

PROPERTY RIGHTS, TRANSACTION COSTS, AND THE LIMITS OF THE MARKET.*

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Abstract

Although the intuition that incomplete property rights can be efficient when transaction costs are sizable is well-known, we still lack a formal framework to think about this idea. Within trade interactions, a rise in transaction costs has the marginal effect of inefficiently pushing some high-valuation potential buyers to expropriate the good and the infra-marginal one of decreasing the social gain from the transfers that continue to be consensual. Then, it must also reduce the protection of property rights, which is the probability that expropriating potential buyers are excluded from consumption. This pattern holds true regardless of whether transaction costs are driven by frictions outside the control of traders or determined by the mix of the dispersion in their valuation and either the original owners' market power or their privileged information. A similar conclusion applies to an upstream firm's property rights on an input necessary to a downstream firm to introduce a new technology and whose cost is random and ex ante non contractible. This time, transaction costs rise with the likelihood of a more productive technology. These implications survive if a group of traders/innovators has a larger political influence on institutional design and if the disincentive effect of weak property rights is considered. The model predictions are consistent with the negative effects of proxies for market frictions and failures on measures of the protection of personal, intellectual, and financial property that I document for a panel of 135 countries spanning the 2006-2015 period. This evidence suggests that the negative correlation between weak property rights and outcomes might be partly spurious.

Keywords: Property Rights; Transaction Costs; Market Frictions; Market Failures.

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“Whenever transactions [...] are very expensive, [...] coercion is inherent [and] society will pick the entitlement it deems favorable to the general welfare” [Calabresi and Melamed 1972, p. 1101].

“As soon as the land of any country has all become private property, the landlords, like all other men, love to reap where they never sowed, and demand a rent even for its natural produce” [Smith 1976, p. 67].

1 Introduction

Albeit overwhelming evidence shows that strong property rights foster trade and innovation, only recently economists have begun to study the determinants of this institution by looking at the trade-off between the dispersed coercive power in a state of anarchy and the predation by a central enforcement authority (Besley and Ghatak, 2010). Here, I qualify these contributions by incorporating into the economics literature the key insight proposed by a well-known legal scholarship (Calabresi and Melamed, 1972) and, notably, that incomplete property rights can be efficient when transaction costs impede economic activities.

To characterize the trade-off between inefficient exclusion from trade/innovation and expropriation guiding property rights selection, I study both the possibly consensual exchange of an asset between its original owner and a potential buyer and a downstream firm’s choice of whether to produce in-house through an old technology or to adopt a new more efficient one necessitating an upstream firm’s input. In the former case, I build on Guerriero (2016a), and I study a society equally split into original owners, who have the same valuation for the only good in the economy, and potential buyers, who are instead endowed with heterogeneous valuations. The former are randomly matched to the latter by an intermediation technology that allows each potential buyer to either obtain the good via consensual transfer by paying the original owner’s valuation and bearing socially wasteful transaction costs or expropriate it at no cost. I define property rights as the probability that an expropriated good is given back to its original owner. When property is fully protected, some potential buyers with valuation higher than that of the original owners are inefficiently excluded from trade due to transaction costs. When instead the protection of property is weak, low-valuation potential buyers inefficiently expropriate original owners. A rise in transaction costs has the marginal effect of inefficiently pushing some high-valuation potential buyers to expropriate

the good and the infra-marginal effect of decreasing the social gain from the transfers that continue to be consensual. Then, it must also reduce the protection of the original owner’s property rights and in turn the size of the market. This pattern holds true regardless of whether transaction costs are driven by frictions outside the control of traders—e.g., financial inefficiencies—or endogenously determined by the mix of the dispersion in the traders’ valuations and either the original owners’ market power or their privileged information.¹ I reach similar conclusions when I turn to investment interactions and I study a society equally split into randomly matched downstream and upstream firms. The new technology requires the provision by the upstream firm of an input whose random cost is realized after the downstream firm has borne an upfront expense. While both costs and the firms’ payoffs are unverifiable and ex ante non contractible, only the cost of the input is ex post contractible. Without loss of generality in particular, I maintain that after the preliminary phase the upstream firm has all the bargaining power and so tries to hold-up his match by asking the high-cost realization. The downstream firm can then either accept to pay the inflated cost, switch to the old technology, or turn to the legal system. In the last case, the payoffs are determined by the upstream firms’ property rights, which capture now the odds with which the downstream firm must accept the high cost. This assumption squares with the idea that courts exploit unverifiable information to favor the party they prefer regardless of the contract terms (Gennaioli, 2013). When the protection of the upstream firms’ property rights is strong, the risk of being held-up discourages the downstream firms from innovating. When instead the upstream firms are only weakly protected, low-productivity downstream firms inefficiently exploit the input. Balancing these two misallocations entails that the protection of property rights (size of the market) will be weaker (larger) the greater incomplete contracting costs are, i.e., the higher is the probability that the cost is low.

Crucially, all the model implications survive when a group of traders/innovators has a larger political influence on institutional design and when the disincentive to effort effect of weak property rights is taken into account, and they apply to a wider range of cases. To

¹Transaction costs are then “any impediments or costs of negotiating” [Calabresi and Melamed 1972, p. 1095]. This definition is regarded by a broad literature as inconsistent with the Coasian logic of organization, which would imply that transaction costs are the costs of “establishing and maintaining property rights” [Allen 1999, p. 898]. Yet, if both expropriation and trade are endogenous, it is ex-post misallocation, and not the ex-ante incentive to protect property, the key driver of property rights (Dari-Mattiacci and Guerriero, 2015).

elaborate on the last point, the legal expropriation by a potential buyer (downstream firm) is strategically similar to a condoned squatting of either a land or a building, the compulsory licensing granted to an intellectual property infringer, a majority stockholder’s legal capacity to tunnel creditors’ and minority shareholders’ resources out of a firm, and the discretion of a principal to lawfully segment a market (an agent’s power to successfully breach a contract).

To assess whether the basic correlations in the available data are consistent with the model predictions, I analyze a panel of 135 countries for which the Executive Opinion Survey—EOS, hereafter—run by the World Economic Forum reports measures of the protection of personal, intellectual, and financial property and proxies for transaction costs between 2006 and 2015 (see table 1). The EOS is the longest-running survey of the opinions of business leaders on a broad range of topics for which statistics are unreliable, outdated, or nonexistent (WEF, 2015).² Starting with property rights, I consider three indicators ranging between one and seven and gaging respectively the protection of generic property including financial assets—i.e., *Property-Rights*, the defense of intellectual property rights including anti-counterfeiting measures—i.e., *Intellectual-Property*, and the safeguard of the interests of minority shareholders, i.e., *Shareholders-Protection* (see table 2 for the definition and sources of these and the remaining variables used in the present study). Since these rights are typically defined on final goods [Burk and McDonnel 2007, p. 591-594], the three indexes constitute an inverse (direct) metrics of the property rights of the upstream (downstream) firms. The maps in figure 1 visualize the strong correlations among these three measures—nowhere lower than 0.81—and their sizable variation across countries. To draw these maps, I averaged each variable over time, and then I divided their ranges into four equal intervals. In the empirical test instead, I use the continuous variables. Crucially, the evidence remains essentially the same when I consider objective measures of property rights and in particular the length of adverse possession of personal property and the investor protection index developed by the Doing Business project (see the Internet appendix).³ Turning to the proxies for exogenous and endogenous transaction costs, I consider respectively measures of

²The 2015 edition gathered more than 14,000 responses in 144 countries (WEF, 2015). I substitute missing observations with the closest data points. This choice is immaterial to the gist of the analysis.

³Adverse possession is a form of property rights acquisition such that a possessor becomes the legal owner of a good without the original owner’s consent, but by virtue of a sufficiently long, open, continuous, and notorious possession. The relative proxy however has no time variation (Dari-Mattiacci and Guerriero, 2015).

the severity of market frictions—i.e., excessive regulation and financial inefficiencies—and proxies for market failures—i.e., lack of the competitiveness of corporate activity, lemons-type distortions, and incomplete contracting costs due to asset specificities.

