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COSTS AND BENEFITS OF LAND OWNERSHIP: THE CASE OF RUSSIAN FIRMS

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COSTS AND BENEFITS OF LAND OWNERSHIP: THE CASE OF RUSSIAN FIRMS*

Private ownership confers numerous benefits, including stronger performance incentives, better use of privately owned assets, and improved access to finance. We argue that privately owned land could be both an asset and a liability, and overall net benefits of land ownership are contingent on the quality of surrounding institutions. We present a simple model and empirical evidence based on the Business Environment and Enterprise Performance Survey (BEEPS) in Russia, which clearly demonstrates such conditionality in the case of land ownership by Russian industrial firms. Consistently with earlier literature, land ownership facilitates firms' access to finance (the "de Soto effect"), but at the same time entails additional risks and obstacles to doing business. When the quality of property rights protection and other key institutions is poor, land ownership could have an adverse effect on firms' performance.

Keywords: de Soto effect, land ownership, property rights, privatization, institutional complementarity

JEL Classification: D23; O17; Q15; R14; R52

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1 Introduction

Private ownership is a cornerstone of the market economy, expected to vastly enhance returns to economic asset; hence, privatization is a standard ingredient of market reform packages. However, in the case of land this policy prescription is often hard to implement due to a host to political, legal, administrative etc. obstacles. As a result, much of the land that is used by households and firms is not privately owned by the users. In his seminal work, Hernando de Soto (2000) argues forcefully that this mismatch is a formidable obstacle to economic development and prosperity. The most often cited benefit of transferring land titles to land users is the ability to pledge privately owned land as collateral to secure a loan. Land-based secured lending makes credit more affordable to borrowers, which is the essence of the "de Soto effect" (Besley et. al., 2012). Other benefits of private land ownership are greater security of land use and hence and stronger incentives for longer-term investments in land and on-the-ground assets.

However in reality economic outcomes of land privatization, e.g. through land titling programs, many of which were inspired by de Soto's arguments, were often disappointing (see e.g. Deninger and Feder, 2009; Galiani, Schargrodsky, 2010). Such failures to meet expectations point out to a downside of private land ownership, and to serious liabilities that it might entail. Causes of these liabilities vary from imperfections of land, labor and credit markets to increased risks of doing business (Deninger and Feder, op. cit.; Besley et al., 2012). All of such causes have in common deficiency in the institutional environment in which landowners conduct their business. This leads to the conjecture that the overall institutional quality is a sorting factor affecting the cost-benefit balance of private ownership of land: strong institutions enable economic agents to reap full benefits of land ownership, including improved access to finance, while suppressing the costs, and vice versa when institutions are poor. While this conjecture is implied in the earlier literature (see e.g. Johnson et al., 2002; Easterly, 2008; Deninger and Feder, op. cit,), it has not yet been substantiated theoretically and tested empirically, and this paper is intended to fill these gaps.

We present a theoretical model, which similarly to Besley, Ghatak, 2010, and Besley et al., op. cit., reproduces the de Soto effect, i.e. alleviation of moral hazard in the case of secured lending. We introduce in the model institutional imperfection by assuming a threat of expropriation of private owners. Land ownership increases the value of a business and hence its attractiveness for takeover: when land title is bundled with our business assets, it amplifies risks of doing business and therefore ceteris paribus adversely affects economic performance. When

the value of land used as collateral approaches the full liability level, the de Soto effect gets weaker and is dominated by amplified expropriation risks, and the overall marginal payoff to land ownership becomes negative.

We test this theory in the empirical part of the paper using a 2012 survey of Russian firms, which was a part of EBRD's Business Environment and Enterprise Performance Surveys (BEEPS) project. In doing so we take advantage of significant variations across Russian regions of both institutional quality *and* incidence of land ownership by industrial firms. Estimations of various empirical models consistently and robustly confirm the conjectured pattern: net economic benefits of land ownership in the industrial sector are contingent on institutional quality and could turn negative when institutions are particularly poor.

The paper proceeds as follows. In the next section, we survey the literature on economic benefits and costs of land ownership, and present intuition implying complementarity between land ownership and institutional quality. This intuition is made precise in a theoretical model, which generates testable hypotheses (Section 3). In section 4, we describe are data, drawn mainly from the BEEPS project, and in Section 5 present empirical findings. Section 6 concludes.

2 Economic Payoff to Land Ownership: Institutions as Sorting Factor

An important economic benefit of land ownership is the "de Soto effect" (Besley et al, op. cit.), i.e. improved access to finance, whereby privately owned land can be pledged as collateral to secure a loan. Land-based secured lending makes credit more affordable to borrowers. Collaterals alleviate moral hazard in credit markets, and strengthen the incentives of a borrower to make best use of the loan (Stiglitz, Weiss, 1981). This generates efficiency gains, which fully or in part accrue to the borrower.

Another potential benefit of land ownership is stronger propensity to invest both in land and in business and other assets that make use of the land (Besley, 1995), since a landowner is the residual claimant and has the confidence necessary to undertake long-term investments. Last but not least, officially recognized and documented land rights are expected to reduce private spending on defending assets from expropriation, thus releasing additional resources for value-generating activities (Field, 2007; Deninger, Feder, 2009).

No matter how compelling these arguments are, empirical evidence of the de Soto effect and related advantages of transferring land titles to land users are elusive and subject to multiple

caveats. A number of studies have confirmed the de Soto effect for developing countries, including Thailand (Feder et al., 1991), Peru (Field, Torero, 2003), Kenia (Place, Migot-Adholl, 1998), Paraguay (Carter, Olinto, 2003), etc. Traditionally such studies considered ownership of agricultural land; Karas, Pyle and Schoors (2015) presented evidence of the de Soto effect in the Russian industrial sector. Other economic outcomes of land ownership include increased investments and labor supply, and higher market value of land (Galiani, Schargrodsky, 2010).

However, such confirmations are not consistent across countries, types of land and land use, and other context-specific factors. Galiani and Schargrodsky (2010) show that residential land ownership in Argentinean suburbs facilitates investments in real estate and human capital, but found no role of the de Soto effect in these outcomes. Deininger and Feder (2009) conclude in their survey of land titling literature that "evidence of improved access to credit due to formalization of land rights is scant" (p. 233).

De Soto effect could be suppressed and/or overshadowed in a poor institutional environment characterized by weak public protection of property rights, a lack of independent judiciary, low quality of governance and inadequate conditions of land and credit markets. De Soto's reasoning as to how land ownership improves economic performance is based on an implicit assumption that a lack of land titles is the only bottleneck restricting business development, and that all other necessary ingredients are in place. This "all-else-is-good" assumption is unlikely in developing countries for which de Soto's recommendations were mainly intended, and whose economic problems are often caused in the first instance by dysfunctional institutions. A lack of land ownership (and hence difficulties in accessing external finance) is but one of many symptoms of institutional deficiency,[5] and an improvement in this field alone, without concurrent progress in other areas, is not guaranteed to deliver the expected results (see e.g. Easterly, 2008). More generally, for particular market-supporting institutions to work, other matching institutions have to be in place (Shleifer, Vishny, 1998).

Limitations of land titling as a development tool in the shadow of bad institutions can be seen and understood from the primacy of property right institutions over contracting institutions (Acemoglu, Johnson, 2005), whereby property rights institutions provide overall protection from expropriation, and contracting institutions support private contracts. It is possible to mitigate deficiencies of credit contracts by higher interest rate, reliance on reputation, and other alternatives, whereas few if any remedies are available when private sector agents can be

[5] La Porta et al. (2000) report correlation between the availability of external finance and the strength of legal system and investors' protection.

expropriated by government and/or elites. Land titles, while nominally dealing with property rights, belong to the contracting institutions category, and as such could be insignificant when property rights, officially recognized or not, are lacking effective public protection.

Johnson, McMillan and Woodroof (2002) confirm the primacy of property rights protection by showing that in transition economies security of property rights is the main driver of investment decisions, and this factor is far more important than the availability of bank finance: "…the availability of bank loans surely matters for growth, but perhaps only once property rights are perceived to be secure. If property rights are insecure, it is immaterial whether or not finance is available".[6]

Deninger and Feder (2009) similarly observe that without good governance, and in particular, without effective and impartial enforcement of property rights, economic benefits of land titling could be severely diminished, especially when state power is "…abused to appropriate property or to assist in the unfair acquisition of land by elites" (p. 238); at the extreme, "bad governance and an ineffective or predatory state … cause negative outcomes [of assigning land property rights]" (p. 256). This is in agreement with the second-best principle (Lipsey, Lancaster, 1956), which states that an isolated improvement of an institution or policy, while bringing the economy closer to the institutional "first-best", could result in net losses, if suboptimal institutions were offsetting each other's deficiencies. Put differently, institutions could be mutual complements (Aoki, 2001), in which case payoff to improvement in one institution is contingent on conditions of the other, and depending on the latter could even be negative.

One example of such complementarity is presented in Besley et al. (2012), who show that increased ability of borrowers to pledge collateral due to land ownership could result in *higher* interest rates, if credit markets are imperfect and lenders have substantial market power. In such cases, the overall effect of land ownership for social welfare could be negative. Due to complementarity between credit market conditions and land ownership, "in the absence of competition [on credit market], it may be optimal to keep property rights under-developed. Improving them only increases the prospect of exploitation of borrowers by lenders" (p. 252). Furthermore, land market could be illiquid, foreclosure of land complicated, and collateral

[6] More than 75% of the firms in the sample used in Johnson, McMillan and Woodroof (op. cit.) were able to offer collateral to banks, but insecurity of property rights deterred businesses even from re-investing their retained earnings, let alone borrowing externally.

registration too costly to generate net gains, especially in the case of relatively small loans (Deninger, Feder, 2009).

