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The Price of the Hippocratic Oath:

Determinants of Bribery in Russian Health Care

First draft

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Abstract
This paper uses the *Russian Longitudinal Monitoring Survey* to examine the incidence and determinants of informal payments in Russian health care industry in 1994-2005. We supplement individual-level data with a large set of regional-level characteristics to control for the effect of local shocks on the incidence and size of informal payments. After correcting both for endogeneity of medical workers' wages and for sample selection bias, our findings indicate that long-run endowments of health care sector, greater economic development and higher health care expenditure have a bribery-reducing effect, while short-run budgetary fluctuations do not have a discernable effect on bribery. We also uncover a positive association between salary of medical personnel and bribery but this effect is not robust. Interestingly, we also find that private sector is more prone to corruption. Contrary to previous studies, we do not find support for regressivity of informal payments in Russia.

Keywords: bribery, informal payments, health services, weather, Russia

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1. Introduction

Negative economic consequences of corruption have long been recognized and studied extensively empirically (Shleifer and Vishny, 1993). Some industries, such as health care, are especially prone to corruption. This is true in many developing countries and particularly in former centrally-planned economies, where bribery in the form of informal payments from patients to health care providers is common and widespread (Lewis, 2000).[1,2] Transitional Russia, where health care is mostly public and free provision of medical services is a constitutional guarantee, presents a particularly interesting case. Anecdotal evidence suggests that informal payments for health care services, a common phenomenon during the Soviet period, did not disappear since the beginning of transition but in fact have become more prevalent. Although rapid shadow commercialization of health care sector has recently attracted more media attention,[3] it remains largely unexplored due to primarily unavailability of reliable data. Using unique individual-level data from the nationally representative *Russian Longitudinal Monitoring Survey*, this study explores the incidence and determinants of informal payments in Russian health care industry in 1994-2005.

There is no consensus on the prevalence and scope of informal out-of-pocket payments for health services in Russia (see Shishkin *et al*, 2003 and Shishkin and Popovich, 2009 for a review of existing studies). Little evidence that does exist suggests that the annual "bribery bill"

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[1] Informal payments are commonly defined as "payments to individuals or institutions in cash or in kind made outside of official payment channels for services that are meant to be covered by the public health care system" (Lewis 2000). The side payments both in money or in-kind to government employees are illegal and considered as bribery. Since 96% of Russian health care is publicly-owned, most informal payments fall into the category of bribery.

[2] Even more developed countries are not immune to some form of corrupt behavior in health care: in the United States, until recently, expensive gifts from pharmaceutical companies to doctors was a common way to leverage doctors' decisions about prescribed medications (see The Boston Globe, "Ban on Gifts to Doctors Sought," December 22, 2009: http://www.boston.com/news/health.)

[3] See Los Angeles Times, "Russia's Outdated Healthcare Mired in Corruption," May 16, 2008: http://articles.latimes.com/2008/mar/16/world/fg-russia16plr.

in the health care sector is quite large. According to the joint study undertaken by the World Bank and the Russian think-tank IDNEM, in Russia an estimated $2.8 billion is attributed to unofficial payments for services which by law require a free provision; of this amount, the health care sector claims the largest share, equaling to $600 million[4] (INDEM, 2001). However, it is nearly impossible to estimate the true social costs of corruption because of its many indirect effects, elusive to the researchers.

In the context of a transitional economy such as Russia, which embeds many unique characteristics, some of the well-established negative consequences of corruption become ambiguous (a brief summary of the key characteristics of the Russian health care system is presented in the Appendix A1). Evidently, under-the-table payments erode official payment channels and, therefore, reduce the revenues of medical facilities, lower government tax revenues and prevent new investment in capital and medical equipment. However, since the government is unable to provide sufficient financing for health care industry, out-of-pocket expenses emerge as an important alternative source of financing health care services. On the one hand, unofficial payments increase the price of public services due to the bribery "tax," introducing inefficiency (Martinez-Vazquez *et al*, 2008); on the other hand, since the Russian health care sector is highly regulated and prices for services are set artificially low, informal payments may facilitate *de facto* privatization of the system and establish market prices, thus increasing efficiency in resource allocation. Furthermore, informal payments may increase inequality if the burden of unofficial payments is borne disproportionately by the poor (Transparency International, Corruption and Health, 2006). Alternatively, informal payment may have no effect on inequality if prices are proportional to the patients' income. Finally, bribery

[4] According to the report, the second place in terms of the amount of bribes belongs to bribes for entrance, transfer, exams in higher educational establishments (INDEM, 2001).

creates perverse incentives for the health care providers to engage in rent-seeking behavior, reinforcing the norm of corruption and undermining the rule of law. However, in the case of Russia, which is synonymous with corruption, it is questionable to which extent bribery in health care may create spillovers to other sectors of the economy. Unfortunately, empirical work offers little guidance as to which of these counteracting effects dominate.

Empirical studies on corruption in the heath care sector are scarce largely due to data unavailability. Majority of existing studies that investigate informal payments in health care perform descriptive analysis, with a goal to document the extent of illegal payments (Gall *et al*, 2006; Belli *et al*, 2004; Falkinghman, 2004; Thompson *et al*, 2003; Chawla *et al*, 1998). Micro-level studies stress the importance of individual characteristics in explaining the proclivity to bribery; the general consensus is that younger, better educated individuals and those with higher income are more willing to pay informally (Mocan, 2008; Balabanova and McKee; Nguyen, 2008). The role of gender is ambiguous[5]. In this study we take a more comprehensive approach by modeling bribery in the equilibrium framework which allows us to test several hypotheses about the determinants of bribery. Specifically, we supplement individual-level data with a large set of regional-level characteristics to control for the effect of local shocks on the incidence and size of informal payments in Russian health care.

Implementation of the market-oriented reforms during the process of transition and subsequent economic recovery in the early 2000s did not eradicate corruption from the health care system, which raises several important questions about the determinants of bribery. First, is bribery ultimately a problem of resource availability? A commonly cited view is that many weaknesses of the financing schemes under the centrally-planned economy introduced much

[5] Although males are typically found to be more tolerant of corruption (Mocan 2008), some studies find that women are more likely to offer informal payments for health services (Nguyen, 2008) while others find no gender effect on the probability of bribing (Thompson and Xavier, 2002).

inefficiency into the health care system and contributed directly to the abundance of health care resources, such as excessive number of hospital beds and health personnel, without the appropriate quality controls (see Figure 1 in the Appendix). Failure to downsize health care sector opens up a possibility that informal payments may be used to purchase better quality services among the excessive number of non-competing facilities. At the same time, too much downsizing can lead to scarcity of the health care resources in the long term and hence to a temptation to use informal channels to compete for a scarce resource, for instance paying a bribe to reduce waiting time. Thus it is unclear *a priori* whether positive aspects of sufficiently large endowments of long-term health care resources can outweigh the negative aspects.

Second, informal payments in health care can emerge in response to budget constraints in the short-term and insufficient financing and underinvestment in the longer run. Ensor (2004), among others, points out that bribery in health care in many developing countries is a problem of declining revenues and chronic under-financing. In Russia between 1995 and 1998, low economic growth, budget volatility and sky-rocketing inflation led to a 31 percent decline in the real public health care spending per capita, practically pauperizing the health care system (Goskomstat, *Health Care* 2005 and *Regions of Russia* 2004, 2007 and 2008). Even during the economic recovery, insufficient financing of health care both at the federal and local levels and a failure to introduce alternative sources of financing may have increased the importance of undocumented payments, shifting the burden of financing to the general public. Our study finds that bribery in Russian health care does not respond to short-run budgetary fluctuations, captured by the regional budget deficits. However, greater per capita health care expenditure and overall level of economic development have a consistent negative impact on the incidence of bribery.

Insufficient budget resources can also manifest themselves in delayed wage payments to medical workers in the public sector and exert a downward pressure on their salaries. We find that in the Fall of 1998 (following the financial crisis) 81% of nurses and 63% of doctors reported wage arrears, amounting to 3.8 months of unpaid wages per affected worker. One would expect that wage arrears propagate unofficial income, but we do not find empirical support for this conjecture. Substantial evidence also suggests that medical professionals in Russia are systematically underpaid relative to professionals in other fields (see Figure 1, panel C; Figure 4)[6]. Theoretically, the relationship between wages and bribery is ambiguous: on the one hand, opportunity to extract bribes from patients is a job amenity which implies a negative relationship between wages and bribery, but on the other hand, if wages and skills are positively correlated, then a positive relationship between bribery and wages is expected. Several empirical studies which investigate the relationship between wages and corruption do not offer a conclusive answer. While van Rijckegham and Weder (2001) uncover a significant negative relationship between the relative civil-service pay and corruption indices in a sample of 31 countries, Rauch and Evans (2000) and Treisman (2000) find no evidence that higher officials' wages are associated with lower corruption levels. Our study shows that once we control for the observed skills of medical workers and endogeneity of medical wages, the positive association between the bribery and wages of medial workers disappears and the relationship is no longer significant.

Finally, underdeveloped private sector and lack of competition in the market for health care services may facilitate corruption. In Russia private provision of health care is very small

[6] When asked about personal attitudes to bribery, a nurse at a Moscow hospital is quoted saying: "We took the Hippocratic Oath and we respect his oath. Just as we take care of people, we want to be taken care of, to be paid accordingly. We want justice" (Radio Free Europe/Radio Liberty, available at http://www.rferl.org/content/article/1062104.html).

and concentrated in a limited range of services (see Appendix A1). Regulated privatization, as opposed to unregulated *de facto* privatization of public health care via informal payments, may encourage fiscal responsibility, greater accountability and create incentives for health care providers to compete on the basis of quality. Contrary to our expectations, the study finds that bribery in Russia is more prevalent in the private than in public sector, perhaps due to greater tax evasion incentives or to sorting of more skilled health care professionals into the private sector where remuneration is higher. However, this finding needs to be explored more thoroughly.

The rest of the paper is organized as follows. Section 2 describes data and variables employed in the empirical analysis. Evidence of bribery from our dataset is discussed in Section 3. Section 4 presents the econometric model of bribery in the supply and demand framework and outlines the main hypotheses to be tested. Section 5 presents estimation results and Section 6 concludes.

2. Data Overview

Russian Longitudinal Monitoring Survey

The primary data for this study are drawn from the Russian Longitudinal Monitoring Survey (RLMS), which is a household panel survey that includes rich information on socio-economic conditions and medical services. The RLMS is organized by the University of North Carolina Population Center in cooperation with the Russian Academy of Sociology. The data are collected annually, and our panel includes 10 waves during the period 1994-2005, with the exception of 1997 and 1999, when the survey was not administered. The number of surveyed individuals varies from 10,500 to 12,700 per year.

The RLMS sample is a three-stage stratified probability sample of dwellings. The response rate exceeds 80 percent for households and is about 97 percent for individuals within

the households. The sample attrition is generally low compared to similar panel surveys in other countries, partly owing to lower mobility and infrequent changes of residences.[7] To account for the panel attrition, summary statistics reported in this study are weighted using the RLMS sample weights that adjust not only for sample design factors but also for deviations from the census characteristics.

The RLMS questionnaire includes a large section on respondents' health conditions and medical services. We use several proxies for the health status such as an indicator if self-assessed health conditions are bad or very bad, a dummy for chronic illnesses (available since 2000), and an indicator for having health issues in the last 30 days. On average, about 12 percent of respondents assess their health conditions as bad or very bad and about 45 percent indicate having chronic illnesses (see Table 1). In addition, we created eleven categories of the type of illness based on provided descriptions of health problems in the last 30 days. The classification is based on the International Statistical Classification of Diseases and Related Health Problems (10^{th} Revision). The details of classification are presented in appendix A2. Figure 1A shows that approximately 40 percent of respondents report having some health issues in the last 30 days; the share remains practically the same between 1994 and 2005.

We also have information on three types of medical services: treatment visit in the last 30 days, hospital stay (or "inpatient visit") in the last 3 months, and preventative checkup visit in the last 3 months. The treatment visit, in turn, is divided into two subcategories: outpatient visit to a medical facility (including any additional procedures performed during that visit) and visit by a medical worker at home. Respondents are asked a few more questions about treatment visits

[7] To deal with attrition, RLMS replenishes its sample on a regular basis by adding new dwellings, especially in the areas of high mobility such as Moscow and other large cities. To maintain the panel, RLMS partially attempts to collect information on those who moved out of the sample dwellings but live in the same location. More details on sample design, attrition, and replenishment are available at http://www.cpc.unc.edu/projects/rlms.

than about hospital stay or checkup visits. For example, for treatment visits, we have information on the type of medical facility visited (hospital, clinic, or home visit), the ownership type of the facility (public or private, which also includes private practitioners), and travel cost. For hospital stay and checkup visits, these variables are missing in later years and, therefore, cannot be used in the analysis. As a result, we employ two samples of individuals: a main sample that includes those who had a treatment visit in the last 30 days and a supplementary sample that covers all three types of medical services but limits the use of several important covariates.

The overall trends in utilization of medical services between 1994 and 2005 are depicted in Figure 1. The share of respondents who uses medical services is about 14 percent for outpatient treatment visits in the last 30 days, 4 percent for home visits in the last 30 days, around 5 percent for inpatient visits at the hospital in the last three months, and about 20 percent for preventative checkup visits in the last three months. The share of all medical visits remains steady over time, with the exception of preventative checkups that appear to be more volatile and closely follow the business cycle, with a decline in the 1990s and a rise in the 2000s. Interestingly, the share of private sector visits has increased, but it is still rather small – below 6 percent as of 2005 (Figure 1B). This confirms that private ownership constitutes a relatively small share of the market of medical services in Russia.

The survey also provides substantial information on characteristics of medical workers, patients, and non-participants (those who did not use medical services). We know their age, gender, years of schooling, tenure, occupation, employment status, earnings, wage arrears, household disposable income, medical and total expenditures, location, and other

characteristics.[8] For children participants (14 years or younger as defined in the RLMS), we use schooling and employment characteristics of the largest household earner who is assumed to make a payment decision for children's treatment. The description of all individual-level variables employed in this study are presented in Table 1 (summary statistics) and appendix A3 (codebook and variable construction).

Regional Variables

The RLMS sample consists of 38 randomly selected primary sample units (PSU) that are representative of the whole country. The surveyed individuals reside in 160 cities and villages (municipalities or locations thereafter), 53 county-sized *raions*, 32 state-sized federal subjects (regions thereafter) and 7 federal districts of the Russian Federation.[9] These regions are highly diverse, both geographically and economically.[10] For example, the maximum-to-minimum ratio across RLMS regions in 2005 was 9.7 for regional domestic product per capita, 5.2 for average monthly earnings, 3.3 for health care budget spending per capita, and 3.0 for number of doctors per 10,000 people. We exploit this significant variation across RLMS regions to account for the effect of local shocks and policies on the incidence and size of informal medical payments. Appendix A4 presents definitions and sources of all regional-level variables employed in this study.

We use numerous statistical publications of the Federal State Statistics Service of the Russian Federation (Goskomstat, thereafter) to obtain regional time-varying information on the number of hospital beds, number of doctors and associate medical personnel, number of

[8] All monetary variables are deflated in prices of December 2002 using monthly national CPI and the date of the interview.

[9] Russia had 89 regions and 7 federal districts as of November 30, 2005. Some PSUs include several municipalities and raions.

[10] Gorodnichenko, Sabirianova Peter, and Stolyarov (2010) calculate that monetary income per capita in the richest Russian region is 10.4 times larger than per-capita income in the poorest region in 2005, whereas a similar maximum-to-minimum ratio across states in the U.S. is only 1.8.

hospitals and clinics, average monthly accrued wages in health care industry, regional budget deficit, population, gross regional product, morbidity rates, and environmental pollution discharges (Goskomstat, 1997, 2001 and 2005). Regional budget expenditures on health care and physical culture are obtained from the Treasury Budget Data (Roskazna, 1995).[11] We have also assembled a large regional database on wage arrears in the health care industry from monthly issues of the statistical bulletin "Wage Arrears" (Goskomstat, 1995). The database includes the total amount of wage arrears in rubles, the share of wage arrears due to budgetary problems, the share of workers with wage arrears, number of health organizations with wage arrears, and number of monthly wage bills owed in affected health organizations.

Other important regional variables that will be used in our identification are regional wage coefficients (or multiples of the base salary) and northern markups designed by the central planners in the 1960s to compensate workers for residing in locations with harsh climate conditions. As of 2005, Russia has kept these policy tools for public sector employees in 52 of 89 regions and allowed regional governments to introduce additional markups to the base salary. The value of the regional wage coefficients set up by the federal government ranges from 1.0 (base salary and no extra compensation) in central Russia to 2.0 (double the base salary) in Siberian Chukotka, in northeastern Russia near the Bering Straight. On top of these coefficients, public sector employees in Northern districts are entitled to northern markups (up to 100 percent of the base salary as in Chukotka). Using the legislation database "Garant" (http://www.garant.ru), we have assembled a timetable of any legal changes in regional wage coefficients and northern markups in the RLMS raions, as these coefficients often vary by raion within the region. Internal budget calculations by the Ministry of Finance turned out to be

[11] We are thankful to Andrey Timofeev for helping us to locate the regional budget information for the 1995-2000 period.

another useful source that provides the total wage coefficient for each region (weighted average across raions, the maximum value is 5.0) and its components: the base regional wage coefficient, northern markup, other climate-related wage markups, and zone coefficients for compensation of transportation costs.[12]

Finally, we supplement our survey data with a rich set of weather indicators to address the potential sample selection bias. Several daily weather indicators such as mean, maximum and minimum daily temperature, mean dew point, mean sea level pressure, precipitation amount, plus an indicator for the occurrence of snow, fog, rain, hail, thunder, and tornado are available from the U.S. Department of Commerce, National Climatic Data Center, Global Summary of the Day. The indicators are collected from about 1,300 meteorological stations in Russia and are exchanged under the World Weather Watch Program. Using the latitude-longitude distance calculator, we have identified a meteorological station which has the shortest distance to the administrative center in each of RLMS raions. If weather data are missing, then the next closest station is chosen. The majority of stations are located within a 100 kilometer radius from the administrative center. We extracted daily weather data from January 1, 1975 through the end of 2006 and computed weather deviations from a 30-year trend for each month. Using deviations from the monthly norm rather than simple means captures sudden, unexpected fluctuations in weather that may have an exogenous effect on medical visits, but do not have a direct effect on bribery. The detailed account of specific weather variables used is presented in appendix A4.

[12] Since the budget for the next year is developed in the middle of the current year, one-year forward values are used for any given year.

3. Evidence of Bribery in the RLMS

The existence of bribery in Russian health care is not something that requires sophisticated verification, as the evidence of this phenomenon is overwhelming and easy to find. Simple internet search brings to the screen hundreds of real life stories that involve informal medical payments and even some cases of doctors' prosecution for the most outrageous violations of the Russian Criminal Code.[13] The case studies of informal medical payments in Russia have also been fairly well documented in the literature (e.g., Shishkin *et al*, 2003; Tragekes and Lessof, 2003; Fotaki, 2009). What is less obvious, but needed for causal inferences, is how one can detect medical bribery in a typical household survey like RLMS, especially on the demand side among medical workers. In this section, we first look at the incidence, amount, and distribution of informal payments reported by patients, and then examine several behavioral outcomes of medical workers that are consistent with bribery, such as patterns in workers' pay, job mobility, the income-consumption gap, and asset holdings.

Supply Side: Patients

Evidence on informal payments on the supply side is easier to obtain as patients are not subject to legal penalties or moral condemnation and, therefore, are more willing to openly acknowledge side payments (without naming the doctor). The literature cites at least six sociological surveys that include questions on the incidence and amounts of informal medical payments in Russia.[14] In the RLMS, with respect to all three types of medical services, the

[13] From time to time, national and regional media outlets highlight cases of doctors' prosecution for accepting bribes in large quantities, demanding payments for services which by law should be free-of-charge, forcing healthy patients to stay in the hospital for pay, falsifying disability documents, and other reasons. Media reports often refer to the Article 290 of the Criminal Code of the Russian Federation that determines the penalties for bribe-taking by a functionary (http://www.russian-criminal-code.com). However, the law is ambiguous whether ordinary public employees fall under the category of the functionary.