OLS estimates suggest that the protection of personal, intellectual, and financial property is the weakest where market frictions and failures are the largest and asset specificities are the most limited. These results are consistent with the model predictions, but they may be capturing reverse causation, the confounding effect of omitted variables, and/or error in the measurement of transaction costs. To gain more insights about causality without the presumption to prove it, I pursue three strategies. First, I control not only for country and year fixed effects, but also for the development level, inclusiveness of political institutions, level of nonproduced output, external and internal conflicts, and human capital. Considering these observables together leaves the results almost intact. Second, I use insights from Altonji, Elder, and Taber (2005) to calculate how much greater the influence of unobservable factors, relative to observables, would need to be to explain away the negative links between property rights and transaction costs. I find that the influence of unobservables would have to be on average sixty times greater than that of all observables considered together, which seems unlikely. Finally, I devise a 2SLS approach based on the positive dependence of market failures on the dispersion in the traders' valuations and of incomplete contracting costs on the likelihood of a more productive technology foreseen by the model. To elaborate, I document strong negative (positive) first-stages between the measures of exogenous transaction costs, the extent of market power, and lemons-type distortions (asset specificities) and proxies for both the availability of the latest technologies and the quality of math and science education. These results are consistent with recent firm-level evidence suggesting that the distance to the technology frontier—and thus the difference in the desirability of old and new products—is smaller in countries endowed with a human capital more apt to absorb ideas and knowledge and in which therefore the likelihood of a more productive technology is larger (Añón Higón et al., 2017). Conditional on all observables, the 2SLS estimates are very similar to the OLS ones, and the validity of the exclusion restriction is vindicated by two extra results. First, the Kleibergen-Paap test always rejects under-identification at the 1 percent or less. Second, the over-identifying restrictions cannot be rejected at a level nowhere lower than 5 percent,

and the excluded instruments have no direct role in the semi-reduced form regressions. All in all, this evidence makes it difficult to envision that OLS correlations are spuriously driven by reverse causation, a different theoretical mechanism, or measurement error. Accordingly, I take them as consistent with causality running from transaction costs to property rights.

The present study is strictly related to several strands of literature. First, a legacy of recent contributions shows that weak property rights can be optimal in an endowment economy (Jordan, 2006; Bar-Gill and Persico, 2016; Segal and Whinston, 2016; Arruñada, Zanarone, and Garoupa, 2017). Not only do I extend this result to production economies by clarifying how weak property rights can curb market frictions and partially solve market failures,⁴ but I also highlight the relationships between the latter and either the dispersion in the traders' valuations or the likelihood of a more productive technology. Accordingly, my analysis is also related to a body of research—still in its infancy—on endogenous transaction costs (Dari-Mattiacci, 2012; Barry, Hatfield, and Kominers, 2014).⁵ Finally, Acemoglu and Johnson (2005) focus on the relative importance of protecting property rights and enforcing contracts, whereas I examine the determinants of the trade-off between these two institutional strategies created by the possibility of transferring value without consent. Differently from this contribution moreover, I also emphasize that weak property rights are society's response to the existence of sizable transaction costs and thus their negative correlation with economic outcomes might be partly spurious (see for a similar argument Aghion et al., [2010]).

The paper proceeds as follows. In section 2, I discuss the basic relationships between property rights and transaction costs to motivate my more general model, which I illustrate in section 3. Next, I assess how likely is that these correlations are causal in section 4. Finally, I conclude in section 5, and I gather the proofs, tables, and figures in the appendix.

2 Property Rights and Transaction Costs

While all legal systems punish theft and embezzlement and provide remedies for the dispossessed owners, the protection of property against private expropriation is almost never

⁴Albeit based on the same basic model, Guerriero (2016a) focuses instead on the relationship between property rights and the heterogeneity in the potential buyers' valuations and does not consider either the issue of technology adoption or the related problem of identifying the drivers of incomplete contracting costs.

⁵While the former emphasizes the feedback of legal rules on transaction costs, the latter draw a link between transaction costs and how egalitarian is the distribution of the collective gains from Coasian bargaining.

complete as clearly displayed in the maps in figure 1. When transaction costs are sizable indeed, a private party is often allowed to take someone else’s property with or without paying compensation (Bouckaert and De Geest, 1995). To cast a first glance at whether this pattern describes also the EOS data, I correlate the aforementioned measures of property rights with one to seven indexes of the severity of both market frictions and the market failures discussed below, i.e., market power, lemons-type distortions, and incomplete contracting costs.

Starting with market frictions, I focus on the financial sector for its crucial relevance for trade and innovation, and I evaluate an index measuring its difficulties in providing products and services to businesses, i.e., *Unavailability-Financing*. A value of one suggests that the financial sector provides a wide variety of product and services, whereas a value of seven implies that it does not provide them at all. Turning to market power, I employ an index capturing the lack of competitiveness, i.e., *Market-Dominance*. A value of one suggests that corporate activity is spread among many firms, whereas a value of seven implies that it is dominated by few business groups. For what concerns lemons-type distortions, I use an index falling with the extent of information used by buyers, i.e., *Asymmetric-Information*. A value of one suggests that purchases are based on a sophisticated analysis of attributes, whereas a value of seven implies that they are based solely on the lowest price. Finally, I capture incomplete contracting costs with a measure of human capital specificity gaging the competitive advantage of the country’s companies in international markets, i.e., *Asset-Specificities*. A value of one suggests that it is low cost labor or natural resources, whereas a value of seven implies that it is represented by unique products and processes.

Conditional on country and year fixed effects, the partial correlations between the measures of property rights and *Unavailability-Financing*, *Market-Dominance*, and *Asymmetric-Information* (*Asset-Specificities*) in figures 2 to 4 (figure 5) reveal that there are strong negative (positive) links between the protection of the original owners’ (downstream firms’) property and market frictions and failures (asset specificities), which are based on a sizable within variation and not driven by a handful of abnormal observations.⁶ Columns (2), (3), (5), and (6) of table 3 report estimates of these correlations from regressions run on the subsamples for which I observe all the additional controls illustrated in section 4.1.1 and

⁶My results are similar when I exclude the outliers identified through the Cook’s distance (Cook 1977).

whose standard errors allow for clustering by country. To illustrate, a one-standard-deviation rise in *Unavailability-Financing*, *Market-Dominance*, or *Asymmetric-Information (Asset-Specificities)*—roughly 1 (0.9)—is associated with about a 0.3(0.4)-standard-deviation—i.e., around 1—fall (rise) in the strength of property rights. These coefficients are all significant at 5 percent or better, and they are coherent with the evidence coming from two alternative one to seven indexes of respectively market frictions and failures (see columns (1) and (4) of table 3). While the former gages the burden of administrative requirements on firms—i.e., *Over-Regulation*, the latter measures the impact of non-tariff barriers on the ability of imported goods to compete with domestic ones, i.e., *Trade-Barriers*. More generally, I document in the Internet appendix that the negative links between the original owners’ property rights and market frictions (failures) survive when the latter are proxied by either the necessity of bribery for the activity of firms, their difficulty to obtain a bank loan, or the hurdle they face when raising money by issuing shares on the stock market (the lack of competitiveness of local markets). Similarly, the positive relationship between the downstream firms’ property rights and asset specificities continues to hold when the latter is measured by either a proxy for capital and asset specificities or one for site specificity (Williamson, 1983).⁷

Next, I present a model of the design of property rights on exchangeable value and innovation activities rationalizing several legal issues included the evidence discussed so far.

3 Theory

I first analyze the case in which transaction costs are driven by frictions outside the control of traders (innovators), and then I turn to characterize the scenario in which they are endogenously determined by the mix of the dispersion in the traders’ valuations and either the original owners’ market power or their privileged information (the likelihood of a more productive technology and the incompleteness of contracts). Finally, I document that the key model implications survive when the economy becomes “political” and thus someone is excluded from the institutional design (see section 3.3.1), and when the original owners can decide whether to produce or invest in their property (see section 3.3.2).