In this paper, we present theoretical and empirical evidence of another case of institutional complementarity involving land ownership – this time with the protection of property rights from expropriation. One of the often-cited benefits of land titling is enhanced security of land use, which saves resources from that otherwise would have been spent on private protection of assets. However granting property titles to land users could make their possession of land *less* secure, because land now can be expropriated (by coercion, extortion, manipulation of the law, abuse of power etc.) with an officially recognized title, which makes it a more valuable prize for those attempting expropriation. Furthermore, if a land title is bundled with other assets, the latter could also be in greater danger of expropriation after such bundling. This is in agreement with Acemoglu and Johnson's (2005) conclusion that contracting institutions are less essential than property rights institutions. We take this argument a step further by showing that an apparent improvement of contracting institutions with unprotected property rights could have an adverse effect.

Similar observation was recently made with regard to corporate transparency (Liu et al., 2015; see also Durnev, Guriev, 2008). Transparency of businesses is akin to land titling in that both are expected to facilitate access to finance by reducing informational asymmetry – land ownership mitigates moral hazard, whereas higher standards of disclosure alleviate adverse selection (Hughes et al., 2007). However, disclosure reveals firms' vulnerabilities and otherwise provides interested parties, including competitors, corporate raiders and predatory bureaucracy with information, which can be turned against more transparent firms (Admati, Pfleiderer, 2000). Benefits of disclosure due to improved access to capital can be partially or fully offset by the disclosure liabilities, which are contingent on the quality of surrounding institutions, such as corruption prevention and the protection of property rights. Liu et al. (op. cit.) show that indeed in countries with weak institutions more transparent firms face higher level of corruption obstacles, and that the overall impact of auditing on firm growth in such countries is negative. Similarly, Durnev and Guriev (2008) demonstrate that resource sector companies reduce their transparency as a defensive measure against expropriation.

One can extend the analogy between corporate transparency and land titling by observing that both facilitate value-creating business transactions (such as between borrowers and lenders), but at the same time create new risks and vulnerabilities when businesses are confronted with predators and other kinds of rent-seekers. Hence, the payoffs to both transparency and land

ownership depend on the quality of property rights protection, since the security of property rights in its turn affects the scale and scope of rent-seeking vis-à-vis value-creating activities (North 1990; Murphy et al., 1993). Strong institutions suppress rent-seeking and enable businesses to take full advantage of the benefits of land ownership or transparency without bearing the costs. However, in the case of weak institutions, rent-seeking is unabated and the costs dominate over the benefits. Therefore, the protection of property rights becomes a *sorting factor* determining net payoffs to transparency and land titling.

In this paper, we analyze the above conjecture in the case of land ownership by industrial firms. We expect that, in agreement with Karas et al. (2015), firms which own their land benefit from the de Soto effect and have better access to finance. On the other hand, such firms are more attractive targets for predation and takeovers, since land ownership could increase, at times steeply, the value of firms. According to the above logic, we expect complementarity between property rights protection and land ownership, so that with poor protection of property rights land ownership could turn into a net liability.

3 The Model

In this section we present a model that captures the benefits and costs of real estate ownership by commercial firms, and specifies mediating mechanisms linking such ownership to firms' performance. Specifically, if a firm owns land, the latter could serve as collateral against debt (which is assumed to be the only source of financing available to the firm, and there are no alternative collaterals). Secured lending gives the firm access to credit on more favorable terms, which is the de Soto effect, and viewed from this angle, land ownership makes the firm better-off. On the other hand, with insecure property rights land ownership could be a significant liability for the firm, as it increases the value of the firm and therefore the costs of offsetting potential expropriation attempts and losses due to such expropriation. This mediating mechanism makes a land-owning firm ceteris paribus less profitable. Relative strengths of the above benefits and costs depend on the protection of property rights or, more generally, on the institutional quality, and the latter becomes a sorting factor affecting net payoff to land ownership in the private sector.

The following highly stylized model combines features of Stiglitz, Weiss (1981) and (Besley et al. (2012). The underlying idea of the model is that collateral facilitates access to

finance by alleviating moral hazard inherent to the agency relations between borrowers and lenders. In the case of limited liability, the borrower is not any longer the residual claimant if a project entails losses in excess of the liability, which weakens the borrower's incentive to supply (unobservable) effort (Eswaran, Kotwal, 1989). A lack of effort increases the odds of a project failure, which pushes up the interest rate to compensate the lender for increased risks of default on the loan.

3.1 Benchmark: secured lending with secure property rights

We begin with a benchmark model when property rights are fully secure. A business undertakes a commercial project, which in the case of success produces output 1, whereas in the case of failure output is zero. The probability of success is $p(e)$, where $e \geq 0$ is the level of effort of the entrepreneur running the project (effort and output are measured in monetary terms).[7] Function $p(\cdot)$ is smooth, monotonically increasing and strictly concave. The project requires capital $B \in (0,1)$ which is borrowed from a bank at the interest rate $r \geq 0$. The borrower can pledge a collateral $C \geq 0$ (in the case of land ownership C is the market value of the land). Both the borrower and lender are risk-neutral; the banking sector is competitive[8] and banks make zero expected profit on their loans.

First-best level of efforts e^* maximizes the expected surplus of the project $p(e)-B-e$ and satisfies the equation

$$p'(e^*)=1. \tag{1}$$

We assume that the maximal surplus is positive:

$$p(e^*)-e^*-B>0, \tag{2}$$

and therefore implementation of the project at the first-best level of efforts is socially optimal.

For a successful project, the firm keeps the net output $1-B(1+r)$ and the bank is paid $B(1+r)$, i.e. in full. If a project fails, the firm pays to the bank $\min\{C, B(1+r)\}$. The expected profit of the firm is

[7] Results of this section largely hold when project outcomes are described by a random variable of general kind with distribution monotonically increasing (in the stochastic dominance sense) in the level of efforts.

[8] This assumption differs from Besley, Ghatak (2010) and Besley et al. (2012), where the de Soto effect is studied against the backdrop of non-competitive credit markets.

$$\Pi = p(e)\big(1-B(1+r)\big)-\big(1-p(e)\big)\min\big\{C, B(1+r)\big\}-e, \tag{3}$$

whereas the expected profit of the bank is $p(e)Br+\big(1-p(e)\big)\big[\min\big\{C, B(1+r)\big\}-B\big]$.

Level of effort e and interest rate r form an equilibrium if the former maximizes the profit of the firm, given the interest rate, and the latter leaves the bank break-even for the given effort level. One can easily check that if $C \geq B$, then the only equilibrium is $e = e^*$, $r = 0$. Otherwise for $C \leq B$ an equilibrium (e, r) satisfies the following equations:

$$p'(e)\big[1-B(1+r)+C\big]=1, \tag{4}$$

$$p(e)\big[B(1+r)-C\big]=B-C. \tag{5}$$

An equilibrium should also meet the participation constraint $\Pi \geq 0$, which due to (5) is equivalent to

$$p(e)-e-B \geq 0 \tag{6}$$

(notice that profit of the firm equals social surplus, since the expected profit of the bank is zero). According to (6), in equilibrium one has $e \in [\underline{e}, e^*]$, where $p(\underline{e})-\underline{e}-B=0$.

We will assume thereafter that B is high enough so that

$$\frac{d}{de}p(e)\left(1-\frac{1}{p'(e)}\right)<0, \ \forall e \in [\underline{e}, e^*] \tag{7}$$

(notice that this inequality is always satisfied for $e = e^*$).

Proposition 1. An equilibrium (4)-(6) exists if and only if $C \in [\underline{C}, B]$, for some $\underline{C} \in [0, B)$. For any $C \in [\underline{C}, B]$, equilibrium $e = e(C)$, $r = r(C)$ is unique and the functions $e(C)$ and $r(C)$ are, respectively, monotonically increasing and monotonically decreasing.[9]

Proof. Conditions (4) and (5) yield

$$C = B - p(e)\left(1-\frac{1}{p'(e)}\right), \tag{8}$$

[9] Besley and Ghatak (2010) observed similar monotonic relations between collateral, effort, and interest, in the case of monopoly lending with $p(e) = \sqrt{e}$.

$$Br = \left(1 - p(e)\right)\left(1 - \frac{1}{p'(e)}\right). \tag{9}$$

Let $\underline{C} \equiv B - p(\underline{e})\left(1 - \frac{1}{p'(\underline{e})}\right)$; then according to (7) in an equilibrium one should have $C \geq \underline{C}$, and $e = e(C)$ is uniquely defined by (8) and is monotonically increasing in C. Therefore according to (9) $r = r(C)$ is uniquely defined by (9) and monotonically decreases in C. ■

The above proposition shows that the equilibrium interest rate decreases in the size of collateral (which reproduces the de Soto effect), and becomes zero when the loan is fully secured. Therefore, if a firm owns land that can be used as collateral, it indeed improves its access to finance. Furthermore, collateral alleviates moral hazard by increasing effort, which reaches its maximal first-best level when the loan is fully secured.

Proposition 2. Equilibrium profit of the firm $\Pi(C)$ increases in $C \in [\underline{C}, B]$.