[14] See Shishkin and Popovich (2009) for the summary of various sociological surveys on the incidence of informal payments in Russian health care. Generally, surveys with larger representative samples report numbers similar to

patients are first asked whether they paid for their last visit *with money or in-kind* and how much they paid for this visit *with money or in-kind*. The small caveat is that the add-on "with money or in-kind" appeared in the 2000-2005 questionnaires, and hence we do not know if respondents included the estimates of in-kind payments in earlier rounds.[15] To make comparisons valid, the trends in total payments need to be analyzed within each sub-period separately, 1994-1998 and 2000-2005. In Figure 2A, we see a sizeable, more than 50 percent increase in the share of paid treatment visits and checkups between 1994 and 1998. The share of paid inpatient visits that include payments for medicine has also risen from 14 percent in 1994 to 24 percent in 1996, spiking at 41 percent in 1998, the year of financial crisis (the trend is not shown to keep the diagram less cluttered). In the later period, the incidence of payments for treatment visits continues to rise, reaching 21 percent in 2005. However, the trend in the incidence of payments for hospital stay without medicine and checkups is less clear, fluctuating between 11 to 18 percent of patients. In total, household expenditures on health care were rapidly rising both in real terms and as the share of the household budget (Figure 2B). In 2005, 1.8 percent of household non-durable expenditures went on medical treatment and physical examination and about 4 percent on purchases of medicine. All of these numbers are considerable, taking into account that the state still guarantees free health care.

RLMS. However, surveys with smaller samples and on-line web interviews report much higher incidence of informal medical payments, which could be due to the sample design issues.

[15] Another small caveat is that in the earlier rounds (1994-1998), payments for medical help during the hospital stay cannot be separated from purchases of medicine needed for hospital procedures. In 2000-2005 surveys, respondents were asked about purchases of medicine in two separate questions: "Did you receive medicine, syringes, and dressings, which were necessary for your treatment in a hospital, for free or did you pay for them with money and gifts?" and "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" (officially in the hospital, directly to the medical personnel with money or in-kind, or in pharmacies outside the hospital). In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped this question. Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.

Importantly, a significant portion of these medical payments does not go through official channels. Beginning with the 2000 survey, the RLMS added questions about the type of payment made for medical services. Specifically, respondents were asked whether the payment was made "officially in the medical organization's cashier's office" or unofficially "with money or gifts directly to the medical personnel", which we refer to as bribes[16]. Figure 2C shows that patients paid informally in about 60 percent of all paid treatment visits during the 2000-2005 period. The share of informally paid inpatient visits has increased from 50 to approximately 70 percent. However, the share of informally paid preventative checkups has decreased from 33 to 18 percent, which may be attributed to the increasing role of officially chargeable checkup services and less willingness to pay for non-threatening medical conditions.[17] In real terms, the average amount of informal payments per paying person increased by more than 50 percent in the last three years of our data (Figure 2D).

This brings about an important question – who bears the burden of informal payments? Evidence from several transition economies suggests that informal medical payments are regressive, that is the burden of unofficial payments is borne disproportionately by the poor who spends a higher proportion of income on medical services (Transparency International, Corruption and Health, 2006). A recent paper by Nguyen (2008) also finds that bribery is a regressive tax in Vietnamese health care. However, we do not find support of regressive bribery in our data. While the incidence and amount of pay for treatment visits increases with household

[16] This measure is likely to capture *delayed* informal payments (paid after the treatment course is complete) but it probably does not account for the costs of any personal favors patients may offer to their doctors. Shishkin *et al* (2003) quote doctors saying *"…I serve him for free. Why? Because for the last 3 years I have been parking my car in his car park. […] Or I know he will be repairing my car. Or it may be that he will be able to renovate my office." "Most of my patients cannot pay me anything. But they can help me with something. For example, repair my car, or renovate my apartment, or take care of my kid."*

[17] Beginning with 1996, public health organizations in coordination with health authorities were allowed to charge patients for the narrow set of health services, including medical examinations and tests that a patient needs to undergo in order to receive a formal certificate, consultations with physicians, some diagnostic procedures, etc. (see Appendix A1 for details).

disposable income (Figures 3A and 3B), the allotment of payments between formal and informal sources is practically identical among three income groups in the sample period (Figure 3C). Furthermore, the household budget share of informal payments for medical services does not depend on the level of income (Figure 3D). One likely explanation of this result is price discrimination of patients in proportion to their level of income.[18] Another possible explanation is the discrimination in quantity and quality of medical services based on patients' income.[19] Whereas the medical bill of the poor could be large due to their lesser health conditions, the resources of the rich can buy them more quantity and quality of medical services. The health effect cancelling the income effect can result in the equal budget shares of informal medical payments among different income groups.

Overall, the RLMS data appear to be a reliable source for examining the incidence of informal medical payments on the supply side. The summary statistics and distributions of key variables by various groups seem reasonable and intuitive.[20] Next, we turn to the demand side.

Demand Side: Medical Workers

Detecting bribery on the demand side is far more challenging since typical household surveys do not ask medical workers about receiving informal payments. The truthfulness of answers to such a question would be highly doubtful even in countries like Russia where bribe-taking is accepted by the society and practically not enforced. Medical workers are unlikely to

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[18] Anecdotal evidence and several case studies reveal that physicians often assess the patients' ability to pay when determining the price of the service. Shishkin *et al* (2003) quote several doctors saying "*It is only natural that we take money from patients who can pay, and we perfectly well know who can*." "*There are no fixed rates at all. We look at each person. One patient can give one sum; another one can afford a larger sum.*" "*When you talk to a person, you can tell who and what he or she is*".

[19] Thompson and Xavier (2002) provide evidence of service differentiation in Kazakhstan, where doctors offer different levels of service quality to patients depending on the amount of unofficial payment.

[20] Although RLMS numbers are in the ballpark of estimates provided by other surveys, we cannot exclude the possibility of underreporting of informal payments by patients. Since we do not have external sources to verify underreporting, in this study we assume the classical left-hand-side measurement error resulting in consistent estimates but inflated standard errors.

disclose side payments if small chances of prosecution exist.[21] Despite this problem, the careful inspection of our data reveals several interesting patterns in medical workers' responses that might be indicative of receiving direct payments from patients.

To begin with, we note that earnings reported by medical workers in the survey are similar to official salaries submitted to Goskomstat by health organizations, suggesting that RLMS income measures are not likely to include informal payments. Several indicators of medical workers' earnings are shown in Figure 4 and Table 2. We observe that medical workers' average monthly official earnings are, on average, 28 percent lower than earnings of other workers. Conditional on gender, schooling, experience, tenure, and location, the wage gap remains significant at 25 percent. The variance of medical workers' earnings is also significantly lower than the variance of earnings in other occupations, reflecting rigid labor remuneration practices based on the wage grid and overall wage compression in the health care industry (Figure 4B). On top of the low official earnings, medical workers often experienced delays in wage payments, especially in the 1990s. At the peak of wage arrears in late 1998, 81 percent of nurses and 63 percent of doctors reported overdue wages, averaging to 3.8 monthly salaries per affected medical worker. As Figure 4C shows, wage arrears receded in later years, but they did not disappear entirely.

High wage compression together with persistently low and irregularly paid salaries should be especially devastating for more productive workers, creating strong incentives for them to leave the job. However, we find very low rates of occupational mobility and job separation for both doctors and nurses compared to other groups. For example, between 2000

[21] In Russia, illegal actions of medical workers could be prosecuted under the Criminal Code, the Federal Law on Corruption, the Federal Law on Civil Service, the Tax Code, regional health care legal regulations, etc. They could also be considered as violations of the Hippocratic Oath that states "*in every house where I come I will enter only for the good of the patient, keeping myself far away from all intentional ill-doing, unjust, and damaging*".

and 2005, only 4 percent of doctors and 15 percent of nurses switched their occupation at the 1-digit ISCO level, compared to 25 percent of other professionals, 41 percent of service workers, and 35 percent of all workers. Similar differences are observed for job separation rates. It is interesting that the number of students enrolled in health care programs at public universities, after a 20 percent drop in the 1990s, has been steadily increasing and by 2004 surpassed its previous highest peak of 1991. It is also revealing that the number of applicants per one funded place in these programs has been continuously higher than the average application rate across all fields between 1990 and 2004 (Goskomstat, 2005). Of course, the medical profession is special and can draw people regardless of pay. But at some point one can question if pure moral satisfaction can retain 96 percent of workers in the profession that consistently underpays in large amounts of 25-30 percent during a very long period of time. We think that seemingly contradictory observations of low reported wages, insignificant worker turnover, and high enrollment statistics can be reconciled with receiving non-declared direct payments and other perks from patients.

Further data examination brings in other results that seem to be inconsistent with small wage numbers, unless some degree of non-reporting is assumed. First, persistently low earnings do not result in lower levels of expenditures among medical workers. Similar to Gorodnichenko and Sabirianova Peter (2007) who find a substantial consumption-income gap in the Ukrainian public sector, we also find a 20 percent discrepancy between reported income and expenditures among Russian medical workers. Table 2 shows that households headed by a medical worker,[22] on average, have lower labor earnings and smaller equivalized disposable income compared to other working households (panel A). Yet, the difference in expenditures per adult equivalent

[22] The head of the household is defined as the largest income earner. In a few exceptional cases when two or more members reported the same level of earnings, the oldest member is chosen.

simply vanishes between these two groups of households (panel B).[23] Second, we find practically no differences in the share of annual income saved, money saved last month, the market value of housing, and possession of various durables (cars, other vehicles, land plots, large appliances, etc.) between households of medical workers and other working households.[24]

In sum, there is strong evidence that bribery for medical services is a common phenomenon in Russian health care industry. Using individual-level data from patients we find that informal payments constitute a signficiant portion of out-of-pocket expenses, particularly for inpatient services. On the demand side, we infer the existence of undeclared income of medical personnel by examining several characteristics of medical workers. We find that despite a significant negative wage premium and delayed wages, medical professionals have a very low rate of occupational mobility and they enjoy a comparable standard of living relative to workers from other industries. These findings provide additional evidence for the prevalence of informal payments in Russian health care.

4. The Econometric Model of Bribery in the Public Sector

In this section, we present the identification strategy for estimating the determinants of informal payments in the public health care sector. Since informal payments to a public sector employee are illegal (though may not be enforced), we will refer to them as bribes. The model is

[23] Even if we take all households of medical workers, regardless of members' relative income contribution, and compare those households with other working families, the result remains qualitatively the same (see column 2 of Table 3). The estimated differences are smaller in column 2 of Table 2 since the households of medical workers include high earners from other industries.

[24] Results with saving and asset holding are not reported to preserve space. A couple of minor exceptions from the overall consistent results are rather amusing – medical workers are less likely to own PCs, but more likely to have VCRs and DVD players.

based on the equilibrium demand-supply identity for each location under the assumption of localized health care (no travel outside the region for medical services):[25]

$$B_{jt} = \sum_m b^d_{mjt} = \sum_i b^s_{ijt},$$

where B_{jt} is the total amount of bribes received/paid in location j and time t, b^d_{mjt} is the amount of bribes received by a medical worker m in time t (d stands for the demand side), and b^s_{ijt} is the amount of bribes paid by a patient i in time t (s stands for the supply side).

Therefore, the extent of bribery in location j can be expressed as total bribes per capita:

$$\bar{B}_{jt} = \frac{B_{jt}}{N_{jt}} = \left(\frac{M}{N}\right)_{jt} \frac{1}{M_{jt}} \sum_m b^d_{mjt} = \left(\frac{M}{N}\right)_{jt} \bar{b}^d_{jt}, \quad (1)$$

where $(M/N)_{jt}$ is the observed share of medical workers in total population in location j at time t and $\bar{b}^d_{jt} = \frac{1}{M_{jt}} \sum_m b^d_{mjt}$ is the average bribe per medical worker in location j.

We model the demand of medical workers for bribe as function of their official wages, w^d_{mjt}, other observable individual characteristics, X^d_{mjt}, observable and unobservable local demand-side shocks (Z^d_{jt} and $\tilde{\varepsilon}^d_{jt}$, respectively), and a worker-specific error term, ε^d_{mjt}:

$$b^d_{mjt} = \pi_0 + \pi_1 w^d_{mjt} + \pi_2 X^d_{mjt} + \pi_3 Z^d_{jt} + \tilde{\varepsilon}^d_{jt} + \varepsilon^d_{mjt}. \quad (2)$$

Individual and local characteristics are included to capture both the cost of bribery and individual preferences towards accepting bribes.

[25] The assumption of localized health care is largely supported by anecdotal evidence (Tragekes and Lessof, 2003). Our data show that in 93 percent of all treatment visits in 1994-2002, it took one hour or less for patients to travel one way (two hours or less in 98 percent of cases). Our results are not sensitive to excluding patients traveling more than one hour to see the doctor. The question on travel time is no longer asked in the survey after 2002.

Since b_{mjt}^d is not directly observed at the individual level, we aggregate equation (2) at the location level without the loss of generality:

$$\bar{b}_{jt}^d = \pi_0 + \pi_1 \bar{w}_{jt}^d + \pi_2 \bar{X}_{jt}^d + \pi_3 Z_{jt}^d + \mu_{jt}^d, \tag{3}$$

where $\bar{w}_{jt}^d$ is average wage of medical workers in location *j*, $\bar{X}_{jt}^d$ is a vector of average characteristics of medical workers in location *j* (e. g. , average schooling and experience), Z_{it}^d is a vector of observable local characteristics, and $\mu_{jt}^d = \tilde{\varepsilon}_{jt}^d + \bar{\varepsilon}_{jt}^d$ is unobserved common local shocks.

The relationship between bribes and official wages is theoretically ambiguous. It could be negative if bribes and wages are substitutes. Suppose that the opportunity to extract bribes is a job amenity that lowers the wage offer. If this is the case, then the hedonic model of compensating differentials would imply a negative correlation between bribes and wages on the demand side, $\pi_1<0$. On the other hand, bribes and wages could be complements. Suppose wages in the public sector are compressed and only partially capture the level of skills and individual productivity. If bribes are payments for better services and are increasing with skills of medical personnel, then the correlation between bribes and wages is likely to be positive, $\pi_1>0$. Both the hedonic trade-off and complementarity arguments imply that wages are clearly endogenous in both (2) and (3), that is $Cov\left(w_{mjt}^d, \varepsilon_{mjt}^d\right) \neq 0$.

Besides wages and measurable skill composition of medical workers, specification (3) also allows us to examine other potential demand shifters of bribery. For example, one can argue that it is not only the low level of wages but the volatility and delays in wage payments in the Russian health care sector may induce medical workers to accept bribes. Thus, the Z_{it}^d vector may include the extent of wage arrears in the health care industry as well as other short-term

budgetary fluctuations such as budget deficit. It is also to important to control for time-varying measures of regional economic development and changes in the endowment resources of health care industry, including health care budget resources and medical facilities. Including these factors will allow us to test whether the extent of bribery is affected by the lack of long-term health care resources and low level of economic development vs. temporary budgetary shocks and wage arrears.

Now we turn to the supply side and model the patient's choice. Conditional on medical visit, patients face three choices: do not pay for visit, pay officially for special medical procedures and chargeable health care services, or pay unofficially. For the moment, we will ignore official pay and model the amount of unofficial pay as a function of health status, ability to pay, demographics capturing preferences for health, type of services, and the extent of bribery in location.

$$b_{ijt}^{s} = \widetilde{\gamma}_0 + \gamma_1 X_{ijt}^{s} + \widetilde{\gamma}_2 \overline{B}_{jt} + \varepsilon_{ijt}^{s}, \tag{4}$$

where b_{ijt}^{s} is the amount of bribes paid by a patient *i* in location *j* at time *t* (*s* stands for the supply side); X_{ijt}^{s} is a vector of observable individual characteristics that include health conditions, household disposable income, demographic characteristics, schooling, employment status, and the type of medical services; and $\overline{B}_{jt}$ is the extent of bribery in location *j*. We assume that the X_{ijt}^{s} vector is exogenous (e.g., no contemporaneous feedback from bribery to health status). Better health conditions are expected to lower the demand for medical services and thus lower the willingness to pay unofficially. We think that household income, schooling, and employment of patients can proxy for their ability to pay and their opportunity cost of being

sick. Therefore, employed and more educated patients from high-income households are likely to pay more. We do not have prior expectations with respect to gender differences in bribing.[26]

The extent of bribery in location j, $\overline{B}_{jt}$, is modeled in (1) and (3). By substituting equations (1) and (3) into (4), we obtain the following reduced-form specification for bribery:[27]

$$b_{ijt}^{s} = \gamma_0 + \gamma_1 X_{ijt}^{s} + \gamma_2 \overline{w}_{jt}^{d} + \gamma_3 \overline{X}_{jt}^{d} + \gamma_4 Z_{jt}^{d} + \varepsilon_{ijt}, \quad (5)$$

where $\varepsilon_{ijt} = \varepsilon_{ijt}^{s} + \mu_{jt}^{d}$ is the error term capturing the unobserved components of local shocks, quality of medical services, preferences, measurement errors, and other residual factors.

There are several econometric complications here. The first one is that wages of medical workers are endogenous for the reasons discussed above. In (5), the endogeneity becomes even more obvious. Suppose that patients pay extra to more productive doctors, but the productivity of doctors is not fully observed − partially it is captured in wages but the rest is in the error term. If wages and unobserved productivity are positively correlated, then the estimate of γ_2 is likely to be biased upward. The positive correlation between wages and productivity could also occur at the regional level as more skilled doctors may sort themselves into better paying locations.[28]

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[26]Empirical evidence with regard to gender differences in bribing is scarce and conflicting. Some studies find that females are less likely to be asked for a bribe (Mocan, 2008) and less likely to agree that corruption can be justified (Torgler and Valev, 2006). Alatas *et al*. (2007), on the other hand, argue that gender differences in corruption maybe culture-specific as they find that men and women have similar attitudes towards corruption in three Asian countries. On the other hand, experimental literature consistently suggests that women are more risk averse than men (Croson and Gneezy, 2009) which has been linked to gender differences in health care preferences. For instance, literature finds that women have higher demand for medical services and they are willing to spend larger share of household income on health and nutrition (Duflo 2000, 2003; Thomas, 1994; Hunt-McCool *et al*, 1995).

[27] This substitution assumes that the share of medical workers in total population is constant. The assumption simplifies the equation presentation considerably, and it is not unreasonable. In our robustness checks, we include the number of medical workers per 10,000 residents as a separate covariate, as it follows from the log transformation of (1). We also weigh estimates by the share of medical workers. The results are not sensitive to either procedure.

[28] Medical workers, on average, have higher rates of geographic mobility than the rest of the population. For example, in our sample we find that 59 percent of medical workers were born in a different municipality and 53 percent lived in a different place other than the birth place and current location for more than 6 months (corresponding numbers for other workers are 55 and 49 percent). Anecdotal evidence suggests that there is sorting of better doctors in locations with greater expected earnings, i.e. larger cities. In order to prevent outflow of medical professionals from less desirable rural locations, in 1995 Russia adopted an alternative to the forced work placement system used under central planning. According to the state decree, students from villages and small towns could

Thus, wages need to be instrumented. Our solution to this problem is to instrument wages of medical workers with regional wage coefficients (or multiples to the base salary) that are inherited from the Soviet era and are still applied to the budgetary medical workers to compensate for unfavorable climate conditions (see discussion of this policy tool in Section 2).

The second econometric complication is that observed bribing is conditional on medical visit (v_{ijt}=1), which in turn is a function of the extent of bribery in location: bribery spread may reduce visits. Since the decision to visit a doctor depends on expected payments, that is $E\left(\varepsilon_{ijt} \mid v_{ijt} = 1 \text{ or } b_{ijt}^{s} \text{ is observed}\right) \neq 0$, we have a classical Heckman-type selection problem. The estimation of the Heckman selection model requires an identifying restriction − the variable that influences visits but does not affect bribery other than through visits. In search of such variable, we turn to the vast medical literature that shows how changes in weather (i.e., short-term fluctuations in the atmosphere) and climate (i.e., average weather over some period) may influence medical visits.[29] Simple climate means such as average temperature for a location in a particular month are not truly exogenous as people can choose locations based on climate conditions. Yet, weather deviations from the average monthly norm are unpredictable and exogenous by their nature. An identifying assumption here is that these sudden weather

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obtain a medical degree free of charge; upon completion of their studies, they were required to return to their original residence and work there for 3 years. However, legal enforcement has proven difficult and very few graduates followed the terms of the contract. Recent attempts by the Ministry of Health to reinstall forced work placement program met considerable public disapproval and the initiative was abandoned (*Novie izvestiya* 12.20.2007, available from: http://demoscope.ru, in Russian).

