The effect of taxation on informal employment: evidence from the Russian flat tax reform

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THE EFFECT OF TAXATION ON INFORMAL EMPLOYMENT: EVIDENCE FROM THE RUSSIAN FLAT TAX REFORM

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The 2001 Russian tax reform reduced average tax rates for the personal income tax and the payroll or social tax. It also made the tax structure more regressive. Because individuals in the lower income bracket were for the most part not affected, it is possible to estimate the effects of the reform using a differences-in-differences approach. I study the effect of the reform on informal employment. Informality is defined using information on employment registration and self-employment. Applying parametric and semi-parametric techniques, I find evidence that the tax reform led to a significant reduction in the fraction of informal employees. Among the different forms of informality I study, the reform seems to have had the strongest effect on the prevalence of informal irregular activities. I also document stronger effects on individuals who benefited from the largest reductions in tax rates. The strong response to the tax reform lends support to the hypothesis that informal and formal labor markets are well integrated.

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1 Introduction

The high prevalence of informality is a well-known characteristic of labor markets in developing countries.[1] Informal work is by nature heterogeneous. It includes self-employed individuals, as well as those working under them (often a few family members and friends). It also extends to those employed by larger organizations but who are not effectively covered by any of the institutions –such as the pension system and other social insurance– that protect formal employees. While for the most part the economic activities of informal workers are legal, they are often not taken into account in official statistics, and much of the income they generate goes untaxed.

An important undecided issue is to what extent informality is a variable of choice. Do individuals choose to participate in the informal sector based on a rational calculation of costs and benefits? Or are informal workers better characterized as victims of a poverty trap? In this paper I provide evidence that supports the thesis that a majority of informal employment is the result of a choice.

My empirical strategy is based on the intuition that, if informality is a voluntary state, changes in the economic environment should lead to an observable response in participation decisions. Specifically, lower taxation rates should reduce individuals' incentives to enter the informal sector. In order to document the causal effect of the level of taxation on informality I focus on an event that exogenously reduced tax rates for a well defined group of individuals while leaving others mostly unaffected.

In 2001, Russia introduced a tax reform that drastically reduced taxation levels and simplified the process of filing taxes. The pre-reform progressive personal income tax rates were replaced by a 'flat' and low rate of 13%. Payroll taxes were also affected. Before the

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[1]In many Latin American countries, the share of informal employment exceeds 50% of the urban labor force (Gasparini and Tornarolli, 2007). Existing estimates for Sub-Saharan Africa and Asia are even higher (Jütting et al., 2008).

reform, employers had to make contributions –adding up to 38.5% of the gross salary– to four different social funds. Starting in 2001, these contributions were unified into a single social tax with a regressive scale. If lower levels of taxation causally affect informality, then such a comprehensive tax reform should have had a measurable impact.

I exploit the fact that the reform greatly reduced tax rates for upper income brackets but left lower brackets almost unaffected, thereby creating well-defined treatment and control groups. The effect of the tax reform on informality can be estimated following a differences-in-differences strategy. Intuitively, the differences in differences estimator captures the post-reform average drop in the probability of participating in the informal sector experienced by the treatment group relative to the control group. I interpret a statistically and economically significant negative estimate as evidence that the reduction in tax rates caused many individuals to *choose* to exit the informal sector. Specifically, I find that, after controlling for observable characteristics and individual fixed effect, employed individuals who were affected by the tax reform were on average 2.5% less likely to be informal employees and 4% less likely to perform informal irregular activities.[2] On the extensive margin, I find that individuals who were not-employed right before the reform and found a job in its aftermath were also less likely to be informally employed.

The debate around the causes of informality has a long history. Since the early contributions to the literature in the 1970s to the present, there have been two main theories of how and why the informal sector develops.[3] According to the segmented labor markets view, the urban informal sector is for the most part comprised of migrants from urban areas who failed to secure a formal position in the modern sector. Labor market segmentation occurs because of rigidi-

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[2]As I explain below, these estimates should be interpreted as lower bounds. I find no evidence that the tax reform affected informal entrepreneurs or informality in the second job. See table 8.

[3]For clarity of exposition I focus on the extreme cases. Fields (2005) suggests labor markets in developing countries probably have elements of both theories.

ties that prevent wages in the formal sector from falling in response to excess supply.[4] In turn, it is typically assumed that there is a potentially infinite supply of labor originating in the traditional rural sector. The only available adjustment mechanism is for firms to limit the quantity of formal employment to the point where the marginal product of labor equals the mandated minimum wage. Those who are rationed out of the formal segment have the opportunity to take a job in the (free entry) informal sector. The distinctive characteristic of this view is that self-employment and other forms of informal employment are seen as unconditionally worse than formal jobs. Workers only accept informality as a survival strategy while queueing up for a position in the modern sector. As long as the wage in the modern sector is kept artificially high, however, people in rural areas continue to find it worthwhile to migrate to the city, and the share of informal employment keeps growing.

This pessimistic interpretation of the informal sector came under review after the publication of De Soto's (1990) book, which argued that informality is a rational response to the labyrinth of useless state regulations and permits required to do business in developing countries. In this alternative view, labor markets are well-integrated (as opposed to segmented) and hence informal jobs must be, at the margin, not inferior to formal sector positions. The formal-informal distinction is one between alternative bundles of characteristics including income levels, risk, taxation and regulation intensity, access (or lack of access) to public goods, and non-monetary aspects such as "being one's own boss", "working for an important firm/brand", etc. According to this view, those who choose self-employment and other forms of informal work are doing the best they can given their endowments and preferences. They should be seen as individuals full of entrepreneurial spirit and skills and not as excluded or disadvantaged.

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[4]For example, in the influential Harris-Todaro (1970) model there is a minimum wage that is enforced only in the formal urban sector. Other rigidities –an urban trade union in Calvo (1978), for example– lead to similar results.

To my knowledge, this is the first empirical study that attempts to test the competing theories by studying a natural experiment like the Russian tax reform.[5] Previous work has, however, provided some evidence favoring the integrated markets hypothesis. First, average earnings of self-employed individuals are typically higher than those of formal salaried workers.[6] Moreover, once longitudinal data became available in developing countries it was possible to document that workers moving out of self-employment and into formal employment faced, on average, a significant decline in remuneration (and viceversa for those going from formal positions into self-employment). A higher monetary remuneration for the self-employed is prima facie hard to reconcile with the segmented labor markets story. However, because benefits and other non-monetary aspects of the job are generally unobservable, it is not possible to draw any hard conclusions from these earnings differentials. Moreover, the earnings of formal sector workers are typically higher than those of informal workers other than the self-employed, so the evidence is not unambiguous even if monetary figures are taken at face value.

Second, the analysis of the relative frequency of transitions in and out of different employment statuses does not seem to hold up well with the idea that informal workers are queueing up for formal sector jobs. In fact, transitions in and out of formal sector positions seem to be roughly as frequent as those in and out of self-employment and other forms of informal employment.[7] While this evidence is somewhat persuasive, it is liable to the criticism that transitions across sectors might be systematically different from transitions within the

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[5]Using a similar methodology, Ivanova et al. (2005) and Gorodnichenko et al. (2009) documented positive effects of the reform on public revenue and tax compliance at the household level but did not address the issue of informality in the labor market.

[6]This is specially true of self-employed professionals. See Gasparini and Tornarolli (2007).

[7]See Maloney (1999, 2004) for evidence on Latin American countries. Using a similar methodology, Lehmann and Pignatti (2007) find mixed evidence in the case of Ukraine.

informal sector. For example, high transition probabilities between formal and informal positions could be simply due to firms in the formal sector conducting evaluations of their workers' performance relatively more frequently. It is not necessarily true that high turnover between the formal and the informal sectors implies absence of entry barriers. This kind of objection cannot be raised against the differences in differences estimates presented below. Moreover, as I show in section six below, while prima facie transition data does not favor the integrated markets hypothesis, a closer analysis that separates transitions by individuals in the treatment and control groups is clearly supportive of it.

Although I focus on informal employment, this paper is also closely related to the burgeoning literature on the determinants of the size of the unofficial economy. The unofficial –also called shadow, hidden or underground– economy refers to the production, whether legal or illegal, of goods and services for the market that escapes detection in the official estimates of GDP (Schneider and Enste, 2000). While the definition and the units of measurement of informal employment are different, in practice there is a strong overlap between the two concepts since a large proportion of informal work is probably not registered in official statistics and viceversa. Moreover, as with informal employment, one widely accepted interpretation is that underground economic activity is a response to excessive involvement of the State in the economy in the form of intrusive regulations and high levels of taxation. Among post-communist countries, there is evidence that only those which succeeded in limiting the political control of economic activity (at the same time as they improved the provision of key public goods necessary for the good functioning of markets) seem to have managed to keep the growth of the unofficial economy under control (Johnson et al., 1997, McMillan and Woodruff, 2002).

Modern Russia seems like a perfect illustration of the theory linking excessive government intervention and the shadow economy. Russian managers face higher effective tax rates, worse bureaucratic corruption, greater incidence of mafia protection, and have less faith in

the court system than their peers in Slovakia, Poland and Romania, and that seems to go some way into explaining why Russia's underground economy is relatively larger (Johnson et al., 2000). Also, Russia inherited an unregulated sector from the Soviet times. Grossman (1977) coined the term "second economy" for the set of illegal and quasi-legal economic activities that individuals engaged in to put up with or exploit the severe rationing of goods and services under communism. Such activities encompassed the cultivation of small plots of land, simple stealing from state enterprises, speculation, illicit production at secondary occupations, and many others. In 1990, almost 15% of personal income of workers and employees had informal sources (Kim, 2003). In other words, the incipient Russian market economy inherited the ability to avoid regulation by the state when such regulation is too costly or otherwise excessive (Gerxhani, 2004, Guariglia and Kim, 2006). Using different methods and definitions, several studies have documented a rising share of the underground activity in Russia during the 1990s (Lacko, 2000).[8]

There are, however, reasons to believe that the statistical association between excessive regulation and a growing unofficial sector is not causal. Firms might decide to operate underground mainly in order to avoid predatory behavior by government officials rather than regulations per se (Johnson et al., 1998). If that is the case, then it is not so much the letter of the law –for example mandating high taxes– that influences informality but rather the discretional authority of administrative officials in the context of a corrupt administrative system. To the extent that informal employment is a good proxy for unofficial activities, my estimates of the effect of the tax reform can also be interpreted as a test of the theory that the shadow economy is a response to excessive regulation.

The paper is organized as follows. The next section is dedicated to the definition of informal employment and how it can be implemented

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[8]These estimates put the size of hidden economy in the order of 40% of official Russian GDP.

given the available data. In section three I present a descriptive analysis of informal workers in Russia using alternative data sources. Section four focuses on the structure of the tax reform and the definition of the treatment and control groups. Section five presents the main results for the intensive and extensive margins, as well as a number of robustness checks. In section six I conduct an analysis of transition probabilities. Section seven concludes.

2   Informality Definition and Measurement

The main data source for this study is the Russian Longitudinal Monitoring Survey (RLMS). In this section I briefly describe the RLMS and discuss my working definition of informal employment.

2.1   Data and Variables

The RLMS is a household panel survey based on the first national probability sample drawn in the Russian Federation.[9]. I use data from rounds VIII–XVIII of phase II of the RLMS, covering the period 1998–2009.[10]   In a typical round, 10,000 individuals in 4,000 households are interviewed. These individuals reside in 32 oblasts (regions) and 7 federal districts of the Russian Federation. A series of questions about the household (referred to as the "family questionnaire") are answered by one householder selected as the reference person. In turn,

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[9]The RLMS is conducted by the Higher School of Economics and the "Demoscope" team in Russia, together with Carolina Population Center, University of North Carolina at Chapel Hill.

[10]Phase II started in 1994 and has been conducted annually thereafter, with the exception of the years 1997 and 1999. In RLMS parlance the first round of phase II is referred to as "round V" (this is because phase I comprised four rounds). While every round of the RLMS is designed to be nationally representative, phase I and phase II cannot be combined for longitudinal analysis. Questions on informality were not asked until round VIII.

each adult in the household is interviewed individually (the "adult questionnaire").