Proof. Equilibrium profit equals $p(e) - B - e$ with $e = e(C)$ and is a single-peaked function of e. Since the equilibrium levels of effort are to the left of the peak value $e = e^*$, the profit increases in e over the equilibrium range, and hence (due to Proposition 1), also in C. ■

Proposition 2 shows that, in agreement with the de Soto dictum, the ability to pledge privately owned land as a collateral improves firms' performance. This proposition also sheds light on the mechanism of such link between land ownership and economic performance, which is often erroneously ascribed to the de Soto effect per se. In fact, this is just a proximate cause: according to (3) firms' savings due to lower interest when the project is successful are exactly offset by higher payments to the bank when the project ends in a failure. In other words, the tradeoff "higher collateral – lower interest rate" in the case of perfectly competitive banking has no impact on the profit of borrowers. The fundamental cause of the economic benefits of secured lending is the alleviation of moral hazard – higher collateral increases efforts and brings the equilibrium closer to the social optimum, with the firm capturing all the gains.[10] Notice also that the marginal returns to the collateral

$$\Pi'(C) = p(e(C))(1 - Br'(C)) - 1 = p'(e(C))e'(C)\left[B(1+r) - C\right]$$

[10] See Besley et al. (2012) for a similar argument.

(we made use of the envelope theorem and condition (5)) is decreasing in $C \in \left[\underline{C}, B\right]$ (due to concavity of $p(e)$) and equals zero once the loan becomes fully secured. Therefore, marginal benefits of the de Soto effect become negligible in the close-to-full-liability range.

3.2 Secured lending with insecure property rights

Suppose now that property rights of the firm are insecure, and the firm is under threat of expropriation. Our model of unsecure property rights is as follows. When property rights lack protection, firms' assets are vulnerable to expropriation. To privately offset expropriation, the firm expends resources, and the value of such outlays, plus possible losses to expropriation, comprise the costs of insecure property rights to the firm. For simplicity we assume that such costs are proportional to the value V of the firm targeted for expropriation, and equal $(1-\gamma)V$, where $\gamma \in [0,1]$ is a measure of property rights security.[11]

Recall that if a project is successful, it generates a unit output, so the total value of the firm is $V = 1 + C$ (before paying due to the bank). A failed project leaves the firm with value $V = C$. Insecure property rights reduce these values to respectively $\gamma(1+C)$ and γC (it as assumed that expropriation is attempted before payments to the bank are made; other timing assumptions lead to similar results). Therefore, insecure property rights leave the firm with the following expected profit:

$$\Pi = p(e)\left[\gamma - B(1+r)\right] - \left(1 - p(e)\right)\min\left\{\gamma C, B(1+r)\right\} - (1-\gamma)C - e, \qquad (10)$$

[11] This simple closed-form expression can be endogenized e.g. as follows. Suppose that value V is contested by an expropriator who invests $x \geq 0$ in the contest, and the firm defends its assets by offsetting expenditures $y \geq 0$. Contest is successful with probability $\frac{\mu x}{\mu x + y}$, where $0 \leq \mu \leq 1$, which is an asymmetric version of Tullock's contest success function. Legal ownership title gives the firm an advantage over the expropriator in such contest; such advantage varies from complete ($\mu = 0$; property rights are fully protected) to nil ($\mu = 1$; property rights lack any protection). Therefore μ can be viewed as a property rights insecurity measure. Solving for equilibrium in the above contest game, one finds $x = y = \frac{\mu V}{(1+\mu)^2}$, and hence the remaining expected value of the firm is $\frac{y}{\mu x + y}V - x = \frac{V}{(1+\mu)^2}$, or, γV, where $\gamma \equiv \frac{1}{(1+\mu)^2}$ measures security of property rights.

and expected profit of the bank equals $p(e)Br+(1-p(e))\left[\min\{\gamma C, B(1+r)\}-B\right]$. As before, in equilibrium (e,r) the firm chooses the profit-maximizing level of effort, while the interest rate leaves the bank break-even.

If the value of collateral after expropriation exceeds the loan principal, i.e. $\gamma C \geq B$, then in equilibrium $r=0$ and $e=e^*(\gamma)$, where

$$\gamma p'\left(e^*(\gamma)\right)=1. \tag{11}$$

Notice that $e^*(\gamma)<e^*$ for $\gamma<1$; due to insecurity of property rights even fully secured loans do not entail socially optimal efforts. This time the shortfall is caused not by moral hazard, but by the losses to expropriation.

If $\gamma C < B$, then the equilibrium satisfies the following equations analogous to (4), (5):

$$p'(e)\left[\gamma - B(1+r)+\gamma C\right]=1, \tag{12}$$

$$p(e)\left[B(1+r)-\gamma C\right]=B-\gamma C. \tag{13}$$

Participation constraint which must be met in equilibrium is as follows: $\Pi \geq -(1-\gamma)C$ (if a firm does not undertake a production project, it loses a part of its collateral's value to expropriation), which is equivalent to

$$\gamma p(e)-e-B\geq 0. \tag{14}$$

According to (11), (14), when property rights are vulnerable, the equilibrium range of efforts shrinks from the original segment $[\underline{e},e^*]$ to its proper subset $\left[\underline{e}(\gamma),e^*(\gamma)\right]$, where $\gamma p\left(\underline{e}(\gamma)\right)-\underline{e}(\gamma)-B=0$. Notice that if the protection of property rights falls below a critical level found from the equation $\gamma p\left(e^*(\gamma)\right)-e^*(\gamma)-B=0$, then no lending is possible and the project will not be undertaken – this is in agreement with the general observation that poor protection of property rights suppresses market activities (Murphy et al., 1993). For the remainder of this section we assume that γ is above this critical level.

The following statement extends Proposition 1 to the case of insecure property rights.

Proposition 3. An equilibrium (12)-(14) exists if and only if $C\in\left[\underline{C}(\gamma),B/\gamma\right]$, for some $\underline{C}\in[0,B/\gamma)$. For any $C\in\left[\underline{C}(\gamma),B/\gamma\right]$, equilibrium $e=e(C,\gamma)$, $r=r(C,\gamma)$ is unique and

the functions $e(C,\gamma)$ and $r(C,\gamma)$ are, respectively, monotonically increasing and monotonically decreasing in C.

Proof. Similarly to Proposition 1, one obtains from (12) and (13)

$$\gamma C = B - p(e)\left(\gamma - \frac{1}{p'(e)}\right), \tag{15}$$

$$Br = (1 - p(e))\left(\gamma - \frac{1}{p'(e)}\right). \tag{16}$$

Notice that due to assumption (7) and the fact that $\left[\underline{e}(\gamma), e^*(\gamma)\right] \subseteq [\underline{e}, e^*]$, the right-hand side of (8) monotonically increases in *e* over the equilibrium range of efforts, and therefore one can put $\underline{C}(\gamma) \equiv B - p(\underline{e})\left(\gamma - \frac{1}{p'(\underline{e})}\right)$; the rest of the proof is the same as in Proposition 1. ■

According to the above proposition, higher collateral still alleviates moral hazard caused by limited liability, even if property rights are insecure. Furthermore, it also improves access to finance, and therefore the de Soto effect holds irrespective of property rights' (in)security. However, there is a major distinction with the benchmark case of secure property rights: when property rights are threatened, it is not guaranteed that higher collateral increases the firm's profit. In fact, an increase of collateral could leave a firm *worse-off*.

Interplay of two effects explains this outcome. The first effect is the alleviation of moral hazard, which improves profit. The second effect is driven by higher losses due to elevated expropriation threat caused by more valuable assets in firm's possession. When collateral approaches the full liability level B/γ, the strength of the first effect is vanishing, since the firm's marginal returns to efforts $\gamma p'(e) - 1$ converges to zero; once the full liability effort is exceeded, the level of efforts $e^*(\gamma)$ stays the same, and the first effect completely disappears. The second effect however is constant and therefore dominates over the first one for collaterals close to or exceeding the full liability threshold.

Proposition 4. When $\gamma < 1$, equilibrium profit $\Pi(C,\gamma)$ decreases in C in the case of limited liability $C < B/\gamma$, when C is sufficiently close to B/γ, and in the case of full liability, when $C \geq B/\gamma$.

Proof. In the case of limited liability one has, due to the envelope theorem and equation (13), $\Pi_C(C,\gamma) = p\big(e(C,\gamma)\big)\big(\gamma - Br_C(C,\gamma)\big) - 1 = p'\big(e(C,\gamma)\big)e_C(C,\gamma)\big[B(1+r) - \gamma C\big] + \gamma - 1$. When $C = B/\gamma$, equilibrium interest rate is zero, and hence $\Pi_C(C,\gamma) < 0$. By continuity, the same is true for $C < B/\gamma$ when C is sufficiently close to B/γ. When $C > B/\gamma$, one has $e(C,\gamma) = e^*(\gamma)$, $r(C,\gamma) = 0$, $\Pi_C(C,\gamma) = p\big(e^*(\gamma)\big)\gamma B - (1-\gamma)C - e^*(\gamma)$ and therefore $\Pi_C(C,\gamma) = -1 + \gamma$. ■

Finally, observe that improvement of property rights protection under certain conditions increases marginal payoff to collateral – in other words, net benefits of secured lending are contingent on the protection of property rights. We prove this, as in the previous proposition, for sufficiently high values of collateral.