[29] The list of weather-related diseases is long. Some examples include respiratory diseases and allergic disorders due to changes in the level of aeroallergens, traumatic injuries in icy conditions, infectious diseases affected by humidity levels, cardiovascular diseases changing in response to fluctuations in temperature and atmospheric pressure, etc. (e.g., Patz *et al*., 2000).

fluctuations do not have any independent (other than through visits) effect on payment methods, nor they are correlated with unobservable determinants of paying for treatment.[30]

The third econometric issue that needs to be considered is that our left hand-side variable is the limited dependent variable with a spike at zero values and positive skewness. Since our objective is to determine general mechanisms influencing bribery decisions rather than, let say, to obtain the precise elasticity of bribery amount with respect to income, we are not constrained in the choice of methods. Our approach is to employ a variety of techniques and forms of the dependent variable to check if results are consistent. First, we use probit and linear probability models for several binary indicators: (1) a binary variable equal to 1 if the respondent paid informally for medical services (and equal to 0 if the respondent didn't pay or paid officially); (2) a similar dummy variable for official payments; and (3) a binary variable for any payments. Second, we estimate the multinomial logit model for the three categories of medical payment: no payment, official payment only, and any informal payment. Finally, we create the log of expenses during medical visits, differentiating between informal, official, and total payments, and apply both OLS and Tobit models for this dependent variable.

5. Findings

In this section, we present the estimates of the bribery function. Since we model bribery in the public sector, we omit the discussion of the private sector until later. Table 3 presents results of applying the Heckman maximum likelihood estimator to our baseline equation, where we control for non-random selection into a subsample of respondents who had a treatment visit

[30] We also experimented with travel time to visit a doctor and pollution discharges as potential identifying restrictions based on the intuition that longer travel may reduce the number of visits, while environmental pollution is likely to increase them. In both cases, though, it is hard to argue against the endogenous location sorting. Deviations of pollution discharges from the 10-year average are very weak predictors of medical visits in the selection equation.

in the last 30 days. Specifically, we first estimate the determinants of informal, official and any type of payment between 2000 and 2005 during a treatment visits (columns 1-3) and then estimate the determinants of the log-adjusted expenses for each payment type (columns 4-6). The equation determining the selection in the analyzed sample (a decision to have or not to have a treatment visit) has the same individual-level controls (illness categories are excluded because they predict visits perfectly) and regional controls as the main equation, plus a set of instruments. We experimented with many weather and pollution indicators and report our preferred results with those that have the highest predictive power in the selection equation (based on F-test). We use deviations from 30-year trend in the average monthly temperature and air pollution fluctuations around the 12-year mean as our indentifying restrictions[31]. Both measures are highly significant (at the 1 percent level) in the selection equation: sudden fall in temperature and emission of pollutants into the atmosphere tend to increase visits to a medical facility. An identifying assumption is that the sudden fluctuations in weather and air pollution levels do not have any causal effect on the payment methods for medical service and they are uncorrelated with any unobservable determinants of paying.

We find evidence of a negative sample selection bias for payments during a treatment visit and for formal payments: individuals who did not have a treatment visit are less likely to pay or pay officially; this is in line with our expectations. Interestingly, it appears that the presence of informal payments does not deter those visits for which patients pay informally. This is not surprising since informal pay is an established and commonly accepted form of

[31] Other weather indicators that were significant in the selection equation are: unusual number of days (more than 3 days) with hail, icy conditions (precipitation and crossing over 0 degree Celsius during the day), maximum and minimum daily temperatures, dew point, mean sea level pressure, and interaction term between sea level pressure and temperature. Most effects disappear once temperature is added to the selection equation since weather indicators are highly collinear.

payment for medical services. This suggests that estimates of informal payments without controlling for sample selection are robust.

Our results are consistent across all specifications. Whether we differentiate between informal or official payments, being a female, an adult and having higher education has a positive effect on the probability of paying for a treatment visit. Age is consistently negative and significant[32] which may be due to an age effect or the cohort effect[33]. If the cohort effect dominates, one possible interpretation is that older generation is more reluctant to pay for medical services—which used to be provided for free during the Soviet era—and they have an innate distaste for bribery, relative to the younger generation. In general, the negative relationship between an individual age and bribery is consistent with a well-established result from crime and corruption literature with asserts that older people are more compliant and law-obedient. Positive effect of employment on the likelihood of paying and paying officially may be capturing greater ability to pay as well as a higher valuation of time by a working individual, relative to someone out of work or out of the labor force. There is a strong positive association between disposable household income and the probability of paying for treatment. Of all our controls for various types of illnesses, only digestive system illnesses and dental problems are associated with a positive probability of paying both informally and officially. As expected, mild respiratory diseases, such as common cold and flu, lower the probability of paying for a treatment visit. The negative effect of heart and circulatory system diseases on the probability of paying is driven by respondents who have high blood pressure. Once we exclude these responses from this category, the effect becomes positive and significant. Chronic illness and poor health

[32] When we add the quadratic term, the effect disappears.

[33] It is important to distinguish the two effects. Age effect measures changing attitudes of the same cohort over time while a cohort effect measures the differences in attitudes among similar age groups in different time periods. In other words, age effect arises due to chronological age while cohort effect is attributed to unique experiences, characteristics or socialization process of a particular cohort (Torgler and Valev, 2006).

dummies do not have a very strong explanatory power because we already include disaggregated controls for various illnesses; once illness dummies are dropped, chronic illness and poor health become highly significant. The probability of paying informally is higher for a hospital visit, as compared to a visit to polyclinic or home visit. This is expected since visit to a hospital signals a more serious health problem and hence a higher willingness to pay. The probability of paying officially is predictably lower for home visits because home visits do not involve services for which patients can be charged legally (see Appendix A1). The log of inflation-adjusted wages of medical workers has a positive and significant coefficient for all types of payments and the effect is stronger for informal payment; however, due to endogeneity problem we cannot offer yet a meaningful interpretation of this result. Endogeneity of medical workers' wage is addressed further. Average schooling of medical workers is not significant. Interestingly, higher regional gross product has a strong and consistently negative effect across all specifications, suggesting that wealthier and more economically developed regions rely less on out-of-pocket expenses and, importantly, have lower incidence of informal payments[34]. When we estimate the determinants of the log inflation-adjusted informal, official and total expenses made during a treatment visit, the results are practically unchanged, lending support for our initial findings. An intriguing finding is that the amount of bribery is slightly more responsive, relative to an official payment, to increases in household income: a 10 percent increase in the adjusted household income is associated with a 0.9 percent increase in the predicted informal expense and a 0.77 increase in

[34] Gross domestic product has been criticized as inaccurate measures of economic development in the developing countries because it typically does not include informal sector which still accounts for a significant portion of output. In order to account for the possible underreporting of output from informal activities, we substituted gross regional product per capita with two measures of income: real monetary income per capita and real consumption expenditures per capita. Monetary income includes income from all forms of economic activity and social transfers (pensions, stipends, subsidies), while consumption expenditure includes all household expenditures on goods and services, except purchases of art work and jewelry to be used as a capital investment. The results are consistent with estimates using real gross regional product per capita. We have also included two alternative measures of economic development: regional mortality rates and regional infant mortality rates. Both variables had the expected sign (positive) but were not significant.

the predicted official expenses, *ceteris paribus*. The regional effects also continue to hold. A 1 percent increase in per capita regional product is associated with a 1.5 percent decrease in the average predicted bribes and a 2.8 percent decrease in the average predicted official expenses. It appears that economic development has overall cost-reducing and briber-reducing properties.

Next we explore sensitivity of estimating the determinants of bribery and the amount of bribes to different estimation methods. Since we do not find evidence for selection of sample based on unobservable for those patients who pay informally, we omit controls for selecting into sample in the following estimates without loss of efficiency. The results are presented in Table 4. In the first column we report probit estimates of the determinants of informal pay during a treatment visit. The results are very similar to the results from the maximum likelihood estimation both in terms of the significance of our controls and the size of the estimated coefficients. The effect of individual-level characteristics is consistent with existing literature: those who are better able to pay (i.e., higher income, better educated, employed) or those with worse health and more serious illnesses are more likely to pay unofficially. Similar results are obtained from multinomial logit estimation, where the effects of explanatory variables on informal and official payments are compared to the base outcome (if no payment was made during a treatment visit). There are some interesting differential impacts of our controls. Relative to not paying, adjusted household income has a significant positive effect on the probability of both informal and official payments, but the propensity to pay unofficially is higher. Additional types of illnesses such as traumatic injury and musculoskeletal and connective tissue illness become significant determinants of informal pay, as compared to free visits. Still, the strongest bribery-inducing effects among illnesses are associated with digestive and dental health problems. Next, we use OLS as well as conditional and unconditional tobit with marginal effects

to test sensitivity of the determinants of the amounts of bribes, which are adjusted for inflation and expressed in the log form. Again the results are consistent; the minor exception is that employment status now becomes significant. The magnitude of the predicted effects is greater (by the absolute value of the estimated coefficients) when marginal effects in tobit estimation are conditioned on non-zero expenses, followed by OLS and unconditional marginal effects. For instance, a 10 percent increase in disposable household income increases the average informal expense by 1.6 percent, 0.9 or 0.6 percent based on conditional marginal effects tobit, OLS or unconditional marginal effects tobit, respectively. We note that all coefficients on individual characteristics are similar to the ones obtained by applying the Heckman maximum likelihood approach. The impacts of the types of illness, place of medical services and regional variables are also uniform across specifications and consistent with the previous results.

Having established that our results continue to hold when subjected to a variety of estimation methods, we now explore the responsiveness of our results to some sample restrictions[35,36]. Table 5 shows results of the probit estimates of the determinants of informal payments when the sample is split between adults and children and by gender. Several intriguing results emerge. For the children subsample, the significant effect of both age and gender disappears implying that parents are as likely to pay informally for daughters as they are for their

[35] As a robustness check, we have also excluded Moscow and Saint Petersburg from the sample. The results remain largely unchanged with the exception of traumatic injury becoming marginally significant. There are also some interesting differences between estimates when we separate them by the level of urbanization. While for urban subsample the results were practically unchanged when compared to the baseline specification, in the subsample of respondents living in rural areas average years of schooling for medical workers become positive and significant. This would be expected since there is relative scarcity of highly-qualified medical workers in rural areas and their education level is an important signal of greater productivity and professionalism. In addition, in the rural subsample both gender and employment status effects disappear and musculoskeletal and digestive illnesses are no longer significant.

[36] We have also estimated probability of informal pay for different types of medical services: 1) excluding patients who reported having additional procedures during their treatment visit; 2) hospital visit with and without purchase of medicine; 3) preventative check-up in the last 30 days. For hospital stay and preventative check-up visits we cannot include controls for the types of illness and the type of medical facility. The results are generally consistent, except for hospital stay without medicine where all coefficients lose their significance, which perhaps is due to a very limited number of observations.

sons, and for younger siblings as much as they are for older children. In other words, parents who pay informally for the treatment of their children do not discriminate against them based on either age or gender. Contrary to the result in the adult subsample, having heart and circulatory system health problems, but not a dental illness, is a significant predictor of informal pay for children. This is intuitive since any heart complications are likely to be more dangerous and life-threatening for children, while dental problems at a young age are less serious and complex than later in life. It is also interesting that visiting a hospital does not have an impact on the likelihood of paying a briber for a child respondent, while it has a positive and significant effect for adults. Perhaps medical workers are more sympathetic to patients with sick children in the hospital and exert less pressure to for informal side payment. The only substantive difference for male and female subsamples is the propensity of bribing for different types of illnesses. For instance, women are more likely to bribe for digestive system illnesses, disorders of nervous system and other systemic diseases, relative to men.

In the last column of Table 5 we incorporate private sector into our analysis by including several additional controls such as a dummy variable indicating whether facility is publicly owned and a regional share of private medical facilities. The results are interesting. Public ownership of a medical facility has a significant negative impact on the probability of informal payment, while a visit to private practitioner and the regional share of private medical facilities have a strong positive effect on bribery. We offer several possible interpretations of this result although empirical verification is necessary to make any concrete policy suggestions. First, privately owned medical facilities may have a greater incentive to foster unofficial payments due to tax evasion motives. Second, if the revenues from private practice are shared among several doctors, there is an individual incentive to accept informal payments to sharing with one's

colleagues. Finally, if there is sorting of more able doctors into the private sector, then higher informal payments may signal better quality of services and greater professional skills of medical workers in the private sector, relative to their public sector counterparts (complementarity argument).

Next we incorporate a variety of local shocks to the baseline model to explore their effect on bribery. Table 6 presents probit estimates from of paying informally based on the presence of various regional shocks. Since we have several measures for wages of medical workers, their observed skills, short-term budget shocks and controls for long-term resources and development, we include them one by one in 5 separate specifications. Regional wages of medical workers based on RLMS data and regional component of the medical workers' wages are both positive and statistically significant. Endogeneity of wages will be addressed in the next step. We control for the observed skills of medical workers with an average schooling of medical workers, skill component of regional wages of medical workers and with the ratio of doctors to nurses; however none of these variables are significant. Furthermore, variables which account for the short-run budgetary fluctuations, including regional budget deficit as a percent of regional GDP[37] and four measures of wage arrears of medical workers do not explain the likelihood of informal payments. Two factors that emerge as important determinants of bribery are long-term health care resources and the extent of regional development. Specifically, two controls for the health care resource endowments, medical personnel rate and rate of hospital beds, are associated with lower levels of bribery. At first this result may appear counterintuitive: one would expect that abundance of health care resources should not lower bribery if patients would have to pay for better quality. However, if quality is fixed, hypothetical scarcity of these resources would be

[37] Budget deficit is defined as the difference between consolidated budgetary income of the subject of the Russian Federation (a particular region) and consolidated budgetary expenditures, expressed as a percent of regional Gross Domestic Product

expected to increase the price of medical services. Since official prices are either zero or are very rigid and cannot adjust, the unofficial price would have to increase to compensate for this disparity. Consistent with previous estimates, greater economic development captures by the log of regional gross product per capita has a substantial negative effect on the probability of informal payments. In addition (specification 5), share of regional budget expenditure on health care and physical culture is associated with lower bribery; however the effect is not sizable.

Next we address endogeneity of medical workers' wages. Table 7 presents results of the IV estimates of the model with regional characteristics where wages of medical workers are instruments with regional wage coefficients (columns 1 and 2) and regional wage coefficients plus the lagged values of medical workers' wages (columns 3 and 4). As mentioned earlier, regional wage coefficients are designed to compensate public sector workers for residing in locations with harsh climates and severe weather conditions. By definition, regional wage coefficients do not affect bribery but they are very strong predictors of medical workers' wages. Results are presented with different combinations of regional coefficients depending on their predictive power at the first stage. Once medical workers are instrumented, all the regional effects, except for the negative impact of regional gross product per capita, disappear[38]. Of all the regional indicators of human, capital, and financial resources, higher level of economic development is the single most robust and consistent bribery-reducing factor.

[38] We have also estimated the IV model for the probability of making an official payment and any payment during a treatment visit. In these specifications, local shocks demonstrate a higher explanatory quality. Log of wages of medical workers is consistently positive and significant (both for official and any pay); it is possible that services for which patients seek help from medical workers with greater-than-average skills are legally chargeable services (see Appendix for the list of services for which legal charges are allowed). In addition, we have also experimented with different estimation methods, such as IV probit (for the probability of informal pay) and IV tobit (for the log of the total informal expense); the results were very similar.

6. Conclusion

In this paper, we explore empirically the determinants of bribery in the Russian health care sector from 1994 to 2005. We build on the existing literature which has demonstrated that individual characteristics, such as gender-age-education composition, play an important role in explaining individual decision to bribe. We take our analysis a step further and build an equilibrium model of bribery which allows us to test several determinants of bribery. Specifically, we use a variety of regional shocks to test whether bribery can be attributed to the short-run budgetary fluctuations, low wages of medical workers, lack of long-term health care resources, or overall level of economic development.

After correcting for sample selection bias, our findings indicate that long-run resources of health care sector, greater economic development, captured by the regional GDP per capita, and higher health care expenditure have a bribery-reducing effect, while short-run budgetary fluctuations do not have a discernable effect on bribery. We do not find evidence that wage arrears of medical workers have an impact on the probability of bribing; this may be partially because wage arrears have declined significantly in the period under investigation. We also uncover a positive association between salary of medical personnel and bribery using a variety of estimators (probit, Heckamn maximum likelihood, tobit, MNL), but the relationship is no longer significant once we control for endogneity of wages in the IV model. Interestingly, we also find that private sector is more prone to corruption. We also explore whether informal payments have a disproportionate negative impact on the low-income portion of the Russian society and conclude that informal payments, at least in purely monetary terms, are not regressive.

In short, this paper offers a more comprehensive approach for exploring the mechanisms and the determinants of informal payments in health care system in the context of a transitional

economy. However, more work is required before offering concrete policy recommendations and designing appropriate reform measures to reduce bribery in health care.

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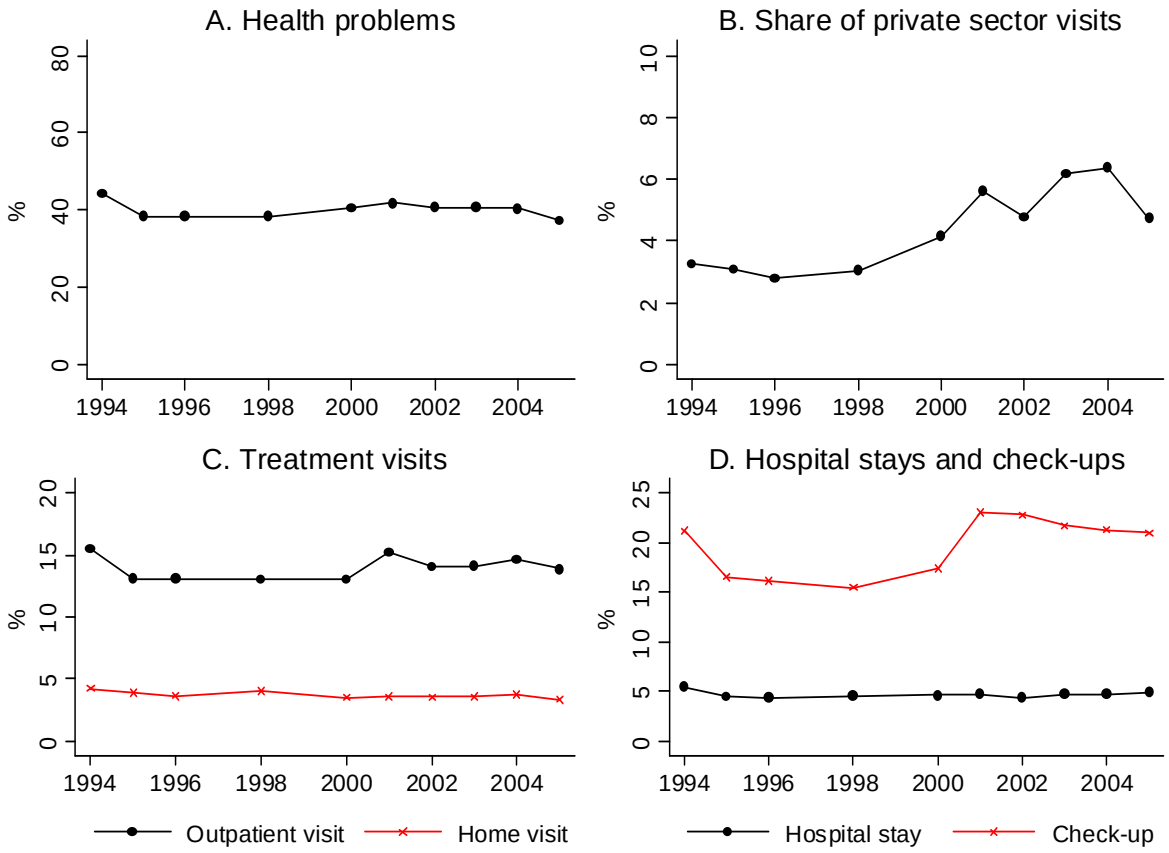
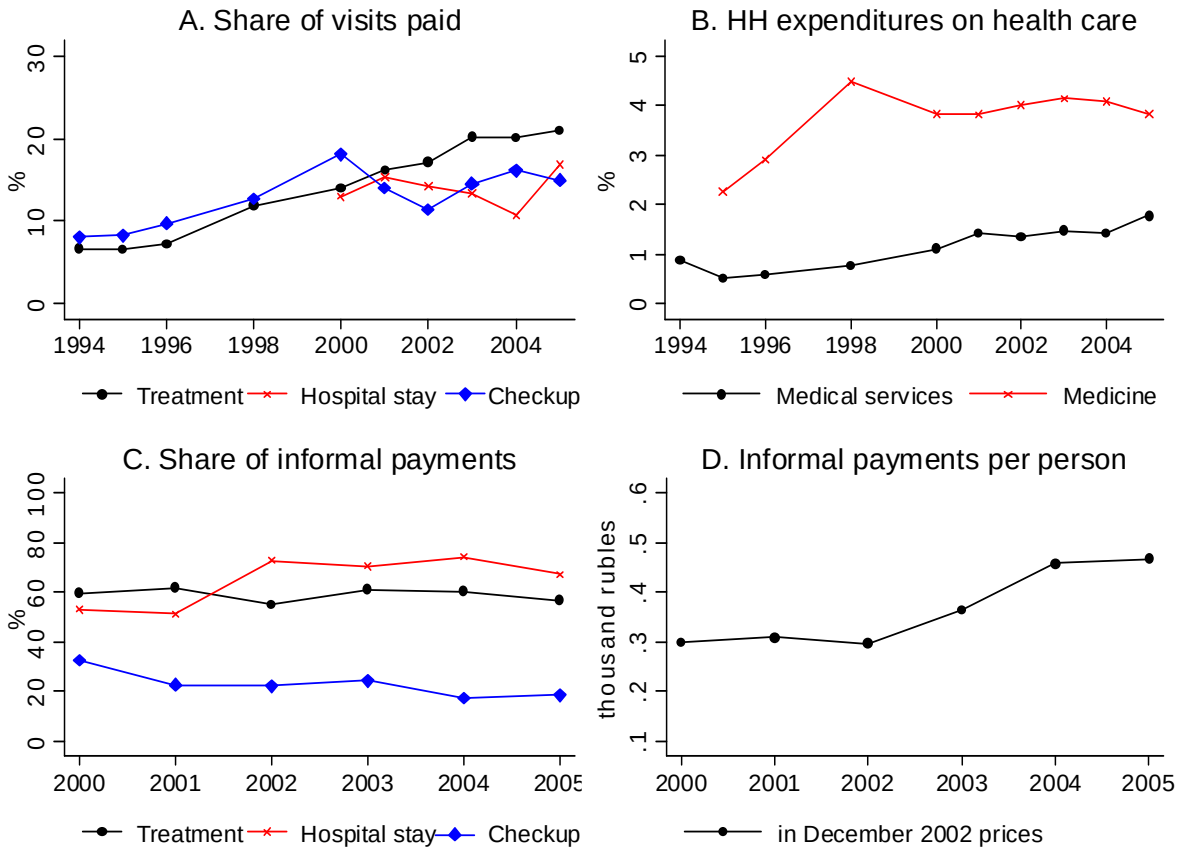
Figure 1: The Incidence of Health Issues and Medical Visits, RLMS