The adult questionnaire includes questions regarding a primary and a secondary job. In addition, individuals are also asked whether they perform what I will refer to as "irregular remunerated activities". The exact phrasing of the questionnaire item is as follows: "Tell me, please: in the last 30 days did you engage in some additional kind of work for which you were paid or will be paid? Maybe you sewed someone a dress, gave someone a ride in a car, assisted someone with apartment or car repairs, purchased and delivered food, looked after a sick person, sold purchased food or goods in a market or on the street, or did something else that you were paid for?" The questionnaire structure is such that no one may answer questions on a secondary job unless they have a primary job. However, questions on the irregular activities are independent.[11]

Figure 1 shows the employment and the unemployment rate, according to the RLMS and the standard labor force survey conducted by ROSTAT. While the two data sources display some minor discrepancies[12], all series show that the period under analysis was –at least labor market wise– one of relative economic prosperity and stability.

In order to gain further insight into the meaningfulness of my informality variables, I also make use of a special supplement of questions on informal work (INFSUP[13]) that was added to the RLMS adult interview in 2009 (round XVIII). The INFSUP questionnaire was administered to all employed individuals after the regular interviews had

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[11]In fact, 8.5% of those considered employed only work doing irregular activities.

[12]The ROSTAT labor force survey counts any form of work, including barter, as employment. It also asks employment-related questions regarding a reference week, while the RLMS asks about activities during the last month.

[13]The INFSUP was designed and financed by the Center for Labor Market Studies at the Higher School of Economics in Moscow and the Labor Markets in Emerging and Transition Economies Research Program at IZA in Germany. I thank Vladimir Gimpelson and Hartmut Lehmann for generously making these data available.

Figure 1 – Employment and Unemployment Rates

been completed.[14]

2.2   Definition of Informal Employment

As has been clearly put in a recent book-length study by the World Bank: "The term informality means different things to different people, but almost always bad things: unprotected workers, excessive regulation, low productivity, unfair competition, evasion of the rule of law, underpayment or nonpayment of taxes, and work 'underground' or in the shadows." (Perry et al., 2007) The idea of the informal sector was originally adopted and popularized by economic anthropologist Keith Hart (1973) and a series of studies sponsored by the International Labour Office (ILO, 1972). Since the beginning, the concept was meant to comprise heterogenous labor practices including petty

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[14]In rare opportunities, the INFSUP was administered on a later date than the regular questionnaire, although always by the same interviewer.

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trading, self-employment of different sorts, own-account professionals, family workers, and other forms of non-standard (from a Western perspective) work prevalent in developing countries. Moreover, many of the initial bounds of the concept were eventually trespassed in one way or another. For example, while the informal sector was originally thought to be predominantly urban, it was quickly accepted that it should also include some forms of small-scale agricultural work. Despite these ambiguities –and partly thanks to them– the concept has proved useful to researchers with a wide range of interests.[15]

While the literature widely recognizes the blurry bounds of the concept, there are two most commonly used definitions of informality. On the one hand, the so called 'productive' definition focuses on a number of characteristics of the production unit (Hussmanns, 2004). First, informal sector enterprises typically include only private unincorporated units, i.e. enterprises not constituted as separate legal entities independently of their owners. Second, at least part of the goods or services they produce is meant for sale or barter. Lastly, their scale of operations is assumed to be very small. In fact, when better data is lacking, informal enterprises are often defined as those whose size in terms of employment is below a given threshold (typically less than 5 employees).

On the other hand, the 'legalistic' or social protection definition focuses on the status of workers in relation to labor law and the social safety net. It measures to what extent workers are effectively –as opposed to only *de jure*– protected by labor market institutions. Informal sector employment occurs in cases of noncompliance to the State in terms of labor regulations and the social security system.

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[15]There are numerous reviews of the literature on the informal sector and informal employment. See for example: Peattie (1987), Swaminathan (1991), and Jütting et al. (2008).

Table 1 – Working Definitions of Informal Work

Employed				
	Main Job	Entrepreneur	Firm Owners†	Formal / Informal
			Individual Entrepreneur‡	Informal§
		Employee	For Firm	Formal / Informal♯
			For Individual Entrepreneur	Informal§
	Second Job			Formal / Informal♭
	Irregular Activities			Formal / Informal♯

†Firm owners work for a firm or organization which they own and where they perform entrepreneurial activities. Considered informal if unregistered.

‡Individual entrepreneurs do entrepreneurial activities independently (not within a firm or organization).

♯Employees are considered informal if they are not registered.

§Registration information is not available for those not working within firms or organizations.

♭Informal in second job if unregistered or not working for a firm or organization.

♯Irregular activities involve remunerated work like sewing a dress for someone or giving someone a ride in a car. Considered informal if not employed under official contract or agreement.

In this paper I use both legalistic and productive criteria to determine if an individual is informally employed. Table 1 shows a schematic representation of the different employment types and my working definition of informality in each case. Throughout the paper, I analyze informality at the main job, the secondary job and the remunerated irregular activities separately.

At the main job, I start by distinguishing between entrepreneurs and employees. The former group is composed of those doing entrepreneurial activities who are either owners of firms or self-employed individuals who work on their own account with or without employees but not at a firm or organization.[16] Following the productive definition, those not working at firms or organizations are considered informal. For those working at firms or organizations, the RLMS questionnaire includes an item that permits determining whether they are registered, i.e. working officially.[17] The Russian labor code mandates that all employees sign a written contract and deposit their 'labor book' with the employer. Therefore, following the social protection criterion, I classify unregistered entrepreneurs and employees as informal.

Some firms in Russia register their employees but declare a fictitious salary that is lower than the real amount in order to reduce the

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[16]This classification is based on four items of the adult questionnaire: 1) "do you work at an enterprise or organization? We mean any organization or enterprise where more than one person works, no matter if it is private or state-owned. For example, any establishment, factory, firm, collective farm, state farm, farming industry, store, army, government service, or other organization." Enterprise workers are considered entrepreneurs if they answer positively to both 2) "Are you personally an owner or co-owner of the enterprise where you work?" and 3) "In your opinion, are you doing entrepreneurial work at this job?". The distinction between entrepreneurs and employees for non-enterprise individuals is based on: 4) "At this job are you...(a) involved in an employer's or individual labor activity or (b) work for a private individual?"

[17]The question is: "Tell me, please: are you employed in this job officially, in other words, by labor book, labor agreement, or contract?" This item was not included in round X (2001).

base of payroll and other taxes. The difference between the declared and the real salary is settled with an "envelope payment" at the end of the month. If such a practice were widespread, the registration criterion could err on the side of underestimating the extent of informality. Fortunately, the 2009 round of the RLMS included an item on envelope payments, which I use below to show that this is probably not an important reason for concern.

While using the productive definition to classify all self-employed individuals and their employees as informal is standard practice, it would be reassuring if the social protection criterion could be applied as well. Unfortunately, a limitation of the RLMS data is that non-enterprise individuals are not asked about registration, so it is not possible to apply the legalistic definition to them.[18] However, thanks to the INFSUP we have some good indication of the extent to which self-employed individuals comply with the regulations. As I show below, the level of compliance is quite low, so choosing between the legalistic and productive definition does not make a big difference for these workers. The supplementary questions also confirm that there is a high correlation between lack of registration and other forms of non-compliance with labor regulations.

In principle, the RLMS questionnaire contains enough detail to treat the main and the second job symmetrically. However, the number of observations would not be large enough for a meaningful statistical analysis of the resulting sub-categories. For example, only about 40 individuals per round do entrepreneurial activities in the second job. Therefore, a single category of informal work in the second job is considered, consisting of those unregistered[19] plus those not working for a firm or organization.

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[18]Russian law does not require self-employed individuals to create a corporation or special legal entity. They are instead allowed to operate under a special and simpler registration procedure. However, the obligation to sign a written contract and register employees applies to all employers without exception.

[19]The registration question for the second job is identical to that in the primary job. It was also not included in round X.

Figure 2 – Informality at Main Job: employees and entrepreneurs
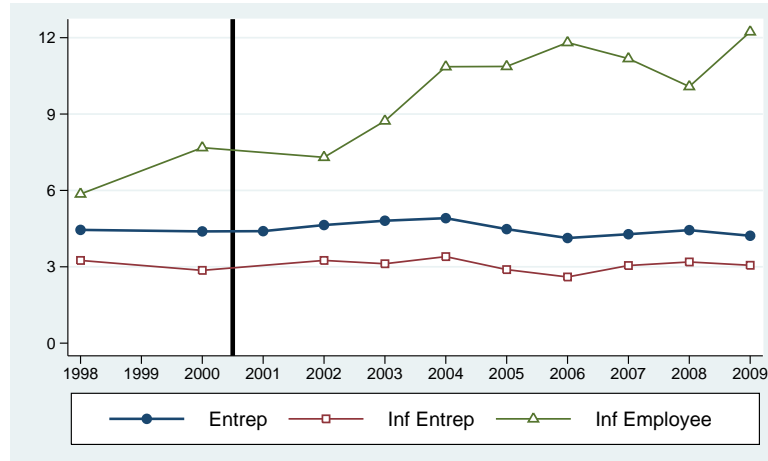
Notes: RLMS, rounds VIII–XVIII (1998–2009). The series are defined as a percentage of those with a main job.

Finally, I consider remunerated irregular activities. Based on the productive definition, all employment of this kind could be classified as informal. However, since not much information is available regarding these activities I only consider them informal if the respondent gives a negative answer to the question: "Tell me, were you employed in this job officially, for example by an agreement, an official contract, or a license?"[20] This methodological decision is unlikely to affect results[21] since almost 87% of irregular work is done without a contract.

According to these definitions, figures 2 and 3 show the evolution of informal employment participation rates over the period and pro-

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[20]This item is available in every round.

[21]In table 9 I show that this distinction does not affect the main results. Similarly, one could distinguish between those whose only remunerated work are irregular activities and those for whom irregular activities are supplementary. This distinction does not affect results either.

Figure 3 – Informality at Second Job and Remunerated Irregular Activities

vide some preliminary evidence on the likely effects of the tax reform. First, the fraction of entrepreneurs in the main job –both formal and informal– has remained stable at around 4.5%. Second, informality among employees has risen almost uninterruptedly and toward the end of the period is well into the double digits. Eyeballing the time series suggests the tax reform might have caused a deceleration of the rate of growth of informal employment in the short run. However, no long run effect is apparent. Third, the percentage of second job holders of any kind has also not changed much during these 11 years. Informality in the second job is relatively uncommon. Finally, prima facie there seems to be a strong negative effect of the tax reform on the prevalence of irregular activities, informal or otherwise. This is important since, at least until the reform was implemented, irregular activities were the most important form of informal work in Russia.

However, simple before-after comparisons are risky. Figure 4 presents

Figure 4 – Real Hourly Earnings
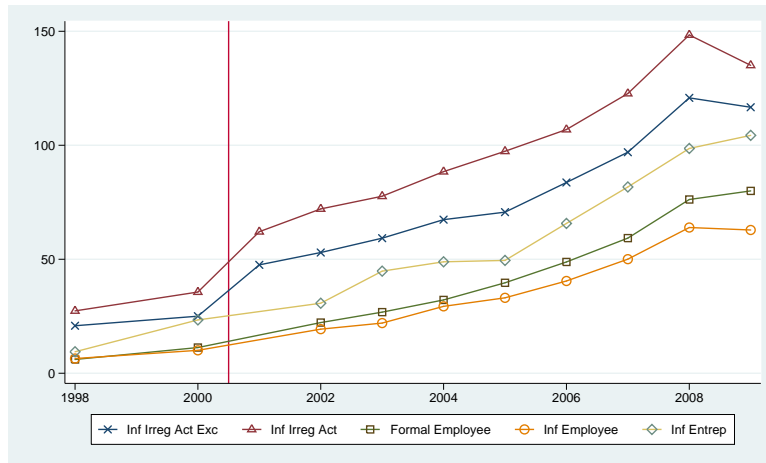
the evolution of real hourly wages for workers in the formal and informal sector. Real incomes were increasing over the period and, to the extent that a growing economy induces formalization, it might well be the case that the tax reform had very little to do with the downward trend in informal irregular activities after 2001. On the other hand, if what matters are *relative* rewards between the formal and informal sector, then it seems unlikely that the modest changes in relative wages shown in the figure might explain quantitatively large sectoral shifts.

3 Description of Informal Employment in Russia

While my working definition of informality has many antecedents[22], it is also somewhat idiosyncratic to the extent that the questionnaire items of the RLMS are unique and that not much is known about the informal sector in modern Russia. There could be legitimate concerns regarding to what extent what is being measured corresponds to the concept of informality.

Fortunately, some insight can be gained thanks to the wealth of information in the regular RLMS survey and in the INFSUP. In this section, I show that workers that are informal according to my definition have many of the characteristics found in other studies. I also present evidence that alternative definitions, while reasonable, would probably not affect the results.

