoe khozyaistvo v 1990 gody*, pp. 349, 386, 393.

Table notes:

1. Data are from *Study of the Soviet Economy*, Vol 2, Table iv.2.2, 1991.

2. *Narodnoe khozyaistvo* provides a total figure for Soviet industry of 46,670 enterprises. This figure is not reproducible given the numbers in each branch.

sector during the early years of Russia's transition. Workers were pushed out of the manufacturing sector as a consequence of unpaid wages, and pulled out as a consequence of more lucrative opportunities in the *de novo* private service sector. Machine building, light industry, and construction materials (except in Moscow) experienced the greatest percentage change in workforce size. Not unexpectedly, the percentage change in output — a 30-60% reduction between 1992 and 1995 in these regions — far exceeded that of labor — a 10-20% reduction during this same time.

The labor productivity results presented in Table 7 must be viewed with a degree of caution. Relatively few firms in the panel provided sufficient information in both years to calculate the percentage change in average labor productivity: in Rostov the figure is 132; in Volgograd, 119; in Tver, 94; and in Moscow, 269. Near-hyper-inflationary conditions in Russia in the early years of the transition process and the lack of comparability in industrial price indices reported in the statistical handbooks over time make it difficult to adjust 1992 output values to comparable 1995 values. Moreover, reported output values in 1992 and 1995 do not necessarily reflect sales; nor do they directly reflect the cash receipts of the firms. With these caveats in mind, it appears that only one-in-five firms in this panel (120 of 617 reporting sufficient data) experienced labor productivity improvements between 1992 and 1995.

Casual empiricism would lead one to conclude that Moscow and Volgograd are doing significantly better than Rostov and Tver with respect to labor productivity improvements. A greater fraction of firms in these two regions experienced labor productivity gains. In Volgograd, labor productivity improvements appear to be driven by firms in the food industry. In Moscow, firms in machine building and light industry appear to be driving the result. Tver, despite having relatively fewer firms experiencing improvements in labor productivity, had the highest proportion of firms exhibiting labor productivity improvements exceeding 25% (20% of Tver firms, in comparison to 16% of Volgograd firms, 14% of Moscow firms, and 10% of Rostov firms). By this measure, the incidence of "pro-active" restructuring is higher in Tver than elsewhere.

How much of the variation in labor productivity improvements (or lack thereof) is explained by

(black), 159%; chemicals, 151%; machine building, 152%; forestry/wood products, 153%; construction materials, 155%; light industry, 141%; food industry, 148%; "all industry", 151%. When these figures are used to adjust the value of output in 1992, the number of firms experiencing labor productivity gains in excess of 25% falls by about 5%.

**Table 6: Percent Change in Workforce Size and Volume of Output, 1992-1995:
Panel Data**

Industry	Novosibirsk			Rostov		
	%ΔL	N	%ΔQ	%ΔL	N	%ΔQ
Power	4.0	1	--	--	0	--
Fuel	16.5	4	--	-3.8	42	--
Ferrous/nonferrous metallurgy	-1.3	3	--	--	0	--
Machine building	--	0	--	-18.4	80	-45.5
Chemicals	-13.0	1	-124.0	3.8	8	15.0
Wood/forestry/pulp/paper	-2.8	40	-66.0	-9.6	27	-91.4
Construction materials	-19.9	17	--	-19.6	36	40.5
Light industry	-8.4	22	112.5	-17.5	46	-126.9
Food industry	-11.6	97	--	-0.4	166	-77.3
Printing	-15.3	11	--	-6.8	17	-22.0
Miscellaneous	--	0	0	-20.2	4	66
Total	-9.6	196	7	-8.5	426	-64.4

Industry	Volgograd			Tver		
	%ΔL	N	%ΔQ	%ΔL	N	%ΔQ
Power	0.2	8	109.6	8.3	11	78.4
Fuel	-5.8	5	69.8	-34.4	12	--
Ferrous/nonferrous metallurgy	30.0	2	-4.0	-28.0	1	-66.0
Machine building	-34.5	51	-66.1	-12.5	53	-35.2
Chemicals	-12.8	13	-7.9	-16.5	8	-83.6
Wood/forestry/pulp/paper	-26.2	42	-105.5	-1.4	62	-43.8
Construction materials	-11.4	24	-35.3	-24.6	13	51.2
Light industry	-28.2	22	-81.2	-14.5	83	-97.3
Food industry	-8.9	128	-43.2	-4.3	113	-48.5
Printing	-9.9	12	--	-11.11	18	-80.0
Miscellaneous	--	0	--	--	0	--
Total	-16.8	307	-32.7	-9.2	374	-46.6

**Table 6: Percent Change in Workforce Size and Volume of Output, 1992-1995:
Panel Data (cont'd)**

Industry	Moscow			
	% Δ L	N	% Δ Q	N
Power	21.7	7	-38.5	2
Fuel	-5.0	1	171.0	1
Ferrous/nonferrous metallurgy	-37.8	4	-178.0	1
Machine building	-38.0	239	-60.9	79
Chemicals	-4.3	33	-41.5	17
Wood/forestry/pulp/paper	-11.5	29	-44.8	20
Construction materials	3.6	31	-13.1	22
Light industry	-23.3	108	-112.8	66
Food industry	5.1	87	-39.1	57
Printing	-30.0	55	-29.0	8
Miscellaneous	-52.9	18	-97.0	9
Total	-23.1	612	-62.3	282