⁷Conditional on observables, these proxies strongly correlate with *Asset-Specificities* and R&D intensity.

3.1 Property Rights and Exogenous Transaction Costs

Following Guerriero (2016a), I consider a society composed by a mass one of original owners and a mass one of potential buyers, all having linear utility over a good x (see footnote 15 for the risk aversion case). While the original owners value x at v , the potential buyers have a valuation λ uniformly distributed over $[\underline{\lambda}, \bar{\lambda}]$ with $l \equiv \bar{\lambda} - \underline{\lambda}$, $\bar{\lambda} > v > \underline{\lambda}$, and $\lambda_m \equiv (\bar{\lambda} + \underline{\lambda})/2$. I employ the uniform distribution to obtain closed form solutions, but in the appendix I show that the results hold under more generic density functions.

Original owners are randomly matched to potential buyers by an intermediation technology allowing the latter to either obtain the good via consensual transfer by paying the former v and bearing positive transaction costs α or expropriate it at no cost. The assumption that expropriation is costless does not bear any loss of generality.⁸ α has no social value and gages inefficiencies like the costs borne by potential buyers to borrow v or those necessary to legalize the transfer and due to bribery, bargaining costs, excessive regulation, or a foreign intermediary's mark-up.⁹ I posit that $\alpha < \min\{v, \bar{\lambda} - v\}$, and I discuss this assumption in footnotes 12, 13, and 14. An expropriated x is returned back with odds γ , which thus summarizes the legal protection of the original owner's property rights or the odds with which the original owner is protected by a property rule as opposed to $1 - \gamma$, which is the chance with which the potential buyer is shielded by a liability rule (Calabresi and Melamed, 1972).

One glaring example of the type of expropriation just discussed is that of an intermediary (agent) selling to a buyer in good-faith a good stolen (embezzled) from an original owner (his principal) at a low price. As happens in the model, then the good is possibly given back to its original owner and the strength of property rights reduces the probability that the buyer consumes. More generally, when the potential buyer directly steals x , only with probability γ the legal system forces her to hand the good back to its original owner. All in all, then γ will be larger the longer the buyer needs to wait before acquiring ownership by adverse possession, the stronger are the remedies in the original owner's hands, and the more effective is law enforcement (Dari-Mattiacci and Guerriero, 2015). The model however applies to a

⁸The model implications survive when expropriation entails either an expensive effort or a punishment and if the liability rule prescribes positive damages, provided that these cost are not too large (Guerriero, 2016a).

⁹Notably, the setup I consider can be interpreted as an efficient market maker assigning high-valuation potential buyers to original owners in exchange for the wasteful payment α .

large array of legal instances. First, the good can be envisaged as an input producing a fixed value when transformed via the “old” technology in the hands of the original owners and an uncertain one when the “new” technology is applied by the potential buyers. Second, expropriation can assume the form of the squatting of either a piece of land or a building (Brueckner and Selod, 2009).¹⁰ Third, the conflict between an original owner and a potential buyer can be reinterpreted as the one involving the creator of an intellectual property and an infringer with $1 - \gamma$ being the chance of either exhaustion of the related rights or compulsory licensing (Ghosh, 2014; Bond and Saggi, 2017). Fourth, the same tension is isomorphic to that between a creditor/minority shareholder and a majority stockholder who can tunnel resources out of the firm through a complaisant management (Johnson et al., 2000). Finally, the very same interaction is strategically similar to that setting an agent against a principal in a segmented labor, financial or housing market with $1 - \gamma$ gaging the principal’s capacity to lawfully operate in the secondary segment (Piazzesi, Schneider, and Stroebel, 2017).

At time t_0 , γ is chosen to maximize the social welfare, which is the sum of the original owners’ and potential buyers’ utilities. At time t_1 , individuals learn who they are and, thus, their valuation. At time t_2 , individuals are matched by the intermediation technology. Finally at time t_3 , any expropriated x is given back to its original owner with probability γ .

In evaluating the foregoing, two remarks should be stressed. First, an alternative instrument in the hands of society is to decrease α . This policy reduces market distortions leading to complete property rights (see footnotes 12 and 13), but it is very costly to implement because of political imperfections (Besley and Ghatak, 2010) and the opposition of those agents who gain from larger transaction costs (see section 3.2 and Barry, Hatfield, and Kominers, [2014]). Second, the model implication are unaffected when the original owners have heterogeneous valuations and the traders can bargain over the price (Guerriero, 2016a).

3.1.1 Equilibrium

A potential buyer buys if her valuation λ net of the purchasing costs $v + \alpha$ is greater than her expected payoff from expropriation $(1 - \gamma) \lambda$, i.e., $\lambda \geq \hat{\lambda} \equiv \frac{v + \alpha}{\gamma}$.¹¹ When selecting

¹⁰The good can be conceived as having a fixed value for the original owner and an uncertain one for the state as in the instances regulated by “partial taking” law. Then, the state pays severance damages $(1 - \gamma)v$ to the original owner to compensate a partial expropriation by the potential buyer (Sackman et al., 2013).

¹¹Provided that only one good can be consumed, the results continue to stand even if those x that are purchased

the optimal property rights level γ^* ,¹² society then maximizes the strictly concave function

$$\int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda - \alpha}{l} d\lambda + \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{(1 - \gamma) \lambda + \gamma v}{l} d\lambda \quad (1)$$

for $\hat{\lambda} < \bar{\lambda} \leftrightarrow \gamma^* \in \left(\frac{v + \alpha}{\bar{\lambda}}, 1 \right]$ and the full expropriation social welfare $(1 - \gamma) \lambda_m + \gamma v \equiv W^{FE}$ whenever $\hat{\lambda} \geq \bar{\lambda}$ and therefore all potential buyers prefer to expropriate.

Switching from complete to incomplete property rights—i.e., from $\gamma^* = 1$ to $\gamma^* < 1$ —has three effects: 1. it saves α at the cost of misallocating x with probability γ^* for the $v + \alpha \leq \lambda < \hat{\lambda}$ matches; 2. it avoids misallocation with probability $1 - \gamma^*$ for the $v \leq \lambda < v + \alpha$ matches by expanding the consumption set of the potential buyers; 3. it misallocates x with probability $1 - \gamma^*$ for the $\lambda < v$ matches. While this last effect is negative, the sum of the first two is positive, provided that α is not too small.¹³ For $\hat{\lambda} < \bar{\lambda}$, optimal property rights are uniquely defined by the necessary and sufficient first-order condition

$$-2 \frac{d\hat{\lambda}}{d\gamma} \left(\gamma^* \hat{\lambda} - \gamma^* v - \alpha \right) - \left(\hat{\lambda}^2 - \underline{\lambda}^2 \right) + 2v \left(\hat{\lambda} - \underline{\lambda} \right) = 0 \leftrightarrow (\gamma^*)^2 = \frac{v^2 - \alpha^2}{\underline{\lambda}(2v - \underline{\lambda})}. \quad (2)$$

Equation (2) implies that a rise in γ has a marginal effect, which is positive, and an infra-marginal effect $\int_{\underline{\lambda}}^{\hat{\lambda}} \frac{v - \lambda}{l} d\lambda = -\frac{(\hat{\lambda} - \underline{\lambda})(\hat{\lambda} + \underline{\lambda} - 2v)}{2l}$, which can be negative only if $v < \lambda_m$. For $v \geq \lambda_m$ then, optimal property rights are complete since also W^{FE} rises with γ . For $v < \lambda_m$ instead, W^{FE} falls with γ and a $\gamma^* \leq 1$ is possible. It equals either the level defined by equation (2) or 0 depending on which of the two maximizes the social welfare. The latter is more likely the case the larger α is.¹⁴ Moreover, an interior γ^* falls with α (see figure 2).