3.1 Demographics

Table 2 provides demographic information on informal workers in Russia toward the end of 2009. The table confirms many of the empirical regularities observed in other countries. For example, informal employees tend to be low skill. Only around 12% of them has a college degree and their level of schooling is below that of the average Russian worker. They are also relatively younger, predominantly male and less experienced. Workers performing informal irregular activities[23] seem to show many of the same characteristics, although a larger share of them live in rural areas and belong to one of the many ethnic minorities.

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[22]For example, Lehmann and Pignatti (2007) use a similar definition for Ukraine. For a discussion of the relative merits of alternative definitions, see Swaminathan (1991) and Portes and Schauffler (1993).

[23]Because I analyze informality in each of the three possible jobs separately, some individuals are counted under more than one category.

Table 2 – Background Characteristics of Informal Workers in Russia

	All Employed	Inf. Employee	Inf. Entrepr.	Inf. Sec. Job	Inf. Irreg. Activ
Female	0.54	0.49	0.42	0.56	0.45
Age	39.5	36.4	40.1	38.9	38.6
College Degree	0.27	0.12	0.23	0.28	0.15
Schooling (Yrs)	12.3	11.5	12.1	12.5	11.4
Experience	14.3	9.2	14.4	14.8	11.3
Married	0.51	0.42	0.66	0.48	0.42
Urban Location	0.77	0.76	0.80	0.88	0.63
Russian National	0.87	0.86	0.77	0.86	0.81
Russian Born	0.91	0.88	0.82	0.87	0.92
Size HH	3.4	3.5	3.6	3.0	3.4
"After Tax" Income					
This Job (rubles)	13,194	11,043	18,661	7,142	7,043
% Reported for Tax	86.6	32.0	62.9	NA	NA
All Jobs (rubles)	13,446	11,132	18,878	17,024	12,470
Obs	7192	815	204	158	583

Notes: The data source is RLMS, round XVIII (2009). Employed workers are those with a job or who do remunerated irregular activities. Informal employees are those who work for a self-employed individual or who work for a firm or organization but are not registered. Informal entrepreneurs are either self-employed or owners of a firm who do entrepreneurial activities but are not registered. Informal second job includes both informal employees and informal entrepreneurs in their second job, regardless of the main job status. Informal irregular activities are other remunerated activities conducted without formal contracting.

As in other countries, individual entrepreneurs in Russia are relatively well off. While they are less educated than average workers, their qualifications are not as low as those of informal employees. Entrepreneurs are also relatively more likely to marry and form a family.

Individuals who participate in the informal sector through a secondary job also have higher than average incomes. In almost all other respects, however, they are difficult to distinguish from the average worker.

The 2009 round of the RLMS included an item on "envelope payments".[24] Formal employees answered that 92% of their earnings were reported to tax authorities. In turn, informal employees and individual entrepreneurs confessed having payed taxes on a significantly lower fraction of earning. While responses to such sensitive issues cannot be taken at face value, the high correlation between informality and declared tax avoidance is reassuring.

Tables 14 and 15 in the appendix show that informal workers overwhelmingly belong to unskilled and service occupations, and work in the trade and construction industries. This is consistent with the idea that informal workers work in occupations/industries with low barriers to entry –i.e. requiring almost no start-up capital or specific knowledge.

3.2 Job Characteristics

The standard RLMS survey offers some detailed information regarding the characteristics of the job[25], which I present in table 3. Informal employees have relatively weak attachment to the job. While their observed average tenure is quite low, the probability of transition implies an even lower[26] average job duration ($1/(1 - 0.35) \approx 1.5$ years). Informal second jobs seem to have short durations too. While we lack information regarding average duration of irregular activities, over 66% of workers answered affirmatively to a specific item asking whether these activities were "incidental". Interestingly, however, this is not the case with informal entrepreneurs, who have below average

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[24]Specifically, after the regular earnings item for the main job, the questionnaire asked: "what percent of that money do you think was officially registered, i.e. taxes were paid?" No similar question was included for the other jobs.

[25]For the second job, some questions were not included in round XVIII. I then report information from the most recent round when the item was available. See the notes at the bottom of the table for data sources.

[26]The reason is that some outliers push the average up. Median observed tenure for informal employees is 1.27 years.

transition probabilities.

Table 3 – Job Characteristics for Informal Workers in Russia

	All Employed	Informal Employee	Informal Entrepr.	Informal Sec. Job
Tenure (Yrs)	7.3	2.8	7.2	2.5$^\natural$
Changed Jobs	0.16	0.35	0.13	NA
Changed Occupation	0.11	0.21	0.06	NA
Has Subordinates	0.20	0.08	0.38	0.10$^\flat$
Firm Characteristics‡				
Ent Size (# of Emp)	584.4	61.8	-	76.2
State Owns Share	0.50	0.06	-	0.20
Russian Indiv Owns Share	0.56	0.91	-	0.70
Firm from Soviet times	0.59	0.09	-	0.40
Firm owes money	0.07	0.13	-	0.19$^\sharp$
Firm pays in kind	0.01	0.03	-	0.02$^\sharp$
Job Benefits‡				
Paid Vacation	0.90	0.17	-	0.19
Paid Sick Leave	0.87	0.11	-	NA
Paid Maternity Leave	0.79	0.07	-	0.17
Paid Health Care	0.24	0.01	-	0.05
Paid Trips to Sanatoria	0.28	0.01	-	0.03
Paid Child Care	0.05	0.01	-	0.01
Assistance w/Food	0.12	0.04	-	0.03
Assistance w/Transport.	0.12	0.03	-	0.01
Paid Educational Activ.	0.25	0.02	-	0.04
Assistance w/Loans	0.05	0.01	-	0.00
Obs	7192	815	204	158

Notes: The main data source is RLMS, round XVIII (2009). Definitions are the same as for table 2. $^\flat$From round 17 (2008). $^\natural$From round 16 (2007). $^\sharp$From round 14 (2005). ‡Only for those working for firms or other organizations.

Table 14 shows that a large fraction for individual entrepreneurs are in the managerial occupations. This is not a matter of labels only. Table 3 shows that almost 40% of them has subordinates working under them.[27] All in all, this descriptive statistics confirm that informal entrepreneurs and other forms of informal work are quite different and should be analyzed separately.

According to the RLMS, almost 90% of non-enterprise individuals work alone or with a few family members.[28] Consequently, a number

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[27]The average number of subordinates is relatively low, however. Conditional on having at least one subordinate, informal entrepreneurs supervise 5.2 people, while formal employees supervise 26.9.

[28]This information comes from round 17 (2008).

of items in the adult questionnaire are only asked to individuals who work for firms.[29] First, respondents are asked about the size of the firm. Table 3 confirms that informal employees work for firms that, while larger than a family enterprise, are still much smaller than average.[30] This is also true of individuals who are informal in the second job.

Second, there are questions regarding firm ownership and origin. The issue of informality and the shadow economy in Russia is often discussed in the context of the transition from the Soviet system (Johnson et al., 1997, McMillan and Woodruff, 2002). A familiar argument is that the incipient capitalist sector makes use of informal arrangements to escape confiscatory intrusions by the State. The data is consistent with this story. The involvement of the Russian State in the economy is very substantial. This is reflected not only in the relatively high prevalence of state ownership, but also in the fact that almost 60% of employment in Russia is still supplied by enterprises that originate in Soviet times. Informal employment is, however, almost exclusively provided by new private firms.

A third important set of questions touch on the issue of wage arrears. Faced with a negative shock, firms in Russia often choose to adjust via delaying the payment of wages (Lehmann et al., 1999, Gimpelson and Kapeliushnikov, 2011). Predictably, table 3 shows that wage arrears and payments in kind happen relatively more frequently to informal employees.

Finally, the RLMS asks enterprise workers regarding fringe benefits. Paid vacation, sick leave, and maternity leave are mandatory benefits according to the labor code and a large majority of employees claim to have them. However, many firms do not provide these

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[29]The informal entrepreneur category is overwhelmingly populated (95%) by self-employed individuals, so I do not present these statistics for them. However, roughly 50% of informal employees work at enterprises.

[30]The median size of informal employees' firms is only 10 workers. The median for the whole sample is 50.

benefits in practice. For example, only 66% of those employed had *actually* been on paid vacation in the previous 12 months, compared to the 90% who claim to have entitlement. In any case, the proportion of informal employees who are given the mandatory benefits is substantially lower than average.[31] Non-mandatory benefits are infrequent in Russia, and almost non-existent for informal employees.

While informative, these questions provide insight into only a minority of informal jobs, i.e those which happen at firms or organizations. Nevertheless, the RLMS includes a series of questions on informal activities during the previous 12 months that are asked to everyone. A summary of these items is in table 4.

Two points are noteworthy. First, nine percent of those employed confessed having worked an informal second job in the previous year. Reassuringly, the agreement with informality in the second job according to my definition is almost perfect.

Table 4 – Informal Activities Last Year

	All Employed	Inf. Employee	Inf. Entrepr.	Informal Sec. Job	Inf. Irreg. Activ
Worked extra job	0.09	0.08	0.08	0.96	0.33
Raised cattle for sale	0.04	0.03	0.04	0.03	0.14
Agric. on own plot for sale	0.04	0.02	0.03	0.04	0.14
Performed services for pay	0.08	0.08	0.06	0.11	0.61
Obs	7192	815	204	158	583

Notes: The data sources is RLMS round XVIII.

Second, almost 40% of individuals who perform irregular activities live in rural areas. Not coincidentally, a significant proportion of them are involved in small scale agriculture and husbandry. However, by far the largest share of these activities involve personal services: taxi rides, repair work, hair styling, tutoring, nursing, etc.

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[31]The proportion of informal employees who had actually been on paid vacation during the previous 12 months was only 8.6%.

3.3 Compliance with the Law

Table 5 contains statistics based on answers to the INFSUP. An important cautionary note is that the INFSUP consisted of a stand-alone questionnaire that was administered to all individuals who had any form of employment. Respondents answered informality-related questions about two jobs (henceforth[32] job-A and job-B). Unfortunately, these jobs are not certain to correspond to those of the standard adult questionnaire.[33] I proceed as follows. I assume that the information about job-A corresponds to the main job if such a job is present. For individuals without a main job, I assume job-A must refer to (the main) remunerated irregular activity. In fact, all statistics on informal irregular activities are based on the latter group. Finally, I assume that job-B refers to the secondary job as long as the individual does not also perform irregular activities. This is the source of information on informal secondary jobs.

A second issue is that the INFSUP asks a different set of questions regarding job-A depending on whether the individual is an entrepreneur or an employee. While for the most part individuals who identify themselves as entrepreneurs in the INFSUP are also classified as such based on the adult questionnaire, the correspondence is not perfect. I base the statistics only on individuals for whom the classifications coincide.

A positive spillover is that the INFSUP provides us with some idea of the composition of remunerated irregular activities. A stunning 40% of these workers consider themselves entrepreneurs.

Working under an oral agreement is strictly forbidden under Russian labor law. The INFSUP asks all employees in job-A whether they have a written contract. This questions is important for validat-

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[32]I reserve the terms 'main job' and 'secondary job' to refer to the adult questionnaire-based categories.

[33]The most significant concern arises for individuals who, according to the adult questionnaire, performed both a second job and irregular activities.

Table 5 – Compliance with the Law

Sup for employees	All Employed	Informal Employee	Informal Sec. Job	Inf. Irreg. Activ
Under oral agreement	0.11	0.69	0.81[♮]	0.96[♯]
% Labor Law Compliace	83.1	52.9	NA	53.2[♯]
% Contract Compliance	86.1	64.3	NA	65.5[♯]
% of Inc Declared for SS	87.6	31.2	NA	10.5[♯]
Obs	6453	777	80	186
Sup for entrepreneurs	All Employed	Formal Entrep	Informal Entrepr.	Inf. Irreg. Activ
Unregistered	0.48	0.03	0.27	0.98[♯]
% Labor Law Compliance	64.4	85.9	53.6	21.3[♯]
% Contract Compliance	66.3	87.5	55.5	27.5[♯]
% Formal Employees	64.0	85.7	53.4	8.3[♯]
Contributes to SS fund	0.47	0.95	0.60	0.06[♯]
Obs	397	64	194	126

Notes: The data sources are RLMS round XVIII and the supplementary questionnaire on informality by the Center of Labor Market Studies, Higher School of Economics (2009). [♮]Based on job-B answers by individuals who do not perform irregular activities. [♯]Based on job-A answers by individuals who do not have a main job.

ing my working definition of informality, since the adult questionnaire only has registration information for enterprise workers in the main job. Remarkably, over 97% of those who work under an oral agreement according to the INFSUP are classified as either informal employees or individuals whose only source of income originates in informal irregular activities.