**Table 7: Percent Change in Average Labor Productivity, 1992-1995:
Panel Data**

Industry	Novosibirsk		Rostov		Volgograd		Tver		Moscow	
	% $\Delta Q/L$	N	% $\Delta Q/L$	N	% $\Delta Q/L$	N	% $\Delta Q/L$	N	% $\Delta Q/L$	N
Power	--	0	--	0	178.3	5	49.5	4	77.5	2
Fuel	--	0	--	0	485.3	4	--	0	1274.6	1
Ferrous/nonferrous metallurgy	--	0	--	0	8.4	2	-33.3	1	-91.8	1
Machine building	--	0	-21.1	32	-5.4	15	1.4	16	265.7	73
Chemicals	--	0	-15.1	4	2.2	11	-41.0	5	-48.7	15
Wood/forestry/pulp/paper	-48.0	1	-58.8	5	-59.6	2	-14.9	16	-11.6	20
Construction materials	--	0	4.8	6	616.1	13	120.6	4	18.8	22
Light industry	5273.6	2	-75.1	19	-42.4	9	-53.3	19	320.2	66
Food industry	--	0	-45.4	62	270.8	58	-37.2	28	-35.4	53
Printing	--	0	-7.0	3	--	0	-51.6	1	28.6	7
Miscellaneous	--	0	141.3	1	--	0	--	0	-26.3	9
Total	3499.8	3	-38.8	132	218.5	119	-20.0	94	146.5	269

industry or ownership structure? Percent change in average labor productivity is used as the dependent variable in an OLS regression that includes dummy variables for industry and ownership structure in 1995.²⁷ We find that in the Rostov region (n = 132), labor productivity is significantly lower in light and food industry firms than in machine building, and significantly higher in firms characterized as worker collectives as compared to state-owned firms. In Volgograd (n = 119), significant labor productivity differences are not evident by industry, nor do they appear by ownership structure. In Tver (n=94), labor productivity is significantly higher in construction materials and significantly lower in light industry in comparison to machine building; 1995 ownership structure had no significant effect. In Moscow, no significant variation in labor productivity by industry emerged, but the higher labor productivity of firms characterized as worker collectives, also found in Rostov firms, is evident among firms in Moscow, as well. Regression results are provided in Appendix A.

Using whether or not the firm experienced labor productivity gains as the dependent variable, and industry and 1995 ownership dummies on the right hand side, we next ran a probit regression for each region. Several results are worth noting. For firms in Rostov, as described above, labor productivity was significantly lower in food industry firms than in machine building firms. In the probit analysis, however, ownership structure was not significant in explaining the probability that a firm would experience labor productivity gains. For firms in Volgograd and Tver, neither industry nor ownership were significant in explaining whether a given firm would exhibit labor productivity gains. For firms in Moscow, the probability that a firm would experience labor productivity gains was influenced by industry and ownership structure. Firms in the food, light and wood/paper industries were significantly less likely than machine building firms to exhibit labor productivity improvements; firms characterized as worker collectives in 1995

²⁷ Machine building is used as the comparison industry and state-owned is used as the comparison ownership structure. See Tables 1 and 2 for listing of industries and ownership structures for which dummy variables were created. Since the privatization program was largely completed by 1994, we used 1995 ownership structure in our analysis. We did run OLS and probit regressions using the 1992 ownership structure to see if the firms that were leased in 1992 performed significantly differently from the others, as has been suggested in the literature (Krueger 196X and Earle 1997). No significant ownership effect is evident when 1992 ownership structure is used; nor does the coefficient on the leased in 1992 variable emerge as significant when this is the only dummy ownership variable included in the specification.

were significantly more likely than state-owned firms to exhibit labor productivity improvements.²⁸

Regression results are provided in Appendix A.

What proportion of the firms in our enterprise sample paid above-industry-average wages?

Interview evidence underscores the two-phase sequence in wage setting behavior. Between 1992 and 1994, when subsidies were relatively abundant and real interest rates were negative, wages frequently were uncorrelated with performance, as measured by changes in output and employment. After 1994, poorly performing firms were unable to pay above-average wages in a timely manner. As seen in Table 8, the correlation between employment level and output is virtually nonexistent in the data collected in 1994. Managers in the early period of transition remained committed to maintaining employment levels regardless of production. The correlation between wages and output is negative in 1994, yet another signal that “red executives” were making every effort to take care of their workers. From 1995 on, the relatively high positive correlation between employment and output indicates that managers became more responsive to economic conditions. In many instances, these were “new” managers that had participated in some sort of western management training or executive development program. Firms that could maintain employment levels in the second phase of transition paid higher wages.

Regression results indicate that the ability to pay higher wages was influenced by industry. Firms in the food industry, in particular, paid higher wages, while firms in machinery and light industry tended to pay relatively low wages. Moreover, average wages became increasingly dispersed along industry lines as the

²⁸ In previous work (Linz and Krueger 1996), we found a significant capital city effect in explaining variation among different performance measures of Russian firms; firms in Moscow tended to do better, *ceteris paribus*. To check for that same effect here, we expand the panel to include firms in an additional 19 regions: Arkhangelsk, Astrakhan, Bryansk, Ivanovo, Kaluga, Kostroma, Moscow region, Murmansk, Penza, Ryazan, Samara, Smolensk, Stavropol, Tomsk, Tula, Ulyanovsk, Vladimir, Vologda, Yaroslavl'. With the inclusion of these regions, the sample size increases from 617 to 1825 firms. In an OLS regression where percent change in labor productivity is the dependent variable, and dummy variables for industry, ownership structure in 1995, and location in Moscow are used on the right hand side, the results indicate that labor productivity was significantly lower for firms in the food industry and light industry in comparison to machine building, but that neither ownership structure nor location in Moscow had any significant effect in explaining variation in labor productivity for firms in this panel. In a probit regression, where the relative impact on labor productivity gains by industry, ownership structure, and location in Moscow are analyzed, the results indicate that, in comparison to machine building, labor productivity gains are more likely in the power industry and wood/paper industry, and less likely for firms in the light and food industries. In this specification, ownership structure is relevant: firms characterized as joint stock and worker collectives were more likely than state-owned firms to exhibit labor productivity gains. Location in Moscow had only a marginal effect; the negative coefficient suggests that firms in Moscow were less likely than firms elsewhere to experience labor productivity gains between 1992 and 1995. Regression results are available from the authors.