Proposition 5. When $C < B/\gamma$ and C is sufficiently close to B/γ, and when $C \geq B/\gamma$, one has $\Pi_{C\gamma}(C,\gamma) > 0$.

Proof. It follows from the proof of Proposition 4 that $\Pi_{C\gamma}(C,\gamma) = 1$ for $C \geq B/\gamma$. One can easily check that the function $\Pi_{C\gamma}(C,\gamma)$ is continuous and hence $\Pi_{C\gamma}(C,\gamma) > 0$ for C less than B/γ and sufficiently close to B/γ. ■

The above analysis leads to the conclusion that net benefits of secured lending are contingent on the protection of property rights. When property rights are well-protected, valuable assets owned by a firm, such as land, could be pledged as loan collaterals and help resolve the moral hazard problem, leaving the firm better off. When property rights are protected poorly, such assets turn into net liabilities, and increased risks of expropriation leave the firm worse-off. Therefore, the quality of property rights protection is indeed a sorting factor affecting the costs-benefits balance of land ownership by commercial firms.

4 Empirical Strategy and Data

We explore empirically the interaction between land ownership and property rights protection in the Russian industrial sector. In doing so, we take advantage of significant variations of both the land use regimes by Russian firms and of the institutional quality across the Russian economy.

Variations in the land use regime are largely of historical and/or political nature, and reflect different regional policies on this subject. Presently there are three such regimes – (i) private ownership, (ii) lease from regional or municipal governments, and (iii) "perpetual use". The latter is a holdover of the Soviet practice whereby a firm can keep its land in perpetuity (essentially having the usufruct right), but is not allowed to transfer land to other users and hence not having the alienation right. Land was largely exempted from the sweeping privatization of the Russian economy in the early 1990s (for a detailed history of land use in the Russian industrial sector see Karas et al., 2015). On many occasions, urban land was of potentially higher value than obsolete equipment, buildings and other privatized assets, and its divestiture from subnational governments to firms continued for the next few years at a piecemeal rate. In 1997 regional administrations were granted a nearly complete discretion over the transfer of land to industrial firms, which resulted in a patchwork of land use regimes across the country, including outright bans in some regions of land ownership in the industrial sector.

A landmark federal legislation passed in 2001 – the Land Code – was expected to streamline and expedite the process and extend private ownership from real estate objects to the land plots to which those objects are attached. In particular, the Land Code has established unified pre-set terms for transferring land titles to actual land users. Since then, land ownership by Russian firms in terms of acreage has increased five-fold, but there was only a modest increase in the number of organizations (legal entities) owning land (Figure 1). Besides, the application and enforcement of the Land Code remained highly uneven across the country, as it was the case with some other nation-wide market reforms initiated at the federal level (Yakovlev, Zhuravskaya, 2013), including inter alia a suburban residential land titling program known as "dacha amnesty" (Vlasova et al., 2012). Regional and local authorities retained de facto significant discretion over land policies and in particular the ability to manipulate urban land prices and to resort to red tape to steer the process (see e.g. Kisunko, Coolidge 2007).

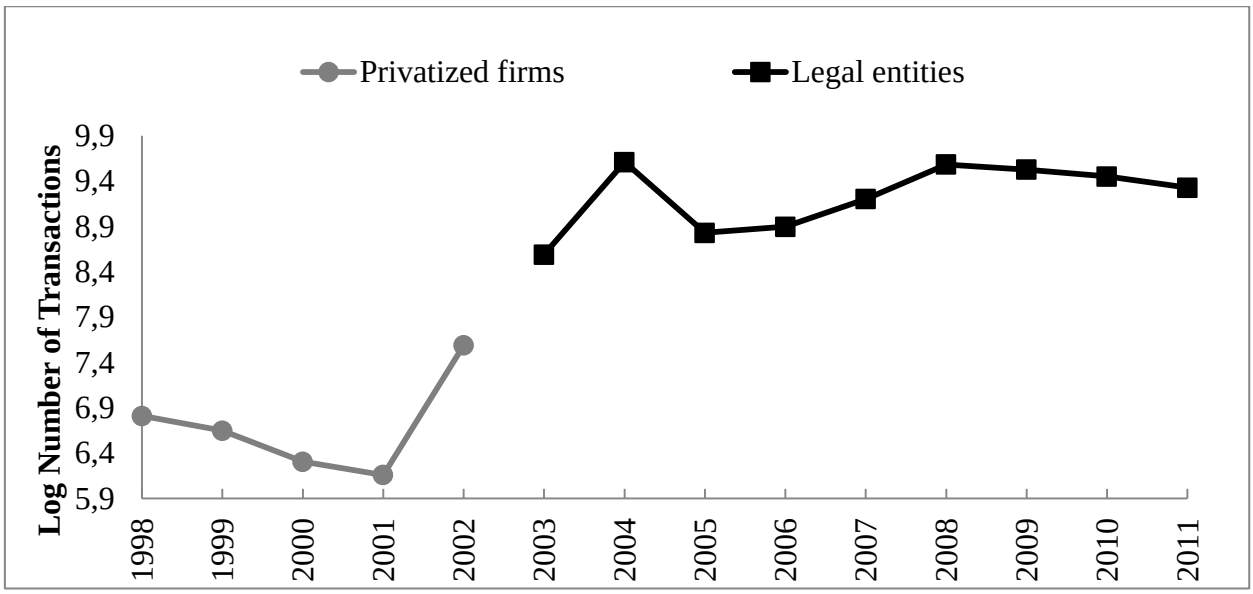

Figure 1. Dynamics of Land Ownership by Russian Juridical Persons, 1998 – 2011

Source: State (National) Reports on the State and Use of Land in the Russian Federation, Moscow, 2000 – 2011

As a result, in today's Russian economy land ownership by industrial firms is still far from universal –according to a recent industrial sector survey (see below), less than 25% of Russian firms are land owners. Variations in land ownership to a significant extent reflect uneven disposition of subnational governments to divest land to businesses, and as such are not endogenous to firms' performance. This, according to Karas et al. (op. cit.), makes the Russian industrial sector more suitable for an empirical analysis of the impact of land ownership on economic outcomes, than in some other cases (see e.g. Galiani, Schargrodsky, 2010).

We also make use of profound variation across the Russian Federation of our second variable of interest – the quality of institutions, including the protection of property rights[12] (see e.g. Baranov et al., 2015). Interregional institutional diversity goes back to the 1990s, when the central government ceded to regions key economic policy and institutional reform prerogatives, and such devolution had resulted in a patchwork of distinct institutional regimes. The institutional diversity largely survived through the ensued re-centralization of the Russian state: despite of the dominance of the central government's "vertical power", regions retained broad policy and institutional autonomy de facto. In fact, against the backdrop of deteriorating national institutions and economic stagnation, interregional institutional diversity in Russia was in all likelihood growing wider (Baranov et al., op. cit.).

[12] To avoid confusion, one should distinguish *security* of property rights, which is understood as protection against expropriation by government, elites, competitors etc., from formal possession of land titles. In many transition and developing countries, including Russia, these are separate concepts (see also Acemoglu, Johnson, 2005).

For both of our factors of interest – land ownership and institutional quality – we use the same main source of data, i.e. the Business Environment and Enterprise Performance Survey (BEEPS) project as the main data source. BEEPS, launched in 1999 by the European Bank for Reconstruction and Development, surveys executives of randomly selected enterprises from different countries to collect information on the environment in which their businesses operate. Such surveys were conducted in several waves; in our main specifications we use data collected in Russia in wave 5 (2011-2012, hereafter BEEPS 2012), whereas the previous wave 4 (2008-2009, hereafter BEEPS 2009) with fewer observations and covered regions is used for robustness check.

BEEPS data are used to estimate profit, access to finance, and (in)security of doing business. They also supply control variables, including firm size (measured by the labor force) and age. Furthermore, we average responses of business executives in a region on various aspects of the environment in which their firms operate to obtain measures of institutional quality in that region. Measures of red tape and corruption in Russian regions are calculated in Baranov et al. (2015) by factor analysis using BEEPS 2012. Corruption index is constructed as the first principle component of average kickbacks paid on state contracts, and average bribes to government officials. Red tape index is calculated as the first principle component of time spent on obtaining an operating license, frequency of inspections, and the burdens of obtaining licenses and complying with tax law. In addition, we use shares of informal employment in regional labor force (from Rosstat data on unofficial employment) as a yet another independently obtained index of institutional quality in Russian regions.

Finally, BEEPS 2012 provides direct information on whether a firm owns its land, and if so, what part.[13]

The sample in BEEPS 2012 consists of 4220 firms from 37 Russian regions; 974 of these firms own their land fully or in part. The distribution of firms by region and industry are presented in Figures 2 and 3. Regional distribution is fairly balanced with the median value of 120 firms per region. A majority of BEEPS 2012 firms operate in the service sector.

[13] In BEEPS 2009 such information was absent, and we had to match firms' addresses and/or GPS coordinates with data from the public cadastral map provided by the Federal Service for State Registration, Cadaster and Cartography (Rosreestr). This map contains information on ownership status and full history of transactions with a particular land plot.