Intuitively, a rise in α has the marginal effect of raising $\hat{\lambda}$ and thus misallocating goods otherwise earmarked to high-valuation potential buyers with probability γ^* and the infra-marginal effect of decreasing the social gain from the transfers that continue to be consensual, i.e., for which $\lambda \geq \hat{\lambda}$. Both effects call for a smaller γ^* . Proposition 1 rephrases this idea:¹⁵

can be expropriated before consumption since all those willing to expropriate have already done it.

¹²The objective function in equation (1) is strictly concave for $\alpha < v$. Should this inequality fail, γ^* will be 1 (0) for $v < \lambda_m$ if the social welfare is larger at 1 (0) than it is at 0 (1), i.e., whenever $(v + \alpha)^2 - 2(\alpha \bar{\lambda} + v \underline{\lambda}) + \underline{\lambda}^2 > (\leq) 0$. This last inequality is more difficult to satisfy the larger α is because of the hypothesis $v + \alpha < \bar{\lambda}$.

¹³Precisely, if $\alpha^2 > (1 - \gamma) v^2$. Moreover, $\gamma^* < 1$ whenever $\alpha > v - \underline{\lambda}$, which can be given my assumptions.

¹⁴The exact condition is $\gamma^* (\bar{\lambda} - v) > \alpha$, which is true for the lowest interior $\gamma^* = (v + \alpha) \bar{\lambda}^{-1}$ if $\alpha < \bar{\lambda} - v$.

¹⁵If risk-averse, the traders who gain an expected utility lower than that prevailing under the certain scenario

Proposition 1: *Optimal property rights γ^* weakly fall with the transaction costs α .*

Proposition 1 is not only consistent with the preliminary evidence discussed in section 2 and the more in depth analysis in section 4, but it also sheds light on several institutionalized cases of incomplete property rights. First, it rationalizes the post-war condoning of power thefts by Indian farmers. In fact, despite its annual cost is around 1.5 percentage points of the 2012 GDP, local politicians have been strenuously defending it by asserting that collecting the electricity invoices, which are mainly constituted by billing costs, would destroy subsistence farming (Charnoz and Swain, 2012). Second, the cost of eviction or the inability to provide a sufficient supply of housing because of regulatory requirements and speculative land-holding are the most recurring justifications to the tolerance towards the roughly 40 percent share of private lands invaded in developing countries and the two billion squatters estimated around the world (Brueckner and Selod, 2009). Third, exhaustion of intellectual property rights has been mainly implemented in high-transaction costs developing countries (Ghosh, 2014), whereas the Article 31 of the TRIPS agreement allows the participants to impose compulsory licensing if the commercial terms for a voluntary license are “unreasonable” (Bond and Saggi, 2017). Finally, Piazzesi, Schneider, and Stroebel (2017) conclude that financial costs explain 14 percent of the price gap between first and secondary housing market segments.

3.2 Property Rights and Endogenous Transaction Costs

Next, I evaluate several key instances of endogenously determined transaction costs.

3.2.1 Property Rights and Market Power

Following Guerriero (2016a), I consider the case in which the intermediation technology is in the hands of the original owners and α is the mark-up on their valuation v . They select it between t_1 and t_2 by maximizing the sum of the expected profits and the expected payoff from consuming x when handed back, i.e., $\frac{(v+\alpha)(\bar{\lambda}-\hat{\lambda})}{l} + \gamma^*v\frac{(\hat{\lambda}-\lambda)}{l}$ for $\frac{v+\alpha}{\gamma^*} = \hat{\lambda} < \bar{\lambda}$ and γ^*v otherwise. Then, α^* can be positive only for $\hat{\lambda} < \bar{\lambda}$ when it equals $\alpha^* = \frac{\gamma^*(\bar{\lambda}+v)}{2} - v$ and rises with the strength of property rights, which in turn increases the original owners’ payoff

of full property rights incur also a loss u . Since all original owners (potential buyers) weakly prefer complete (incomplete) property rights, a rise in risk aversion is isomorphic to a fall in v and thus induces a weakly lower γ^* . Indeed, an increase in v has the infra-marginal effect of boosting the original owners’ payoff when property rights are protected and the marginal effect of raising $\hat{\lambda}$. Both patterns imply a higher γ^* .

regardless of whether transfers are consensual. A rise in γ^* reduces instead the potential buyers' payoff from expropriating and, through its positive impact on α^* , their utility from buying x . Because of the linearity of preferences, the two effects cancel out and $\frac{d\hat{\lambda}}{d\gamma^*} = 0$ (see the Appendix). Since α is now a transfer, $\gamma^* < 1$ if the distortions in the potential buyers' demand are sizable. Being $\hat{\lambda} = \frac{\bar{\lambda}+v}{2} < \bar{\lambda}$, society maximizes the linear function

$$\int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda}{l} d\lambda + \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{(1-\gamma)\lambda + \gamma v}{l} d\lambda, \quad (3)$$

whose derivative with respect to γ for $v < \lambda_m$ is negative for $\alpha^* > (2v - \underline{\lambda})\gamma^* - v \leftrightarrow \bar{\lambda} + 2\underline{\lambda} > 3v$ and positive otherwise. Then, γ^* possibly jumps from 0 to 1 as α^* becomes sufficiently small. For $\gamma^* = 1$, $\alpha^* = \frac{(\bar{\lambda}-v)}{2}$ and the mark-up increases with the difference between high-valuation potential buyers' and original owners' valuation. Again, optimal property rights must be complete if $v \geq \lambda_m$. Proposition 2 takes stock of this analysis:

Proposition 2: *The optimal property rights level γ^* weakly decreases with the mark-up α^* , which in turn is larger the higher the dispersion in the traders' valuations $\bar{\lambda} - v$ is.*

Proposition 2 not only rationalizes some of the results discussed in sections 2 and 4, but it also helps make sense of growing evidence on the weakness of property rights on renewable resources in the presence of market power. Common access to the fishing harvest together with individual transferable quotas indeed is more often observed in Nova Scotia and New Zealand where the fishermen's market power is the strongest (Croutzet and Lasserre, 2017).¹⁶

3.2.2 Property Rights and Lemons-type Distortions

As noticed by Hasen and McAdams (1997), "theft may avoid the "lemons" problem." Following Guerriero (2016a), I maintain here that the original owners have private information on v , which is drawn from a uniform distribution with support $[0, \bar{\lambda}]$ and correlated with the valuation of the potential buyers. In particular, $\Delta/2$ of them value x at θv , $1 - \Delta > 0$ of them have valuation αv , and the remainder gain from consuming x a payoff v/θ with $\theta > 2 > \alpha > 1$. Here, θ gages the polarization of the potential buyers' preferences, α

¹⁶Focusing on the fishing industry, Croutzet and Lasserre (2017) also show that the strength of the property rights on renewable resources should fall with the elasticity of output to effort and rise with the price elasticity of demand, the number of firms, and the difference between input and output values.

covers the role that exogenous transaction costs have in the basic setup and represents a measure of the difference between the payoff of the middle-valuation potential buyers and the valuation of the original owners, and a rise in Δ constitutes a mean-preserving spread of the λ distribution. These three parameters emphasize the impact of lemon-type distortions on allocative efficiency in the regime L . To illustrate, middle and low-valuation potential buyers expropriate (do not consume) if $\gamma^* < (=) 1$ since the expected value of x is $p_L/2$ at the exogenous price p_L . Original owners indeed sell only if $v \leq p_L$. High-valuation potential buyers buy (expropriate) if $\gamma^* \geq (<) \frac{2}{\theta}$, and society maximizes the linear function

$$\theta \lambda_m \frac{\Delta}{2} + (1 - \Delta) [(1 - \gamma) \alpha \lambda_m + \gamma \lambda_m] + \left[(1 - \gamma) \frac{\lambda_m}{\theta} + \gamma \lambda_m \right] \frac{\Delta}{2} \quad (4)$$

for $\gamma^* \geq \frac{2}{\theta}$ and $(1 - \gamma) \left[(1 - \Delta) \alpha + \frac{\theta^2 + 1}{\theta} \frac{\Delta}{2} \right] \lambda_m + \gamma \lambda_m$ otherwise. Hence, the derivative of society's problem with respect to γ is positive for $\gamma^* \geq \frac{2}{\theta}$ and both $1 - \Delta$ and α sufficiently small and it is negative otherwise. Intuitively, as the share of middle-valuation potential buyers for which x will be misallocated under complete property rights becomes less important because of a rise in heterogeneity, γ^* jumps from 0 to 1 for α small. Similarly, a sufficiently large rise in lemons-type distortions α induces a decrease in the optimal property rights level from 1 to 0 for Δ small. Proposition 3 recaps the analysis of this section:

Proposition 3: *Optimal property rights γ^* weakly fall with the lemon-type distortions α , which in turn constitute a measure of the dispersion in the traders' valuations.*

Proposition 3 not only clears up some of the evidence illustrated in sections 2 and 4, but it also helps explain recent stylized facts about sharing economies. In particular, Lee (2016) builds on 2008 data on BitTorrent private-network file sharing activity and album sales to conclude that the former has no impact (a positive effect) on top(mid)-tier artists' sales for which asymmetric information on perceived talent is the least (most) detrimental.