Table 8: Correlations Between Changes in Output, Changes in Employment and Dollar Wages¹

Variable Pair	Year	Correlation	Number of Firms
Employment, Output	1994	0.07	23
Employment, Wages		0.36	
Wages, Output		-0.15	
Employment, Output	1995	0.50	22
Employment, Wages		0.46	
Wages, Output		0.41	
Employment, Output	1996	0.36	31
Employment, Wages		0.46	
Wages, Output		0.21	
Employment, Output	1997	0.64	15
Employment, Wages		0.66	
Wages, Output		0.49	

¹ Dollar wages were calculated using the exchange rate for the second quarter of each year based on exchange rate data provided in IMF International Financial Statistics, 1996 CD Rom. We used 1\$=5780 rubles for June 1997.

transition progressed. Whereas in 1994 the ratio of average wages in food to machinery was 1.4 to 1, by 1997 this ratio had increased to 2 to 1. Similar changes in magnitude occurred with other branches. As most of these interviews are follow up interviews in the same firms, with the same personnel, these movements in average wages are unlikely to be the result of problems in the sub-sample of firms within each group. The ability to pay high wages also is explained by location in Moscow.

IV. Does Barter Enhance or Impede Enterprise Restructuring?

The above results suggest that a number of Russian enterprises are actively restructuring their operations. However, the two measures of restructuring — labor productivity improvements and payment of above average wages — are somewhat at odds in identifying the role of industry in predicting enterprise restructuring behavior.²⁹ The labor productivity results suggest that, of those firms apparently engaged in restructuring between 1992 and 1995, machine building firms set the standard. That is, only construction materials firms tended to do better than machinery firms in terms of labor productivity improvements; food industry and light industry firms tended to do worse.³⁰ However, the wage data suggest that firms in the food industry are in a superior situation relative to machine building. In order to reconcile these differences, we find it necessary to examine managerial decisions regarding restructuring strategies. We focus on the choice between utilizing formal versus informal means to restructure; the former using market or market-like transactions and the latter involving a “web of mutual support.” It is especially instructive to analyze the factors which result in a manager’s decision to engage in barter.

Managerial decisions regarding whether to use formal or informal means to restructure hinge on the extent to which their firm operates in the formal economy. A recent paper by Johnson *et al.* (1996) hypothesizes that firms will enter the formal economy if the benefits of doing so exceed the costs. Firms entering the formal economy derive benefits in the form of access to public goods; e.g., security, as well as opportunities to expand their market share by using traditional advertising techniques. However, firms entering the formal sector must pay taxes, and fulfill any other bureaucratically-imposed obligations.

²⁹ To date, most studies have not examined the role of industry in enterprise restructuring. See, for example, Blasi *et al.* (1997), Commander *et al.* (1996), Dobrinsky (1996), Estrin *et al.* (1995), Frydman *et al.* (1996).

³⁰ Using labor productivity improvements exceeding 25% as the measure: 33% of the firms in construction materials met this criterion, 25% of the firms in machine building, 20% of the firms in chemicals, 18% of the firms in forestry/wood/paper, 10% of the firms in food industry, and 6% of the firms in light industry.

Johnson *et al.* (1996) also assume that once a firm commits to the formal sector, the decision is irreversible.

In transition economies, in general, and the Russian economy, in particular, the greater the number of firms operating in the formal sector, the greater the potential network effects, and the greater the availability of public goods. The greater the fraction of formal activities in total economic activity, the more likely a particular firm will find the benefits of going formal exceeding the costs. If few firms are operating in the formal sector, however, then the reverse is true. The network effects are smaller, and any predatory or confiscatory behavior of government officials is distributed among a smaller pool of sacrificial lambs. In such an environment, any given firm will find that it is better off remaining in the informal economy.

Conceptually, this approach results in two potential equilibria. In the “good” equilibrium, most firms opt to join the formal sector. Tax-paying firms generate government revenues, and benefit from the provision of public goods. In the “bad” equilibrium, few firms join the formal sector. Public revenues remain meager and provision of public goods is low. This scenario perpetuates a firm’s willingness to remain in informal relationships. Indeed, Ickes *et al.* (1997) and Hendley *et al.* (1997) view the decision to engage in barter to be motivated mostly by managers’ efforts to seek informal profits, and especially a desire to avoid taxes.³¹

While it is likely that many Russian managers actively seek out barter transactions in order to avoid taxes, as Hendley *et al.* (1997) state, we find this explanation incomplete. Like Hendley *et al.* (1997), we note that barter transactions are very costly to effect. Barter agreements depend upon trust; multilateral barter agreements involve a chain of contingent transactions. Enforcement of such agreements typically require informal mechanisms. Consequently, the return associated with barter transactions frequently is highly uncertain. Moreover, when set against the advantages of cash transactions, at the margin barter appears as a strictly inferior asset. Not only are cash transactions less costly to effect, cash transactions provide a high degree of certainty with respect to return. In Russia, this was especially true after 1995, when inflation declined from the near-hyper-inflationary levels of the previous three years, and more or less stabilized.

We find no evidence in the interview data we gathered that the tax avoidance advantages of barter,

³¹ They also recognize the role of liquidity constraints in inducing barter. Their conclusions are based on interviews with managerial personnel in 15 enterprises in Moscow and Yekaterinburg in 1996.

although significant, are necessarily superior to cash transactions in either the formal or informal economy. While we recognize that cash transactions in the U.S. are the primary means used by Americans operating on the economic fringe to avoid taxes, we find no evidence that Russian tax inspectors are more capable than U.S. inspectors in ferreting out the truth. Rather, lacking the appropriate infrastructure and institutions, we suspect that Russian tax inspectors are somewhat less successful. We therefore find the tax avoidance explanation for the use of barter incomplete and at odds with the empirical evidence we have gathered in our research. In particular, having conducted interviews in over 100 firms in five different regions in Russia, we tend to view the use of barter in a more positive light and consider it a mechanism to avoid Ericson's (1996) type II errors (shutting down potentially viable firms). A number of factors contributed to our rather positive perspective of the role of barter in Russian enterprise operations and restructuring efforts.