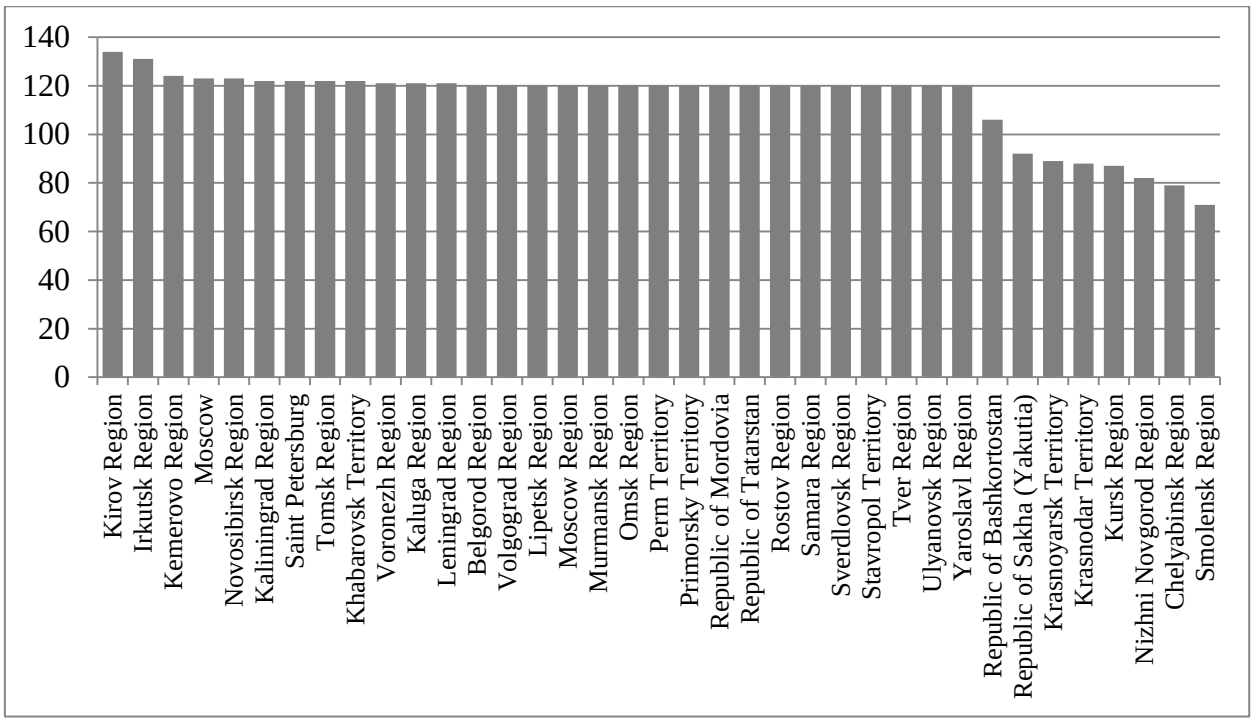

Figure 2. Distribution of BEEPS 2012 firms by region

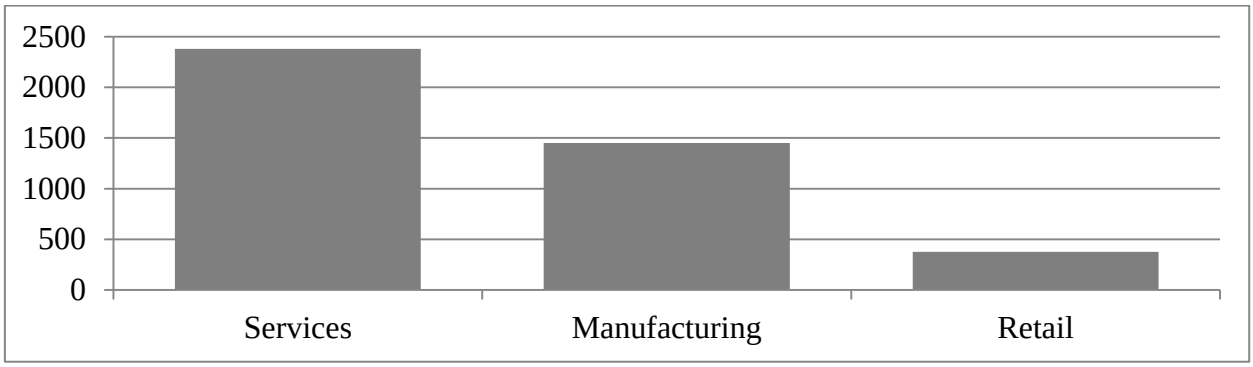

Figure 3. Distribution of BEEPS 2012 firms by industry

Table 1. BEEPS 2012 Descriptive Statistics

Variable	Mean	St. Dev.	Min	Max
Number of employees	68.77	330.85	4	11000
Number of competitors	9.78	12.56	0	100
Percent of the land owned by a firm	24.50	41.42	0	100
Profit	$2.13 \cdot 10^{8}$	$2.12 \cdot 10^{9}$	$-3.00 \cdot 10^{9}$	$7.97 \cdot 10^{10}$
Access to finance as an obstacle	1.32	1.35	0	4
Payment for security	0.67	0.47	0	1
Size of kickback (percent of the contract value)	3.30	8.33	0	100
Average size of bribes to officials (percent of the total sales)	0.92	4.00	0	60
Number of tax inspections	2.88	4.17	1	60
Tax administration as an obstacle	0.96	1.20	0	4
Business licensing and permits as an obstacle	0.77	1.25	0	4
Percent of total senior management's time spent on dealing with requirements imposed by government regulations	17.36	21.52	0	100

Source: BEEPS 2012

Since we intend to explore empirically the joint impact of land ownership and institutional quality on firms' performance, it is important that the regional variation in the progress of land privatization does not covary with the regional variation in our measures of institutional quality. This is illustrated by the following scatter plots (Figures 4-6), where the above measures of institutional quality are plotted against the land privatization index – the regional ratio of urban residential-commercial-industrial land owned by enterprises and that owned by government entities – proposed in Karas et al. (2015) as a proxy of private land ownership in the industrial sector. The pairwise correlation between the land index and each of these variables is not statistically different from zero (-0.21 for corruption, p-value 0.21; -0.05 for red tape, p-value 0.78; and 0.08 for informal employment, p-values 0.65). It is clear from the plots that there is plenty of variation in the land index holding the institutional quality measure constant, and vice versa. Therefore, Russia indeed provides a good testing ground for studying the interplay between property rights protection and land ownership in the industrial sector.