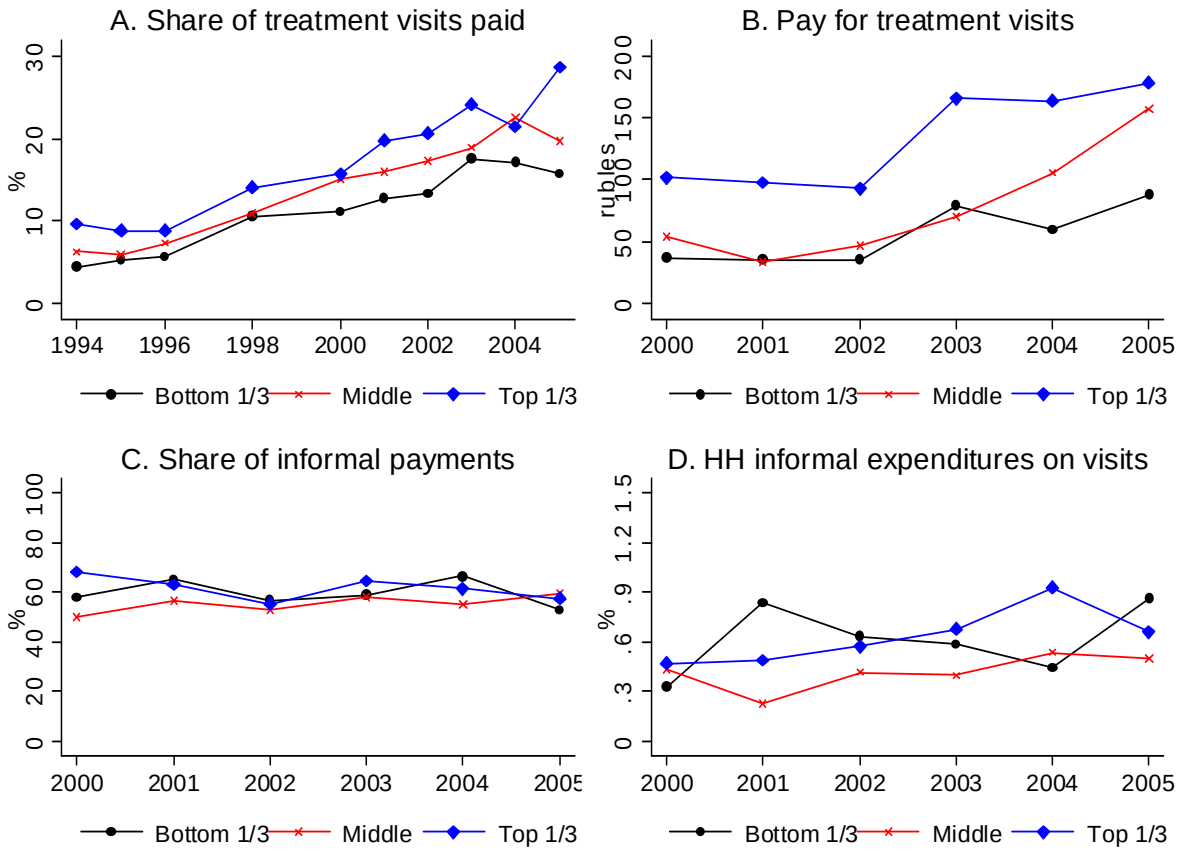
Notes: Figure 1 shows the percent share of respondents who experienced health problems in the last 30 days (panel A), visited doctor for treatment ("outpatient visit") or had a doctor's visit at home in the last 30 days (panel C), stayed overnight at the hospital and visited a doctor for preventative checkup in the last 3 months (panel D). Panel B shows the share of visits to the private doctor or private medical facility among all treatment visits. All numbers are weighted with individual sample weights provided in the RLMS.

Figure 2: Pay for Medical Services, RLMS



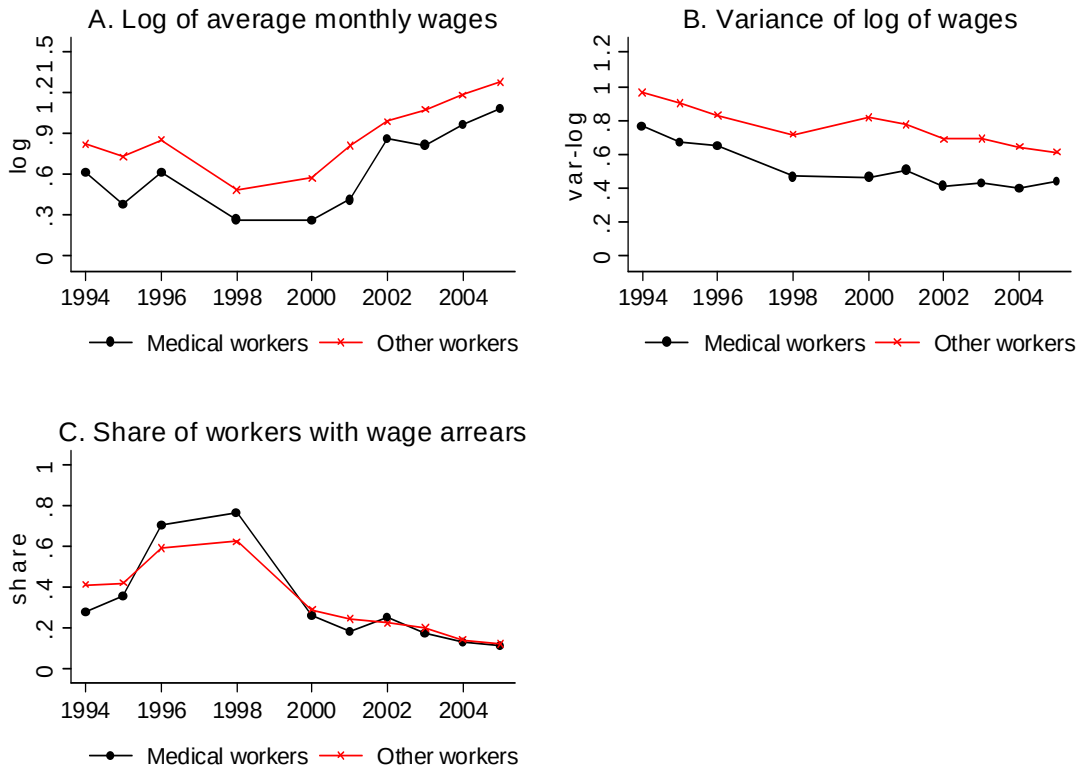
Notes: Panel A depicts the percent share of paid visits for three types of medical services. Treatment visits include both outpatient visits and home visits. Panel B reports total household expenditures on medical services (treatment, hospital stay and checkup) and purchases of medicine as percent share of household non-durable expenditures in the last 30 days (calculated from the household part of the questionnaire). Panel C shows the percent share of visits paid informally among all paid visits. Panel D shows the average amount of informal payments on all three types of visits per paying patient in the last 30 days (in thousand rubles deflated using national monthly CPI, December 2002=1). In all panels, payments for hospital stay do not include purchases of medicine required for hospital procedures. All numbers are weighted with individual and household sample weights provided in the RLMS.

Figure 3: Distribution of Patients' Payments by Income Group, RLMS



Notes: The figure depicts the incidence and amount of patients' payments for medical visits by three income groups (bottom third, middle third, and top third). Income groups are defined based on household real disposable income for each year separately. Panel A shows the percent share of treatment visits paid by patients. Panel B reports the average amount spent both officially and unofficially on treatment visit per patient (in thousand rubles deflated using national monthly CPI, December 2002=1). Panel C shows the percent share of visits paid informally among all paid visits. Panel D reports total informal payments on all medical visits by all members of the household as percent share of household non-durable expenditures in the last 30 days. All numbers are weighted with individual and household sample weights provided in the RLMS.

Figure 4: Wages of Medical Workers, RLMS



Notes: Average monthly wages are deflated using national monthly CPI (December 2002=1). All numbers are weighted with individual sample weights provided in the RLMS.

Table 1: Descriptive Statistics of Individual-Level Variables, RLMS

	Patients, 2000-2005		Non-patients, 2000-2005	
	Mean	St. dev.	Mean	St. dev.
Female	0.602	0.490	0.519	0.500
Age	39.011	24.935	34.885	20.654
Adult (dummy 14+)	0.780	0.415	0.821	0.384
Schooling (years)	10.963	3.184	11.102	2.862
Employment (dummy)	0.504	0.500	0.571	0.495
Disposable HH income (log)	7.732	0.788	7.641	0.901
Type of illness (dummies)				
Mild respiratory	0.281	0.449	0.164	0.370
Serious respiratory	0.064	0.244	0.007	0.085
Heart and circulatory	0.246	0.431	0.075	0.264
Symptoms	0.143	0.350	0.129	0.336
Traumatic injury	0.058	0.233	0.012	0.109
Musculoskeletal	0.164	0.370	0.074	0.262
Digestive	0.166	0.372	0.055	0.229
Nervous system	0.028	0.166	0.006	0.076
Sensory	0.054	0.227	0.009	0.097
Dental	0.082	0.275	0.019	0.137
Other systemic	0.063	0.243	0.006	0.076
Health problems, last 30 days (dummy)	1	0	0.421	0.494
Chronic illness (dummy)	0.661	0.473	0.399	0.490
Poor health (dummy)	0.286	0.452	0.088	0.283
Urban (dummy)	0.776	0.417	0.729	0.444
N	9714		43158	

Notes: Sample of patients includes respondents who seek medical help in the last 30 days. Non-patient sample includes those respondents who did not seek medical help in the last 30 days. HH=household. Household income is deflated using national monthly CPI. All estimates are performed using individual sample weights provided in the RLMS.

Table 2: The Gap in Income and Consumption Measures between Medical Workers and Other Employees

Panel A. Individual-level data	**Log difference**	
Individual labor earnings at primary job, raw	-0.278***	
	(0.046)	
Individual labor earnings at primary job, conditional		
All medical workers	-0.250***	
	(0.040)	
Doctors	-0.248***	
	(0.063)	
Nurses	-0.252***	
	(0.048)	
N (individual observations)	20,368	
Panel B. Household-level data	**Medical worker as**	
	HH head	**any HH member**
Household labor earnings, conditional	-0.240***	-0.079**
	(0.045)	(0.030)
Household disposable income, conditional	-0.128***	-0.052***
	(0.018)	(0.013)
Household non-durable expenditures, conditional	-0.062	-0.023
	(0.050)	(0.039)
Household total expenditures, conditional	-0.055	-0.023
	(0.047)	(0.033)
N (household observations)	11,441	11,456

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of working individuals (panel A) or households with at least one working member (panel B) surveyed during the 2000-2005 period. All income measures are per month and after-tax. Panel A reports the difference (gap) in the log of earnings between medical workers and other workers, and the gap is either unconditional or conditional on gender, schooling, experience, experience squared, tenure, tenure squared, 7 federal districts, urban location, and year dummies. Panel B reports the difference in the log of income or consumption between households whose head (or member with the largest reported income) is a medical worker and other households (column 1) as well as between households with any medical worker and other households (column 2). All estimates in panel B are conditional on household head characteristics (gender, schooling, age, and tenure), federal districts, urban location, number of household members, number of children 16 years old or younger, and year dummies. HH=household. All estimates are performed using individual and household sample weights provided in the RLMS.

Table 3: Determinants of Paying for Treatment Visit by Payment Type in the Public Sector, Heckman sample selection correction, ML Estimates, 2000-2005

	Informal pay	Official pay	Any pay	Informal expense, (log)	Official expense, (log)	Any expense, (log)
Female	0.015***	0.013**	0.022***	0.066***	0.057**	0.100***
	(0.005)	(0.005)	(0.007)	(0.025)	(0.027)	(0.035)
Age	-0.001***	-0.001***	-0.002***	-0.004***	-0.005***	-0.008***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Adult (dummy 14+)	0.044***	0.077***	0.111***	0.236***	0.391***	0.579***
	(0.009)	(0.012)	(0.015)	(0.043)	(0.056)	(0.069)
Schooling (years)	0.004***	0.004***	0.006***	0.019***	0.020***	0.034***
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.006)
Employment (dummy)	0.010	0.018**	0.026***	0.076**	0.083**	0.148***
	(0.006)	(0.008)	(0.009)	(0.030)	(0.042)	(0.047)
Disposable HH income (log)	0.016***	0.011**	0.023***	0.089***	0.077***	0.143***
	(0.005)	(0.005)	(0.005)	(0.025)	(0.023)	(0.027)
Illness type (dummies)						
Mild respiratory	-0.033***	-0.043***	-0.065***	-0.194***	-0.211***	-0.358***
	(0.006)	(0.006)	(0.007)	(0.029)	(0.031)	(0.042)
Serious respiratory	-0.005	0.002	-0.002	-0.059	-0.014	-0.059
	(0.009)	(0.013)	(0.015)	(0.042)	(0.059)	(0.067)
Heart and circulatory	-0.018***	-0.019***	-0.028***	-0.112***	-0.076**	-0.151***
	(0.007)	(0.007)	(0.009)	(0.032)	(0.036)	(0.045)
Symptoms	0.000	-0.003	0.000	-0.005	0.022	0.030
	(0.005)	(0.006)	(0.007)	(0.028)	(0.034)	(0.036)
Traumatic injury	0.014	-0.011	0.006	0.048	-0.080	-0.016
	(0.011)	(0.013)	(0.016)	(0.064)	(0.060)	(0.084)
Musculoskeletal	0.011	0.009	0.017	0.069*	0.047	0.099*
	(0.008)	(0.008)	(0.010)	(0.040)	(0.040)	(0.052)
Digestive	0.031***	0.046***	0.064***	0.180***	0.242***	0.360***
	(0.007)	(0.009)	(0.010)	(0.038)	(0.047)	(0.053)
Nervous system	0.030*	-0.010	0.021	0.113	-0.025	0.092
	(0.018)	(0.015)	(0.021)	(0.093)	(0.078)	(0.108)
Sensory	-0.003	-0.001	-0.002	-0.041	0.018	-0.007
	(0.011)	(0.010)	(0.013)	(0.047)	(0.052)	(0.068)
Dental	0.081***	0.146***	0.215***	0.406***	0.761***	1.122***
	(0.013)	(0.025)	(0.027)	(0.068)	(0.124)	(0.128)
Other systemic	0.013	0.015	0.025*	0.043	0.103*	0.126*
	(0.011)	(0.011)	(0.013)	(0.054)	(0.059)	(0.069)
Chronic illness (dummy)	0.011*	0.012	0.014*	0.055**	0.052	0.078*
	(0.006)	(0.007)	(0.008)	(0.028)	(0.039)	(0.044)
Poor health (dummy)	0.013	0.011	0.018**	0.061*	0.039	0.074*
	(0.008)	(0.007)	(0.008)	(0.036)	(0.034)	(0.042)
Place of medical services (clinic is omitted)						
Hospital	0.075***	0.018	0.075***	0.361***	0.100	0.408***
	(0.016)	(0.012)	(0.018)	(0.085)	(0.068)	(0.104)
Home visit	0.005	-0.031***	-0.025*	0.030	-0.145***	-0.107*
	(0.008)	(0.008)	(0.013)	(0.036)	(0.035)	(0.056)
Urban (dummy)	0.004	0.011	0.012	0.016	0.063	0.068
	(0.009)	(0.010)	(0.012)	(0.045)	(0.049)	(0.061)
Regional wages of medical workers (log)	0.039***	0.021*	0.050***	0.218***	0.101*	0.278***
	(0.010)	(0.012)	(0.014)	(0.051)	(0.056)	(0.071)
Average schooling of medical	-0.005	0.002	-0.003	-0.029	0.037	0.006

workers (years)	(0.006)	(0.005)	(0.006)	(0.030)	(0.025)	(0.035)
Regional real GDP per capita	-0.033***	-0.063***	-0.083***	-0.156***	-0.282***	-0.382***
(log)	(0.007)	(0.012)	(0.013)	(0.030)	(0.063)	(0.068)
Constant	0.025	0.437***	0.434***	-0.169	1.203*	0.992
	(0.097)	(0.141)	(0.138)	(0.502)	(0.683)	(0.765)
Selection equation:						
Female	0.076***	0.082***	0.083***	0.076***	0.082***	0.084***
	(0.012)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
Age	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adult (dummy 14+)	-0.598***	-0.580***	-0.572***	-0.600***	-0.580***	-0.574***
	(0.033)	(0.034)	(0.034)	(0.033)	(0.033)	(0.033)
Schooling (years)	0.002	0.001	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Employment (dummy)	-0.106***	-0.098***	-0.097***	-0.106***	-0.099***	-0.097***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Disposable HH income (log)	0.049***	0.049***	0.050***	0.049***	0.049***	0.051***
	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)
Chronic illness (dummy)	0.501***	0.507***	0.512***	0.500***	0.506***	0.510***
	(0.021)	(0.020)	(0.021)	(0.021)	(0.020)	(0.020)
Poor health (dummy)	0.673***	0.680***	0.686***	0.670***	0.678***	0.681***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Urban (dummy)	0.025	0.031	0.031	0.023	0.031	0.031
	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Regional wages of medical	-0.105***	-0.104***	-0.100**	-0.106***	-0.103***	-0.100***
workers (log)	(0.041)	(0.039)	(0.039)	(0.040)	(0.039)	(0.039)
Average schooling of medical	0.035	0.034	0.033	0.035	0.033	0.032
workers (years)	(0.021)	(0.021)	(0.020)	(0.022)	(0.021)	(0.021)
Regional real GDP per capita	0.188***	0.185***	0.177***	0.189***	0.185***	0.178***
(log)	(0.052)	(0.052)	(0.051)	(0.053)	(0.052)	(0.051)
Residual temperature	-0.010***	-0.009***	-0.010***	-0.009***	-0.009***	-0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Residual air pollution	0.007***	0.008***	0.008***	0.007***	0.008***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	-3.047***	-3.012***	-2.966***	-3.039***	-3.015***	-2.966***
	(0.640)	(0.630)	(0.619)	(0.643)	(0.632)	(0.624)
Selection term (ρ)	-0.003	-0.043**	-0.043*	-0.001	-0.047***	-0.044**
	(0.038)	(0.019)	(0.023)	(0.025)	(0.018)	(0.022)
N of all observations	70512	70863	71126	70455	70833	71049
N of censored observations	58837	58837	58837	58837	58837	58837
LR χ^2	0.005	5.399	3.500	0.003	6.960	4.049
LR p-value	0.946	0.020	0.061	0.958	0.008	0.044

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of respondents who had a treatment visit at a non-privately owned medical facility in the last 30 days. Dependent variable in the selection equation is an indicator variable equal to 1 if a respondent had a treatment visit in the last 30 days. Reported are marginal effects. The omitted category is a clinic for the place of medical services. HH=household. Household income and wages of medical workers are after-tax and deflated using national monthly CPI. Year and region dummies are included but their coefficients are not reported. For the children subsample, schooling and employment are for the head of the household. The LR χ^2 test is the Wald test of independent equations (ρ=0).