First, our interview data support the aggregate statistic that barter activity is on the rise in Russia. Figures from the OECD survey on Russia indicate that the share of barter in industrial sales has steadily increased from 5% in 1992 to nearly 45% by the spring of 1997 (OECD 1997, p. 116). Few managers mentioned barter transactions in 1994. By 1997, it was not unusual for managers to describe in detail barter deals in which they routinely engaged. More importantly, however, it is not the case that the incidence of barter occurred only in firms headed by "red directors."

The rise in barter activity requires some explanation. In theory, as the transformation from plan to market proceeds and profitability governs enterprise decision making, barter, if it even exists, should decline as a percentage of total economic activity. Improving macroeconomic conditions enable firms to operate in the formal economy, and developments in financial and other requisite market institutions and infrastructure, provide an incentive for them to do so. Changing production patterns as firms engage in restructuring activities are likely to undermine existing (socialist) supplier networks, making barter even more costly (less profitable) as a consequence of the search for new, trustworthy partners. An exception would occur if "red directors" maintain their posts and continue operations as if the transition did not exist, or if macroeconomic conditions do not improve sufficiently well to enable managers, red directors or not, to obtain cash in exchange for deliveries of goods or materiel. In such a scenario, barter may remain relatively stable over time. Barter will increase during the transition process if access to cash declines, regardless of whether reduced access to cash is driven by the firm's situation or by macroeconomic conditions.

Our interview data support the third scenario: an increase in barter activities driven by liquidity constraints. Were Berliner's (1952) query about the importance of economic milieu in shaping managerial behavior to be repeated for Russia's transition economy, our interview data would support a resounding "yes." The importance of liquidity constraints in driving management into barter transactions is summarized as follows. For many firms in our survey, the ability to routinely engage in cash transactions depended upon their access to retail consumers. Retail access required managers to find the funds to invest in a kiosk or truck; or put together sufficient cash (or goods) to lease space in a building. Consequently, cash transactions imposed a higher fixed cost than barter transactions, but remained lower in terms of marginal cost per transaction. The absence of well-functioning capital markets to support investment in the capital the improves the firm's liquidity position forced many firms into barter transactions.³²

Second, our interview data provide no evidence that managers utilize barter transactions to preserve existing relationships. In order for the "preservation" hypothesis (Ickes *et al.* 1997) to be correct, given the fact that barter was initially a small fraction of total industrial production in Russia, then grew over the course of the transition process, enterprises would have to be using barter to **reestablish** previous relationships. No empirical evidence has been forthcoming to warrant this conclusion.

Third, our data suggest that barter is used unevenly across firms and is correlated with the particular industry in which the firm operates. Food industry firms appear less likely to rely on barter, while firms in machinery and light industry appear most likely to do so. In fact, barter patterns appear inversely correlated with the wage patterns reported in Table 8. Firms that have ready access to cash, and which can therefore pay above average wages, tend not to use barter. Firms that are removed from the final customer and must deal on a wholesale level tend to rely more on barter.

Industry Effects

The importance of industry effects in understanding managerial strategies that involve participation in the formal and informal sectors of the Russian economy warrants further attention. These two sets of data, one based on a large survey of Russian manufacturing firms, the other on in-depth interviews with a much smaller set of firms, combined with the analysis of barter, helps to explain the co-existence of what

³² We note that neither the kiosk nor the truck require significantly large investments, and both, potentially, are valuable in resale markets. Yet, without the "web of mutual support," access to this funding was restricted.

appears to be a greater propensity of machinery firms to improve productivity, yet also pay much lower wages. A handful of the surveyed firms engaged in barter and paid low wages; a strategy managers adopted to save on scarce cash, which they viewed as the only source of funds for restructuring. At the same time, some of the firms where we conducted interviews reduced employment by an amount sufficient to boost productivity. Industry, much more than ownership structure, appears to drive this result.

Firms in the food industry and others with access to the retail customer, tend to pay high wages, but do not appear to have dramatically increased productivity.³³ Food industry firms, which may not have increased their total volume of production (measured in tons or units), have vastly increased their assortment and made major improvements in quality. As they seek to secure their cash flow, many have also made major investments in retail facilities, integrating distribution into their overall operations. Such strategies require additional employees, but do not directly contribute to increases in total output. These strategies do, however, improve the firms' cash flow to the point where their reliance on barter becomes quite small, both absolutely and relative to firms in other industries.

The unique aspect of these industry differences is that changes in assortment for the firms that are dependent upon barter were financed through delayed wage payments. Workers were in effect lending money to their firm to finance restructuring. The unorthodox strategy of delaying wage payments to finance restructuring appears to be common in the second phase, where firms were relatively confident of their market niche, but lacked access to bank credit to finance investment. This tactic for raising cash can only be explained by worker and manager optimism — or desperation — relative to that of potential lenders who could smooth the firm's consumption path were they so inclined. The irony of the situation is that optimism and desperation manifest themselves in the same economic behavior — wage delays as the source of investment in the firm's future.

Case Studies

More insight into the factors that induce a firm to use barter may be obtained from a case by case examination of some of the firms that reported engaging in a significant amount of barter. Industry variation in the incidence of barter is pronounced. Twenty percent of the firms in light industry responded with data

³³Part of this is no doubt due to the lack of comparable price data in 1992 and 1995 that biases the productivity measure.

on barter in 1995 and 1997. Fifty percent of the machinery firms from 1996 provided data on barter. Only one of the four food industry firms interviewed in 1997 provided data on barter.