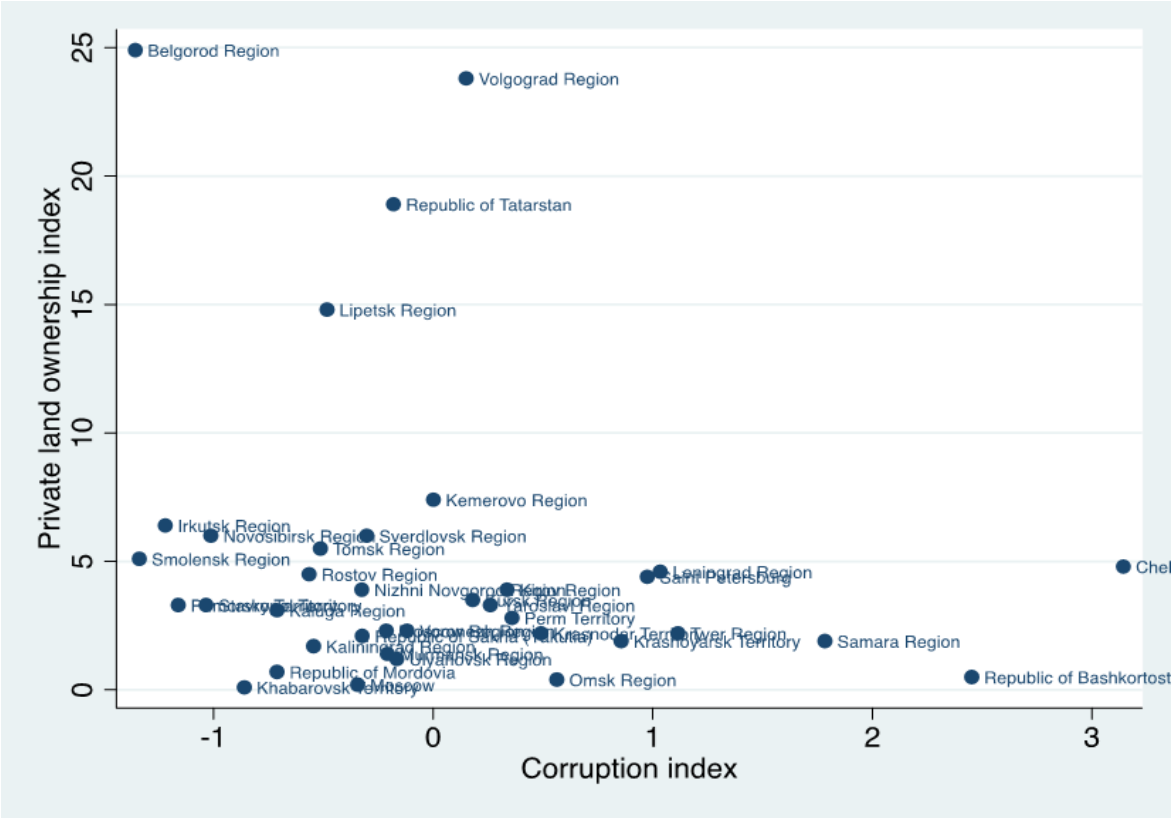

Figure 4. Land ownership and corruption

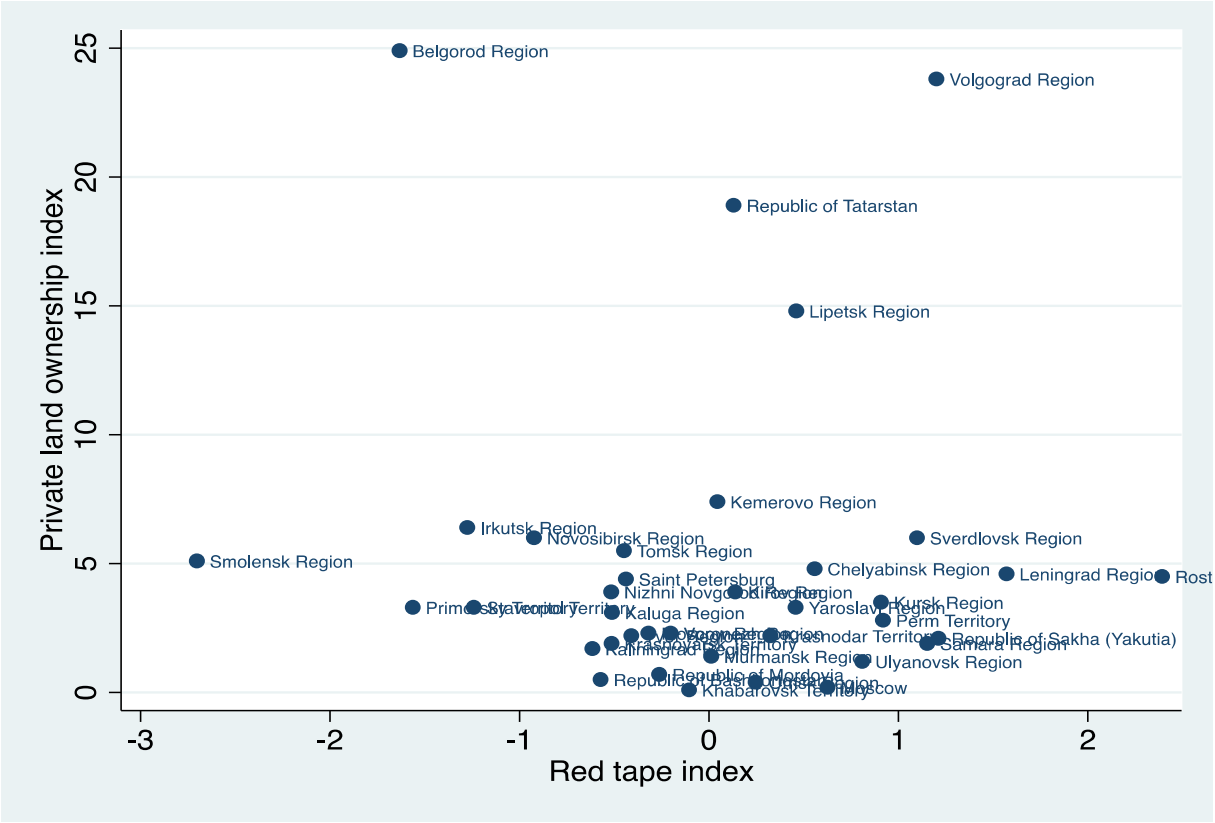

Figure 5. Land ownership and red tape

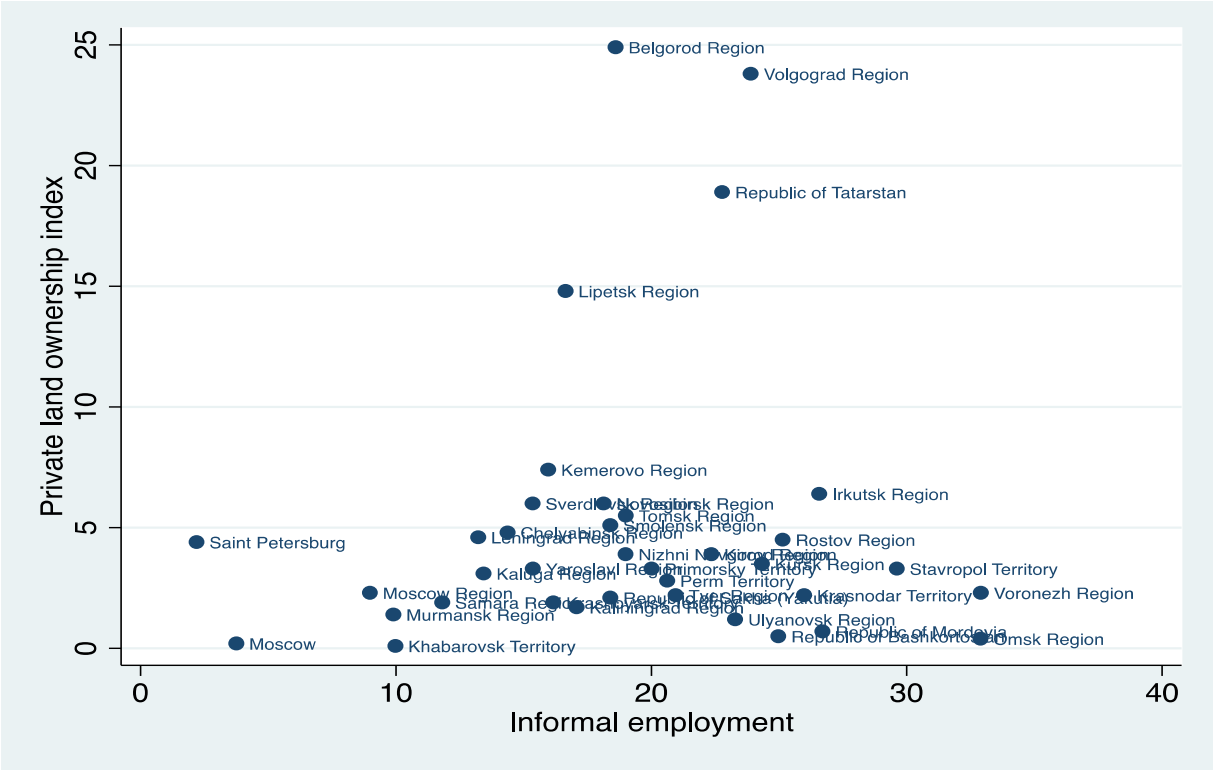

Figure 6. Land ownership and informal employment

5 Main Results

Our empirical strategy is as follows. First, we estimate partial effects of land ownership for access to finance and firms' outlays for security and dealing with government officials, which are expected to represent, resp., benefits and costs of land ownership. Next, we estimate the overall impact of land ownership for the performance of firms in the sample. In these estimations we interact land ownership with various measures of institutional quality to demonstrate the expected complementarity.

BEEPS 2012 generally agrees with the de Soto effect in the Russian industry previously observed by Karas et al. (2015) – land ownership indeed improves access to finance, although the observed effect is not particularly strong and in some specifications its significance falls below 10%. In regressions reported in Table 2 the dependent variable measures the difficulty in accessing external financing and takes the following values: 0 ("no obstacle"), 1 ("minor obstacle"), 2 ("moderate obstacle"), 3 ("major obstacle"), and 4 ("very severe obstacle"). Our control variables hereafter include the number of permanent full-time employees, age of a firm,

and region and industry fixed effects. Regional fixed effects are important, given the variations of firms' land ownership across the Russian Federation (see the previous section), as well as interregional variations of economic performance and business environment in Russia. We also observe the same effect in an even sharper form in BEEPS 2009 data (not reported here).

Table 2. Land ownership and access to finance

	Access to finance as an obstacle (0–4 scale)					
Share of land owned by the firm	-0.000851* (0.000455)	-0.000876* (0.000480)	-0.000897* (0.000484)	-0.000946* (0.000493)	-0.000661 (0.000501)	-0.000688 (0.000508)
(Log) number of employees		0.001882 (0.015931)	0.000065 (0.016916)	-0.017459 (0.017744)	0.002260 (0.017317)	-0.016909 (0.018151)
(Log) years since establishment			0.012150 (0.026992)	0.017620 (0.027463)	0.009704 (0.027728)	0.012801 (0.028181)
Sector fixed effects	No	No	No	Yes	No	Yes
Regional fixed effects	No	No	No	No	Yes	Yes
N	3384	3378	3344	3344	3344	3344
Pseudo R^2	0.0004	0.0004	0.0004	0.0067	0.0248	0.0350

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses.

Next, we seek evidence of costs and liabilities of land ownership. To this end, we observe that land ownership is positively correlated with higher security costs (Table 3), which is in full agreement with our theory and hypotheses. This correlation is much more statistically significant (1%-5%, depending on specification), than in the de Soto effect.

Table 3. Land ownership and security costs

	Payment for security (1 – yes, 0 – no)					
Share of land owned by the firm	0.006509*** (0.000592)	0.004231*** (2.561)	0.004097*** (0.000635)	0.003640** (0.000647)	0.004436*** (0.000665)	0.003947*** (0.000676)
(Log) number of employees		0.311492*** (0.021997)	0.293221*** (0.022973)	0.325677*** (0.024408)	0.306428*** (0.023892)	0.335947*** (0.025370)
(Log) years since establishment			0.096396*** (0.033474)	0.089387*** (0.034347)	0.126688*** (0.034893)	0.120463*** (0.035745)
Sector fixed effects	No	No	No	Yes	No	Yes

Regional fixed effects	No	No	No	No	Yes	Yes
N	3473	3465	3430	3419	3430	3419
Pseudo R^2	0.0298	0.0809	0.0828	0.1068	0.1287	0.1492

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses.