The supplement also asks employees about the extent to which their employers comply with labor law and the specifics of the individual labor contract or agreement. These items are interesting because registration is only one of the many mandates of labor law. The average workplace has compliance levels well over 80%. Informal workers report significantly lower levels of compliance. These figures are consistent with the finding (table 3) that absence of mandatory benefits and wage arrears are more frequent for informal employees. Finally, employees are also asked about the percentage of their earnings that is reported for social security purposes. In general, responses

are very much in agreement with a similar item in the RLMS adult questionnaire (table 2). Thanks to the INFSUP, however, we have information on those performing irregular activities. Predictably, tax compliance is extremely low for this kind of jobs.

The questionnaire for entrepreneurs provides information regarding registration of business operations. In Russia, the self-employed can either register individually or as a company. While some form of registration is necessary to operate formally, it is unclear whether it is sufficient. Practically all of the few formal entrepreneurs in the RLMS sample are registered according to the INFSUP. Moreover, 64% of registrations are in the form of incorporated businesses. On the other extreme, individuals performing irregular activities are overwhelmingly unregistered. In between, a majority of those classified as informal entrepreneurs in the main job are registered, but only 17% of them have an incorporated business.

Entrepreneurs are also asked a number of questions regarding their employees. On one hand, in formal firms labor law and contract compliance is high, the share of informal work is low and contributions to social security are very frequent. Informal entrepreneurs, on the other hand, confess to much lower levels of compliance, specially in the irregular activities sector.

Overall, the information in the regular adult questionnaire of the RLMS and the INFSUP confirm that my working definition of informality is meaningful and that informal workers in Russia share many of the characteristics documented in other countries.

4   The Tax Reform

In January 2001, Russia introduced a radical reform of its tax system. The main components of the reform are shown in table 6. A number of changes involved the personal income tax (PIT). Before 2001, the PIT had a progressive scale with marginal rates starting at 12% and reaching 30%. The new system fixed a flat and low rate of 13%. The

reform touched other aspects of the PIT. The standard allowance was slightly increased, from 3,168 to 4,800 rubles but now could only be claimed by those earning less than 20,000 rubles. Also, the number of permissible deductions and other loopholes was greatly limited.

Before the reform, employers were supposed to make separate contributions –adding up to 38.5% of the gross salary– to four independent social funds. The reform replaced this system with a unified social tax (ST) with a regressive scale. It also eliminated the 1% employee contribution to the social fund.

Table 6 – The Russian Tax Reform

	Gross Yearly Income (r.)	Before (2000)			After (2001)		
		PIT	ST		PIT	ST	
			Employee	Employer		Employee	Employer
Control	<3,168[♯]	0			0		
	3,168–4,800[♯]	12	1	38.5	0	0	35.6
	4,800-50,000	12			13		
$Treat^1$	50,000–100,000	20					35.6
$Treat^2$	100,000–150,000	20					20
$Treat^3$	150,000–300,000	30	1	38.5	13	0	20
$Treat^4$	300,000–600,000	30					10
	>600,000	30					2[♭]

Notes: The data source is Russian Tax Code, part 2 (2001-2). [♯]The tax allowance in 2001 was only available to those with income below 20,000 rubles. [♭]Rate initially set to 5% and lowered to 2% in 2002.

Overall, the message of the reform was unambiguous. The government was offering a new deal to the Russian public: lower taxation levels and a more reasonable system. In exchange, it expected higher levels of compliance. The response from the public has been widely regarded as positive. Tax compliance improved significantly and government revenue increased despite the lower average tax rates (Ivanova et al., 2005, Gorodnichenko et al., 2009).

4.1 Identification of the Tax Reform Effect

The combined effect of the PIT and ST reform can be seen in figure 5. The tax reform affected the costs and benefits of informality faced

by all economic agents. However, some groups were more affected than others. Specifically, people earning less than 50,000 rubles per annum had a net tax reduction of only 1.4%. In comparison, those earning between 50 and 100 thousand rubles faced a reduction of 7.2%. Finally, it is clear from the graph that the greatest reductions in tax burden were received by those earning 100 thousand rubles or more.

Figure 5 – Combined Tax Burden
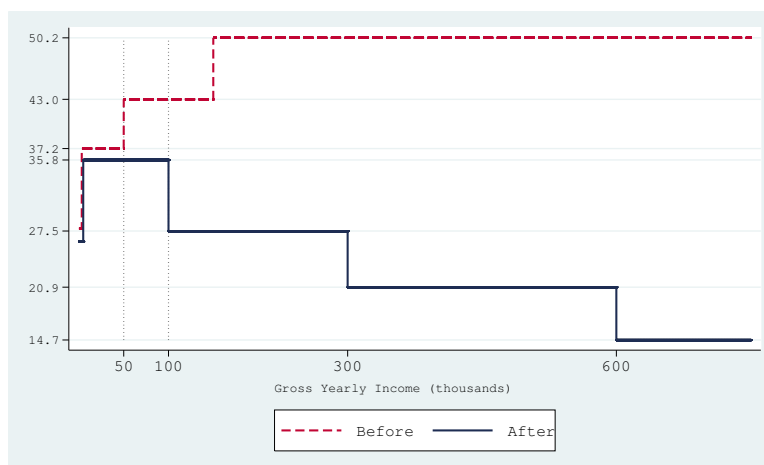
Notes: Russian Tax Code, part 2.

The design of the reform created a natural experiment that can be exploited to obtain a differences-in-differences (DID) estimate of the effect of lower taxation levels on informality. Individuals earning less than 50,000 rubles a year constitute a 'control group' whose marginal tax rate remained practically unchanged. People with higher incomes faced lower tax rates and therefore are considered 'treated'. The DID identification strategy assumes that the evolution of participation in the informal sector for the control group can be used to estimate what would have happened to individuals in the treatment group had they not been treated.

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In practice, the determination of who belongs to the treatment group is complicated by the fact that people misreport income in surveys. Because tax rates were lower and regressive after 2001, it is plausible that misreporting decreased (Gorodnichenko et al., 2009). Therefore, the treatment group should be defined based on post-reform reported income only. In the absence of misreporting, individuals with after-tax monthly labor income above 3,625 rubles[34] can be considered treated. If however income is under-reported, some individuals will be incorrectly included in the control group. Thus, the resulting DID estimate is a lower bound of the true effect of the reform on informality.

A second complication is that an individual's income may be above the threshold only in some of the post-reform rounds. I consider anyone whose income is ever above the threshold as treated. The control group is given by those untreated and employed in at least one post-reform period.[35]

I report selected statistics on the control and treatment groups in table 16 in the appendix. Over three fourth of the sample is in the treatment group. In short, the treatment group is younger and has less labor market experience, tends to be better educated, and is more likely to be married than the control group. The households of treated individuals are relatively more likely to be in urban areas, are slightly larger, and have more members who are female or young.

5 Results

As a first step into understanding the effect of the reform, I plot the informality time series for the treatment and control groups. Figure 6 shows that the reform probably affected informal employees. Before 2001, participation in this kind of informal work was approximately

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[34]This threshold is obtained as follows: 3,625=(50,000/12)*(1-0.13).

[35]I offer a series of robustness checks to this definitions below.

the same in both groups. However, their post-reform behavior was very different. The prevalence of informal employees in the control group experienced a steady increase. Informality among treated individuals barely increased.

While less conspicuous, this pattern is also present for informal entrepreneurs (figure 7). Before the reform, informality was more prevalent among the treated. By 2009, the control group had a higher proportion of informals. Figure 8 shows that the reform did not seem to affect informality in the second job. Finally, figure 9 provides compelling graphic evidence that the tax cuts worked toward reducing informal irregular activities.

Figure 6 – Informal Employees by Treatment
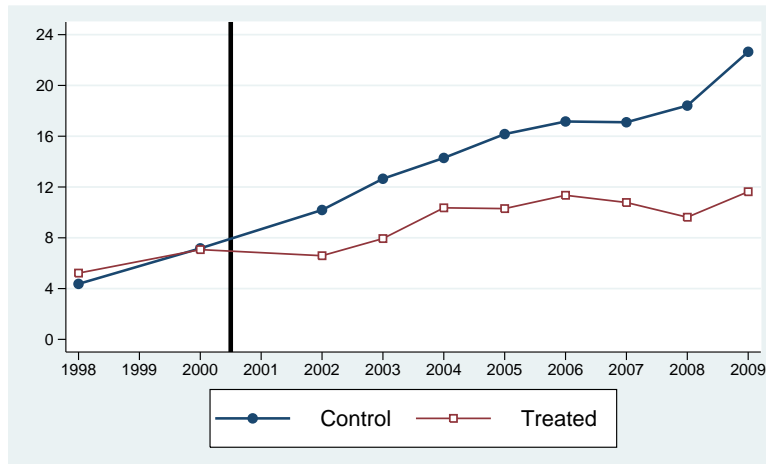
Notes: RLMS, rounds VIII–XVIII (1998–2009). Treatment defined based on labor income in the post-reform period.

These figures suggest that the tax reform was a success beyond the realm of tax compliance. The reduction in taxation levels seems to have pulled a large number of people into formal status. However, there is some chance that the visual evidence is not statistically signif-

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Figure 7 – Informal Entrepreneurs by Treatment

icant. More importantly, as shown in table 16, there are some marked observable differences between the treatment and control groups. The figures in the previous section do not control for any of these factors. It is possible that the visual evidence is an artifact of spurious correlation.

In order to obtain statistical evidence on the effect of the reform and control for the possible confounding effect of observable characteristics, I estimate the following DID equation:

$$INF_{it} = \theta_t + X_{it}\beta + Z_i\gamma + \psi Post_t + \mu Treat_i + \alpha(Treat_i \times Post_t) + u_{it} \tag{1}$$

where INF_{it} is one of the informality-related dependent variables, θ_t are time dummies, X_{it} and Z_i represent sets of time-varying and time-invariant individual characteristics respectively, $Post_t$ is a post-
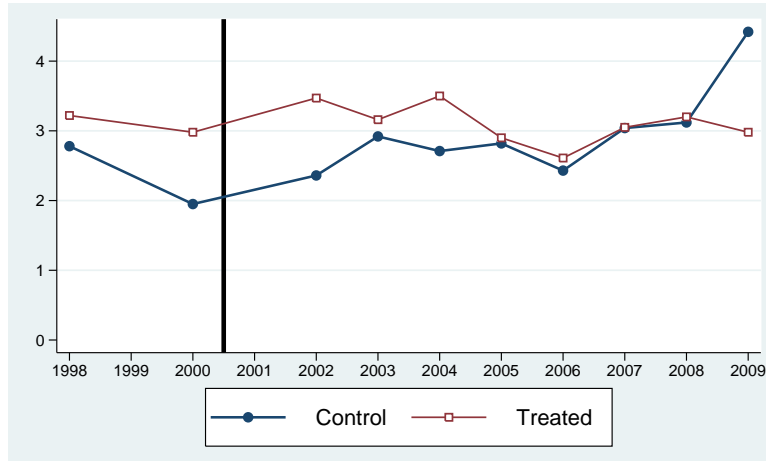
Figure 8 – Informal Second Job by Treatment
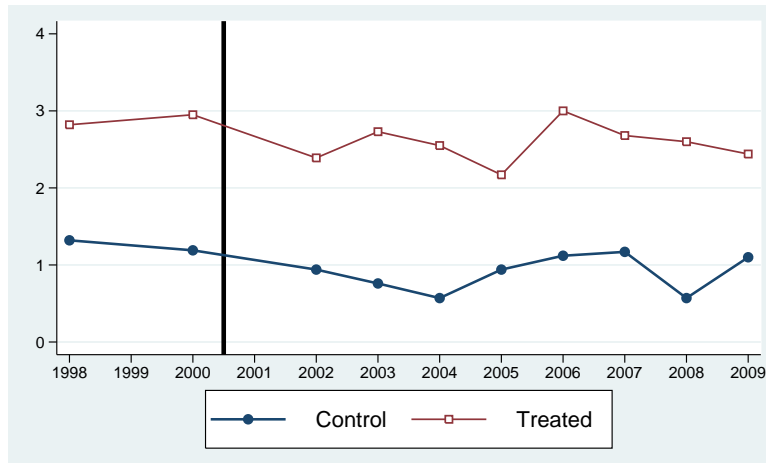
Notes: RLMS, rounds VIII–XVIII (1998–2009). Treatment defined based on labor income in the post-reform period.

reform dummy, $Treat_i$ is the treatment group indicator, and u_{it} is the error term. The main object of interest is α, the DID parameter that measures the average change in the probability of informal status for the treatment group relative to the control group, conditional on all the observables.