Table 9 presents data on the share of barter as a fraction of total production that were obtained from a selection of interviews conducted by Krueger. That is, the data in Table 9 represent only those firms that provided specific figures on barter.³⁴ As seen in Table 9, the share of production involved in barter transactions varies significantly by industry. For the meat processor in Moscow, the share of barter was quite low. No other food industry firms are represented in Table 9 during the four years of interviews. Machinery firms tend to engage in relatively more barter arrangements. An exception to this is the machinery plant in Novosibirsk. Under the guidance of a younger manager trained in Germany, the firm made substantial changes in production — from woodworking machinery to gas pumps and consumer goods. In addition, the firm opened two retail outlets as a way to generate cash flow, and minimize distribution costs. This exception to the general rule of disproportionately high barter transactions in machinery firms illustrates the importance of human capital and entrepreneurship in successful restructuring.

Four of the observations from Table 9 are from two firms: the tire manufacturer in Moscow (1995, 1997) and the light industry firm in Tver (1995, 1997). For the latter, the change in the use of barter is substantial: the share of barter in total production increased from 50% to 90% by 1997. For the tire firm, the share of barter remained basically unchanged during this period.

We focus first on the tire company in Moscow. The tire firm established a network of retail dealers and consequently was able to sell a large fraction of its output directly to customers for cash. According to the financial manager, this firm experiences a “good cash flow” and is able to pay relatively high wages. When asked specifically about the use of barter, the financial director stated unequivocally that producing for barter was not desirable from an economic or financial perspective. Rather, barter was forced on the firm by the Moscow city government. The tire firm had previously received assistance from the city when its warehouse was destroyed. The mayor’s office requested the tire company accept trucks produced by the ailing manufacturer, *Zil*, in exchange for delivering its tires to the truck company. The tire company’s

³⁴ Barter transactions were described by at least one third of the managers interviewed. The incidence of barter was less frequently reported in 1994 than 1997. The relative share of total activity also was less in 1994 for those firms that did engage in barter.

Table 9: Barter and Performance

Year	City	Branch	Percent Change in Output, 1990 to Year	Percent Change in Employment 1990 to Year	Average Dollar Wage ^a	Share of Production in Barter
1995	TVER	LIGHT	0.0	-16.67	\$66	50%
1995	MOSCOW	TIRES	-20.0	-14.29	\$203	30%
1996	MOSCOW	LIGHT	-75.0	-31.03	\$137	70%
1996	TVER	MACHINERY	-75.0	-33.33	\$98	90%
1996	TVER	MACHINERY	-40.0	-31.25	\$157	80%
1996	NOVOSIBIRSK	MACHINERY	-70.0	0.00	\$98	10%
1996	MOSCOW	MACHINERY	-85.0	-64.71	\$149	95%
1996	NOVOSIBIRSK	MACHINERY	-80.0	-62.50	\$137	80%
1997	MOSCOW	FOOD	272.0	500.00	\$432	3%
1997	MOSCOW	MACHINERY	-90.0	-76.92	\$87	60%
1997	MOSCOW	TIRES	-17.0	-14.29	\$311	30%
1997	TVER	LIGHT	-12.0	-58.33	\$81	90%

^a Calculated using ruble/\$ exchange rate current during the month of the interview.

management had no choice but to respond affirmatively to the request.

For the furniture manufacturer in Tver, the increase in barter was symptomatic of the dire financial condition of the firm. As seen in the last line of Table 9, the furniture firm (light industry) paid exceedingly low average wages, even by regional standards. The firm experienced a significant employment decline, especially of skilled carpenters. Consequently the firm was forced to alter its assortment from specialized furniture to the less demanding prefabricated doors and windows. The firm delivered these items to construction companies at a significant cost to the firm's cash flow and profitability. It was this switch in assortment, with the consequent change in customers, from direct retail to serving construction firms which was responsible for most of the increase in barter.

Our interview data suggests that Russian firms are firms using barter as a survival mechanism to buy themselves time to restructure and compete in the post-transition economy. A machinery firm in Tver reported in 1996 that it used barter (up to 90% of production) to conserve cash, which the manager plowed back into re-designing new variations of its primary product (excavators). The almost exclusive reliance on barter took place even after the "red director" was replaced by the "40-something" director of finance. In the late summer of 1997, this firm was reported to have signed a major contract with the Japanese firm *Komatsu*.³⁵

Barter also was used successfully in Moscow's large machine tool manufacturer *Krasny Proletarie*. Like most machine tool firms in Russia, this firm faced exceptionally difficult times during the transition. Output fell by 90%, and employment by nearly 80% (from 7,000 workers to 1,500 workers). Average wages were abysmally low for the Moscow region, at \$87 (U.S.) per month in 1997. Before the transition, the firm produced numerically controlled lathes (roughly 4,500 per year). About 10% of the firm's production in 1990 involved simpler variants. During transition, the production of numerically controlled lathes declined to less than 200 per year. However, the production of the "simple" variant increased from 100 per year in 1990 to 1,800 per year in 1994. Customers preferred the simpler model due to its lower cost and ease of repair. By 1997, the firm sold one numerically controlled lathe for each 20 simple lathes it produced, and relied on barter for about 60% of total "sales." Interestingly enough, in 1997, the firm was making upwards

³⁵ *Veche tveri*, 11 September 1997, p. 4. Unfortunately, the article gives few details.

of 45% of its cash income from leasing a portion of its facilities, and the sales of parts and other repair services. In short, the company was rapidly becoming a service company, with property management and machinery repair at the core of its new “lines” of business.

By any reasonable measure, the Moscow machinery firm engaged in rather significant restructuring. It shut down a large fraction of its production, and reoriented its main activity from production of machinery, in which there was clearly excess capacity, to the production of parts and the offering of repair services, which traditionally had been under-provided. Significant changes took place in the firm’s governance structure as well. Ownership became increasingly concentrated among top management. During the in-depth interviews, the firm’s managers appeared in every way committed to the firm’s survival. While we cannot assess whether the firm will continue to produce machinery in the post-transition economy, in our view, if the firm does manage to survive, the survival will be attributed in large part to the firm’s ability to sustain operations by engaging in barter transactions. Barter allowed the firm to conserve on cash resources and make some important changes in its operations. Thus, for this firm, and dozens others like it in our pooled enterprise sample, barter played a positive function in day-to-day operations and restructuring efforts.