Table 4: Determinants of Paying Informally for Treatment Visit in the Public Sector: Sensitivity to Different Methods, 2000-2005

	Probit	MNL	OLS	Tobit,

	Informal pay			log (1+ informal expense)	log (informal expense)	
		Informal pay	Official pay		Cond. ME	Uncond. ME
Female	0.013***	0.012***	0.008**	0.067***	0.156**	0.057***
	(0.005)	(0.004)	(0.004)	(0.025)	(0.061)	(0.021)
Age	-0.001***	-0.001***	-0.001***	-0.004***	-0.008***	--0.003***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)
Adult (dummy 14+)	0.033***	0.036***	0.060***	0.236***	0.422***	0.136***
	(0.006)	(0.008)	(0.009)	(0.045)	(0.076)	(0.025)
Schooling (years)	0.004***	0.004***	0.002***	0.019***	0.046***	0.017***
	(0.001)	(0.001)	(0.001)	(0.004)	(0.009)	(0.003)
Employment (dummy)	0.008	0.006	0.013**	0.076**	0.113**	0.042*
	(0.005)	(0.004)	(0.005)	(0.030)	(0.057)	(0.022)
Disposable HH income (log)	0.014***	0.013***	0.008**	0.089***	0.165***	0.061***
	(0.004)	(0.004)	(0.003)	(0.025)	(0.051)	(0.019)
Illness type (dummy)						
Mild respiratory	-0.029***	-0.029***	-0.032***	-0.194***	-0.373***	-0.127***
	(0.005)	(0.006)	(0.005)	(0.029)	(0.066)	(0.021)
Serious respiratory	0.001	-0.001	0.007	-0.059	0.002	0.001
	(0.009)	(0.008)	(0.010)	(0.042)	(0.769)	(0.040)
Heart and circulatory	-0.013**	-0.013**	-0.008	-0.112***	-0.179**	--0.063**
	(0.005)	(0.006)	(0.006)	(0.032)	(0.070)	(0.023)
Symptoms	0.001	-0.001	0.001	-0.005	0.005	0.002
	(0.005)	(0.005)	(0.005)	(0.028)	(0.060)	(0.022)
Traumatic injury	0.015	0.013*	-0.003	0.048	0.182	0.074
	(0.010)	(0.007)	(0.009)	(0.065)	(0.114)	(0.051)
Musculoskeletal	0.013*	0.011*	0.008	0.069*	0.187**	0.074**
	(0.008)	(0.006)	(0.006)	(0.040)	(0.084)	(0.035)
Digestive	0.028***	0.022***	0.028***	0.180***	0.359***	0.152***
	(0.007)	(0.004)	(0.006)	(0.038)	(0.068)	(0.034)
Nervous system	0.029*	0.021**	-0.005	0.113	0.298*	0.128
	(0.016)	(0.010)	(0.013)	(0.093)	(0.166)	(0.081)
Sensory	-0.001	-0.000	0.003	-0.041	-0.065	-0.023
	(0.011)	(0.010)	(0.008)	(0.047)	(0.125)	(0.043)
Dental	0.075***	0.055***	0.073***	0.406***	0.739***	0.378***
	(0.012)	(0.006)	(0.009)	(0.068)	(0.099)	(0.064)
Other systemic	0.014	0.011	0.013*	0.043	0.143	0.057
	(0.009)	(0.007)	(0.008)	(0.054)	(0.095)	(0.042)
Chronic illness (dummy)	0.011**	0.009**	0.010*	0.056*	0.125**	0.045**
	(0.005)	(0.005)	(0.005)	(0.033)	(0.063)	(0.002)
Poor health (dummy)	0.011*	0.009**	0.012**	0.062*	0.098	0.037
	(0.006)	(0.005)	(0.005)	(0.033)	(0.069)	(0.027)
Place of medical services (clinic is omitted)						
Hospital	0.063***	0.041***	0.005	0.361***	0.534***	0.252***
	(0.013)	(0.006)	(0.007)	(0.085)	(0.107)	(0.063)
Home visit	0.005	0.005	-0.038***	0.030	0.050	0.019
	(0.009)	(0.008)	(0.007)	(0.036)	(0.093)	(0.035)
Urban (dummy)	0.003	0.002	0.007	0.016	0.039	0.014
	(0.008)	(0.007)	(0.007)	(0.045)	(0.092)	(0.034)
Regional wages of medical workers (log)	0.034***	0.031***	0.014	0.218***	0.416***	0.154***
	(0.010)	(0.009)	(0.010)	(0.052)	(0.115)	(0.043)
Average schooling of medical workers (years)	-0.004	-0.003	-0.000	-0.029	-0.055	-0.020
	(0.005)	(0.005)	(0.004)	(0.030)	(0.065)	(0.024)
Regional real GDP per capita (log)	-0.029***	-0.026***	-0.047***	-0.155***	-0.352***	-0.130***
	(0.007)	(0.006)	(0.012)	(0.031)	(0.072)	(0.028)

N	11675	12286	12286	11618	11618	11618
R^2 / Pseudo R^2	0.091	0.089	0.089	0.051	0.057	0.057

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of respondents who had a treatment visit at a non-privately owned medical facility in the last 30 days. MNL=multinomial logit. In probit, MNL, and tobit, marginal effects are reported. In MNL specifications, the reference category is no payment. In the first tobit column, marginal effects are conditional on non-zero expenses. The second tobit column reports unconditional marginal effects on the expected value of the latent variable. The omitted category is a clinic for the place of medical services. HH=household. Household income and wages of medical workers are after-tax and deflated using national monthly CPI. Year and region dummies are included but their coefficients are not reported. For the children subsample, schooling and employment are for the head of the household.

Table 5: Determinants of Paying Informally for Treatment Visit in the Public Sector: Sensitivity to Different Subsamples, 2000-2005

	Adults	**Children**	**Female**	**Male**	**Private included**
Female	0.019***	-0.004	…	…	0.011**
	(0.005)	(0.006)			(0.005)
Age	-0.001***	-0.001	-0.001***	-0.001***	-0.001***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Adult (dummy 14+)	…	…	0.044***	0.016*	0.036***
			(0.006)	(0.009)	(0.006)
Schooling (years)	0.004***	0.002*	0.004***	0.003***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Employment (dummy)	0.009	0.000	0.009	0.007	0.009*
	(0.006)	(0.009)	(0.007)	(0.007)	(0.005)
Disposable HH income (log)	0.014***	0.011**	0.014***	0.012**	0.013***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Illness type (dummies)					
Mild respiratory	-0.032***	-0.011	-0.025***	-0.035***	-0.033***
	(0.005)	(0.009)	(0.006)	(0.009)	(0.004)
Serious respiratory	-0.008	0.024	-0.004	0.001	0.001
	(0.009)	(0.018)	(0.010)	(0.013)	(0.011)
Heart and circulatory	-0.018***	0.070*	-0.007	-0.023***	-0.014***
	(0.006)	(0.039)	(0.007)	(0.007)	(0.006)
Symptoms	0.000	0.003	-0.008	0.015*	-0.001
	(0.006)	(0.016)	(0.006)	(0.008)	(0.006)
Traumatic injury	0.015	0.034	0.014	0.011	0.012
	(0.011)	(0.026)	(0.016)	(0.011)	(0.010)
Musculoskeletal	0.011	0.090**	0.014	0.009	0.014*
	(0.008)	(0.044)	(0.010)	(0.009)	(0.008)
Digestive	0.028***	0.037**	0.033***	0.016	0.028***
	(0.007)	(0.018)	(0.008)	(0.011)	(0.007)
Nervous system	0.033*	0.002	0.031*	0.014	0.026*
	(0.018)	(0.027)	(0.018)	(0.021)	(0.015)
Sensory	-0.002	-0.001	0.001	-0.007	-0.009
	(0.013)	(0.013)	(0.018)	(0.011)	(0.011)
Dental	0.091***	-0.002	0.096***	0.041**	0.064***
	(0.014)	(0.018)	(0.020)	(0.018)	(0.012)
Other systemic	0.015	0.018	0.022*	-0.006	0.010
	(0.011)	(0.019)	(0.012)	(0.012)	(0.010)
Chronic illness (dummy)	0.010	0.005	0.005	0.017**	0.010*
	(0.006)	(0.008)	(0.007)	(0.008)	(0.005)

Poor health (dummy)	0.009	0.039*	0.014*	0.008	0.013**
	(0.006)	(0.022)	(0.008)	(0.008)	(0.006)
Place of medical services (clinic is omitted)					
Hospital	0.075***	0.005	0.081***	0.041***	0.064***
	(0.016)	(0.016)	(0.019)	(0.015)	(0.013)
Home visit	0.007	-0.002	0.001	0.011	-0.039***
	(0.011)	(0.008)	(0.011)	(0.010)	(0.011)
Private doctor	…	…	…	…	0.235***
					(0.048)
Publicly-owned facility (dummy)	…	…	…	…	-0.058***
					(0.017)
Regional share of private medical facilities	…	…	…	…	0.003**
					(0.001)
Urban (dummy)	0.007	-0.008	0.004	0.001	0.000
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Regional wages of medical workers (log)	0.034***	0.030***	0.038***	0.026**	0.034***
	(0.012)	(0.012)	(0.012)	(0.013)	(0.011)
Average schooling of medical workers (years)	-0.006	-0.000	-0.001	-0.009	-0.004
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
Regional real GDP per capita (log)	-0.027***	-0.028***	-0.023**	-0.041***	-0.032***
	(0.009)	(0.007)	(0.009)	(0.010)	(0.009)
N	9251	2424	7211	4464	12293
Pseudo R^2	0.088	0.148	0.091	0.112	0.129
Wild χ^2	620.899	828.197	715.801	312.997	1932.262

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Dependent variable is a binary variable equal to 1 if paid informally and 0 if didn't pay or paid officially. In (1)-(4), the sample is restricted to the respondents who had a treatment visit at a non-privately owned facility in the last 30 days. In (5), the sample also includes visits to private doctors and privately-owned facilities. Reported are marginal effects. The omitted category for the place of medical services is clinic. HH=household. Household income and wages of medical workers are after-tax and deflated using national monthly CPI. Year and region dummies are included but their coefficients are not reported. For the children subsample, schooling and employment are for the head of the household. Regional share of private medical facilities is measured in 2006.

Table 6: Determinants of Paying Informally for Treatment Visit in the Public Sector: Response to Regional Shocks, 2000-2005

	(1)	(2)	(3)	(4)	(5)
Wages of medical workers					
Regional wages of medical workers (log), RLMS	0.036***			0.026***	
	(0.010)			(0.010)	
Regional component of regional wages of medical workers, RLMS		0.033**			0.033***
		(0.014)			(0.012)
Average regional monthly wage in the health care industry (log)			-0.005		
			(0.017)		
Observed skills of medical workers					
Average schooling of medical workers (years), RLMS	-0.005			-0.005	
	(0.005)			(0.005)	
Skill component of regional wages of medical workers, RLMS		0.024			0.019
		(0.034)			(0.036)
Doctors/nurses			0.042		
			(0.051)		
Short-term budget shocks					

Budget deficit, % of regional GDP	0.003				
	(0.003)				
Wage arrears per worker		-0.002			
in health care, (log)		(0.002)			
Monthly wage bills owed in			-0.000		
health care			(0.000)		
Share of workers with				0.000	
wage arrears in health care				(0.001)	
Months of unpaid wages for					0.005
medical workers, RLMS					(0.006)
Long-term resources and development					
Regional real GDP per capita	-0.029***		-0.019**	-0.026***	-0.032***
(log)	(0.007)		(0.008)	(0.007)	(0.007)
Real health expenditure per capita		-0.036***			
(log)		(0.009)			
Medical personnel, rate			-0.032*		
			(0.016)		
Hospital beds, rate				-0.001**	
				(0.000)	
Share of regional budget expenditure					-0.003*
on health care & physical culture					(0.002)
N	11675	11675	11675	11675	11675
Pseudo R^2	0.092	0.091	0.090	0.093	0.092
Wild χ^2	802.3	1277.1	…	1023.7	874.7

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of respondents who had a treatment visit at a non-privately owned medical facility in the last 30 days. Dependent variable is a binary variable equal to 1 if paid informally and 0 if didn't pay or paid officially. All monetary variables are deflated using national monthly CPI.

Table 7: Determinants of Paying Informally for Treatment Visit in the Public Sector: Response to Regional Shocks, 2000-2005, IV Estimates

	IV=regional wage coefficients		**IV=regional wage coefficients and 1998 wages**	
	(1)	**(2)**	**(3)**	**(4)**
Wages of medical workers				
Regional wages of medical	0.001		0.038	
workers (log), RLMS	(0.077)		(0.030)	
Regional component of regional		0.077		0.042
wages of medical workers, RLMS		(0.200)		(0.055)
Observed skills of medical workers				
Average schooling of medical	-0.004		-0.005	
workers (years), RLMS	(0.020)		(0.009)	
Skill component of regional		0.004		0.019
wages of medical workers, RLMS		(0.143)		(0.045)
Short-term budget shocks				
Budget deficit, % of regional GDP	0.002		0.005	
	(0.004)		(0.003)	
Wage arrears per worker		-0.001		-0.002
in health care, (log)		(0.003)		(0.002)
Long-term resources and development				

Regional real GDP per capita (log)	-0.024 (0.020)		-0.032*** (0.008)	
Real health expenditure per capita (log)		-0.050 (0.073)		-0.030* (0.016)
N	11675	11675	11529	11529
1st F-test	6.500 (weak)	0.900 (weak)	34.256	31.385
1st *p*-value	0.012	0.344	0.000	0.000
1st partial R^2	0.020	0.004	0.173	0.149
Hansen *J*	…	…	0.148	0.135
R^2 overall	0.047	0.047	0.050	0.049
Hansen *p*-value	…	…	0.700	0.714

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of respondents who had a treatment visit at a non-privately owned medical facility in the last 30 days. Dependent variable is a binary variable equal to 1 if paid informally and 0 if didn't pay or paid officially. All monetary variables are deflated using national monthly CPI.

Table A5: Probit estimates of informal pay, 3 types of medical services, sensitivity to different samples

	Treatment visit: No additional procedures, 2000-2005	Hospital stay: with no medicine 2000-2005	Preventative check-up visit: 2000-2005	Hospital stay: with medicine 2001-2005
Female	0.008	0.022	0.002	-0.046
	(2.34)*	(2.63)**	(0.61)	(1.03)
Age	-0.000	0.000	-0.000	0.001
	(4.30)**	(0.76)	(2.66)**	(0.55)
Adult (dummy 14+)	0.028	0.001	0.013	-0.089
	(5.57)**	(0.09)	(2.98)**	(1.21)
Schooling (years)	0.002	0.003	0.002	-0.006
	(3.97)**	(1.88)	(3.84)**	(0.73)
Employment (dummy)	0.007	0.026	-0.005	0.058
	(2.00)*	(2.78)**	(1.11)	(1.27)
Disposable HH income (log)	0.010	0.017	0.009	0.005
	(3.29)**	(2.10)*	(4.66)**	(0.17)
Chronic illness (dummy)	0.003	-0.001	0.012	-0.023
	(0.73)	(0.10)	(4.31)**	(0.45)
Poor health (dummy)	0.003	0.028	0.004	0.047
	(0.68)	(2.41)*	(0.73)	(0.87)
Urban (dummy)	0.001	0.015	0.005	-0.094
	(0.10)	(1.23)	(0.95)	(1.89)
Regional wages of medical workers (log)	0.025	0.055	0.013	0.028
	(3.03)**	(3.01)**	(2.16)*	(0.29)
Average schooling of medical workers (years)	-0.001	0.006	0.004	0.082
	(0.31)	(0.55)	(1.38)	(1.54)
Regional real GDP per capita (log)	-0.013	-0.053	-0.019	-0.042
	(2.41)*	(3.90)**	(4.78)**	(0.50)
N	12344	3581	15123	510
Pseudo R^2	0.065	0.074	0.071	0.110

Notes: Robust standard errors clustered by location are in parentheses, *** significant at the 1%, ** - significant at the 5%, * - significant at the 10%. Sample consists of respondents who 1) had a treatment visit at a non-privately

owned medical facility in the last 30 days, excluding any additional procedures; 2) stayed at a non-privately owned hospital in the last 3 months, with no expenses on medicine; 3) had a preventative check-up at a non-privately owned medical facility in the last 30 days; 4) stayed at a non-privately owned hospital in the last 3 months, with some expenses on medicine. In all specifications marginal effects are reported. HH=household. Household income and wages of medical workers are after-tax and deflated using national monthly CPI. Year and region dummies are included but their coefficients are not reported. For the children subsample, schooling and employment are for the head of the household.