Table 7 presents OLS estimates of equation (1). I report Arellano (1987) standard errors that allow for heteroscedasticity and autocorrelation of arbitrary form.[36] The main identifying assumption of OLS-DID is that none of the unobservable characteristics that influence informality participation are correlated with treatment status.

The results provide further confirmation that the tax reform reduced the prevalence of informal employees. On one hand, after con-

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[36]This is one of the recommended approaches for DID studies (Bertrand et al., 2004).

Figure 9 – Informal Irregular Activities by Treatment
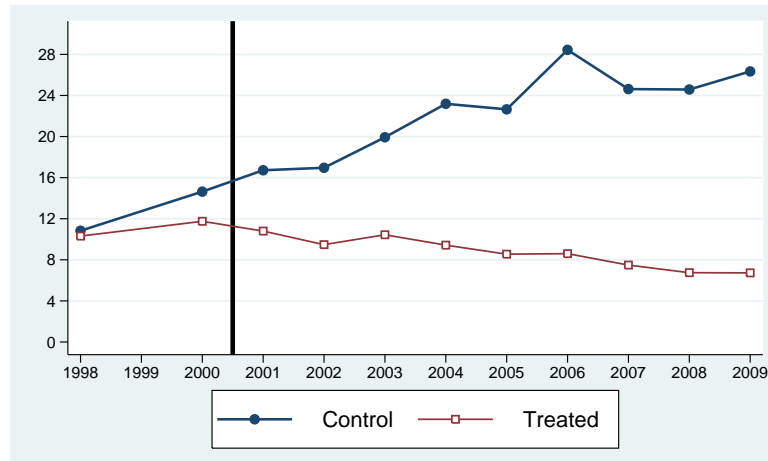
trolling for all observable individual and household characteristics and for any macroeconomic shocks absorbed by the year dummies, the expected probability of informal status for the control group was 8% higher in the period after the reform. In contrast, informality grew 4% less among those facing lower levels of taxation. These estimates are statistically significant despite the robust standard errors. Finally, the coefficients for the control variables have the expected signs. Informality is less likely among women, Russian nationals, and high-skill and married workers.

The effect of the reform on informal irregular activities is estimated to be 7.2%. This is a very large effect considering that the overall share of workers in this category was just above 13% in 2000.

As anticipated, the regression results also show that the effect on informal entrepreneurs and informality in the second job was neither economically nor statistically significant. I conclude that the reform

Table 7 – The Effect of Tax Reform on Informality: DID OLS

	Inf Employee	Inf Entrep	Inf Sec Job	Inf Irreg Act
Household Characteristics				
Number of Members	-0.0006	0.0003	-0.0054***	-0.0033
	(0.002)	(0.002)	(0.001)	(0.002)
Number of Female Members	0.0059*	-0.0027	0.0018	0.0039
	(0.003)	(0.002)	(0.001)	(0.003)
Number of Youth, 18-	-0.0090***	0.0057**	0.0058***	0.0129***
	(0.003)	(0.002)	(0.001)	(0.003)
Number of Elderly, 65+	-0.0106**	-0.0003	-0.0024	-0.0050
	(0.004)	(0.003)	(0.002)	(0.004)
Urban Location	0.0043	0.0178***	0.0045	-0.0228***
	(0.008)	(0.006)	(0.003)	(0.009)
Individual Characteristics				
Female	-0.0189***	-0.0161***	-0.0001	-0.0555***
	(0.004)	(0.003)	(0.002)	(0.004)
Russian National	-0.0096**	-0.0106***	0.0006	-0.0011
	(0.004)	(0.004)	(0.002)	(0.004)
Age	0.0025	0.0087***	-0.0012	-0.0008
	(0.002)	(0.001)	(0.001)	(0.002)
$Age^2/100$	0.0056**	-0.0060***	0.0006	0.0158***
	(0.003)	(0.002)	(0.001)	(0.003)
Experience	-0.0117***	-0.0043***	0.0017***	-0.0111***
	(0.001)	(0.001)	(0.000)	(0.001)
$Experience^2/100$	0.0056**	0.0011	-0.0027***	-0.0048**
	(0.003)	(0.002)	(0.001)	(0.002)
Secondary Sch Comp	-0.0026	0.0053	0.0007	-0.0190***
	(0.007)	(0.005)	(0.003)	(0.007)
Vocat Sch Comp	-0.0023	-0.0044	-0.0000	-0.0171*
	(0.010)	(0.006)	(0.005)	(0.010)
Tech Sch Comp	-0.0349***	0.0021	0.0011	-0.0484***
	(0.007)	(0.004)	(0.003)	(0.007)
College Comp	-0.0942***	-0.0077	0.0036	-0.0751***
	(0.007)	(0.005)	(0.004)	(0.007)
Grad Level Comp	-0.1270***	-0.0198***	0.0224**	-0.1244***
	(0.010)	(0.007)	(0.011)	(0.016)
Married	-0.0248***	0.0012	-0.0040**	-0.0335***
	(0.003)	(0.002)	(0.002)	(0.003)
DID Estimates				
Post	0.0774***	0.0017	-0.0026	0.0089
	(0.010)	(0.007)	(0.005)	(0.010)
Treat	0.0109	0.0072	0.0112***	-0.0049
	(0.007)	(0.005)	(0.004)	(0.009)
Treat×Post	-0.0427***	-0.0060	-0.0010	-0.0722***
	(0.009)	(0.006)	(0.004)	(0.010)
Region Dummies[b]	YES	YES	YES	YES
Year Dummies[b]	YES	YES	YES	YES
Constant	0.1475***	-0.1544***	0.0649***	0.2299***
	(0.042)	(0.027)	(0.017)	(0.039)
Obs	44,452	44,452	44,452	53,769
R^2	0.061	0.022	0.012	0.115

Notes: RLMS, rounds VIII–XVIII (1998–2009). Definitions are as in table 2. Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. Omitted category is no educational degree. [b]Thirty-eight regional dummies, including Moscow and St Petersburg, and nine year dummies were included but not reported. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

did not have a strong impact on these groups.

The reduction in the share of informal employment among wage and salary workers and those performing irregular activities could be due to omitted variable bias. Specifically, it could be the case that unobservable characteristics of people in the control group systematically differed from those of individuals that were treated. The panel structure of the RLMS can be used to control for individual heterogeneity by relying on within-individual changes only. The key identifying assumption of the fixed effects model is that the effect of unobservables is constant over time. Formally, this is stated by assuming that the error term in equation (1) can be written as: $u_{it} = c_i + \epsilon_{it}$, where c_i is the constant individual heterogeneity and ϵ_{it} is an idiosyncratic error term with zero mean conditional on treatment, the other covariates, and the individual heterogeneity.[37] As is well-known, the price to be paid for the robustness of the fixed effects estimator is that none of the parameters of the time-constant regressors are identified.

Table 8 presents the fixed effects estimation results for equation (1). The effect on informal employees is now estimated as -2.5%, while the effect on informal irregular activities is -4.0%. Both results are still statistically significant. Attenuation in the absolute size of the coefficients is a frequent occurrence with fixed effects estimates, since within-individual variation is relatively more sensitive to measurement error (Griliches and Hausman, 1986). I interpret these results as indication that, while unobservable ability bias might be a factor influencing the OLS estimates, the tax reform indeed made informality less desirable.

Rather than reflecting a real reduction in overall informality, the results in this section could be illusory if the tax reform pushed individuals from one form of informal employment into others. To check against this perverse case, I estimate the same equation for an index of overall informality. The estimates in the third column of table 8 suggest that, if anything, the results for the detailed informality categories are conservative.

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[37]That is, $\mathrm{E}[\epsilon \mid X, Z, Post, Treat, c] = 0$.

Table 8 – The Effect of Tax Reform on Informality: DID FE

	Informal Employee	Informal Irreg Activ	Any Informal Employment
Household Characteristics			
Number of Members	0.0010	-0.0088***	-0.0121***
	(0.003)	(0.003)	(0.004)
Number of Female Members	-0.0040	0.0083	0.0095
	(0.005)	(0.005)	(0.007)
Number of Youth, 18-	-0.0003	0.0112***	0.0105**
	(0.004)	(0.004)	(0.005)
Number of Elderly, 65+	-0.0100*	0.0005	-0.0011
	(0.006)	(0.006)	(0.008)
Individual Characteristics			
Age	-0.0091	-0.0135*	-0.0062
	(0.010)	(0.008)	(0.012)
Age^2/100	0.0130***	0.0173***	0.0213***
	(0.004)	(0.004)	(0.005)
Experience	-0.0025	-0.0048***	-0.0061***
	(0.002)	(0.002)	(0.002)
Experience^2/100	-0.0008	0.0006	-0.0013
	(0.003)	(0.003)	(0.004)
Secondary Sch Com	-0.0053	-0.0066	0.0037
	(0.010)	(0.009)	(0.011)
Vocat Sch Comp	-0.0113	-0.0075	-0.0029
	(0.011)	(0.010)	(0.013)
Tech Sch Comp	-0.0132*	-0.0214***	-0.0174*
	(0.008)	(0.007)	(0.010)
College Comp	-0.0276**	-0.0394***	-0.0506***
	(0.011)	(0.011)	(0.015)
Grad Level Comp	-0.0321*	-0.0704***	-0.0649*
	(0.019)	(0.025)	(0.034)
Married	-0.0086**	-0.0098***	-0.0137***
	(0.004)	(0.004)	(0.005)
DID Estimates			
Post	0.0495	0.0350	-0.0315
	(0.099)	(0.075)	(0.119)
Treat×Post	-0.0250**	-0.0403***	-0.0584***
	(0.010)	(0.010)	(0.014)
Year Dummies^b	YES	YES	YES
Constant	0.2799	0.4481*	0.2996
	(0.306)	(0.232)	(0.365)
Obs	44,452	53,769	47,718
# of Indiv	11,263	12,411	11,969
R^2 Overall	0.04	0.03	0.01

Notes: RLMS, rounds VIII–XVIII (1998–2009). Any informal employment includes informality at the main job, the second job or irregular activities. Other definitions are as in table 2. Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. Omitted category is no educational degree. ^{b}Nine year dummies were included but not reported. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

5.1 Robustness Checks

In table 9, I present estimates of the tax reform effect under alternative specifications.[38] I also provide estimates for all irregular activities

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[38]To save space I omit all other covariates.

(contractual or otherwise) and for informal irregular activities as exclusive source of earnings.

In order to control for changes in characteristics at the regional level –such as local tax enforcement efforts, financial markets, etc– I add to the equation interactions between the 39 districts and the year dummies. Including these additional controls does not affect the results significantly.

Table 9 – Robustness Checks

	Informal Employee	Informal Irreg Activ	Any Informal Employment	All Irregular Activ	Informal Irreg Activ as Main Job
Baseline	-0.0250**	-0.0403***	-0.0584***	-0.0421***	-0.0343***
	(0.010)	(0.010)	(0.014)	(0.010)	(0.009)
Including interactions $District \times Year$	-0.0246**	-0.0337***	-0.0467***	-0.0373***	-0.0295***
	(0.011)	(0.010)	(0.015)	(0.011)	(0.009)
Control group excludes unreported income	-0.0256**	-0.0408***	-0.0588***	-0.0427***	-0.0350***
	(0.010)	(0.010)	(0.014)	(0.011)	(0.009)
Treatment defined using income from all sources	-0.0363**	-0.0219**	-0.0708***	-0.0339**	-0.0219**
	(0.014)	(0.011)	(0.019)	(0.013)	(0.011)
Treatment defined using 2001 labor income only[†]	-0.0183	-0.0455***	-0.0637***	-0.0514***	-0.0365***
	(0.012)	(0.014)	(0.019)	(0.015)	(0.010)
$Treat \times Trend$[♭]	-0.0063**	-0.0148***	-0.0187***	-0.0159***	-0.0137***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$Placebo\ Reform$[♯]	-0.0008	0.0128	0.0251	0.0055	-0.0074
	(0.012)	(0.015)	(0.019)	(0.016)	(0.010)

Notes: RLMS, rounds VIII–XVIII (1998–2009). Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. "All irregular activities" includes those done under contract. "Informal irregular activities as main job" excludes individuals with any other form of remunerated work. [†]Excludes individuals who receive treatment in the late post-reform years (see main text for details). [♭]Includes a post-reform time trend (2000 = 1) instead of the post-reform dummy. [♯]The placebo "reform" estimates are obtained by assuming that a similar change in the tax code happened between rounds 8 and 9 (it did not). All other covariates are the same as in table 8. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

I also try a number of modifications in the definitions of the treatment and control groups. First, I exclude from the analysis individuals whose labor income is never reported, which under my baseline definition fell in the control group. Second, I define treatment based on an alternative income item in the adult questionnaire. This alternative includes income from all sources –some of them non-taxable– and is

therefore not entirely appropriate to define treatment.[39] Neverthe-less, it is reassuring to verify that the main results hold with this alternative definition.