IV. Summary and Conclusions

This paper examines the nature and scope of enterprise restructuring in Russia. Using a panel of over 2,000 civilian manufacturing firms in five regions of Russia, we calculated labor productivity improvements between 1992 and 1995. Fewer than one-in-five firms experienced labor productivity gains exceeding 25%, our first measure of enterprise restructuring. Industry, more than ownership or location, influenced whether or not a firm exhibited improvements in labor productivity. Interview data collected from top-level managers of 47 firms in four regions of Russia enabled us to examine the relationship between wages, industry, ownership structure, employment and output changes, and location. Once again, industry, more than ownership or location, influenced whether or not a firm paid above-average wages, our second measure of enterprise restructuring.

We found it useful to conceptualize restructuring as a two stage process. In the first stage, firms identify their market niche and re-orient their assortment and/or improve product quality to meet the needs of customers within that niche. In the second stage, firms direct their efforts toward process improvements

(efficiency gains) and cost reductions. Firms that make it to the second stage have the option utilizing formal or informal mechanisms to conduct their day-to-day operations and engage in restructuring activities.

Results based on interviews with more than one hundred managers between 1994 and 1997 indicate that many Russian firms are pro-actively restructuring their operations, using both formal — market and contractually-based methods of transaction — and informal — extra-contractual mechanisms which involve what Berliner (1952) termed a “web of mutual support.” We would expect that, over the course of Russia’s transition from plan to market, the relative share of informal transactions will attenuate. As the market economy and the corresponding institutions develop in Russia, the share of formal transactions, those based on transparent actions by both parties, will likely increase.

Reliance on informal mechanisms to restructure the firm is driven by numerous factors, foremost of which is access to cash, or lack thereof. Our results suggest that industry is acting as proxy for access to liquidity. Food industry firms with access to cash engage primarily in formal restructuring mechanisms; firms finding themselves in a relatively cash-free financial situation tend to engage in a broad array of informal mechanisms.

What we view as unique, and troubling, about Russia’s transition is the apparent increase informal (extra contractual) transactions over time. These types of exchanges result in reduced government revenues, depriving the citizenry of needed social services. Informal transactions also provide fertile ground for lawlessness and extra-legal activity, which in turn reinforces the dependence on extra-contractual mechanisms of exchange.

At the same time, however, informal mechanisms play as important a role in Russia’s transition economy that they played in the former Soviet economy. Informal mechanisms allow managers to navigate through apparently insurmountable obstacles; in effect, smoothing out the overall operation of the economy by finding ways to avoid or eliminate bottlenecks caused by systemic and policy features. Informal mechanisms in Russia’s transition economy appear to be allowing many potentially viable firms — firms that could not initially survive in pure market-oriented, contract-based system — to continue operations.³⁶

³⁶ This brings us back to Ericson’s (1996) point that there are two types of transition errors when dealing with former state-owned enterprises: eliminating viable firms, and not eliminating the unviable ones. Of course, adopting policies that avoid eliminating viable firms necessarily implies a greater likelihood of not eliminating the unviable firms.

Firms in the machine building and chemicals industries represent the best examples of this phenomenon. As economic stabilization takes root, and the long-run viability of Russian firms becomes more apparent, it ought to be possible, in principle, to assess the costs and benefits of the uniquely Russian dependence on informal methods of allocation.

Meanwhile, the absence of a developed banking system, more importantly, the absence of fully functioning credit or capital markets in Russia, makes the reorganization of production activities, as well as the capital renovations required for quality improvement, next to impossible. Luckily, these managers have worked in the realm of the impossible for decades.

Appendix A: Regression Results

I. OLS regression, by region (original panel)

Rostov

dependent variable = %chg labor productivity

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
power	(dropped)					
fuel	(dropped)					
ferrous	(dropped)					
chemical	5.574542	25.74254	0.217	0.829	-45.39389	56.54298
wood/pulp	-38.34367	23.34825	-1.642	0.103	-84.57157	7.884235
const mat	26.03468	21.66076	1.202	0.232	-16.85213	68.92148
light	-52.83504	14.99525	-3.523	0.001	-82.52459	-23.14548
food	-34.84157	10.62169	-3.280	0.001	-55.87178	-13.81136
print	12.19543	29.35203	0.415	0.679	-45.91955	70.3104
misc	166.6356	49.90369	3.339	0.001	67.82979	265.4415
jtstock95	6.09804	10.37903	0.588	0.558	-14.45172	26.6478
collect95	688.7153	49.37844	13.948	0.000	590.9494	786.4812
lease95	3.650302	31.1179	0.117	0.907	-57.96097	65.26157
other95	-1.430007	16.13983	-0.089	0.930	-33.38574	30.52573
constant	-25.3023	12.11948	-2.088	0.039	-49.29802	-1.306575

Number of obs = 132

Adj R-squared = 0.6315

Volgograd

dependent variable = %chg labor productivity

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
power	329.5586	962.4137	0.342	0.733	-1578.314	2237.431
fuel	-150.392	1101.828	-0.136	0.892	-2334.638	2033.854
ferrous	-233.8603	1397.594	-0.167	0.867	-3004.427	2536.706
chemicals	89.72781	735.5274	0.122	0.903	-1368.369	1547.825
wood/pulp	91.57398	1396.181	0.066	0.948	-2676.193	2859.341
const mat	735.8812	707.4856	1.040	0.301	-666.6264	2138.389
light	-46.8212	780.3434	-0.060	0.952	-1593.761	1500.118
food	267.654	536.4934	0.499	0.619	-795.8814	1331.19
print	(dropped)					
misc	(dropped)					
jtstock95	-786.8627	467.7159	-1.682	0.095	-1714.055	140.3294
collect95	-1078.17	1155.199	-0.933	0.353	-3368.218	1211.877
lease95	(dropped)					
other95	-873.6037	641.2935	-1.362	0.176	-2144.893	397.6859
constant	635.6527	601.2126	1.057	0.293	-556.1811	1827.486