Table A6: Probit estimates of informal pay, public sector only, sensitivity to different samples, 2000-2005

	Moscow and St. Petersburg	Exclude Moscow and St. Petersburg	Urban	Rural
Female	-0.007	0.016***	0.015***	0.009
	(0.008)	(0.005)	(0.006)	(0.008)
Age	-0.001***	-0.001***	-0.001***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Adult (dummy 14+)	0.020	0.033***	0.036***	0.024***
	(0.018)	(0.006)	(0.007)	(0.007)
Schooling (years)	0.006***	0.003***	0.004***	0.004***
	(0.002)	(0.001)	(0.001)	(0.001)
Employment (dummy)	0.017**	0.006	0.014***	-0.011
	(0.008)	(0.006)	(0.005)	(0.010)
Disposable HH income (log)	0.038***	0.011***	0.014**	0.013**
	(0.004)	(0.004)	(0.005)	(0.006)
Mild respiratory	-0.033	-0.029***	-0.034***	-0.016*
	(0.025)	(0.005)	(0.005)	(0.009)
Serious respiratory	-0.024***	0.006	0.003	-0.008
	(0.007)	(0.010)	(0.011)	(0.013)
Heart and circulatory	0.007	-0.016***	-0.011*	-0.019**
	(0.010)	(0.005)	(0.006)	(0.008)
Symptoms	-0.010	0.002	0.001	-0.003
	(0.012)	(0.005)	(0.005)	(0.010)
Traumatic injury	-0.010	0.020*	0.020	-0.010
	(0.031)	(0.011)	(0.012)	(0.015)
Musculoskeletal	0.000	0.015*	0.021**	-0.012
	(0.010)	(0.008)	(0.009)	(0.011)
Digestive	0.063***	0.023***	0.031***	0.015
	(0.005)	(0.006)	(0.007)	(0.012)
Nervous system	0.059	0.022	0.032*	0.004
	(0.091)	(0.013)	(0.019)	(0.020)
Sensory	0.002	-0.001	0.003	-0.016
	(0.022)	(0.012)	(0.012)	(0.017)
Dental	0.041	0.079***	0.066***	0.086***
	(0.034)	(0.013)	(0.012)	(0.032)
Other systemic	0.025***	0.013	0.013	0.009
	(0.009)	(0.011)	(0.010)	(0.016)
Chronic illness (dummy)	0.014	0.010*	0.010*	0.011
	(0.015)	(0.005)	(0.006)	(0.009)
Poor health (dummy)	0.029***	0.009	0.008	0.022*
	(0.006)	(0.006)	(0.007)	(0.012)

Hospital	0.114	0.056***	0.080***	0.018
	(0.091)	(0.013)	(0.017)	(0.014)
Home visit	0.042	-0.002	0.006	0.004
	(0.068)	(0.006)	(0.011)	(0.012)
Urban (dummy)	…	0.004	…	…
		(0.007)		
Regional wages of medical workers (log)	0.281***	0.031***	0.037***	0.014
	(0.018)	(0.010)	(0.010)	(0.018)
Average schooling of medical workers (years)	-0.050***	-0.002	-0.015***	0.023**
	(0.001)	(0.005)	(0.005)	(0.009)
Regional real GDP per capita (log)	-0.047***	-0.031***	-0.029***	-0.061**
	(0.003)	(0.010)	(0.008)	(0.024)
N	1605	10070	8875	2800
Pseudo R^2	0.076	0.101	0.095	0.135
Wild χ^2	…	687.319	1904.795	393.036

Table ? Log of average deflated monthly earnings of medical workers in private and public industries

		1994	1995	1996	1998	2000	2001	2002	2003	2004	2005
Private	Mean	7.969	7.382	7.600	7.048	7.449	7.687	7.985	7.887	8.074	8.239
	St. dev.	0.887	0.651	0.909	0.936	0.715	0.740	0.547	0.562	0.622	0.502
	Obs.	10172	10666	6024	8575	7951	9417	9668	12656	12641	12237
Public	Mean	7.813	7.545	7.676	7.337	7.264	7.429	7.801	7.786	7.923	8.065
	St. dev.	0.391	0.427	0.368	0.300	0.373	0.344	0.315	0.374	0.336	0.410
	Obs.	11290	10666	10465	10675	10975	12121	12523	12656	12641	12237

Appendix A1: Characteristics of the Russian Health Care System

Overview. The Russian health care system has evolved significantly over the last 20 years. Unlike other sectors of the economy, which experienced rapid privatization, the influence of market forces in health care has been limited. The 1993 Health Care Reform introduced the mandatory health insurance program jointly financed by employers and regional governments, but the reform stalled shortly after its inception and was not completed. As a result, the current system combines some features of the Soviet health care system with the changes introduced by the health care reform. Despite important developments, the system possesses many of the same characteristics and inefficiencies it had under central planning, such as predominantly public provision of health care, lack of proper incentives, low and compressed wages of medical workers, residual financing, overutilization of inpatient services, among others. The fundamental challenge facing the Russian health care system is government's inability to reconcile a constitutional guarantee of free public health care with the lack of adequate financing. In addition, Russia continues to struggle with poor quality of medical services and deteriorating indicators of wellbeing and health.

Public Financing. Article 41 of the Constitution of the Russian Federation (1993) guarantees free health care in state and municipal medical organizations. In reality, health care provision is only nominally free, as the government has been unable to fulfill this guarantee due to insufficient financing. The economic downturn during the early period of transition to a market economy led to a 31 percent decline in real public health care spending per capita between 1995 and 1998 (Treasury Budget Data, annual; Goskomstat *Health Care* 2005 and *Regions of Russia* 2004, 2007, 2008). Even after the economy stabilized and started to recover after the financial crisis of 1998, public health care spending, measured as a percent of GDP, remained low, reaching the bottom at 2.1 percent in 2001 as compared to 2.9 percent in 1995 (Goskomstat, *Health Care* 2007, 2005). In comparison, developed European countries spent on average 8.7 percent of GDP on health in 2006 while Russia spent 5 percent (including private spending) (World Health Organization, Statistical Information System)[39]. Even when compared to developing Central and Eastern European and Former Soviet Union counties[40], Russian health expenditure ranks below the average. In terms of the share of health expenditure in total budget spending, in 2006 17 percent of budget spending went to health care, only slightly surpassing the 1995 level (Figure A1). Chronic underfunding of the health care sector is not surprising given that health care budget decisions are still governed by the Soviet-era "residual principle". According to the residual principle budgeting rule, the health sector receives residual funds from the budget after other sectors of the economy − considered to be of primary importance − receive their necessary share. Introduction of direct payroll contributions by employers as part of the 1993 Health Care Reform generated wide regional disparities in available health care funds and did not solve the financing puzzle. At present the employer contributions account for approximately 16 percent of total health care financing (Goskomstat, *Health Care* 2007, 2005).

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[39] Countries include: Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

[40] Countries include: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Montenegro, Poland, Republic of Moldova, Romania, Serbia, Tajikistan, the Former Yugoslav Republic of Macedonia, Turkmenistan, Ukraine, and Uzbekistan. The average total expenditure on health as a share of GDP in 2006 is 6 percent.

Chargeable Private Services. In response to the dwindling ability to finance the generous constitutional guarantee of a comprehensive universal coverage, in 1996 the government passed a resolution introducing formal chargeable health services. However, the range of medical services for which patients are required to make formal payments through cashier of a health care facility is very limited.[41] The generated revenues were insufficient to ameliorate the financing deficit; anecdotal evidence suggests that the bulk of the revenues from chargeable services are commonly used as a salary bonus for administrators of health care facilities and as an additional source to cover hospital's expenses (Shishkin *et al*, 2003)[42]. The prices of services are determined not by market forces but by public health care authorities at the regional and municipal levels in accordance with two federal regulations.

Another challenge to the constitutional guarantee came in 1998 with the introduction of Guaranteed Package Program. The program established the minimum amount of free medical services, guaranteed by the federal government[43]. Regional authorities can extend the number of free services in excess of the minimum standard (Ministry of Health and Social Development, 2009). However, the Guaranteed Package maintains the original structure of guaranteed health care benefits due to political risks tied to introducing any fundamental changes (Blam and Kovalev, 2003).

Public Insurance and Access to Health Care. All citizens of the Russian Federation are entitled to a comprehensive coverage through a universal insurance system called Mandatory Medical Insurance (MMI). In order to qualify for region-specific set of additional free services (in excess of those provided in the basic package), an individual is required to obtain an MMI certificate. This can be accomplished individually or, for those employed, by an employer who submits the necessary information (employees' full name, date of birth, place of employment, and address of permanent residence) to an insurance company. Although the regional MMI insurance certificates are valid for urgent medical help in all regions across the country (in accordance with Article 5 of the Law of Russian Federation № 1499-1 "Medical Insurance of the Citizens of the Russian Federation")[44], non-urgent outpatient care in polyclinics (multi-service clinics) is governed by *uchastkoviy* or location principle. Each house and each family is assigned to the closest polyclinic in their district based on the resource availability of a particular medical facility (the Ministry of Health and Social Development, 04.08.2006, N 584 "On the Form of Organization of the Medical Care Based on Location Principle"). For inpatient treatment or for

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[41] Chargeable services include: 1) medical examinations and tests that a patient needs to undergo in order to receive a formal certificate; 2) hotel/auxiliary services at hospitals (a single room with a TV set, refrigerator, etc.); 3) medical interventions involving the use of advanced technologies (e.g. endoscopy); 4) consultations by physician specialists; 5) diagnostic procedures, including those "bypassing the list"; 6) additional treatments, such as massage; 7) high-quality prosthesis; 8) personal nursing station; 9) cosmetic or plastic surgery (Shishkin *et al*, 2003). Price-setting for chargeable services is performed by the public health institutions and by health authorities, in accordance with two federal regulations.

[42] Shishkin *et al* (2003, p.16) note that the distribution of revenues from chargeable services often does not take into account interests and contributions of medical personnel directly involved in provision of health care. Thus direct providers typically are not avid supporters of extending the range of chargeable services.

[43] The Guaranteed Package Program specifies a comprehensive list of medical services (and medicine) which are guaranteed free provision. These include primary, urgent and specialized medical care for contagious and parasitic diseases; oncological diseases; endocrine system diseases; nutrition and immune system dysfunctions and abnormalities; blood, heart and circulatory system diseases; ear, eye and respiratory diseases; musculoskeletal system and connective tissue diseases; inborn development pathologies; deformities and chromosomal disorders; poisonings and traumatic injuries; pregnancies, delivery and abortions (Program of State Guarantees of Free Medical Care for the Citizens of the Russian Federation 2010, Ministry of Health and Social Development, 2009).

[44] Urgent ambulatory medical care is provided even if an individual does not have proof of MMI, national passport or is not a permanent resident.

services not offered at the assigned polyclinic, a patient must receive a referral. Ironically, this system coexists with a guarantee of a patient's *free* choice of a medical facility and a medical professional, in accordance with MMI agreement (Article 6 of the Law of the Russian Federation "On the Medical Insurance of the Citizens of the Russian Federation"). There are a few nuances for exercising this right. An individual must submit a written request to the head doctor of his or her polyclinic asking to be assigned to a different specialist or to be assigned to a different medical facility (a medical facility has to be on the list specified by the MMI agreement)[45]. In reality, the patient's wish may be difficult to accomplish: in some regions patients who seek outpatient care at the polyclinic they are not assigned to according to their residence may be required to pay for medical services that otherwise would be provided for free at their clinic[46] (Bestremyannaya, 2006). Anecdotal evidence also suggests that patients who request to be assigned to a specific specialist usually rely on recommendations from friends and families, or even other physicians, and are motivated by their wish to receive higher-than-average quality of services (Shishkin *et al*, 2003)[47].

Household spending. As a result, system-wide deficits persist, shifting the burden of financing health care to patients through higher out-of-pocket expenses. In fact, household payments for medical services and medicine have skyrocketed while the share of state funding fell from 100 percent in 1992 to less than 50 percent of total health care costs in 2000 (Tragakes and Lessof, 2003). During the period 1994 to 2007 out-of pocket expenses for chargeable services and medication increased in real terms by a factor of 7.9, accounting for over 40 percent of total spending (Shishkin and Popovish, 2009, p. 8). Since official statistics do not account for the presence of shadow payments for health care, a number of case studies infer the size of informal payments as a difference between officially reported household expenditures and the reported expenditure on legally chargeable services. Given wide differences in methodologies and sampling techniques, there is no consensus on the size of informal payments in overall out-of-pocket expenses (see a review in Shishkin and Popovich, 2009). The unique longitudinal data used in this study allows us to conclude that informal payments are widespread (accounting for more than half of all inpatient expenses) and have become more prominent since 2000.

Private health care sector. Historically, health care in Russia has been overwhelmingly public; only in recent years has private health sector seen a substantial growth (Goskomsat, *Health Care* 2007). In 1995, only 3 percent of outpatient clinics were non-state, compared to 8 and 20 percent in 2000 and 2005, respectively (Goskomstat, *Health Care* 2007)[48]. Utilization rate of private health care facilities is small: measured in thousands of visits per shift, in 2006 utilization of private outpatient clinics was 110 as compared to 3,385 visits in pubic establishments (Goskomstat, *Health Care* 2007). Private health care facilities are typically specialized, offering a limited spectrum of medical services. Dental and gynecology/urology services take a lead, accounting for 80 percent of the market, followed by diagnostics, cosmetology and multi-service private facilities (Kolomeyskaya, 2006). As more private health care facilities emerge, driving down the costs, and the range of services rises, private provision in

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[45] Patient's request can be legally declined only if a specialist refuses to accept a patient or if a head doctor provides documental support proving that facility does not have insufficient resources for accepting a patient.

[46] Nevinnaya, Irina "Did you choose a doctor?" Nedelya (Week), Feb. 7, 2008, available at (in Russian): http://www.rg.ru/2008/02/07/vrachi.html.

[47] In case of referrals from friends and family, patients typically know *a priori* that they would need to make "under-the-table" payments and of what amount.

[48] Data on private (*chastnie*) medical facilities is available from Goskomstat starting 2006. Prior to 2006, private facilities are included in "non-state" (*negosudarstvennie*) estimates.

health care is projected to increase and play a more important role (Ministry of Health and Social Development, 2008).

Private health care insurance. In Russia the market for private health care insurance is not well developed. Although private health insurance, called Voluntary Health Insurance (VHI), has existed since 1993, the share of individual purchases has been very small. According the recent estimates, only 5% of household purchased voluntary insurance, mainly for their children (Tragakes and Lessof, 2003). 95 percent of the market for VHI is dominated by contracts purchased by employers of large companies and enterprises for their employees (Shishkin and Popovich, 2009). VHI is characterized by a fairly limited coverage of health care services. It typically covers only emergency (ambulatory) treatment while the coverage of inpatient care or more serious conditions such as cancer is very rare (Shishkin and Popovich, 2009). However, the range of covered services is expected to grow, increasing individual purchases of VHI.

Excess capacity. Current Russian health care system is often characterized by excess capacity[49] and overutilization of inpatient care. Russia has approximately 3 times more hospital beds per 10,000 population than the U.S. (Figure A1). Although both countries have seen a decrease in hospital beds over the years, the large difference has abided. Russia also has more doctors per capita when compared to more developed countries. The ratio of doctors to population has increased both in Russia and the U.S. at about the same rate since 1990; however, Russia claims significantly more doctors per capita—approximately 50 per 10,000 population as compared to 40 per 10,000 population in the U.S. in 2006. This comparative abundance of health care resources in Russia is often linked to inefficient financing mechanims used under the Soviet system.[50]

Low wages. Another unique feature of Russian health care is relatively low earnings of medical workers relative to workers in other industries (Figure A1). In addition to relatively low pay, delayed wages to medical workers are also common. In fact, using our data we find that in the Fall of 1998 (following the financial crisis) 80% of nurses and 63% of doctors reported wage arrears, amounting to almost 3 months of unpaid wages on average. One likely explanation for the low remuneration of medical workers, relative to other professionals, is highly regulated labor market. The Ministry of Labor and the Health Ministry are responsivel for setting both the employment levels and salary increases for the medical staff of public institutions (Blam and Kovalev, 2003). Central control of employment and renumeration of medical workers introduces inefficiency to the system, making adjustmens to market conditions difficult. An additional concern is that compensation of medical workers is not directly tied to individual performance, which makes quality control rather problematic.

Quality of health. Indicators such as life expectancy are commonly used to account for the quality of medical services. Average life expectancy in Russia is exceptionally low relative to countries with

[49] Excess capacity is a broad term designed as a rough proxy for the capacity of medical facilities (in terms of the maximum number of patients being received or treated in a set amount of time), without appropriate controls for the quality.

[50] In the Soviet health care system, a major source of budgeting was based on the total number of bed-days which a hospital reported at the end of the fiscal year; the funding for next year was then allocated from the center in accordance with the previous year bed-days. Thus, the incentive was to offer healthier patients longer in-patient services. In the out-patient facilities, remuneration of staff was based in part on the number of patients received, not the number of treated patients, which created an incentive to receive many patients but refer them to a hospital for a secondary treatment (Tragakes an Lessof, 2003).

comparable levels of economic development. Since 1990 both genders have expereinced a decrease in life expectancy (Figure A1) while in the U.S. life expectancy for both genders has improved. In fact, U.S.women have the highest life expectancy, reaching a little over 80 years in 2006, while life expectancy of Russian women—70 years on average—is slighly below that of U.S. males. In sharp contrast, the Russian male is not expected to live beyond his late 50s.

Summary. The Russian health care system is facing many challenges. The goals of the 1993 Health Care Reform were to introduce some market features into the system, generate new revenues and eliminate inefficiencies. The reform did not achieve its objectives, largely due to overly complex financing mechanism, poor regulation and lack of proper incentives for health care providers (Shishkin, 1999; Tompson, 2007). Although the health care system incorporated some commercial elements, such as private provision, insurance and chargeable health services, it also preserved many characteristics of the Soviet centrally-planned system. Paradoxically, the constitutional guarantee of free medical services was never reconciled with the government's ability to finance this guarantee, and the deficit in health care continues to grow. The chronic underfunding and other inefficiencies are facilitating rapid unregulated commercialization of the health care sector, increasing importance of unofficial payments by patients and leading to deteriorating quality of medical services.

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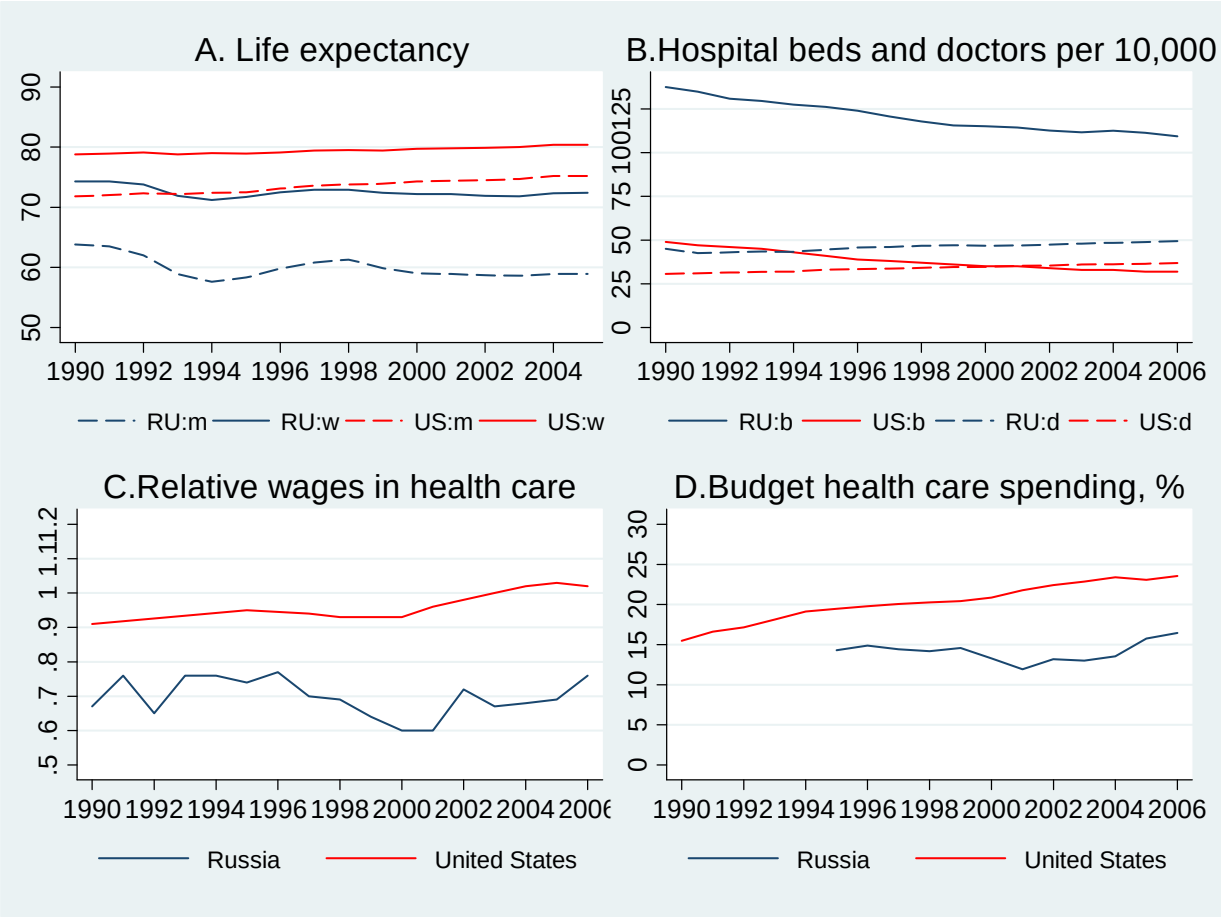
Figure 1: Key Health Indicators: Russia and U.S.