The table also presents estimates when treatment is defined based on labor income received during 2001 only. As shown in figure c above, real wages were increasing over the post-reform period. As a result, in my baseline definition many individuals enter the treatment group late. It is possible that these "late comers" also had a higher propensity to become formal and are therefore driving the results. To guard against this possibility, I define treatment based on 2001 labor income only and exclude from the analysis all individuals who receive treatment (i.e. higher incomes) later. Under this specification the estimate for informal employees is not statistically significant. The effect on informal irregular activities is larger in absolute value than in the baseline case and remains highly statistically significant. I conclude "late comers" are not driving the main results. I further investigate the robustness to "late comers" in the next subsection.

Another robustness test involves obtaining an estimate of the ef-fect of the reform on the *time trend* of informality in the post-reform period. This alternative specification implies a much larger overall effect. For example, by 2009 the reform is predicted to have reduced informal irregular activities by $1.5 \times 8 = 12\%$.

The final set of estimates in table 9 correspond to a placebo re-gression. I (wrongly) assume that a similar tax reform happened some time between rounds 8 and 9 of the RLMS. The new "treatment" variable equals one if the individual is in the upper income brackets ($> 50,000$ rubles) in round 9. In the table are fixed effects estimates of equation (1) using the latter treatment definition. As expected, none of the estimates are significantly different from zero and most

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[39]The question is: "What is the total amount of money that you received in the last 30 days? Please include everything: wages, retirement pensions, premi-ums, profits, material aid, incidental earnings, and other receipts, including foreign currency, but convert the currency into rubles."

have the wrong sign.

5.2 Estimating Average Treatment Effect on the Treated Using a Matching Estimator

The fixed effects differences-in-differences estimates seem to be robust to minor changes in specification. However, there are a number of assumptions underlying the estimating equation that are hard to relax within this parametric setting. In particular, the fixed effects estimates do not restrict estimation to the region of common support of the independent variables between the treated and the control group. In this subsection I use the matching differences-in-differences (M-DID) estimator first introduced in Heckman et al. (1997) to estimate the effect of the reform year-by-year. This semi-parametric estimator allows me to check whether results are robust to changes in the functional form of the control function, as well as to restricting estimation to the region of common support. I also use the estimator to investigate the sensitivity of the results to alternative definitions of the the treatment group. The M-DID estimator is given by:

$$
\hat{M_{DID}} = \sum_{i \in T} \frac{1}{N_{T,t}}[(INF_{i,t} - INF_{i,2000}) \sum_{j \in C} W(i,j)(INF_{j,t} - INF_{j,2000})]
$$

(2)

where T and C are the sets of indexes for treated and control individuals respectively, and $N_{T,t}$ is the number of observed treated individuals in year t of the post-reform period ($t \in \{2001, \ldots, 2009\}$).

Intuitively, the M-DID estimator compares *changes* in informality status between year t and the (pre-reform) year 2000 for each treated individual to similar changes for a set of appropriate control individuals. Which individuals are selected as controls for each treated individual depends on the weighting function $W(i,j)$. The estimates presented here use nearest-neighbor matching based on the propensity

40

score.[40]

Figure 10 – Year by Year ATT for Informal Irregular Activities
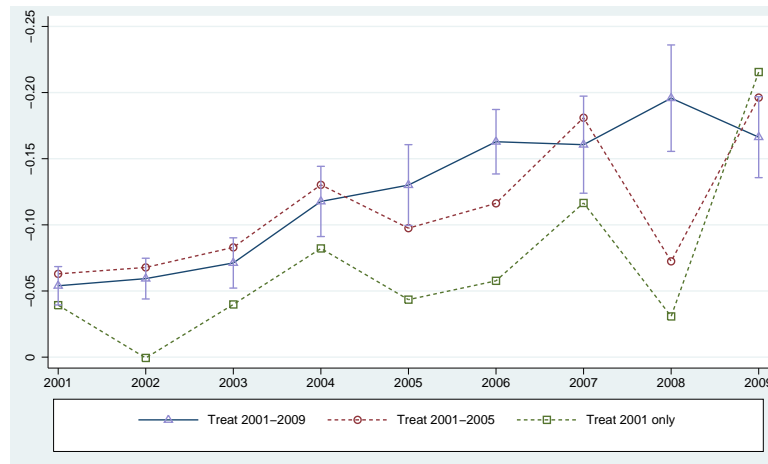
Notes: Reversed scale in y-axis. ATT obtained with a matching differences-in-differences estimator for each post-reform year. Treatment defined based on labor income in years 2001–9, 2001–5, or 2001. The I-beams are one-standard-deviation confidence intervals.

Figures 10 and 11 presents M-DID estimates (and one-standard-deviation confidence intervals) for informal irregular activities and informal employees respectively. For each year in the post-reform period, the figures present estimates obtained when treatment is defined based on labor income received during the whole 2001–2009 period, when the period is reduced to 2001–5, and when only income in 2001

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[40]Specifically, I used an average of the 10 nearest neighbors. I also experimented using a kernel matching procedure (as in Heckman, Ichimura, and Todd's original paper) but while the results were almost identical, processing times were much longer. Therefore I stick to nearest neighbor matching. The propensity score was estimated using a logit model that included all time-constant and time-varying controls (as in the OLS regression of table 7). Matching was done on the index rather than the probability. Estimates were obtained using Leuven and Sianesi's `psmatch2` module for STATA.

is considered.

Several points are worthy of note. First, the M-DID estimates of the impact of the reform using the baseline treatment definition are substantially higher in absolute value. The effect on irregular activities is estimated to have been -5.4% in 2001 and to have increased thereafter. By 2009, individuals affected by the reform were 16.6% less likely to perform informal irregular activities. For employees, the reform is estimated to have decreased informality by 5.5% in 2002. In this case, estimates do not trend upwards but neither do they wither away in time.

Second, I check whether the time pattern of the effects is an artifact of the treatment definition. I estimated M-DID estimates under restricted treatment definitions. Restricting treatment to years 2001–5 does not affect results. With the exception of a pronounced dip in the effect on irregular activities in 2008, all estimates lay within the one-standard-deviation band of estimates using the whole 2001-9 period. Further restricting treatment definition to individuals treated in 2001 leads to a uniform downward shift in the time series of estimates for informal irregular activities. Interestingly, the time pattern of effects is not affected, suggesting that the reform had significant long run effects.

Overall, this experiment in this sub-section is interesting for three reasons. First, it shows that the tax reform led to a reduction in informality regardless of the time period considered either for defining treatment or for measuring the effect. Second, the effect of the reform is robust to a non-parametric specification of the control function and to restricting estimation to the region of common support. Finally, the time pattern of the effect was very different for informal irregular activities and informal employees.

5.3   Detailed Treatment Groups

The tax reform affected individuals with annual earnings of 50,000 rubles or more. However, the effect was heterogeneous even within

Figure 11 – Year by Year ATT for Informal Employees
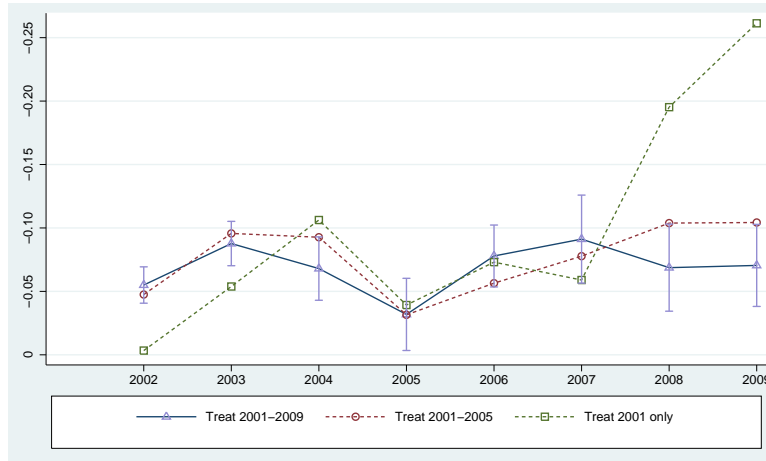
Notes: Reversed scale in y-axis. ATT obtained with a matching differences-in-differences estimator for each post-reform year (except 2001 when no registration questions where asked to employees). Treatment defined based on labor income in years 2001–9, 2001–5, or 2001. The I-beams are one-standard-deviation confidence intervals.

this group. In particular, as figure 5 shows, those in relatively higher tax brackets experienced a larger reduction in marginal tax rates. It is natural to expect that the effect of the reform was stronger for them.

Following this intuition, I define four detailed treatment variables that distinguish among individuals with after-tax monthly earnings in the following intervals: 3,625–7,250, 7,250–10,875, 10,875–21,750, and 21,750+. I refer to these variables as $Treat^1$ through $Treat^4$ respectively.[41] Naturally some individuals fall into different brackets in different periods. I operationalize the definition so that the groups are mutually exclusive.[42] I then re-specify the DID equation as follows:

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[41]These detailed treatment groups correspond with the following tax brackets: 50,000–100,000, 100,000–150,000, 150,000–300,000, and 300,000+ (see also table 6).

[42]See notes to table 10 for details.

$$INF_{it} = \theta_t + X_{it}\beta + Z_i\gamma + \psi Post_t + \sum_{h=1}^{4} \mu_h Treat_i^h + \qquad (3)$$

$$+ \sum_{h=1}^{4} \alpha_h (Treat_i^h \times Post_t) + u_{it}$$

As above, I assume that the error term has the constant unobserved effect structure, so I estimate equation (3) using fixed effects. In table 10, I report the results.[43]

Table 10 – Detailed Treatment Groups: DID FE

	Informal Employee	Informal Irregular Activities	Any Informal Employment
Post	0.0494	0.0358	-0.0298
	(0.099)	(0.075)	(0.120)
$Treat^1 \times Post$	-0.0172	-0.0209*	-0.0310*
	(0.012)	(0.012)	(0.017)
$Treat^2 \times Post$	-0.0235*	-0.0601***	-0.0768***
	(0.013)	(0.013)	(0.018)
$Treat^3 \times Post$	-0.0267**	-0.0501***	-0.0793***
	(0.011)	(0.012)	(0.016)
$Treat^4 \times Post$	-0.0388***	-0.0276*	-0.0390*
	(0.014)	(0.015)	(0.020)
Obs	44,452	53,769	47,718
# of Indiv	11,263	12,411	11,969
R^2 Overall	0.04	0.03	0.01

Notes: RLMS, rounds VIII–XVIII (1998–2009). $Treat^4$ are individuals with after-tax monthly earnings above 21,750 rubles in any post-reform period. $Treat^3$ are individuals with earnings above 10,875 rubles at least once but never above 21,750. $Treat^2$ and $Treat^1$ are similarly defined using 7,250 and 3,625 rubles as cutoffs. The control group includes all those untreated and employed in the post-reform period. Other definitions are as in table 2. Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. Covariates are the same as in table 8. All estimated coefficients have the same sign and level of significance and are available upon request. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

For informal employees, the estimates follow a simple pattern. The reform had the strongest effect in the highest income bracket. The effects on the other groups were still negative but smaller in absolute

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[43]To save space, I report only the coefficients of interest. Other covariates have the same sign and significance as in table 8. All estimation results are available from the author upon request.

value. Indeed, the estimate for $Treat^1$ is not significant at the conventional levels.

The pattern for informal irregular activities is nonlinear. The effect of the reform peaked among those in $Treat^2$ and declined thereafter. One simple explanation could be that informal irregular activities are infrequent in the highest brackets. Moreover, it could be the case that informal activities are heterogeneous and that relatively wealthy individuals only perform the most profitable among them. Thus, it would take an ever larger reduction in taxes to lure these individuals out of the informal sector.

An alternative explanation is that the reductions in the PIT and the ST had different effects on this kind of informal employment. As shown in table 6, reform-wise the difference between $Treat^1$ and $Treat^2$ involved a reduction in the ST of over 15 percent. Meanwhile, the difference between treatment group 2 and groups 3–4 was mostly about the PIT.