Number of obs = 119

Adj R-squared = -0.0573

Tver

dependent variable = %chg labor productivity

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
power	48.4367	41.06547	1.179	0.242	-33.25559	130.129
fuel	(dropped)					
ferrous	-34.3425	75.35637	-0.456	0.650	-184.2503	115.5653
chem	-44.18385	37.6721	-1.173	0.244	-119.1256	30.75795
wood/pulp	-18.93866	27.11811	-0.698	0.487	-72.88521	35.0079
const mat	116.668	40.98652	2.846	0.006	35.1328	198.2033
light	-52.54134	24.86466	-2.113	0.038	-102.0051	-3.077616
food	-37.53032	23.69345	-1.584	0.117	-84.66413	9.603488
print	-63.45014	77.73037	-0.816	0.417	-218.0806	91.18031
misc	(dropped)					
jtstock95	-10.72997	21.46562	-0.500	0.619	-53.43191	31.97198
collect95	.5965093	34.22865	0.017	0.986	-67.49517	68.68819
lease95	(dropped)					
other95	-38.7765	30.51434	-1.271	0.207	-99.47924	21.92624
constant	11.80179	26.81534	0.440	0.661	-41.54246	65.14604

Number of obs = 94

Adj R-squared = 0.1538

Moscow

dependent variable = %chg labor productivity

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
power	-152.8688	1316.045	-0.116	0.908	-2744.618	2438.88
fuel	1101.963	1851.906	0.595	0.552	-2545.083	4749.009
ferrous	-264.4496	1851.906	-0.143	0.887	-3911.496	3382.596
chemicals	-351.466	520.6	-0.675	0.500	-1376.708	673.7763
wood/pulp	-452.9027	467.1803	-0.969	0.333	-1372.943	467.1376
const mat	-187.936	445.5767	-0.422	0.674	-1065.431	689.5594
light	-44.29912	325.5011	-0.136	0.892	-685.3239	596.7256
food	-333.8708	333.7766	-1.000	0.318	-991.1929	323.4513
print	-160.485	733.7811	-0.219	0.827	-1605.555	1284.585
misc	-243.7683	650.0036	-0.375	0.708	-1523.851	1036.315
jtstock95	57.69973	285.335	0.202	0.840	-504.224	619.6235
collect95	1571.63	527.7667	2.978	0.003	532.2743	2610.986
lease95	-33.56126	692.7272	-0.048	0.961	-1397.782	1330.659
other95	-23.71923	790.8355	-0.030	0.976	-1581.149	1533.711
constant	172.6273	290.3119	0.595	0.553	-399.0976	744.3522

Number of obs = 269

Adj R-squared = -0.0050

II. Probit regression, by region (original panel)

Rostov

dependent variable = labor productivity gains

Log Likelihood = -31.576656

Number of obs = 106
 chi2(6) = 19.59
 Prob > chi2 = 0.0033
 Pseudo R2 = 0.2368

gains	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dumchem	.6563569	.6779059	0.968	0.333	-.6723142	1.985028
dumconst	.2211931	.5929257	0.373	0.709	-.9409199	1.383306
dumfood	-1.467515	.4675535	-3.139	0.002	-2.383903	-.5511272
dumprint	.2364104	.794674	0.297	0.766	-1.321122	1.793943
jtstk95	-.0432852	.4647887	-0.093	0.926	-.9542543	.8676838
other95	-.1572666	.7581446	-0.207	0.836	-1.643203	1.328669
_cons	-.6238525	.4584329	-1.361	0.174	-1.522364	.2746594

Note: dumwood==0 predicts failure perfectly, dumwood dropped (5 obs not used), dumlight==0 predicts failure perfectly, dumlight dropped (19 obs not used); dummisc==0 predicts success perfectly, dummisc dropped (1 obs not used). Note: collct95==0 predicts success perfectly, collct95 dropped (1 obs not used) Note: dumpowr dumfuel dumferr lease95 dropped due to collinearity.

Volgograd

dependent variable = labor productivity gains

Log Likelihood = -38.791179

Number of obs = 108
 chi2(8) = 5.72
 Prob > chi2 = 0.6780
 Pseudo R2 = 0.0687

gains	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dumferr	1.504968	1.030259	1.461	0.144	-.5143026	3.524239
dumchem	.8469592	.6473796	1.308	0.191	-.4218815	2.1158
dumconst	.3611912	.6630683	0.545	0.586	-.9383988	1.660781
dumlight	.277734	.7491777	0.371	0.711	-1.190627	1.746095
dumfood	.1848025	.5462644	0.338	0.735	-.8858561	1.255461
jtstk95	.1767781	.4366224	0.405	0.686	-.6789861	1.032542
collct95	.9240353	.8521454	1.084	0.278	-.7461389	2.59421
other95	-.1146554	.6375135	-0.180	0.857	-1.364159	1.134848
_cons	-1.593357	.5760747	-2.766	0.006	-2.722443	-.4642717

Note: dumpowr==0 predicts success perfectly, dumpowr 5 obs dropped; dumfuel==0 predicts success perfectly, dumfuel 4 obs dropped; dumwood==0 predicts failure perfectly, dumwood 2 obs dropped; Note: dumprint dummisc lease95 dropped due to collinearity.