Notes: Figure A1 shows life expectancy in years by gender in Russia and the U.S. (Panel A), number of hospital beds and number of doctors per 10,000 population in Russia and the U.S. (Panel B), the ratio of the average wages in the health care industry to the average wages in other industries in Russia and the U.S., excluding the farm sector in the U.S. (Panel C), and the percent share of budget expenditures on health care in Russia and the U.S. (Panel D). For Russia, the following definitions are used. 1) Hospital beds include "beds which are equipped according to the necessary standards, irrespective of whether they are occupied or not" (Yearbook 2008, Yearbook 2001, Goskomstat). 2) "Doctors" include "all doctors who have obtained the medical degree and who are occupied in the treatment, sanatorium establishments, establishments of social care and research institutes, establishments which provide training of medical workers, in health care sector, etc." (Yearbook 2008, Yearbook 2001, Goskomstat). 3) Wages in the health care are average nominal monthly accrued wages for workers of establishments of health care and social work. Wages in other industries are average nominal monthly accrued wages for workers from all industries (Yearbook 2008, Yearbook 2001, Goskomstat). 4) Share of budget health care spending is a percent of current expenditures on health care and physical culture of the total consolidated budgetary expenditures. Consolidated budget consists of budgets of all levels of budgetary system of the Russian Federation (federal budget and budgets of state non-budget funds; budgets of the subjects of the Russian federation and budgets of the territorial non-budget funds; local budgets) (Treasure Budget data, Health Care in Russia 2005, Regions of Russia 2007, Goskomstat). For the U.S., the following definitions are used. 1) Hospital beds include "all hospital beds which are regularly maintained and staffed and immediately available for the care of admitted patients" (OECD Health Data 2009). 2) "Doctors" include practicing physicians (active medical doctors, M.D., active doctors of osteopathy, D.O. who have office-based or hospital-based practices, including residents and interns in medicine).and practicing dentists (OECD Health Data 2009). 3) Wages in health care are average weekly earnings for health care and social insurance industries in the private sector (transformed into average annual earnings) (Statistical Abstracts of the United States 2009 and 2007). Wages in other industries are average weekly earnings in non-farm private establishments (transformed into average annual earnings) (the Economic Report of the President 2009). 4) Share of budget health care spending is a percent of current public health expenditures of the total of federal, state and local governments current receipts and expenditures (Statistical Abstracts of the United States 2009 and 2007; the Economic Report of the President 2009).

Appendix A2: Coding of Illnesses

The eleven categories of the type of illness were based on respondents' descriptions of health problems. Specifically, the respondents were asked to describe any health problems they had in the last 30 days. The classification is based on the International Statistical Classification of Diseases and Related Health Problems (10^{th} Revision) available from: http://apps.who.int/classifications/apps/icd/icd10online/?gm91.htm+m93. We identified and coded sixteen types of illnesses; since some diseases had a very small number of observations, we aggregated them into broader categories for the total of eleven illness categories. Given a large number of observations, we coded manually approximately 1000 observations; the rest of coding was performed via statistical software. Table A2 presents the illness categories and a brief summary of diseases in each category. If no answer was provided, a respondent is assigned into category 11 (no answer). If a respondent reported having multiple diseases, our choice of appropriate illness category was motivated by our instrumental variable. In other words, illnesses that are more likely to be associated with sudden weather fluctuations—such as mild and serious respiratory problems—are given a priority. The order of illness prioritization follows the ascending order of the illness categories. For instance, if a respondent reported respiratory and heart problems, he is assigned into the first category, mild and serious respiratory problems; if a respondent reported traumatic injury, heart disease and digestive system problems, he is assigned in the second category, heart disease.

Table A2: RLMS Codebook for Illness

Category	Illness category	Diseases	ICD-10
1	Mild respiratory system disease/allergies	Flu, cold, respiratory allergy, cough, congestion, rhinitis, pharyngitis, sore throat, fever with no other diseases, sinusitis (gaimorit), croup (krup)	
1	Respiratory system – serious diseases	Asthma, bronchitis, pneumonia (vospaleniye of lungs), laryngitis, plevrit (pleurisy), tracheitis, adenoid hypertrophy, nasal polyp	J00-J99
2	Heart/circulatory system	Heart diseases, blood pressure, hypertension, stroke, atherosclerosis, arrhythmia, stenocardia, ischemia, thrombophlebitis, thrombosis, aneurism, varicose veins, hemorrhoids, cerebral arteries (sosudy golovnogo mozga)	I00-I99
10	Other symptoms, signs, and ill-defined conditions	Headache, stomachache, alcohol-related, nausea and vomiting, malaise and fatigue (nedomoganiye, ustalost', slabost'), bleeding unspecified, fainting and collapse, difficulties of breathing (odyshka), menopause symptoms, cramps and spasms unspecified, enlarged lymph nodes, abnormal findings on examination of blood and urine, etc.	R00-R99
3	Traumatic injuries	Contusion (ushib), concussion, fractures, dislocation, wounds, burns, bites, other injuries	S00-Y98
9	Infectious and parasitic diseases	Hepatitis, tuberculosis, chicken pox (vetryanka), scabies (chesotka), gonorrhea, salmonella infections, adenovirus infection, erysipelas (rozhistoe vospalenie), mumps (svinka), scarlet fever (skarlatina), leprosy (prokaza), herpes,	A00-B99

		measles (kor'), dysentery, virus disease unspecified, candidiasis (molochniza)	
4	Musculoskeletal system and connective tissue	Osteochondrosis, arthritis, joint disorders, polyarteritis, myositis (inflammation of the muscles), bursitis (bursit, inflammation of the joints), unspecified pains in joints, muscles and limbs, rheumatism**,** osteoporosis, lumbago, radiculitis and sciatica (radikulit)	M00-M99
5	Digestive and genitourinary systems	Diarrhea, dysbacteriosis, stomatitis, hernia, constipation (zapor), colitis, disease of intestine, diseases of liver such as fibrosis and cirrhosis, disorders of gallbladder and pancreas, cholecystitis (holezistit)**,** gastritis**,** acute appendicitis**;** diseases of urinary system, diseases of male genital organs such as prostate, diseases of urinary system such as cystitis, renal failure (pochechnaya nedostatochnost), mammary dysplasia, mastopathy, peritonitis, inflammatory diseases of female pelvic organs (adnexitis), menstrual pain and other symptoms, poisoning, jaundice unspecified (zheltuxa)	K00-K99, N00-N99
6	Nervous system and mental diseases	Meningitis, encephalitis, Parkinson's disease, dystonia, multiple sclerosis, depressive disorder, sleep disorders, epilepsy, paralysis, cerebral palsy (detskiy zerebralniy paralich) and other paralytic syndromes, neuralgia, nerve disorders, neurasthenia, neurosis, migraine (excludes headache), muscular dystrophy, disorders of speech and language	G00-G99, F00-F99
7	Eyes and ears	Visual disturbances and blindness, myopia (blizorukost')**,** conjunctivitis, glaucoma, cataract and other diseases of the eye; otitis, loss of hearing and other diseases of the ear (incl. earaches)	H00-H95
9	Skin and subcutaneous tissue	Dermatitis, eczema, skin allergies, furunculosis, psoriasis, skin infections, lichen (lishay), cutaneous abscess (excludes ear, eyelids, mouth, nose), acute lymphadenitis (vospalenie limfoticheskih uzlov), nails disorders, boil (chirey), hair loss and other skin disorders	L00-L99
10	Pregnancy and childbirth	Spontaneous abortion, miscarriage, complications of labor and delivery such as preterm labor, single or assisted delivery	O00-O99
9	Neoplasms, tumor, and cancer	Cancer, neoplasms, adenoma, cyst, lipoma (zhirovik)	C00-D48
8	Dental problems	Teeth ache, dental caries, gingivitis and	K00-K09

		periodontitis, pulpitis, and other dental problems	
9	Other specified	Anemia and other blood diseases, diabetes, thyroid disorders (tschitovidnaya zheleza), diathesis (diatez), pancreatitis, malnutrition, obesity	D50-D89; E00-E90
10	General sickness	General sickness, aging (starost'), surgery unspecified, hospital checkup, examination to obtain the disability status, military committee examination	
97	Care	Care for children and others in the hospital	
98	Surgery unspecified	Surgery unspecified	
11	Unclassified	Illness unclassified	

Appendix A3: Description of Individual-Level Variables

TABLE A3: Variable Description, RLMS

Variable name	Definition	Notes
Female	=1 if a respondent is female	
Age	Age in years	
Adult (dummy 14+)	=1 if a respondent's age is greater than or equal 14	
Schooling (years)	Educational status is converted into a continuous variable representing adjusted years of schooling.	
Employment (dummy)	=1 if a respondent is currently working, is on the maternity leave, any other paid leave or is on unpaid vacation	
Disposable HH income (log)	Log of disposable after-tax household income, deflated using national monthly CPI and adjusted for the size of the household. Disposable income=labor earnings+net private transfers+financial income+public transfers.	
Type of medical visit		
Treatment visit	=1 if a respondent had a treatment visit in the last 30 days ("outpatient visit") or had a doctor's visit at home. Respondents were asked "[In the most recent time you saw a health worker in the last 30 days] did you go to an appointment yourself or did the health worker come to your home?" (walked or rode to an appointment, called to home).	
Hospital stay	=1 if a respondent stayed at a hospital in the last 3 months. Respondents were asked "Have you stayed in the hospital in the last 3 months?"	
Preventative check-up	=1 if a respondent had a preventative check-up in the last 3 months. Respondents were asked "In the last 3 months have you gone to a medical institution or simply to a specialist, not because you were sick but for a preventative check-up?"	
Type of payment		
Informal pay (treatment visit)	=1 if a respondent paid informally for treatment visit, including additional procedures. In 2000-2005 surveys, those respondents who paid for medical services during treatment were asked the following question: "Whom and how much did you pay for this visit?" (paid officially in the medial enterprise's cashier's office or paid money or gifts directly to the medical personnel). Those respondents who paid for additional tests and procedures were also asked: "Whom and how much did you pay?" (paid officially in the medical enterprise's cashier's office or paid money or gifts directly to the medical personnel). Payment with "money or gifts directly to the medical personnel" is defined as informal payment.	Available in 2000-2005

Informal expense, log (treatment visit)	Total expenses in rubles if they were paid with "money or gifts directly to the medical personnel" during a treatment visit, including expenses for additional procedures. In 2000-2005 surveys, those respondents who paid for medical services during treatment were asked the following question: "Whom and how much did you pay for this visit?" (paid officially in the medial enterprise's cashier's office and how much in rubles, or paid money or gifts directly to the medical personnel and how much in rubles). Those respondents who paid for additional tests and procedures were also asked: "Whom and how much did you pay?" (paid officially in the medical enterprise's cashier's office and how much in rubles or paid money or gifts directly to the medical personnel and how much in rubles). The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005
Official pay (treatment visit)	=1 if a respondent paid officially for treatment visit. In 2000-2005 surveys, those respondents who paid for medical services during treatment were asked the following question: "Whom and how much did you pay for this visit?" (paid officially in the medial enterprise's cashier's office or paid money or gifts directly to the medical personnel). Those respondents who paid for additional tests and procedures were also asked: "Whom and how much did you pay?" (paid officially in the medical enterprise's cashier's office or paid money or gifts directly to the medical personnel). If a respondent answered "yes" to the first part of either of these questions ("paid officially in the medical enterprise's cashier's office"), we define his payment as official.	Available in 2000-2005
Official expense, log (treatment visit)	Total expenses in rubles for treatment visit if they were "paid officially in the medical enterprise's cashier's office" during a treatment visit, including expenses for additional procedures. In 2000-2005 surveys, those respondents who paid for medical services during treatment were asked the following question: "Whom and how much did you pay for this visit?" (paid officially in the medial enterprise's cashier's office and how much in rubles or paid money or gifts directly to the medical personnel and how much in rubles). Those respondents who paid for additional tests and procedures were also asked: "Whom and how much did you pay?" (paid officially in the medical enterprise's cashier's office and how much in rubles or paid money or gifts directly to the medical personnel and how much in rubles). The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005
Any pay (treatment visit)	=1 if a respondent paid for medical services during a treatment visit, including additional procedures. In 1994-1995 surveys, respondents were asked the following questions about the treatment visit in the last 30 days: "Did you pay to the doctor for the visit" and "Did you pay for additional examination and procedures?" In 1996 and 1998 surveys the formulation of the first question changed slightly: "Did you pay for the visit?" In 2000-2005 surveys both questions changed to "Did you pay for the visit in money or in kind?" and "Did you pay for additional examination and procedures in money or in kind?"	In our estimates we consider two periods: 2000-2005 and the whole period, 1994-2005
Total expense, log (treatment visit)	Total expense in rubles for treatment visit, including expenses on additional procedures. In 1994-1996, 1998 surveys those who paid for a treatment visit where asked: "How much money did you pay for this visit?" (amount in rubles) and those who paid for additional procedures where asked "How much extra did you pay?"	In our estimates we consider two periods: 2000-2005 and the whole period, 1994-2005

	(amount in rubles). For these years, total expenditure=expenses for treatment visit+ expenses for additional procedures. For 2000-2005 years, total expenditure=informal expense +official expense for treatment visit, including informal and official expenses for additional procedures. The expenses are deflated using monthly CPI; log transformation is applied.	
Informal payment (hospital stay, with and without medicine)	=1 if a respondent paid informally for a hospital stay in the last 3 months (with and without medicine). In 2000-2005 surveys, the respondents were asked the following two questions about their stay in hospital in the last 3 months: "Whom and how much money in all have you paid in the last 3 months for stay in the hospital?" (for treatment and care, not counting for medicine, paid officially in the hospital cashier office or paid to doctors and other medical personnel with money or gifts) and "Did you receive medicine, syringes, and dressings, which were necessary for your treatment in a hospital, for free or did you pay for them with money and gifts?" (officially in the hospital, directly to the medical personnel with money or in-kind, or in pharmacies outside the hospital). Thus we consider two types of informal payments during hospital stay, with and without medicine.	Available in 2000-2005. In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.
Informal expense, log (hospital stay, with and without medicine)	Total informal expense in rubles for hospital stay in the last 3 months with and without medicine. In 2000-2005 surveys, those respondents who paid for hospital stay in the last 3 months were asked: "Whom and how much money in all have you paid in the last 3 months for stay in the hospital?" (for treatment and care, not counting for medicine, paid officially in the hospital cashier office and how much in rubles or paid to doctors and other medical personnel with money or gifts and how much in rubles) and "Whom and how much in all did you and your family pay for medicines, syringes, and dressings when you were in the hospital?" (paid officially in the cashier's office or pharmacy of the hospital you were in and how much in rubles, paid money or gifts directly to the physicians or other staff and how much in rubles, medicine, syringes and dressings were bought for you in the pharmacy outside the hospital and how much in rubles). We consider two types of informal payments during hospital stay, without medicine and with medicine, defined as payments made "with money or gifts directly to physicians and medical personnel". Informal expense with medicine=informal expense without medicine+ informal expense on medicine. The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005. In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.
Official payment (hospital stay, with and without medicine)	=1 if a respondent paid officially for a hospital stay in the last 3 months (with and without medicine). In 2000-2005 surveys, the respondents were asked the following two questions about their stay in hospital in the last 3 months: "Whom and how much money in all have you paid in the last 3 months for stay in the hospital?" (for treatment and care, not counting for medicine, paid officially in the hospital cashier office or paid to doctors and other medical personnel with money or gifts) and "Did you receive medicine, syringes, and dressings, which were necessary for your treatment in a hospital, for free or did you pay for them with money and gifts?" (officially in the hospital, directly to the medical personnel with money or in-kind, or in pharmacies outside the hospital). Thu we consider two types of official	Available in 2000-2005. In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.

	payments during hospital stay, with and without medicine.	
Official expense (hospital stay, with and without medicine)	Total official expense in rubles for hospital stay in the last 3 months (with and without medicine). In 2000-2005 surveys, those respondents who paid for hospital stay in the last 3 months were asked: "Whom and how much money in all have you paid in the last 3 months for stay in the hospital?" (for treatment and care, not counting for medicine, paid officially in the hospital cashier office and how much in rubles or paid to doctors and other medical personnel with money or gifts and how much in rubles) and "Whom and how much in all did you and your family pay for medicines, syringes, and dressings when you were in the hospital?" (paid officially in the cashier's office or pharmacy of the hospital you were in and how much in rubles, paid money or gifts directly to the physicians or other staff and how much in rubles, medicine, syringes and dressings were bought for you in the pharmacy outside the hospital and how much in rubles). We consider two types of official payments during hospital stay, without medicine and with medicine, defined as payments made "officially in the hospital cashier's office". Official expense with medicine=official expense without medicine+ official expense on medicine. The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005. In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.
Any pay (hospital stay, including medicine)	=1 if a respondent paid for hospital stay in the last 3 months, including any payments for medicine. In 1994-1998 surveys, payments for medical help during the hospital stay cannot be separated from purchases of medicine needed for hospital procedures. Specifically, the respondents were asked "Did you pay for hospital stay, medical help, treatment, and medicine?" In 2000-2005 surveys, the respondents were asked about payments for medicine in two separate questions: "Did you receive medicine, syringes and dressing materials for free or did you pay for them with money or gifts?" (all medicine were received free, some medicines were received free of charge and some paid for, we paid for all medicines) and "Whom and how much in all did you and your family pay for medicines, syringes, and dressings when you were in the hospital?" For consistency we need to include payments on medicine in this measure. Thus any pay for hospital stay with medicine includes: payments for hospital stay with medicine for 1994-1998 years, official or informal payments on hospital stay with medicine, and if a respondent indicated that "some medicines were received free of charge and some paid for" or "we paid for all medicines."	In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.
Total expense, log (hospital stay, including medicine)	Total expense in rubles for hospital stay in the last 3 months, including medicine. In 1994-1998 surveys, payments for medical help during the hospital stay cannot be separated from purchases of medicine needed for hospital procedures. Specifically, those respondents who paid for a hospital stay, including medical help treatment and medicine, were also asked "How much money did you pay for hospital stay, medical help, treatment, and medicine in the last 3 months?" (amount in rubles). In 2000-2005 surveys, the respondents were asked about medicine in a separate question. For consistency we need to include expenses on medicine in the total expense. Total expense=total expense, including medicine (for 1994-1998 years)+official expense, excluding medicine (for 2000-2005 years) +official expense on medicine (2000-	In Round 9 (2000), due to a typo in the questionnaire, many respondents skipped the question: "Whom, how, and how much money did you or your family pay for medicine, syringes, and dressings when you were in the hospital?" Thus, our estimates of payments for hospital stay with medicine will exclude the year 2000.