3.2.3 Property Rights and Incomplete Contracting Costs

Setup.—Consider now a mass one of upstream firms and a mass one of downstream firms. The latter can employ two technologies to produce x . The “old” one does not necessitate any input from the upstream firm, and it produces one unit of output of value $\delta \lambda$ with $\delta < 1$, λ uniformly distributed over $[\underline{\lambda}, \bar{\lambda}]$, $l \equiv \bar{\lambda} - \underline{\lambda}$, $\bar{\lambda} > v > \underline{\lambda}$, and $\lambda_m \equiv (\bar{\lambda} + \underline{\lambda})/2$. The “new”

technology instead delivers one unit of output of value λ and requires first an upfront payment v by the downstream firm, and then the provision by the upstream firm of an input whose cost c is realized after the preliminary phase and equals 0 with probability $0 < \alpha < 1$ and $(1 - \delta)\lambda$ otherwise.¹⁷ While both costs and the firms' payoffs are unverifiable and ex ante non contractible, only the cost of the input is ex post contractible. Without loss of generality (see footnote 18), I maintain that after the preliminary phase the upstream firm has all the bargaining power. Hence, the cost uncertainty creates with odds α an "appropriable quasi-rent" $(1 - \delta)\lambda$, which is larger the more productive the new technology is relative to the old one, and in turn the incentive for the upstream firm to always claim that $c = (1 - \delta)\lambda$ (Barzel, 1989). Only with probability γ yet, the upstream firm is legally allowed to charge the high cost. Hence, γ captures the strength of the upstream firm's property rights on his input relative to the power of the downstream firms' property rights on x . When the input is an idea or know-how for instance, v might be seen as the expenses supported by the downstream firm to let the upstream firm understand how to incorporate his input in the old production process, c is the cost of providing the input, and γ can be interpreted as the probability that, in a lawsuit for breach of contract launched by the downstream firm, a court allows the upstream firm to charge for the input provision $(1 - \delta)\lambda$ instead of 0. This setup squares with the idea that courts display personal biases and arbitrarily evaluate the evidence when certain states are hard to verify and so subject to interpretation (Gennaioli, 2013). Then, the parameter γ can also be seen as the share of pro-upstream firm courts.

The timing of the institutional and economic activities is as follows. At time t_0 , γ is chosen to maximize the social welfare, which is the sum of upstream and downstream firms' payoffs. At time t_1 , each downstream firm selects her preferred technology. If the old one is employed, production is immediate, otherwise the downstream firm is matched to an upstream one and the two firms sign a contract establishing that in time t_2 the latter has residual rights on his input and all bargaining power at renegotiation (Grossman and Hart, 1986). At time t_2 , first the preliminary phase is concluded, then the upstream firm makes a take-it-or-leave-it request to the downstream firm. Next, the latter can either accept, reject

¹⁷Should the low cost be $\mu < (1 - \delta)\lambda$, the social welfare will equal $\alpha \int_{\tilde{\lambda}}^{\bar{\lambda}} \frac{\lambda - v}{\lambda} d\lambda + (1 - \alpha) \int_{\tilde{\lambda}}^{\bar{\lambda}} \frac{\lambda - v - \mu}{\lambda} d\lambda + \int_{\underline{\lambda}}^{\tilde{\lambda}} \frac{\delta \lambda}{\lambda} d\lambda$ with $\hat{\lambda} \equiv \frac{v + \gamma \alpha}{1 - \delta} \geq \tilde{\lambda}$ and the whole argument of this section will go through unchanged.

and turn to the old technology, or reject and exploit the available legal remedies. In this last case, the downstream and upstream firms' payoffs are determined by the prevailing γ .

Interpretation.—The parameter α should be seen as a general measure of incomplete contracting costs. To elaborate, the conflict between upstream and downstream firms resembles again that between a creditor/minority shareholder and a majority stockholder who can tunnel value out of the firm through a complaisant management asserting that investing in a new activity needs resources that are ex ante non contractible. Similarly, the contrast between the two firms is strategically equal to the interaction between a principal and an agent who can breach their contract by claiming that the ex ante non contractible cost of using a new technology is $(1 - \delta)\lambda$ instead of being 0 (Ganglmair, 2017).

Equilibrium.—For $\gamma^* = 1$, the downstream firm obtains $\delta\lambda - v$ with the new technology and $\delta\lambda$ with the old one. She prefers the latter and the social welfare is $\int_{\underline{\lambda}}^{\bar{\lambda}} \frac{\delta\lambda}{l} d\lambda$, which is inefficiently lower than that under the ex ante efficient equilibrium prescribing innovation and a downstream's (upstream's) expected payoff of $\alpha\lambda + (1 - \alpha)\delta\lambda$ (0) for $\lambda \geq \tilde{\lambda} \equiv \frac{v}{\alpha(1-\delta)}$.

Incomplete property rights solve this hold-up failure since they allow the downstream firm to obtain from adopting the new technology $\lambda - v$ with probability $1 - \gamma$ and $\delta\lambda - v$ otherwise and the upstream firm to get from the input provision the expected loss $(1 - \alpha)(1 - \delta)\lambda$ with probability $1 - \gamma$ and the expected gain $\alpha(1 - \delta)\lambda$ otherwise. Hence, the downstream firm will prefer the new technology for $\lambda \geq \hat{\lambda} \equiv \frac{v}{(1-\delta)(1-\gamma)}$, and the upstream firm will produce only if property rights are sufficiently strong, i.e., $\frac{\gamma^*}{(1-\gamma^*)} \geq \frac{1-\alpha}{\alpha} \leftrightarrow \gamma^* \geq 1 - \alpha$. For $\gamma^* \geq 1 - \alpha$ and $\hat{\lambda} < \bar{\lambda}$, society maximizes the following strictly concave function

$$\alpha \int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda - v}{l} d\lambda + (1 - \alpha) \int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\delta\lambda - v}{l} d\lambda + \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{\delta\lambda}{l} d\lambda, \quad (5)$$

which decreases with γ for $-\frac{d\hat{\lambda}}{d\gamma} \left[\alpha\hat{\lambda} + (1 - \alpha)\delta\hat{\lambda} - v - \delta\hat{\lambda} \right] = -\frac{v^2(\alpha-1+\gamma)}{(1-\delta)(1-\gamma)^3} \leq 0$, i.e., if $\gamma \geq 1 - \alpha$. To elaborate, a rise in $\gamma \geq 1 - \alpha$ has the welfare decreasing marginal effect of shrinking the set of matches for which the downstream firm adopts the new technology. Yet, a γ^* weakly larger than $1 - \alpha$ is necessary to push the upstream firm to participate in the production process. Therefore, $\gamma^* = 1 - \alpha$.¹⁸ In other words, the larger the odds α of a