We further expect that costs and liabilities of land ownership depend on the quality of surrounding institutions, and increase when institutions deteriorate. To this end, we estimate a regression of another index of insecure property rights – times spent on dealing with government regulation, whereas institutional quality is measured by the share of informal employment in a region (under the standard assumption that the quality of institutions is inversely related to the size of informal sector – see e.g. Baranov et al., 2015). The interaction of the two variables of interest – land ownership and informal employment – has the predicted sign and is significant at the 5% level (Table 4). These regressions show that deterioration of institutions imposes a heavier regulatory burden on land-owning firms.

Table 4. Land ownership, institutional quality and regulatory burden

	Percentage of time spent on dealing with government regulations					
Share of land owned by the firm	.003675 (.009452)	0.002077 (0.009450)	- 0.067532** (0.030566)	- .0068749** (0.030810)	- 0.068499** (0.030945)	- 0.067109** (0.030975)
Informal employment		0.183145*** (0.056440)	0.112259* (0.063695)	0.114030* (0.063810)	0.121700* (0.064249)	0.135122** (0.064507)
Informal employment × Share of land owned by the firm			0.003483** (0.001455)	0.003515** (0.001456)	0.003420** (0.001462)	0.003175** (0.001463)
(Log) number of employees				0.104472 (0.333695)	-0.055948 (0.354162)	-0.199046 (0.368774)
(Log) years since establishment					0.860272 (0.559465)	0.795280 (0.566202)
Sector fixed effects	No	No	No	No	No	Yes
N	3132	3132	3132	3126	3096	3096
Adj. R^2	-0.0003	0.0028	0.0043	0.0041	0.0045	0.0096

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses.

Finally, we turn to the overall impact of land ownership for Russian firms, inclusive of the above costs and benefits. To this end, we use various measures of institutional quality, such as corruption, red tape, and the size of informal economy (measured by informal employment). For each of these measures, we regress profit on land ownership alone, land ownership and an institutional quality measure, and finally on the above variables and their interaction under different sets of control. In all specifications (Tables 5-7) we consistently observe that the interaction of land ownership and institutional quality have the predicted signs and are significant at the 1%-5% levels; these results are robust to various sets of controls.[14]

Table 5. Land ownership, corruption, and profit

	Profit					
Share of land owned by the firm	5394518*** (1241199)	5400550*** (1240905)	5153432*** (1245187)	1297360 (1293678)	1295693 (1310995)	1142492 (1332625)
Corruption		$-7.79\cdot10^7$** ($5.56\cdot10^7$)	-9397418 ($6.56\cdot10^7$)	-5475966 ($6.43\cdot10^7$)	-4002825 ($6.48\cdot10^7$)	5485791 ($6.53\cdot10^7$)
Corruption × Share of land owned by the firm			-2562593** (1301411)	-2582806** (1275550)	-2554866** (1286509)	-2974801** (1303713)
(Log) number of employees				$3.82\cdot10^8$*** ($4.21\cdot10^7$)	$3.82\cdot10^8$*** ($4.53\cdot10^7$)	$3.84\cdot10^8$*** ($4.76\cdot10^7$)
(Log) years since establishment					5759474 ($7.37\cdot10^7$)	$1.59\cdot10^7$ ($7.49\cdot10^7$)
Sector fixed effects	No	No	No	No	No	Yes
N	1981	1981	1981	1981	1972	1972
Adj. R^2	0.0090	0.0094	0.0109	0.0498	0.0490	0.0506

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses.

[14] BEEPS 2009 data also demonstrate the expected effect, although due to a smaller sample and cruder measures of land ownership it is less sharp than in the case of BEEPS 2012. Recall that our theory predicts complementarity of land ownership and institutional quality for collaterals close to or in excess of full liability (Proposition 5). This latter condition appears to be met in Russian industry – urban land owned by firms is sufficiently valuable to cover their borrowing needs. Indeed, in an earlier BEEPS 2002 for almost 80% of firms that reported pledging collateral for loan, the value of collateral was equal to or in excess of 100% of the loan. The median and mean of collateral as percentage of loan were, respectively, were 130% and 142%.

Table 6. Land ownership, red tape, and profit

	Profit					
Share of land owned by the firm	5394518*** (1241199)	5373466*** (1240942)	5500778*** (1245187)	1649588 (1292630)	1663526 (1303501)	1542443 (1326531)
Red tape		$-1.19\cdot10^{8}$** ($5.34\cdot10^{7}$)	$-1.87\cdot10^{7}$ ($6.31\cdot10^{7}$)	$-2.52\cdot10^{7}$ ($6.19\cdot10^{7}$)	$-2.57\cdot10^{7}$ ($6.21\cdot10^{7}$)	$-2.59\cdot10^{7}$ ($6.24\cdot10^{7}$)
Red tape × Share of land owned by the firm			-3618917*** (1310576)	-3477350*** (1201195)	-3433421*** (1211998)	-3649143*** (1224094)
(Log) number of employees				$3.81\cdot10^{8}$*** ($4.21\cdot10^{7}$)	$3.83\cdot10^{8}$*** ($4.52\cdot10^{7}$)	$3.84\cdot10^{8}$*** ($4.75\cdot10^{7}$)
(Log) years since establishment					978775 ($7.36\cdot10^{7}$)	$1.37\cdot10^{7}$ ($7.48\cdot10^{7}$)
Sector fixed effects	No	No	No	No	No	Yes
N	1981	1981	1981	1981	1972	1972
Adj. R^2	0.0090	0.0109	0.0148	0.0535	0.0526	0.0543

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses.

Table 7. Land ownership, informal employment, and profit

	Profit					
Share of land owned by the firm	5394518*** (1241199)	5585320*** (1240942)	$1.69\cdot10^{7}$*** (3702507)	$1.22\cdot10^{7}$*** (3671907)	$1.23\cdot10^{7}$*** (3687032)	$1.24\cdot10^{7}$*** (3707570)
Informal employment		$-1.53\cdot10^{7}$** (6986845)	-3289009 (7887644)	1191298 (7755609)	1121725 (7788341)	1260138 (7838247)
Informal employment × Share of land owned by the firm			-579953*** (178518)	-534609*** (175228)	-537424*** (175763)	-553002*** (176357)
(Log) number of employees				$3.73\cdot10^{8}$*** ($4.23\cdot10^{7}$)	$3.74\cdot10^{8}$*** ($4.53\cdot10^{7}$)	$3.75\cdot10^{8}$*** ($4.76\cdot10^{7}$)
(Log) years since establishment					1615218 ($7.37\cdot10^{7}$)	$1.17\cdot10^{7}$ ($7.49\cdot10^{7}$)
Sector fixed effects	No	No	No	No	No	Yes

N	1981	1981	1981	1981	1972	1972
Adj. R^2	0.0090	0.0108	0.0156	0.0524	0.0518	0.0531

*** P < 0.01; ** P < 0.05; * P < 0.1. Standard errors in parentheses

Therefore, we conclude that our hypothesis that the economic payoff to land ownership in the Russian industrial sector is contingent on the quality of surrounding institutions finds robust support in data. While land ownership could improve firms' performance, its net benefits are significantly eroded by a lack of property rights protection, and when institutions are particularly poor, land ownership turns into a net liability for Russian firms. This can be seen from Figures 2-4 below which show full marginal effects (inclusive of the interaction term with institutional quality) of land ownership, based on regressions reported in Tables 13-15. According to these figures, for particularly bad institutions such effect is indeed negative and statistically significant at the 5% level.

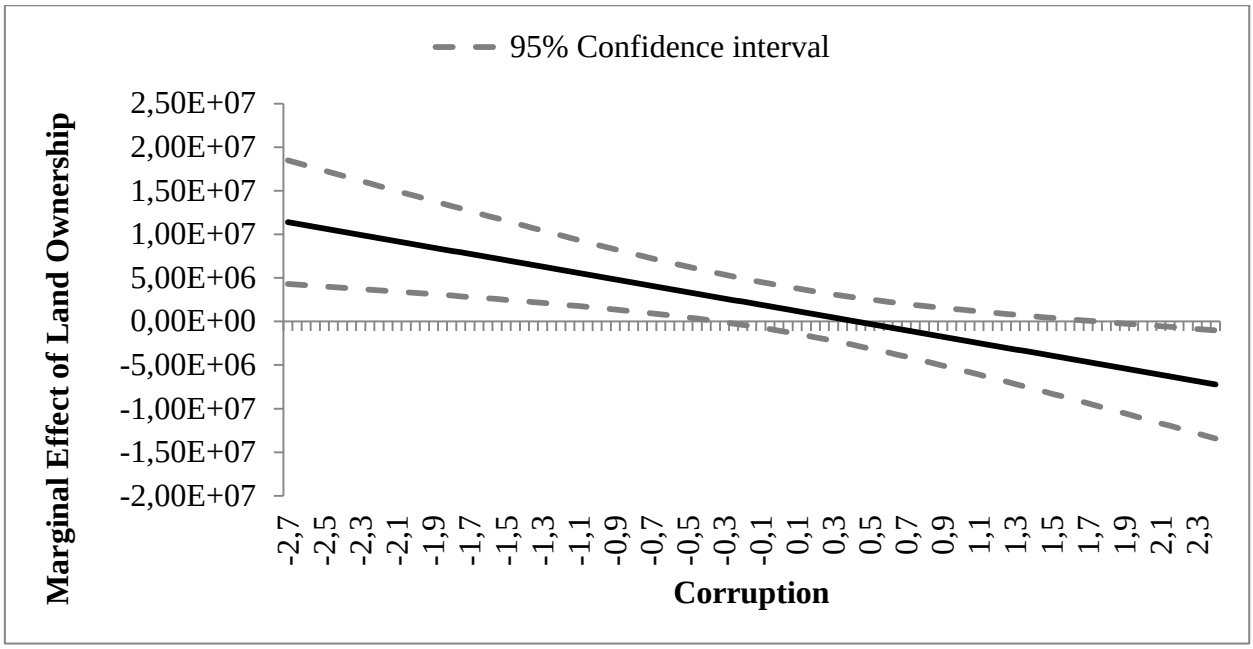

Figure 7. Full marginal effect of land ownership on the profit inclusive of corruption