5.4 Weighted Differences in Differences

The analysis of the detailed treatment effects suggests that the effects of the reform may be heterogeneous. It also raises the concern that the reduction in informal sector participation was endogenously determined, and not a consequence of the reform. Even though we control for observable and (to some extent) unobservable characteristics that differ across groups, it could still be the case that individuals in higher brackets are somehow different in ways we fail to take into account.

Because the reduction in tax rates occurred in discontinuous jumps at different income thresholds, it would in principle be possible to analyze the effect of the reform in a regression discontinuity framework. There are, however, not enough individuals in the RLMS to apply the RD method meaningfully. An alternative approach involves weighting observations by the distance of reported earnings from the threshold

of 50,000 rubles.[44] Specifically, the weighted differences-in-differences estimand is:

$$\sum_{i=1}^{n} \omega_i \left[INF_{it} - \theta_t - X_{it}\beta - \psi Post_t - \alpha(Treat_i \times Post_t) - u_{it} \right]^2 \quad (4)$$

where ω_i is the individual weight and I omit the time-constant regressors. The weights are a decreasing function of the distance of the individual's post-reform income from the threshold at 50,000 rubles. Specifically, given reported monthly income Y_{it}, the weights are calculated as $K(\frac{Y_{it}-3625}{h})/\sum_{i=1}^{n} K(\frac{Y_{it}-3625}{h})$, where $K(\cdot)$ is a Gaussian kernel and h is the optimal bandwidth.[45] I interpret the resulting weighted differences in differences estimates as robustness check in the spirit of regression discontinuity, since individuals with incomes close to the threshold are probably relatively closer in terms of all unobservable characteristics.

Table 11 – Weighted DID with FE

	Informal Employee	Informal Irregular Activities	Any Informal Employment
Post	-0.0658	0.0245	-0.1852
	(0.121)	(0.063)	(0.141)
Treat×Post	-0.0178	-0.0329*	-0.0546**
	(0.019)	(0.019)	(0.027)
Obs	41,930	50,914	45,134
R^2 Overall	0.005	0.03	0.001
# of Indiv	10,180	11,220	10,856

Notes: RLMS, rounds VIII–XVIII (1998–2009). Treatment effect estimated by a weighted fixed effects regression. Included covariates are the same as in table 8. Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 11 reports the estimation results for equation (4) with individual fixed effects. The estimates are fairly close to those in table 8.

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[44]This approach was first suggested in Gorodnichenko et al. (2009). See also Duncan and Sabirianova Peter (2009).

[45]$h = 0.9\frac{\sigma}{\sqrt[5]{n}}$ and σ is the smaller amount between the standard deviation of reported income and the inter-quartile range.

The number of observations goes down because of a number of individuals who are assigned zero weights, which is the intended effect of the strategy. As a consequence, including the weights almost doubles the standard errors of the treatment interaction term.

5.5 The Extensive Margin

So far, all estimates of the effect of the reform on informality have implicitly relied on individual transitions in and out of informal employment. However, an alternative route through which the reform might have affected informality is by changing the probability of choosing a formal job for those that were unemployed before the reform and found employment in the post-reform period.

Table 12 – Tax Reform Effect on the Extensive Margin

	Informal Employee	Informal Irreg Activ	Any Informal Employment
A. Baseline			
Post	0.2740***	0.4429***	0.5704***
	(0.093)	(0.058)	(0.114)
Treat×Post	-0.0146	-0.1433***	-0.1355***
	(0.025)	(0.023)	(0.027)
Obs	21,224	24,924	22,899
# of Indiv	7,339	8,080	7,709
R^2 Overall	0.027	0.016	0.054
B. Robustness Tests			
Including $District \times Year$ interactions	-0.0111	-0.1467***	-0.1357***
	(0.025)	(0.023)	(0.028)
Treatment defined using income from all sources	-0.0314	-0.0948***	-0.1242***
	(0.029)	(0.026)	(0.031)
Treatment defined using years 2001–2005[†]	-0.0284	-0.1362***	-0.1044***
	(0.029)	(0.027)	(0.033)
Control group excludes unreported income	-0.0121	-0.1387***	-0.1310***
	(0.025)	(0.023)	(0.027)
$Treat \times Trend$[♭]	-0.0007	-0.0212***	-0.0197***
	(0.004)	(0.004)	(0.005)

Notes: RLMS, rounds VIII–XVIII (1998–2009). Sample restricted to those unemployed just before the reform and who were employed at least once in the post-reform period. The dependent variable is set to zero in round 9. Round 8 is excluded. [†]Excludes individuals who receive treatment in the late post-reform years (see main text for details). [♭]Includes a post-reform time trend (2000 = 1) instead of the post-reform dummy. All other covariates are the same as in table 8. Arellano (1987) robust standard errors in parentheses allow for heteroscedasticity and auto-correlation of arbitrary form. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In order to estimate the effect of the reform on the extensive mar-

gin, I restrict the sample to individuals who were unemployed in round 9 but found employment some time during the post-reform period.

The top panel of table 12 reports estimation results for the baseline fixed effect specification. I interpret these estimates as the predicted change induced by the reform in the probability of informal employment, other things constant, and conditional[46] on finding employment in the post-reform period.

The tax reform significantly reduced the probability of informal irregular activities for new jobs. Specifically, individuals in the treated group were over 14% less likely to choose this form of informal employment relative to the control group. The estimate for informal employment in the main job is negative but not statistically significant. Finally, the effect on the overall informality indicator was similar to that on irregular activities.

In the bottom panel of the table I report some robustness tests (comparable to those in table 9). In general, the results reinforce the message that the reform had a strong effect on the extensive margin for irregular activities, while for informal employees the effect was probably not significant.

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[46]Duncan and Sabirianova Peter (2009) study the effect of the reform on the extensive margin of employment in general (independently of formal status). Using the same DID methodology, they find that the expected probability of finding a job in the post-reform period was significantly higher for individuals in the treated group. The estimated effect is between 0.09 and 0.14, depending on whether they use a male or female sample. However, these estimates require extrapolating earnings for individuals not employed throughout the post-reform period in order to assign them to treatment or control. This is not necessary for investigating the effect on informality, conditional on employment.

6 Did lower taxes push people into formality, pull them out of informality, or both?

The tax reform significantly reduced participation in informal irregular activities and, to a smaller extent, in informal employment at the main job. In principle, the impact of the reform could have taken two avenues: an increase in the relative flow of workers into formal employment or a slowdown of the flow into informality. In this section I try to assess the relative importance of each.

In order to consistently account for all labor market flows, I divide workers into six mutually exclusive and exhaustive categories: not-in-the-labor-force, unemployed, formally employed (either working for others or as an entrepreneur), informal employees, informal entrepreneurs, and employed in irregular activities only (IAO).[47] Using this classification, table 17 in the appendix reports overall patterns of mobility in the Russian labor market between rounds 9 and 11 of the RLMS.

The study of labor market transitions in a developing economy has an important antecedent in Maloney (1999), which argued that patterns of worker mobility are better than sectoral earnings differentials for investigating the extent of dualism in the labor market. Maloney argued that the different sectors of the labor market were well integrated Mexico. First, he observed relatively high turnover rates in the formal salaried sector, with an implied average duration (tenure) of formal positions of 5.7 years. For the self-employed, average duration was in the same ball park at 4 years. Second, he showed that —after appropriate normalization— transitions into and out of formal and

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[47]Informal employees and entrepreneurs are defined as above. The consolidation of formal employees and entrepreneurs is due to the low number of transitions into and out of the latter category. For the same reason, the IAO category includes all workers doing irregular activities regardless of registration or official contracting. The classification is based on the main job only, and so irregular activities done in parallel with a main job are not taken into account in the classification.

informal positions were of similar magnitude. Together with other evidence, these two points made a strong case against the dualist model of the labor market.

Table 17 shows that the same methodology would lead to different conclusions for the Russian labor market. First, the implied duration of formal sector jobs is much higher than that found in Mexico.[48] Moreover, all of the informal sector categories have markedly lower probabilities of permanence. Note this is not an artifact of the level of aggregation (3 informal categories vs only one formal). Consolidating all informal categories gives a probability of permanence of 0.41 (implied duration of 3.37 years).[49]

Second, even after the normalizations[50] suggested by Maloney, the flows across sectors do not seem to lend support to the hypothesis of integrated markets. In general, flows from the informal sector into the formal sector seem more frequent than the reverse. Furthermore, workers coming from non-employment seem to prefer the formal sector over any of the informal alternatives.

The relative longer duration of formal jobs is even higher among workers between 25 and 60 years of age.[51] This suggests that, once they have found a formal job, Russian workers rarely move to the informal sector. All in all, Russian transition data does not seem to lead to conclusions similar to those in Maloney (1999).

Table 13 presents the same type of transition data, this time dis-

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[48]For each labor market state, this is calculated as $2/(1-p_{ii})$ since we are considering transitions between rounds two years apart. Because we cannot considering within-sector turnover, this is an estimate of tenure in the sector and not at a job.

[49]Lehmann and Pignatti (2007) find a similar asymmetry in the implied durations of informal and formal sector tenure using two rounds of the Ukrainian Longitudinal Monitoring Survey (2003–4).

[50]First, we normalize transition probabilities between sectors by the size of the destination cell (second panel of table 17). This makes flows in both directions between two sectors comparable. Second, in order to make all flows comparable, each cell is multiplied by the churning rates in the origin and destination state (bottom panel).

[51]These results are not included to save space but are available upon request.

aggregated into treatment and control groups as determined by the flat tax reform in 2001.[52] We apply the same normalization steps to the disaggregated matrices, only that in this case we use the overall terminal sector distribution and overall durations (from table 17) for normalization.[53] Conditional on treatment, it is still generally the case that flows from informal and into formal status are larger than the reverse. Also, workers coming out of non-employment seem to prefer the formal over the informal sector.[54]

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[52]More precisely, these transitions are a disaggregation from a *subset* of all transitions presented in table 17. The subset corresponds to individuals who were employed at least once during the post-reform period and for whom, accordingly, it is possible to determine treatment status.

[53]This is the correct procedure as long as segmentation does not occur across treatment status.

[54]The main exceptions to these observations are flows into irregular activities in the control group, specially for those that were out of the labor force in 2000.

Table 13 – Mobility in Russian Labor Market: treatment and control groups

Transition Probabilities: $[p^k_{ij}]$

	CONTROL GROUP								TREATED GROUP							
	NILF	U	IAO	I. Empl	I. Ent	AF	$p^C_{i\cdot}$ (♭)	Implied Duration	NILF	U	IAO	I. Empl	I. Ent	AF	$p^T_{i\cdot}$ (♭)	Implied Duration
NILF	0.56	0.06	0.14	0.05	0.01	0.19	-	4.51	0.55	0.07	0.08	0.04	0.01	0.25	-	4.41
Unemployed	0.30	0.17	0.14	0.06	0.02	0.30	-	2.42	0.17	0.10	0.13	0.08	0.00	0.52	-	2.23
Irreg Act Only	0.30	0.07	0.37	0.08	0.01	0.17	0.124	3.19	0.21	0.07	0.29	0.07	0.05	0.31	0.078	2.80
Inf Employee	0.16	0.02	0.16	0.14	0.02	0.50	0.062	2.33	0.08	0.05	0.07	0.25	0.06	0.48	0.065	2.67
Inf Entrep	0.20	-	0.07	0.07	0.47	0.20	0.017	3.75	0.05	0.01	0.05	0.11	0.49	0.30	0.027	3.91
All Formal	0.15	0.05	0.03	0.03	0.01	0.73	0.796	7.40	0.03	0.02	0.03	0.03	0.01	0.88	0.828	16.72
$p^k_{\cdot j}$ (♭)	-	-	0.179	0.083	0.019	0.718			-	-	0.070	0.061	0.032	.837		

Incidence Matrix: $[q^k_{ij} = p^k_{ij}/p^{all}_{\cdot j}]$

	CONTROL GROUP						TREATED GROUP					
	NILF	U	IAO	I. Empl	I. Ent	AF	NILF	U	IAO	I. Empl	I. Ent	AF
NILF		1.30	2.70	1.36	0.31	0.42		1.72	1.51	1.15	0.69	0.54
Unemployed	0.76		2.65	1.57	1.41	0.67	0.42		2.43	2.17	0.29	1.14
Irreg Act Only	0.74	1.62		2.11	0.53	0.38	0.52	1.64		2.01	3.02	0.69
Inf Employee	0.40	0.47	3.04		1.21	1.10	0.21	1.15	1.40		3.88	1.05
Inf Entrep	0.50	-	1.27	1.80		0.44	0.12	0.28	0.91	2.89		0.66
All Formal	0.37	1.21	0.59	0.92	0.36		0.09	0.46	0.48	0.72	0.84	

Disposition to Move: $[v^k_{ij} = q^k_{ij} \times (1 - p^{all}_{ii}) \times (1 - p^{all}_{jj})]$

	CONTROL GROUP						TREATED GROUP					
	NILF	U	IAO	I. Empl	I. Ent	AF	NILF	U	IAO	I. Empl	I. Ent	AF
NILF		8.36	20.47	9.68	3.27	13.03		11.11	11.50	8.16	7.35	16.89
Unemployed	4.90		4.30	2.37	3.21	4.43	2.69		3.94	3.29	0.65	7.57
Irreg Act Only	5.65	2.63		3.77	1.41	3.00	3.97	2.67		3.59	8.10	5.37
Inf Employee	2.86	0.71	5.43		3.04	8.07	1.50	1.74	2.51		9.73	7.71
Inf Entrep	5.37	-	3.40	4.50		4.85	1.28	0.63	2.43	7.24		7.22
All Formal	11.58	8.01	4.62	6.70	3.94		2.67	3.06	3.75	5.27	9.29	

Notes: RLMS, rounds IX and XI only (registration questions not present in round X). p^k_{ij} is the fraction of individuals from the k group ($k = control, treated$) who started in sector i and then moved to sector j. (♭) $p^k_{i\cdot}$ and $p^k_{\cdot j}$ are the distributions of states conditional on being employed in 2000 and 2002 respectively. Implied duration conditional on treatment is calculated as $2/(1 - p^k_{ii})$. The normalizations in the center and bottom panel use terminal sector size ($p^{all}_{\cdot j}$) and churning rates ($1 - p^{all}_{ii}$) from the overall transitions matrix (table 17).