¹⁸When the upstream firm appropriates a share $\beta > 0$ of the surplus from renegotiation—i.e., $(1 - \delta)\beta\lambda -$

positive appropriable quasi-rent are and thus the more severe asset specificities are, the lower γ^* should be to convince the downstream firm to adopt the new technology and the upstream firm to provide his input.¹⁹ Crucially, the latter is indifferent between charging as input price the expected cost and holding-up the downstream firm given γ^* . By assuming that if indifferent he selects the former strategy, then the setup produces no hold-up in equilibrium. For α large moreover, the welfare under incomplete property rights and innovation is larger than that with $\gamma^* = 1$ and without innovation. The latter also describes the scenario in which $\hat{\lambda} \geq \bar{\lambda} \leftrightarrow v \geq \alpha(1 - \delta)\bar{\lambda}$. Proposition 4 summarizes the conclusions of this section:

Proposition 4: *Optimal property rights γ^* fall with the incomplete contracting costs α , which in turn measure the likelihood that the new technology is more productive.*

Recognizing that both parties should be incentivized to foster innovation, proposition 4 entails that, differently from Grossman and Hart (1986), Hart and Moore (1990), and Williamson (2010), asset allocation is optimized by probabilistically leaving residual claimant each party. This result has key ramifications for the theory of the firm.²⁰

More generally, the findings of this section are not only coherent with some of the estimates discussed in sections 2 and 4, but they also help make sense of anecdotal evidence on the positive link between the strength of the downstream firm’s intellectual property rights—a high $1 - \gamma^*$ —and the severity of asset specificities. In particular, Burk and McDonnell (2007) document that stronger and easier to obtain downstream firm’s intellectual property rights—i.e., trade secrecy and copyright instead of patents—are typically granted whenever asset specificities are particularly severe, i.e., technological businesses, such as the software industry, and the entertainment industries.²¹ Furthermore, these remedies allow the downstream firm to impose on her employees and upstream partners non-disclosure agreements, work-for-hire provisions, and non-compete clauses reducing their ability to exploit

and $\gamma^* = 1$, only the downstream firms with $\lambda > \frac{v}{\alpha(1-\beta)(1-\delta)}$ will adopt the new technology, leading to under-innovation. For $\beta > 0$ and $\gamma^* < 1$ instead, the downstream firms will always turn to the legal system.

¹⁹This incentive will be unnecessary, should the cost be certain. In this case, full property rights will contemporaneously solve the hold-up failure and assure the upstream firm’s participation constraint.

²⁰Guerriero (2017) shows that the model predictions survive if the firms can choose whether to vertically integrate and that this happens more often when asset specificities (property rights) are more severe (stronger).

²¹First, trade secrecy and copyright arise spontaneously, upon fixation of a creative work in a tangible medium of expression, whereas patent are granted only upon the disclosure of the claimed invention (Burk and McDonnell, 2007). Second, they receive a longer protection, i.e., respectively perpetual monopoly and the author’s life plus 50 to 100 years rather than the 20 years of patent protection (Burk and McDonnell, 2007).

proprietary information, i.e., a low γ^* (Burk and McDonnel, 2007). “From the standpoint of employee incentive [indeed], trade secrecy [and copyright are the] most expensive method of protection [since they include] forms of intellectual capital most likely to become commingled [...] from the skills or knowledge of an employee” [Burk and McDonnel 2007, p. 609].

3.3 Robustness Checks

In this section, I document the robustness of the main model implications to two key alternative assumptions, i.e., the possibility that part of the population is excluded from institutional design and the possibility for the original owners to decide whether to produce the good or to invest on it before trading (see the appendix for the relative proofs).

3.3.1 The Political Economy of Property Rights Protection

Thus far, I have examined the design of property rights on assets under a perfect veil of ignorance, behind which everybody is identical, and the choice of property rights on innovation by downstream and upstream firms with equal political power. Reality is however much less ideal. To evaluate the positive side of property rights protection, I consider a situation in which the group of agents selecting γ either knows his future role in the economy or can exclude the rest of the population from the social welfare maximization (Alesina, Aghion, and Trebbi, 2004). It seems natural to think of these “insiders” as the original owners (downstream firms) and the potential buyers (upstream firms) with intermediate valuation (productivity). This assumption incorporates into the model the idea put forward by a growing literature on endogenous lobbying that the groups actively participating in institutional design are those most affected by it (Felli and Merlo, 2006; Guerriero, 2016b).

In the case of exogenously determined transaction costs then, γ^* maximizes $\int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda - \alpha}{t} d\lambda + \int_{\underline{\lambda} + \epsilon}^{\hat{\lambda}} \frac{(1 - \gamma)\lambda + \gamma v}{t} d\lambda + \frac{\gamma v \epsilon}{t}$ for $\hat{\lambda} < \bar{\lambda}$ and $W^{FE} - (1 - \gamma) \frac{\epsilon^2 + 2\epsilon\lambda}{2t}$ otherwise when the excluded potential buyers have valuation lower than $\underline{\lambda} + \epsilon$ with ϵ not too large. Comparing this objective function with that in equation (1) suggests that γ^* still falls with α for ϵ not too large, but it is set inefficiently high,²² e.g., Zamindari system of taxation allowing Indian landowners to evict evading tenants who were often more productive (Besley and Ghatak, 2010). If instead

²²In a political economy, γ^* is always too high since some potential buyers, which always prefer $\gamma^* = 0$, are excluded from the social welfare maximization, and the original owners, who instead favor $\gamma^* = 1$, are not.

to be excluded are the potential buyers whose valuation is higher than $\bar{\lambda} - \epsilon$, γ^* decreases with α for ϵ small and equals (is higher than) the γ^* found in the basic setup if interior (otherwise). When instead the transaction costs are driven by market power, α^* continues to be determined as in section 3.2.1 and thus a rise in γ still has only an infra-marginal effect on society's objective function. As a result, equation (3) implies that the analysis is unchanged when high-valuation potential buyers are excluded from the institutional design and that γ^* is set too high and falls with α^* for ϵ small when instead low-valuation potential buyers are kept out. Similarly, in the scenario of transaction costs determined by lemon-type distortions, a gaze at equation (4) suggests that equilibrium property rights are again inefficiently high and decrease with α provided that ϵ is not too large. Finally, a glance at equation (5) clarifies that excluding a sufficiently small group of either high- or low- λ downstream firms from the institutional design does not affect at all the equilibrium when the transaction costs are shaped by incomplete contracting inefficiencies.

3.3.2 The Disincentive to Effort Effect of Weak Property Rights

Production.—As highlighted in section 1, all the other contributions documenting that weak property rights can be optimal focus on endowment economies. Here, I prove that the mechanisms illustrated in sections 3.1, 3.2.1, and 3.2.2 survive when production is introduced in the theoretical framework. This time, original owners decide between t_1 and t_2 whether to produce x at the cost $\kappa < v$. Therefore, there is no production for $\gamma^* = 0$ and $\hat{\lambda} \geq \bar{\lambda}$, but there can be when the original owners' expected utility is positive for $\gamma^* > 0$ and so $\hat{\lambda} < \bar{\lambda}$. To elaborate, the original owners' expected utility increases with γ^* , and therefore there is a $\tilde{\gamma}$ such that x is produced only if $\gamma^* \geq \tilde{\gamma}$. Since production creates value also for the potential buyers, society always selects the maximum $\hat{\gamma}$ between $\tilde{\gamma}$ and γ^* for κ not too large. In the most interesting case of endogenous transaction costs finally, $\tilde{\gamma}$ weakly decreases with α for $\bar{\lambda}$ sufficiently large and v not too small compared to the transaction costs α . This last comparative statics leaves qualitatively unaffected the main model testable implication.

Investment.—The standard “security” argument for strong property rights claims that expropriation induces a disincentive to invest (Besley and Ghatak, 2010). To understand how the intuition affects the basic results, I analyze a regime I envisioning an investment

possibly implemented by the original owners between t_1 and t_2 at the cost $\zeta < v$ and raising their valuation v and those of the potential buyers λ to respectively $v(1 + \rho)$ and $\lambda(1 + \rho)$ with $\rho > 0$.²³ Accordingly, this setup is similar to the instance of a production economy.