	2005 years)+ informal expense, excluding medicine (for 2000-2005 years) +informal expense on medicine (2000-2005 years). The expenses are deflated using monthly CPI; log transformation is applied.	
Informal pay (check-up visit)	=1 if paid informally for a check-up visit in the last 3 months. In 2000-2005 surveys, those respondents who paid for the preventative check up (either in money or in gifts) were asked: "Whom and how much did you pay?" (paid officially in the cashier's office of a medical institution or paid doctors and other medical personnel directly with money or gifts). Informal pay is defined if "paid doctors and other medical personnel directly with money or gifts."	Available in 2000-2005
Informal expense (check-up visit)	Expense in rubles for check-up visit in the last 3 months if it was "paid doctors and other medical personnel directly with money or gifts." In 2000-2005 surveys, those respondents who paid for the preventative check up (either in money or in gifts) were asked: "Whom and how much did you pay?" (paid officially in the cashier's office of a medical institution and how much in rubles or paid doctors and other medical personnel directly with money or gifts and how much in rubles). The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005
Official payment (check-up visit)	=1 if paid officially for a check-up visit in the last 3 months. In 2000-2005 surveys, those respondents who paid for the preventative check up (either in money or in gifts) were asked: "Whom and how much did you pay?" (paid officially in the cashier's office of a medical institution or paid doctors and other medical personnel directly with money or gifts). Official pay is defined if "paid officially in the cashier's office of a medical institution."	Available in 2000-2005
Official expense (check-up visit)	Expense in rubles for a check-up visit in the last 3 months if it was "paid officially in the cashier's office of a medical institution." In 2000-2005 surveys, those respondents who paid for a preventative check up (either in money or in gifts) were asked: "Whom and how much did you pay?" (paid officially in the cashier's office of a medical institution and how much in rubles or paid doctors and other medical personnel directly with money or gifts and how much in rubles). The expenses are deflated using monthly CPI; log transformation is applied.	Available in 2000-2005
Any pay (check-up visit)	=1 if a respondent paid for a preventative check-up. In 2000-2005 surveys, those respondents who had a preventative check-up in the last 3 months were asked "Did you pay for this preventative check-up either in money or in gifts?"	
Total expense (check-up visit)	Total expense in rubles on a preventative check-up visit in the last 3 months. In 1994-1996, 1998 surveys respondents who paid for a preventative check-up visit were asked: "How much did you pay for this check-up?" (amount in rubles). For these years total expense is equal to this amount. For 2000-2005 years, total expense=informal expense +official expense for preventative check-up in the last 3 months.	
Ownership type of the facility		
Public	=1 if a respondent visited a public facility during a treatment visit in the last 30 days. Specifically, the respondent was asked: "Tell me, please, where did you go the last time?" (a polyclinic of the raion, city, state, village; a commercial polyclinic; a	Available only for treatment visit

	hospital of the raion, city, state, village; a commercial hospital; a private physician). In Round 5 (1994), additional option was "private hospital" which we combine with commercial hospital. The respondent visited a public facility if his response was "a polyclinic of the raion, city, state, village," "a hospital of the raion, city, state, village," or "a private physician"	
Private	=1 if a respondent visited a private facility during a treatment visit in the last 30 days. Specifically, the respondent was asked: "Tell me, please, where did you go the last time?" (a polyclinic of the raion, city, state, village; a commercial polyclinic; a hospital of the raion, city, state, village; a commercial hospital; a private physician). In Round 5 (1994), additional option was "private hospital" which we combine with commercial hospital. The respondent visited a private facility if his response was "a commercial polyclinic," "a commercial hospital," or "private physician"	Available only for treatment visit
Home visit	=1 if a medical worker visited an individual at home in the last 30 days during a treatment visit. Specifically, a respondent was asked: "Tell me, please, last time did you go yourself to an appointment or did the health worker come to your home?" (walked or rode to an appointment or called to the home). A home visit is defined if the respondent answered "called to the home."	Available only for treatment visit
Type of illness (categories)	Respondents were asked the following question: "Recall, please, what were these [health] problems [in the last 30 days]?" For hospital stay, the respondents were asked "For what reason and reasons were you hospitalized [in the last 3 monts]?"	This question is not asked for a preventative check-up visit
Mild respiratory	=1 if a respondent has a mild respiratory system disease or allergy	
Serious respiratory	=1 if a respondent has a serious respiratory system disease	
Heart and circulatory	=1 if a respondent has heart/circulatory system disease	
Symptoms	=1 if a respondent has other ill-defined symptoms, general sickness, pregnancy or uncoded disease	
Traumatic injury	=1 if a respondent has a traumatic injury	
Musculoskeletal	=1 if respondent has musculoskeletal or connective tissue disease	
Digestive	=1 if a respondent has digestive or genitourinary systems disease	
Nervous system	=1 if a respondent has nervous system disease	
Sensory system	=1 if a respondent has sensory disease of eyes or ears	
Dental	=1 if a respondent has dental disease	
Other systemic	=1 if a respondent has infectious or parasitic diseases, skin and subcutaneous tissue disease, cancers or tumors, or other specified diseases	
No answer	=11 if respondent did not provide an answer. This includes respondents who answered negatively to either of the following questions: "Have you in the last 30	

	days had any health problems?" and "Or perhaps in the last 30 days you had a light indisposition, for example, a headache, a sore throat or toothache, a cold or a slightly upset stomach, a fever, a burn, an injury, a gaze?" or respondents who refused to answer	
Chronic illness (dummy)	=1 if a respondent has a chronic illness. In 2000-2005 surveys, a respondent was asked: "Do you have any kind of chronic illness?" (heart disease, illness of lungs, liver disease, kidney disease, gastrointestinal disease, spinal problems, other chronic illnesses. If a respondent answered positively, he is considered to have a chronic illness.	Since the question is available in Rounds 9-14 (2000-2005), the variable is not included in the estimates of bribery function for the entire 1994-2005 period.
Poor health (dummy)	=1 if a respondent rated his health as "bad" or "very bad." A respondent was asked the following question: "Tell me, please, how would you evaluate your health? It is" (very good, good, average, bad, very bad).	
Place of medical services		
Hospital	=1 if a respondent visited a hospital during a treatment visit ("outpatient" services) in the last 30 days. Specifically, the respondent was asked: "Tell me, please, where did you go the last time?" (a polyclinic of the raion, city, state, village; a commercial polyclinic; a hospital of the raion, city, state, village; a commercial hospital; a private physician). In Round 5 (1994), additional option was "private hospital" which we combine with commercial hospital. The respondent visited a hospital if his response was "a hospital of the raion, city, state, village" or "a commercial hospital."	Not available for hospital stay and is discontinued after Round 11 (2002) for a preventative check-up visit. Therefore, we do not include this variable in estimates of bribery during hospital stay and during preventative check-up visit.
Clinic	=1 if a respondent visited an outpatient clinic during a treatment visit ("outpatient" services in the last 30 days. Specifically, the respondent was asked: "Tell me, please, where did you go the last time?" (a polyclinic of the raion, city, state, village; a commercial polyclinic; a hospital of the raion, city, state, village; a commercial hospital; a private physician; other place). The respondent visited a clinic if his response was "a polyclinic of the raion, city, state, village"; "a commercial polyclinic" or "other place."	Not available for hospital stay and is discontinued after Round 11 (2002) for a preventative check-up visit. Therefore, we do not include this variable in estimates of bribery during hospital stay and during preventative check-up visit.
Private doctor	=1 if a respondent visited a private doctor during a treatment visit in the last 30 days. Specifically, the respondent was asked: "Tell me, please, where did you go the last time?" (a polyclinic of the raion, city, state, village; a commercial polyclinic; a hospital of the raion, city, state, village; a commercial hospital; a private physician). The respondent visited a private doctor if his response was "a private physician"	Not available for hospital stay and is discontinued after Round 11 (2002) for a preventative check-up visit. Therefore, we do not include this variable in estimates of bribery during hospital stay and during preventative check-up visit.
Home visit	=1 if a medical worker visited an individual at home in the last 30 days during a treatment visit. Specifically, a respondent was asked: "Tell me, please, last time did you go yourself to an appointment or did the health worker come to your home?" (walked or rode to an appointment or called to the home). A home visit is defined if the respondent answered "called to the home."	Not available for hospital stay and is discontinued after Round 11 (2002) for a preventative check-up visit. Therefore, we do not include this variable in estimates of bribery during hospital stay and during preventative check-up visit.
Urban (dummy)	=1 if a respondent resides in a "regional center" (regionalniy zentr), "city" (gorod), or in a "village of a city type" (pos'elok gorodskogo tipa).	
Regional wages of medical workers (log)	Monthly average contractual earnings of medical workers (averaged by the primary sampling units for each year; if the number of medical workers in a primary	

	sampling unit for a given year was less than 5, then the regional average was used). Wages are deflated using monthly CPI. Log transformation is applied.
Average schooling of medical workers (years)	Average years of schooling of medical workers (averaged by the primary sampling units for each year; if the number of medical workers in a primary sampling unit for a given year was less than 5, then the regional average was used). Educational status is converted into a continuous variable representing adjusted years of schooling.
Region dummies	8 dummies for each of the following regions: Metro, North West, Central, Volga, North Caucasus, Ural, West Siberia and East

Appendix A4: Description of Regional-Level Variables

Variable Name	Variable Description	Units	Years	Source: publication	Table	Calculation/Formula
Doctors/Nurses	Ratio of doctors to associate medical personnel	ratio	1995-2006	Regions of Russia, 2004; Regions of Russia, 2007	6.6; 6.9	Ratio of the number of doctors, in thousands, to the number of associate medical personnel, in thousands
Budget deficit, % of regional GDP	Budgetary deficit of the subjects of the Russian Federation, as a percent of regional GDP	percent	1995-2006	Regions of Russia, 2004; Regions of Russia, 2007; Regions of Russia, 2008; Statistical Yearbook, 2001	20.3, 22.3, 22.4; 20.1, 22.1, 22.2; 10.1, 11.1	(Consolidated budgetary income of the subjects of the RF-consolidated budgetary expenditures of the subjects of the RF)*100/total regional GDP
Wage arrears per worker in health care, (log)	Log of the wage arrears per worker in health care industry. Wages are deflated using annual CPI	rubles	1995-1999, 2001-2005; 1995-2006	Wage arrears, Goskomstat; Health Care in Russia, 2001; Health Care in Russia, 2005; Health Care in Russia, 2007	T2A91500; 91500T10; T15; 10.23; 3.21; 4.16	Total wage arrears for workers in health care industry/ total number employed in establishments and organizations of the "Health care" sector
Monthly wage bills owed in health care, % of total bills	Wage arrears, as a percent to the monthly wage bill	percent	1995-1999, 2001-2005	Wage arrears, Goskomstat	T2A91500; 91500T10; T15;	
Share of workers with wage arrears in health care	Share of workers in health care industry with wage arrears	percent	1995-1999, 2001-2005	Wage arrears, Goskomstat; Health Care in Russia, 2005; Health Care in Russia, 2007	T15; 10.23; 3.21; 4.16	Number of workers for whom health care establishment has wage arrears /total number employed in establishments and organizations of the "Health care" sector
Months of unpaid wages for medical workers	Average number of unpaid monthly wages for medical workers, by psu-year	number	1995-1996, 1998, 2000-2005	RLMS	N/A	

Regional real GDP per capita (log)	Log of regional GDP per capita. Regional GDP is deflated using annual CPI	rubles; before 1996- thousands of rubles	1994-2006	Russian Statistical Yearbook, 2001; Regions of Russia, 2004; Regions of Russia, 2008	12.23; 10.2; 11.2	
Real health expenditure per capita (log)	Log of health care expenditure per capita. Health expenditure is deflated using annual CPI	rubles	1995-2006	Treasury Budget Data, annual; Health Care, 2005; Regions of Russia 2007; Regions of Russia 2004; Regions of Russia 2008	8.6; 22.5; 2.1, 3.1	Consolidated budgetary expenditures of the subjects of the Russian Federation on health care and physical culture/Total population, thousands
Medical personnel	Number of doctors and associate medical personnel per 100 population	number	1995-2006	Regions of Russia, 2004; Regions of Russia, 2007	6.7; 6.10	Sum of the number of doctors and associate medical personnel per 10,000 population/100
Hospital beds, rate	Number of hospital beds per 10,000 population, end of year	number	1995-2006	Regions of Russia, 2004; Regions of Russia, 2007	6.2	
Share of regional budget expenditure on health care	Share of regional budget expenditure on health care and physical education in total expenditures	percent	1995-2006	Treasury Budget Data, annual; Health Care, 2005; Regions of Russia 2004; Regional of Russia 2007;	8.6; 22.5; 20.3; 22.3; 22.4	Consolidated budgetary expenditures on health care and physical education*100/ Consolidated budgetary expenditures of the subjects of the Russian Federation
Regional share of private medical facilities	Share of private medical facilities in 2006, average by location	percent	2006	Health Care in Russia, 2007	3.15	Number of non-public hospitals/(number non-public hospitals+number of public hospitals). Average by location
Residual temperature	Deviation of mean temperature for the month in degrees of Fahrenheit from monthly norm	number	1975-2005	U.S. Department of Commerce, National Climatic Data Center, Global Summary of the Day	N/A	Residuals from a regression of the mean temperature on the interaction of locations and a trend (from 1974) and interaction of location and months
Residual pressure	Deviation of mean sea level pressure for the month in millibars from monthly norm	number	1975-2005	U.S. Department of Commerce, National Climatic Data Center, Global Summary of the Day	N/A	Residuals from a regression of mean sea level pressure on the interaction of locations and a trend (from 1974) and interaction of location and months

Residual max temperature	Deviation of the maximum temperature for the month from monthly norm	number	1975-2005	U.S. Department of Commerce, National Climatic Data Center, Global Summary of the Day	N/A	Residuals from a regression of maximum temperature on the interaction of locations and a trend (from 1974) and interaction of location and months
Residual precipitation	Monthly deviations of the share of days with precipitation from monthly norm	number	1975-2005	U.S. Department of Commerce, National Climatic Data Center, Global Summary of the Day	N/A	Residuals from a regression of the share of days with precipitation in a given month on the interaction of locations and a trend (from 1974) and interaction of location and months
Regional component of regional wages of medical workers	Regional component of regional wages of medical workers, by psu-year	number	1995-1996, 1998, 2000-2005	RLMS	N/A	Residual from a regression of log of contractual monthly wages on gender, adjusted years of schooling, potential experience (years), potential experience squared, tenure (years), tenure squared for medical workers. Average by psu-year
Skill component of regional wages of medical workers	Skill component of regional wages of medical workers, by psu-year	number	1995-1996, 1998, 2000-2005	RLMS	N/A	Predicted means from a regression of log of contractual monthly wages on gender, adjusted years of schooling, potential experience (years), potential experience squared, tenure (years), tenure squared for medical workers. Average by psu-year
Water pollution, per capita	Discharge of polluted sewage water to water bodies per capita	Thousands of cubic meters	1995-2005	Environment, 2001; Environment, 2006; Regions of Russia 2004; Regions of Russia 2008	7.20; 7.18; 2.1, 3.1	Discharge of polluted sewage water to water bodies per capita/Total population, thousands
Air pollution, per sq. km	Discharge of substances polluting atmosphere from stationary sources per square kilometer	tons	1995-2005	Environment, 2001; Environment, 2006; Yearbook, 2008	8.8; 8.5; 2.1	Discharge of substances polluting atmosphere from stationary sources, thousands of tons/land area, thousands of square kilometers

Top regional coefficient (not shown) based on legal laws	Regional wage coefficient based on federal and regional laws	2000-2005	http://khantymansi.news-city.info/docs/sistemsm/dok_pegvko/index.htm; http://www.spbustavsud.ru/printdoc?tid=&nd=902134995&nh=0&ssect=1	N/A	
Northern markup based on legal laws (not shown)	Northern markup based on federal and regional laws	2000-2006	http://khantymansi.news-city.info/docs/sistemsm/dok_pegvko/index.htm; http://www.spbustavsud.ru/printdoc?tid=&nd=902134995&nh=0&ssect=1	N/A	
Base regional wage coefficient (not shown)	Base regional wage coefficient	2000-2006	Ministry of Finance of the Russian Federation, Interbudgetary relations	2-2-1; 3-2-1; 3-2-1; 3-2-1; ИБР; ИБР	
Weighted wage markup in Northern locations (not shown)	Average wage markup in the regions of Extreme North and in territories equated to them	2000-2006	Ministry of Finance of the Russian Federation, Interbudgetary relations	2-2-1; 3-2-1; 3-2-1; 3-2-1; ИБР; ИБР	
Total regional wage coefficient	Total regional wage coefficient (with markups and compensation)	2000-2006	Ministry of Finance of the Russian Federation, Interbudgetary relations	2-2-1; 3-2-1; 3-2-1; 3-2-1; ИБР; ИБР	Sum of the base regional wage coefficient, weighted wage markup in Northern locations, other wage markups in Eastern Siberia and Far East, and conditional wage markup for transportation expenses in Northern locations.

Notes: Komi-Permyatski okrug is merged with Permskaya oblast in 2005. Taymyrsky (Dolgano-Nenezkiy) and Evensky autonomous okrugs are merged with Krasnoyarskiy kray in 2005. Health care industry includes physical culture and social work. Data for autonomous republics are included into data for oblasts (necessary recalculations are performed to make variables consistent over time). Social policy is not included in budget expenditures on health care and physical culture. Data for Chechnya in 2000 is presented from municipal (local) budgets. Morbidity rate is not provided for autonomous okrugs; it is taken from oblast numbers. Gross regional product is not calculated separately for autonomous regions before 2000. When computing per capita measures, mid year population estimates are used. For wage arrears data are as of the end of year, except for 1999; data for 1999 as of July 1, 1999; for 2000, the averages of 1999 and 2001 is taken. For regional wage coefficients, 2006 data are missing information on autonomous republics; assumptions are made based on previous values. Since the budget is developed in the middle of the year, one-year forward values for regional wage coefficient have been used for any given year

Summary Statistics of Regional Variables

Variable name		1995	1996	1998	2000	2001	2002	2003	2004	2005
Doctors/Nurses	Mean	0.404	0.406	0.416	0.428	0.456	0.459	0.463	0.468	0.469
	St. dev.	0.097	0.098	0.100	0.102	0.130	0.134	0.139	0.144	0.141
Budget deficit, % of regional GDP	Mean	-0.365	-0.944	-0.341	0.007	-0.086	-0.577	-0.467	-0.105	-0.043
	St. dev.	0.635	1.386	0.917	1.078	0.598	0.929	0.833	0.898	0.644
Wage arrears per worker in health care, (log)	Mean	6.306	7.058	6.881	4.940	1.900	2.467	2.018	1.305	0.835
	St. dev.	1.402	1.770	1.480	1.635	1.846	1.878	2.095	1.665	1.097
Monthly wage bills owed in health care, % of total bills	Mean	1.126	1.703	2.277	1.217	0.828	0.668	0.607	45.961	0.504
	St. dev.	0.467	0.825	0.947	0.695	0.890	0.735	1.322	210.951	1.067
Share of workers with wage arrears in health care	Mean	N/A	N/A	N/A	17.992	2.497	2.616	2.472	0.735	0.187
	St. dev.				14.083	6.469	5.171	5.137	1.997	0.426
Months of unpaid wages for medical workers	Mean	0.693	1.693	2.792	0.445	0.272	0.303	0.323	0.189	0.187
	St. dev.	0.640	1.038	1.712	0.426	0.326	0.336	0.490	0.317	0.400
Regional real GDP per capita (log)	Mean	10.725	10.826	10.303	10.648	10.795	10.858	10.913	11.050	11.148
	St. dev.	0.379	0.371	0.417	0.568	0.556	0.555	0.514	0.543	0.572

Real health expenditure per capita (log)	Mean	0.181	0.391	-0.218	0.055	0.105	0.330	0.355	0.476	0.680
	St. dev.	0.416	0.412	0.455	0.531	0.415	0.355	0.306	0.311	0.381
Medical personnel	Mean	1.536	1.562	1.562	1.523	1.543	1.568	1.573	1.580	1.583
	St. dev.	0.173	0.184	0.188	0.174	0.187	0.187	0.187	0.183	0.186
Hospital beds, rate	Mean	123.938	122.251	117.238	115.480	114.553	113.453	113.189	113.756	112.999
	St. dev.	12.422	10.439	10.157	12.615	13.054	13.095	13.058	13.056	12.812
Share of regional budget expenditure on health care	Mean	14.993	15.567	14.831	15.568	13.471	14.522	14.655	15.346	16.866
	St. dev.	2.255	2.376	2.473	2.665	2.915	3.148	2.967	3.081	2.271
Regional share of private medical facilities	Mean	2.189	2.123	2.027	1.816	2.625	2.743	2.797	2.885	2.763
	St. dev.	3.068	2.989	2.815	2.520	3.565	3.697	3.747	3.810	3.711
Residual temperature	Mean	1.639	-1.016	-5.452	-0.709	-0.863	-1.272	0.273	0.391	1.802
	St. dev.	1.596	2.895	6.210	2.589	2.006	3.246	2.052	1.343	2.062
Residual pressure	Mean	-0.783	0.594	1.380	3.569	-0.909	-1.253	-0.055	-0.236	3.436
	St. dev.	2.513	2.555	3.738	4.027	3.153	2.341	3.794	1.804	2.996
Residual max temperature	Mean	1.029	-2.042	1.022	-1.328	-1.375	-0.544	2.061	0.918	1.510
	St. dev.	4.768	4.310	6.106	5.486	4.324	5.058	5.579	3.452	4.722

Residual precipitation	Mean	-0.052	-0.027	0.045	-0.032	0.023	0.080	0.020	0.030	-0.096
	St. dev.	0.094	0.130	0.104	0.113	0.131	0.128	0.129	0.100	0.148
Regional component of regional wages of medical workers	Mean	N/A	N/A	N/A	-0.005	-0.018	0.021	0.033	-0.004	-0.026
	St. dev.				0.346	0.310	0.337	0.378	0.346	0.379
Skill component of regional wages of medical workers	Mean	N/A	N/A	N/A	6.977	7.153	7.598	7.541	7.738	7.868
	St. dev.				0.156	0.143	0.109	0.131	0.103	0.103
Water pollution, per capita	Mean	0.148	0.135	0.130	0.120	0.129	0.133	0.125	0.123	0.115
	St. dev.	0.097	0.082	0.090	0.069	0.073	0.075	0.071	0.069	0.063
Air pollution, per sq. km	Mean	13.971	12.721	9.158	6.889	11.893	12.546	12.053	11.808	10.720
	St. dev.	36.918	35.301	25.123	18.452	24.322	25.110	25.287	24.057	22.621
Total regional wage coefficient	Mean	N/A	N/A	N/A	1.186	1.174	1.170	1.162	1.159	1.167
	St. dev.				0.317	0.322	0.317	0.294	0.289	0.295