Tver

dependent variable = labor productivity gains

Number of obs = 75
 chi2(6) = 2.14
 Prob > chi2 = 0.9059
 Pseudo R2 = 0.0253

Log Likelihood = -41.375331

gains	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
dumchem	.2318457	.6604337	0.351	0.726	-1.062581 1.526272
dumwood	-.1031177	.5080432	-0.203	0.839	-1.098864 .8926286
dumlight	-.4837903	.4898482	-0.988	0.323	-1.443875 .4762946
dumfood	-.3336591	.4545691	-0.734	0.463	-1.224598 .5572799
jtstk95	.1427627	.417177	0.342	0.732	-.6748892 .9604145
collct95	.4153783	.6552726	0.634	0.526	-.8689325 1.699689
_cons	-.596084	.5037598	-1.183	0.237	-1.583435 .3912671

Note: dumpowr==0 predicts success perfectly, dumpowr 4 obs dropped; dumferr==0 predicts failure perfectly, dumferr 1 obs dropped; dumconst==0 predicts success perfectly, dumconst 4 obs dropped; dumprint==0 predicts failure perfectly, dumprint 1 obs dropped; other95==0 predicts failure perfectly, other95 9 obs dropped; Note: dumfuel dummisc lease95 dropped due to collinearity.

MOSCOW

dependent variable = labor productivity gains

Number of obs = 267
 chi2(12) = 25.15
 Prob > chi2 = 0.0141
 Pseudo R2 = 0.0966

Log Likelihood = -117.63869

gains	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
dumpowr	.4672382	.9045261	0.517	0.605	-1.3056 2.240077
dumchem	-.6728174	.4559534	-1.476	0.140	-1.56647 .2208349
dumwood	-.9782646	.458367	-2.134	0.033	-1.876647 -.0798818
dumconst	.1869416	.3165378	0.591	0.555	-.4334611 .8073443
dumlight	-.7689154	.2669023	-2.881	0.004	-1.292034 -.2457965
dumfood	-.9849104	.3092456	-3.185	0.001	-1.591021 -.3788001
dumprint	.0588237	.5332858	0.110	0.912	-.9863972 1.104045
dummisc	-.2426803	.4900964	-0.495	0.620	-1.203252 .717891
jtstk95	.2126445	.2443716	0.870	0.384	-.266315 .691604
collct95	.8886904	.4026607	2.207	0.027	.09949 1.677891
lease95	-.2729312	.6380005	-0.428	0.669	-1.523389 .9775268
other95	.3044663	.5784481	0.526	0.599	-.8292711 1.438204
_cons	-.6798828	.2292845	-2.965	0.003	-1.129272 -.2304934

Note: dumfuel==0 predicts success perfectly, dumfuel 1 obs dropped; dumferr==0 predicts failure perfectly, dumferr 1 obs dropped

III. OLS regression, capitol city effect (expanded panel)

dependent variable = %chg labor productivity

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dumpowr	-3195.182	3657.718	-0.874	0.382	-10368.98	3978.614
dumfuel	-3045.518	5675.515	-0.537	0.592	-14176.77	8085.733
dumferr	-3497.845	4767.089	-0.734	0.463	-12847.42	5851.733
dumchem	-3368.525	2532.775	-1.330	0.184	-8335.996	1598.946
dumwood	-3203.052	2005.568	-1.597	0.110	-7136.525	730.4214
dumconst	-3311.309	2179.674	-1.519	0.129	-7586.252	963.6331
dumlight	-3361.198	1682.779	-1.997	0.046	-6661.592	-60.80405
dumfood	-3402.128	1488.04	-2.286	0.022	-6320.584	-483.6709
dumprint	-3007.902	4792.477	-0.628	0.530	-12407.27	6391.468
dummisc	-2859.05	5863.643	-0.488	0.626	-14359.27	8641.174
jtstk95	551.7727	1324.354	0.417	0.677	-2045.652	3149.197
collct95	294.6281	2522.353	0.117	0.907	-4652.402	5241.658
lease95	-149.8157	4754.002	-0.032	0.975	-9473.727	9174.095
other95	-167.2646	2106.511	-0.079	0.937	-4298.714	3964.185
moscow	-986.5028	1410.384	-0.699	0.484	-3752.656	1779.65
_cons	3178.467	1689.068	1.882	0.060	-134.2616	6491.195

Number of obs = 1825

Adj R-squared = -0.0047

IV. Probit regression, capitol city effect (expanded panel)

dependent variable = labor productivity gains

Number of obs = 1825

chi2(15) = 194.55

Prob > chi2 = 0.0000

Pseudo R2 = 0.0998

Log Likelihood = -877.44729

checkout	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dumpowr	.9530651	.2343343	4.067	0.000	.4937782	1.412352
dumfuel	.5308225	.3460507	1.534	0.125	-.1474244	1.209069
dumferr	.0381613	.3031524	0.126	0.900	-.5560065	.6323291
dumchem	-.0517532	.1635041	-0.317	0.752	-.3722154	.268709
dumwood	.2877367	.1262384	2.279	0.023	.040314	.5351595
dumconst	.0953805	.1382107	0.690	0.490	-.1755076	.3662686
dumlight	-.9190287	.1277339	-7.195	0.000	-1.169382	-.6686749
dumfood	-.5859992	.1007763	-5.815	0.000	-.7835172	-.3884812
dumprint	-.1071404	.319887	-0.335	0.738	-.7341074	.5198265
dummisc	.0341434	.3774107	0.090	0.928	-.7055679	.7738547
jtstk95	.1868685	.0959813	1.947	0.052	-.0012513	.3749883
collct95	.451968	.1702777	2.654	0.008	.1182299	.7857061
lease95	-.3533122	.4239119	-0.833	0.405	-1.184164	.4775399
other95	-.1502776	.161931	-0.928	0.353	-.4676565	.1671014
moscow	-.1713191	.1025526	-1.671	0.095	-.3723184	.0296802
_cons	-.5921546	.1156852	-5.119	0.000	-.8188934	-.3654159

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