When transaction costs are exogenous, original owners invest only if $\gamma_I^* > 0$ and their expected utility $v(1 + \rho) \frac{\bar{\lambda} - \hat{\lambda}_I}{I} + \gamma_I^* v(1 + \rho) \frac{\hat{\lambda}_I - \lambda}{I} - \zeta$ is weakly positive. Both γ_I^* and $\hat{\lambda}_I$ are as in section 3.1.1 with $\alpha/(1 + \rho)$ in place of α , and thus $\gamma_I^* > \gamma^*$, $\frac{d\gamma_I^*}{d\alpha} \leq 0$, and $\hat{\lambda}_I < \hat{\lambda}$. Hence, investment inducement weakly strengthens property rights protection. Since the original owners' expected payoff rises with γ_I^* , there is a $\tilde{\gamma}_I$ such that investment goes through only if optimal property rights are larger than $\tilde{\gamma}_I$. For $\gamma_I^* > \tilde{\gamma}_I$, society picks γ_I^* instead of γ^* if the social welfare is larger at γ_I^* with investment than it is at γ^* without. For $\gamma_I^* \leq \tilde{\gamma}_I$ instead, $\tilde{\gamma}_I$ is preferred to γ^* if the social welfare is larger at $\tilde{\gamma}_I$ with investment than it is at γ^* without. To elaborate, investment always goes through for α sufficiently small compared to v and for ρ (ζ) not too small (large). For $v \geq \lambda_m$, then $\gamma^* = 1$ and investment materializes.

In the case of transaction costs determined by the existence of market power, the fact that the original owners' expected utility is multiplied by $1 + \rho$ implies that $\alpha_I^* = \alpha^*(1 + \rho)$ and so $\gamma_I^* = \gamma^*$ and $\hat{\lambda}_I = \hat{\lambda}$. Since the original owners' expected payoff rises with γ_I^* , investment realizes only if γ_I^* is larger than $\tilde{\gamma}_I$. As in the production case, $\tilde{\gamma}_I$ falls with α when the mark-up is sufficiently small compared to v . Under the same condition and for ρ (ζ) not too small (large), society picks the maximum $\hat{\gamma}_I$ between γ_I^* and γ_I since investment is socially beneficial. Finally, $\gamma_I^* = 1$ and thus investment is always successful for $v \geq \lambda_m$.

For what concerns the scenario of transaction costs driven by lemon-type distortions, a glance at equation (4) suggests that society's objective function is now multiplied by $1 + \rho$ and the analysis of the basic setup is unchanged provided that $\alpha < \frac{2}{1 + \rho}$. High-valuation potential buyers buy for $\gamma^* \geq \frac{2}{\theta(1 + \rho)}$ and expropriate otherwise. Once again, the original owners' expected utility rises with γ_I^* , and therefore investment prevails only if optimal property rights are larger than $\tilde{\gamma}_I$. Society selects $\hat{\gamma}_I$ if investment is welfare enhancing and, in particular, if its fixed cost is sufficiently small and its return is sufficiently large.

²³When investment is continuous, the algebra becomes so tangled to be uninformative about the model robustness except in the $\bar{\lambda}$ large and v small case when the basic analysis stands intact being $\frac{d\rho}{d\gamma^*}$ small. The core results will also survive, should potential buyers decide whether to invest. Then, γ^* will be optimally weakened as in the case of "tracing" by an original owner of an asset substituted to the early property by an intermediary and possibly acquired by a potential buyer in good faith or of its proceeds (Smith, 1997).

4 Evidence

The main model implication is that incomplete property rights are efficient when transaction costs impede trade or innovation, whether or not constitution writers are benevolent and the disincentive to effort effect of weak property rights is taken into account. As a consequence, the main model testable predictions can be stated as follows:

Predictions: *The strength of the original owners' (upstream firms') property rights falls with the severity of market frictions and failures (incomplete contracting costs), which rises with the dispersion in the traders' valuations (likelihood of a more productive technology).*

The negative (positive) links between the measures of the protection of personal, intellectual, and financial property and the proxies for market frictions and failures (asset specificities) discussed in section 2 are consistent with these predictions. Yet, they may be capturing reverse causation, omitted variables, and/or errors in the measurement of transaction costs.

4.1 Gaining More Insights About Causality

To gain more insights about causality, I pursue the following three strategies. First, I control for the other main drivers of property rights discussed by the extant literature. Second, I use selection on observables to assess the likelihood that the estimates are driven by unobservables. Finally, I devise a 2SLS approach based on the aforementioned positive dependence of market failures on the dispersion in the traders' valuations and of incomplete contracting costs on the likelihood of a more productive technology.²⁴

4.1.1 Controlling for Observables

The key variables potentially omitted from the analysis of section 2 are those shaping property rights through channels other than the trade-off between inefficient exclusion from trade/innovation and expropriation and associated with transaction costs. They are the development level, the inclusiveness of political institutions, the level of state capacity, internal conflicts, and the extent of human capital accumulation. Next, I illustrate them in turn.

First, transaction costs could affect property rights through their adverse impact on

²⁴The data aggregated at the cross-sectional level confirm the core of the analysis and suggest that transaction costs can be treated as exogenous. Crucially, these patterns also imply that lags in property rights reforms are not impairing the empirical exercise. Consistent with this view, estimates available upon request entail that the basic results survive when the proxies for transaction costs are lagged either one, two, or three years.

economic development, which in turn is related to the protection of private rights through the modernization effect (Williamson, 2010). Accordingly, I consider the natural logarithm of the output-side real GDP at chained PPPs in 2011 US dollar per capita, i.e., *Income*.

Second, less inclusive political institutions obstruct the distribution of the rents from innovation and trade among non-elite (North, Wallis, and Weingast, 2009), while easing the expropriation of the property of private citizens by both politicians and elite members (Acemoglu and Johnson, 2005). To assess the importance of such a mechanism, I consider the constraints on the executive authority score from the POLITY IV dataset, i.e., *Democracy*.²⁵

Third, low levels of non-produced output worsening the disincentive to effort effect, the incidence of external wars, and German and Scandinavian legal origins are stable predictors of a state capacity to exchange/innovate and protect private rights (see Besley and Persson, [2009]; but also Guerriero, [2016b]). While I take into account the last factor through the country fixed effects, I assess the role of the first two by controlling for the crude oil proved reserves in barrels per capita—i.e., *Reserves*—and the share of previous half-century in which the country was involved in external military conflicts, i.e., *Conflict-External*.

Fourth, inter-groups conflicts are related to both large transaction costs (Seitz, Tarasov, and Zakharenko, 2015) and insecure private rights (Ashraf and Galor, 2013). I consider the role of these connections by incorporating into the analysis the share of previous half-century in which the country was involved in internal military conflicts, i.e., *Conflict-Internal*.

Fifth, more limited transaction costs provide incentives for investment in human capital (Foss, 2011), which in turn helps shift labor from traditional to modern sectors and so curb inequality and favor institutions that protect private property (Cervellati, Fortunato, and Sunde, 2008). To evaluate these patterns, I control for the ratio of the total tertiary enrollment regardless of age to the population of the relative age group, i.e., *Human-Capital*.

Finally, a culture of morality and the efficiency of law enforcement alter the incentives of intermediaries and thus the balance between protecting property and enhancing the reliance on contracts (Dari-Mattiacci and Guerriero, 2015).²⁶ Moreover, they may shape the intensity

²⁵To illustrate, the score ranges between one and seven and assumes higher values when the holder of the executive power is accountable to the citizens and/or the government is constrained by checks and balances.

²⁶While I proxy a culture of morality with the first principal component extracted from the level of generalized trust and the importance of respect self-reported to either the World Value Survey or the European Value Study, I measure the efficiency of law enforcement with the first principal component extracted from the

of both exchange and innovation (Seitz, Tarasov, and Zakharenko, 2015). Estimates reported in the Internet appendix reveal that considering these factors greatly lowers the number of available observations but leaves essentially intact the gist of the analysis.