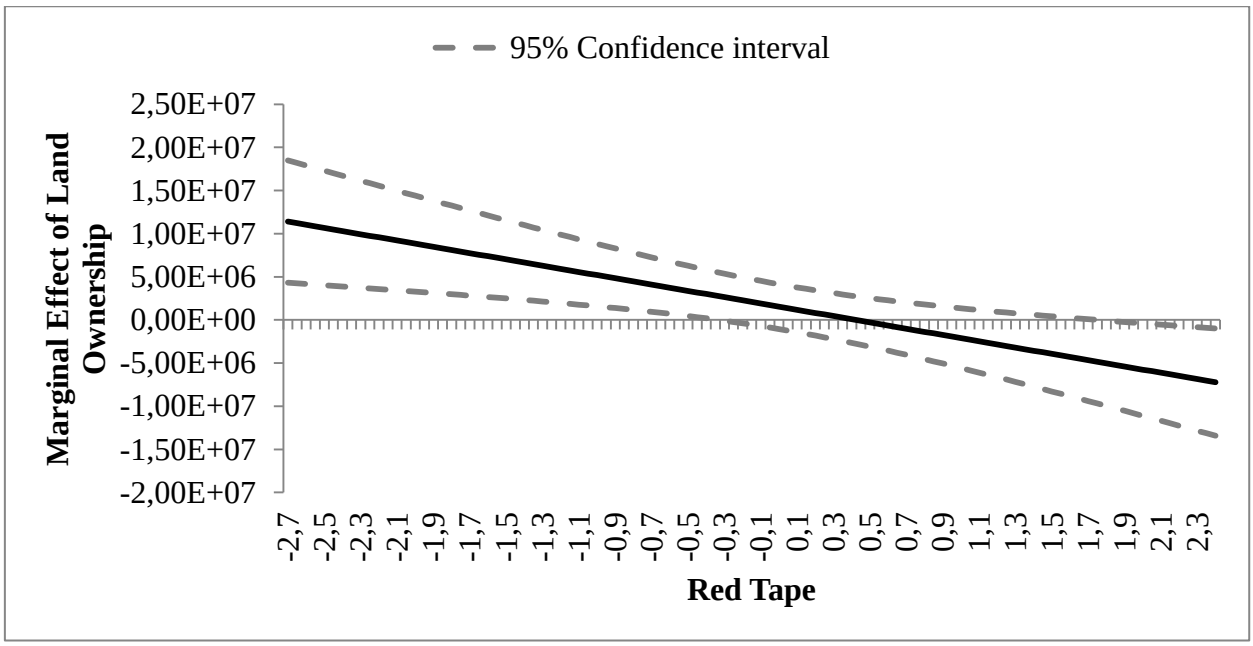

Figure 8. Full marginal effect of land ownership on the profit inclusive of red tape

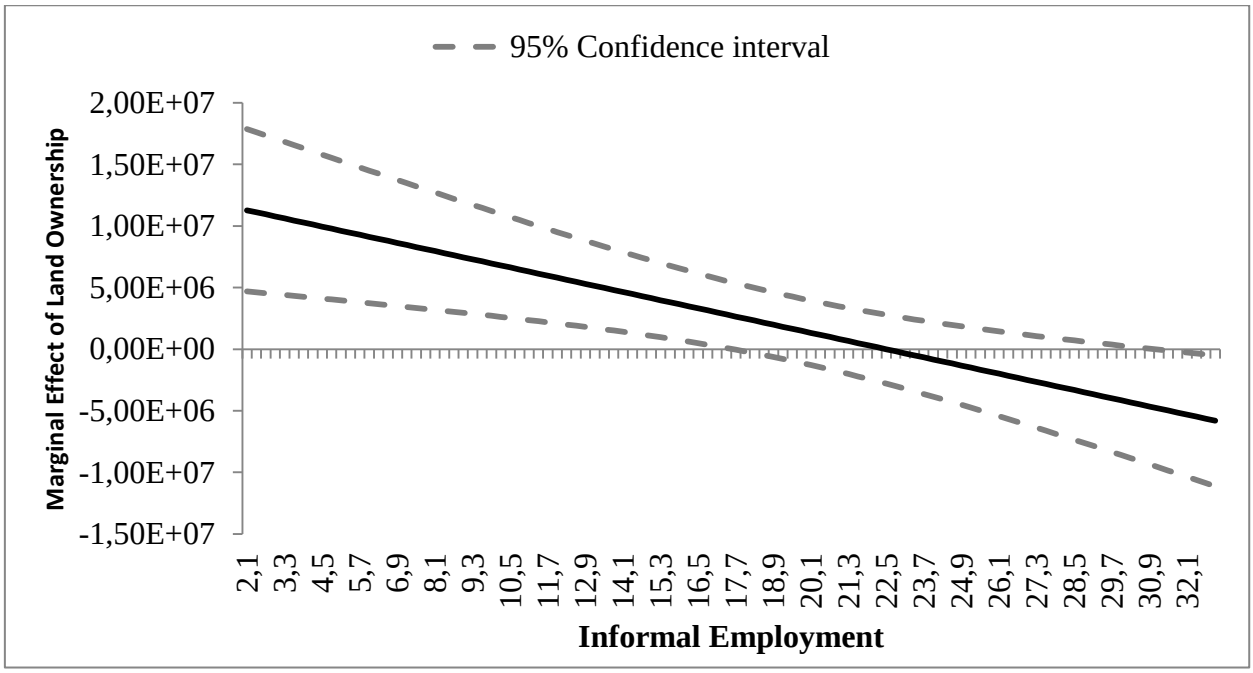

Figure 9. Full marginal effect of land ownership on the profit inclusive of informal employment

6 Concluding Comments

Private ownership confers numerous benefits, including stronger performance incentives, better use of privately owned assets, and improved access to finance. We argue in this paper that in reality, the benefits of land privatization are contingent upon the quality of the surrounding institutions, such as competitive markets, rule of law, and corruption prevention, and present new empirical evidence based on a Russian private sector survey that clearly demonstrates such conditionality. If the market value of land is added to the often much lower value of complementary assets, such bundle becomes a more attractive target for expropriation than the assets excluding the land. Therefore if private property rights are insecure due to a lack of the rule of law, corruption and other institutional pathologies, privatization of land heretofore owned de facto, but not de jure, could put businesses in greater danger of hostile takeovers, raider attacks etc., often by dubious if not outright criminal means. We presented a simple equilibrium model, which makes the above intuition precise and shows that indeed if land is privatized by businesses operating under insecure property rights, this could adversely affect such firms' performance. On the other hand, if property rights are secure, land privatization brings about economic benefits envisaged by de Soto. This leads to a testable hypothesis that overall institutional quality complements land ownership in terms of economic payoffs.

We test this hypothesis by using data on land ownership, operation, and economic performance of Russian commercial firms. In doing so we take advantage of a two-stage procedure of the privatization in the Russian economy, whereby the first stage involved the privatization of firms' tangible and intangible assets but excluding land. The latter was privatized to various degrees, if at all, at later stages. As a result, presently in the Russian private sector one finds a variety of land use and ownership patterns, combined with full private ownership of attached above-the-ground production assets. Hence, land ownership could be considered as a "treatment" and its effect measured by proper econometrics techniques. We show in the paper that while land ownership indeed produces the expected benefits for Russian commercial firms, the magnitude of these benefits depends on the institutional quality of the firms' surrounding operational environment. Furthermore when such environment is poor (e.g. characterized by rampant corruption, red tape and other institutional pathologies), land ownership could become a significant net liability for firms.

Further research is needed to adequately address potential endogeneity which is a major consideration in land ownership studies (see e.g. Galiani, Schargrodsky, 2010; Karas et al, 2015).

Thus, one may be concerned about regional factors that affect both the subnational disposition toward land ownership and firms' performance. Additionally, even after accounting for these regional characteristics, either through fixed effects or controlling for observable regional covariates, some of the residual variation in land ownership could plausibly be associated with unobservables that correlate with individual firm performance.[15] As such, the presented empirical results should not be strictly interpreted as causal statements. However, to the extent that cross regional variation swamps the within region variation in land ownership, the scope for potential bias may be limited. Moreover, investigating whether the correlations between land ownership and firm performance are consistent with the theory we have presented in the paper is still a useful and meaningful exercise.

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[15] We intend to address the above endogeneity problem in a subsequent publication.

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