A very different lesson emerges by comparing the treatment and the control groups: 1) Before the reform, the distribution of employment categories was quite different in the two groups. Conditional on employment, treated individuals were more likely to have a formal job. The tax reform operated to widen this gap significantly, specially because of the marked reduction in the fraction of formal workers in the control group. The same conclusion can be reached by looking at the implied durations. Over 88% of treated formal workers remained in the formal sector. Only 73% did so in the control group. 2) Every flow (except informal entrepreneurs) into the formal sector is larger for the treatment than for the control group. In particular, while only 17% of workers in the control group who performed irregular activities before the reform became formal, more than 30% of comparable treated individuals acquired a formal job by 2002. 3) All flows (again except informal entrepreneurs) moving workers away from the formal sector were smaller for those treated by the reform. In particular, the probability of moving from a formal job and into irregular activities was halved for those facing lower marginal tax rates.

Overall, examining the flows resulting from the Russian tax reform suggests that the pattern of transitions observed by Maloney in Mexico is not a *necessary* condition for an integrated labor market. In Russia workers choose among sectors and, when the underlying parameters of the decision change, they change sectors accordingly. The evidence suggests that sector choice is fairly stable unless major parameters affecting the participation decision change. In particular, Russian workers are very unlikely to leave the formal sector once they have entered it.

The tax reform provided strong incentives in favor of formal employment. Consequently, workers in the treated group were less likely to leave formal sector jobs, and more likely to transition from non-employment or informality into formal positions.

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7 Conclusions

The modern Russian economy is notorious for the high level of uncertainty regarding regulations, the pervasiveness of corruption and tax evasion, and the relative powerlessness of the State to enforce the law. The economic and social costs of these institutional failures are probably large. Unfortunately, there are negative feedback effects that make the emergence of better institutions unlikely. Russia seems to be trapped in low-level equilibrium of high informality and poor public goods provision by the State.

In this context, the tax reform of 2001 appears as a highly important experiment. The reform reduced average tax rates for the PIT and the ST and made the tax structure more regressive. Because individuals in the lower income bracket were for the most part not affected, it is possible to estimate the effects of the reform using a DID approach.

In this paper I study the effect of the reform on individual participation in the informal sector. I find evidence that the reform led to a reduction in the fraction of informal employees. The reform seems to have had an even stronger negative effect on the prevalence of informal irregular activities. These effects –which I estimate to be in the order of 2.5 and 4.0 percent respectively– are robust to a number of different specifications and small alterations in the definition of treatment status. A semi-parametric estimator gives even larger estimates of these effects. It also shows that the reform had long-lasting effects.

I also find that, predictably, the effects of the reform were relatively stronger in the top income brackets, where the reduction in marginal tax rates was more radical. Finally, the reform made it 14% less likely that someone entering the job market in the post-reform period would perform informal irregular activities.

I interpret these estimates as strong evidence that informality, at least in Russia, is mostly a voluntary state. Intuitively, the decline in tax rates reduced the benefits to being informal and, as a result,

induced a significant fraction of individuals to migrate to the formal sector. This kind of behavioral response would be impossible if people were trapped in the informal sector due to the existence of entry barriers. Moreover, informal employees and individuals performing irregular activities are arguably the most vulnerable groups (at least within the realm of people who have some sort of employment) in society. If someone is trapped, they should be the ones. The two categories of informal employment that were not affected by the reform –entrepreneurs and second job informals– constitute a small fraction of overall informality and are certainly not among the most vulnerable.

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Table 14 – Occupation Conditional Distribution

1-digit ISCO Occup	All Employed			Inf Emp	Inf Entrep	Inf Sec Job	Inf Irreg Act
	Main Job	Sec Job	Irreg Act	Main Job	Main Job		
Legislators, Sen Manag, Officials	5.2	6.9	0.9	1.0	**30.9**	5.8	0.7
Professionals	**17.1**	**32.0**	9.8	2.8	3.9	**18.8**	9.3
Technicians, Assoc Prof	**17.4**	13.1	7.6	10.2	4.9	9.7	6.2
Clerks	5.8	1.4	2.6	2.2	0.0	1.3	1.9
Service and Market Workers	13.0	10.3	18.3	**28.0**	**26.5**	14.9	18.9
Skilled Agric-Fishery	0.3	0.0	1.9	0.1	2.0	0.0	1.5
Craft and Related Trades	13.1	11.7	**30.3**	17.3	21.1	**18.8**	**32.6**
Plant-Machine Oper-Assemblers	14.8	7.2	8.5	15.2	9.8	11.0	8.2
Unskilled Occupations	13.3	**17.5**	**20.3**	**23.1**	1.0	**19.5**	**20.8**
Obs	6659	291	696	814	204	154	583

Notes: The data source is RLMS round XVIII (2009). For definitions of informal work see notes to table 2.

Table 15 – Industry Conditional Distribution

1-digit Industry	All Employed Main Job	All Employed Sec Job	Inf Emp Main Job	Inf Entrep Main Job	Inf Sec Job
Food and Other Light Industry	6.3	2.6	6.7	4.2	3.5
Civil Machine Construction	3.3	1.1	0.7	0.0	0.7
Military Industrial Complex	1.8	0.4	0.0	1.0	0.0
Oil and Gas Industry	2.8	2.2	0.8	0.0	2.1
Other Heavy Industry	3.1	1.5	0.4	0.0	1.4
Construction	9.5	10.6	**19.1**	**13.0**	**14.0**
Transportation, Communication	9.5	7.3	11.7	9.4	10.5
Agriculture	5.1	2.6	5.8	3.1	2.8
Government and Public Adm	2.3	1.1	0.4	0.0	0.0
Education	**10.5**	**20.5**	0.8	2.1	12.6
Science, Culture	3.2	5.9	1.2	1.6	4.2
Public Health	7.9	9.2	1.6	0.5	2.8
Army, Security Services	5.5	0.7	1.2	1.0	0.0
Trade, Consumer Services	**20.8**	**26.0**	**45.7**	**61.5**	**37.1**
Finances	2.3	1.1	0.9	0.5	1.4
Energy (Power) Industry	1.9	1.5	0.7	0.0	2.8
Housing and Communal Services	4.3	5.9	2.4	2.1	4.2
Obs	6422	273	758	192	143

Notes: The data source is RLMS round XVIII (2009). For definitions of informal work see notes to table 2.

Table 16 – Summary Statistics by Treatment

	Control	Treated	All Employed
Female	0.61	0.52	0.54
Age	42.29	37.18	38.21
Secondary Ed Comp	0.76	0.87	0.85
College Ed Comp	0.12	0.23	0.21
Schooling (Yrs)	11.07	12.16	11.94
Experience	20.12	16.26	17.04
Married	0.47	0.59	0.57
Urban Location	0.63	0.78	0.75
Russian National	0.63	0.73	0.71
Russian Born	0.92	0.92	0.92
Size HH	3.32	3.54	3.50
# Fem HH	1.77	1.86	1.84
# Youth HH	0.72	0.84	0.81
# Elderly HH	0.29	0.18	0.20
Obs	17,404	68,475	85,879
Indiv	3,545	11,487	15,032

Notes: RLMS, rounds VIII–XVIII (1998–2009). An individual is considered treated if her after-tax monthly labor income from all sources is above $3,625$ rubles in any post-reform round. The control group comprises the un-treated individuals who were employed.

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Table 17 – Mobility in the Russian Labor Market: 2000–2002

Transition Probabilities: $[p_{ij}^{all}]$

	NILF	U	IAO	I. Empl	I. Ent	AF	$p_{i\cdot}^{all}$	Implied Du-ration
NILF	0.82	0.03	0.04	0.02	0.00	0.09	0.400	10.99
Unemployed	0.28	0.15	0.11	0.06	0.01	0.39	0.048	2.35
Irreg Act Only	0.32	0.07	0.28	0.07	0.03	0.23	0.055	2.76
Inf Employee	0.11	0.04	0.09	0.23	0.05	0.47	0.038	2.58
Inf Entrep	0.07	0.01	0.05	0.10	0.48	0.28	0.014	3.88
All Formal	0.08	0.03	0.03	0.03	0.01	0.82	0.444	11.34
$p_{\cdot j}^{all}$	0.397	0.043	0.053	0.037	0.017	0.454		

Incidence Matrix: $[q_{ij}^{all} = p_{ij}^{all}/p_{\cdot j}^{all}]$

	NILF	U	IAO	I. Empl	I. Ent	AF
NILF		0.81	0.75	0.47	0.21	0.19
Unemployed	0.70		2.14	1.71	0.53	0.86
Irreg Act Only	0.81	1.55		1.80	1.95	0.52
Inf Employee	0.28	1.00	1.70		3.30	1.05
Inf Entrep	0.18	0.24	0.96	2.72		0.62
All Formal	0.21	0.68	0.49	0.74	0.72	

Disposition to Move: $[v_{ij}^{all} = q_{ij}^{all} \times (1 - p_{ii}^{all}) \times (1 - p_{jj}^{all})]$

	NILF	U	IAO	I. Empl	I. Ent	AF
NILF		5.22	5.67	3.35	2.27	5.97
Unemployed	4.50		3.47	2.60	1.20	5.72
Irreg Act Only	6.18	2.52		3.21	5.22	4.05
Inf Employee	2.01	1.51	3.04		8.28	7.66
Inf Entrep	1.90	0.54	2.58	6.83		6.86
All Formal	6.46	4.52	3.81	5.40	7.94	

Notes: RLMS, rounds IX and XI only (registration questions not present in round X). p_{ij}^{all} is the fraction of individuals in sector i that moved to sector j. $p_{i\cdot}^{all}$ and $p_{\cdot j}^{all}$ are the relative sizes of sectors in 2000 and 2002 respectively. Implied duration is calculated as $2/(1 - p_{ii}^{all})$.

Налоговая реформа, проведенная в 2001 г., снизила средние налоговые ставки для подоходного и социального налогов, а также сделала шкалу налогов более регрессивной. Поскольку индивидуумы в нижней части доходного распределения оказались практически не затронуты, для оценки эффекта реформы мы можем использовать метод двойных различий (differences-in-differences). Мы исследуем влияние реформы на неформальную занятость, которая определяется на основе данных о наличии трудовых договоров и о самозанятости. Применяя параметрическую и полупараметрическую технику, мы получаем подтверждение тому, что налоговая реформа существенно снижает долю неформальных работников. Среди различных исследуемых нами форм неформальности наибольшее влияние реформа оказала на вероятность неформальной случайной занятости и на тех, кто испытал наибольшее снижение налогового бремени. Сильный отклик рынка труда на изменения в налогах свидетельствует о том, что формальный и неформальный рынки труда тесно взаимосвязаны.

Слонимчик Фабиан

Влияние налогообложения на неформальную занятость (на примере российской реформы по переходу к плоской шкале)

(на английском языке)