Including all these controls in the specification also factors in the heterogeneity in preference/productivity, which reduces the contribution to the social welfare of the utilities of those middle-valuation (productivity) potential buyers (downstream firms) whose exclusion from trade (innovation) is more socially costly, and thus call for stronger property rights (Guerriero, 2016a). Since transaction costs might also be correlated with preference/productivity heterogeneity (Ashraf and Galor, 2013), considering its role is crucial.

Panels (A) to (C) of table 4 report the estimates relative to the specifications with dependent variables *Property-Rights*, *Intellectual-Property*, and *Shareholders-Protection* respectively and considering all together the extra controls. The key observations are that the coefficients on these regressors are generally jointly insignificant, whereas those on the proxies for transaction costs are negative and significant at 5 percent or better and display a magnitude almost equal to their counterparts in table 3. In the same spirit, results available upon request reveal that the impacts of the proxies for transaction costs remain similar when considered together and that the extra controls contribute only marginally to the total R^2 .²⁷

4.1.2 Using Selection on Observables to Assess the Bias from Unobservables

Despite my attempts to control for relevant observable factors, OLS estimates may still be biased by unobservables. To evaluate this issue, I calculate the index proposed by Altonji, Elder, and Taber (2005) to measure how much stronger selection on unobservables, relative to selection on observables, must be to explain away the full estimated effect.²⁸ To see how the index is calculated, consider a regression with a restricted set of control variables and one with a full set of controls. Next, denote the estimate of the coefficient attached to a proxy for transaction costs from the first regression β^R , where R stands for “restricted,” and that from the second regression β^F , where F stands for “full.” Then, the index is the absolute value

number of police personnel and that of professional judges per 100,000 inhabitants as collected from the United Nations’ surveys of crime trends and the operations of criminal justice systems.

²⁷According to the Shapley value decomposition, their contribution amounts on average only to the 13 percent, whereas the share explained by transaction costs (country and year fixed effects) is the 35 (52) percent.

²⁸I use the version developed by Bellows and Miguel (2009) for possibly endogenous continuous variables.

of $\beta^F / (\beta^R - \beta^F)$. The intuition behind the formula is as follows. The lower the absolute value of $(\beta^R - \beta^F)$ is, the less the estimate of the relevant coefficient is affected by selection on observables, and the stronger selection on unobservables needs to be to explain away the entire effect. Moreover, the higher the absolute value of β^F is, the greater is the effect that needs to be explained away by selection on unobservables, and thus the higher is the index.

In table 5, I consider the specifications conditioning only for country and year fixed effects and reported in table 3 as the restricted regressions and those controlling for all observables in table 4 as the full regressions. The ratios calculated when the dependent variable is either *Property-Rights*, *Intellectual-Property*, or *Shareholders-Protection* are reported respectively in columns (1) to (3). None of them is less than one, and the median and average ratios are 29.2 and 60. Therefore, to attribute the entire OLS estimates of the coefficients on the proxies for transaction costs to selection effects, selection on unobservables would have to be on average sixty times greater than selection on all observables, which seems unlikely.

4.1.3 2SLS Estimates: Property Rights and Endogenous Transaction Costs

My final strategy is to use instrumental variables. This approach requires instruments that are correlated with transaction costs but uncorrelated with any other dimension affecting property rights. To achieve this goal, I build on the positive dependence of market failures on the dispersion in the traders' valuations and of incomplete contracting costs on the likelihood of a more productive technology foreseen by the model, and I use as excluded instruments two indexes, both ranging between one and seven. The first one captures the availability for firms of the latest technologies—i.e., *Technology-Availability*—and the other measures the quality of math and science education, i.e., *Math-Science*. This choice is consistent with Añón Higón et al. (2017), who build on over one million firm-level data for 23 EU states between 2003 and 2014 to document that more labor skilled firms are closer to the technology frontier and this pattern is more accentuated in service sectors. Such results have four crucial implications for my 2SLS estimation approach. First, countries endowed with a human capital more apt to absorb ideas and knowledge are those more likely to display not only smaller differences in firms' productivity but also a smaller dispersion in the payoffs of their users and thus a smaller extent of market power and more limited lemons-type distortions. Second, these

are also the countries in which the likelihood of a more productive technology will be larger (Acemoglu, Aghion, and Zilibotti, 2006) and so will be the severity of asset specificities. Third, it is reasonable to think that the very same drivers of market failures determine market frictions. Accordingly, Acemoglu, Aghion, and Zilibotti (2006) suggest that credit market imperfections are typical of countries further away from the technology frontier as opposed to those close to approach it. Finally, it seems unlikely that a society’s inclination to spread and adopt more effectively innovation is systematically related to the protection of property rights conditional on the inclusiveness of political institutions, the level of state capacity, internal conflicts, fixed effects, and especially the level of development and human capital.

Table 6 reports in panels (A) to (C) the 2SLS estimates of the specifications with dependent variables respectively *Property-Rights*, *Intellectual-Property*, and *Shareholders-Protection* and controlling for all observables. Starting from the first stages, both *Technology-Availability* and *Math-Science* have always a negative (positive) and generally statistically significant relationship with the proxies for market friction and failures (incomplete contracting costs).²⁹ Accordingly, I can always reject that the estimated equation is under-identified at 1 percent. Turning to the second stages, the proxies for market friction and failures (measure of incomplete contracting costs) have (has) always negative (positive) and strongly significant—at 1 percent—effects (impact) on the measures of property rights protection and the attached coefficients (coefficient) display(s) a magnitude very similar to those in table 4. Finally, I cannot reject that the over-identifying restrictions hold at a level nowhere lower than 5 percent and I document in the Internet appendix that the excluded instruments have no direct impact on property rights in the semi-reduced form regressions. Overall, these patterns support the inference made above and confirm the validity of the model predictions.

5 Conclusions

This paper has developed and tested a model clarifying how the protection of property rights is optimally weakened in the face of sizable costs of trading/innovating, and in particular market frictions and failures, and how the latter are more severe whenever the dispersion

²⁹Consistent with this evidence, Dari-Mattiacci and Guerriero (2015) document that a culture of self-reliance, which fosters innovation, is linked to stronger original owner’s property rights mainly through its positive impact on the intermediaries’ morality and its negative effect on the strength of law enforcement.

in the traders' valuations or the likelihood of a more productive technology is larger.

To characterize the general trade-off between inefficient exclusion from trade/innovation and expropriation guiding the selection of property rights, I study both the possibly consensual exchange of an asset between its original owner and a potential buyer and a downstream firm's choice of whether to produce in-house through an old technology or to adopt a new one necessitating an upstream firm's input. In the former case, a rise in transaction costs has the marginal effect of inefficiently pushing some high-valuation potential buyers to expropriate the good and the infra-marginal effect of decreasing the social gain from the transfers that continue to be consensual. Then, it must also reduce the protection of property rights, which is the probability that expropriating potential buyers are excluded from consumption, and in turn the size of the market. This pattern holds true regardless of whether transaction costs are exogenously driven by frictions outside the control of traders/innovators or determined by the mix of the dispersion in traders' valuations and either the original owners' market power or their privileged information. A similar conclusion applies to the upstream firm's property rights on his input. Being the relative cost random and ex ante non contractible, a strong protection of the upstream firms' property discourages the downstream firms from innovating because of the risk of being held-up. When instead the upstream firms are only weakly protected, low-productivity downstream firms inefficiently exploit the input. Balancing these two misallocations of the upstream firm's input entails that property rights (size of the market) will be weaker (larger) the greater incomplete contracting costs are, i.e., the higher is the probability that the cost is low. Crucially, these implications survive when a group of traders/innovators has a larger political influence on institutional design and when the disincentive to effort effect of weak property rights is taken into account.

To evaluate the central model predictions, I consider a panel of 135 countries spanning the 2006-2015 period. OLS estimates suggest that the protection of the original owners' (downstream firms') property rights is the weakest (strongest) where market frictions—i.e., excessive regulation and financial inefficiencies—and failures—i.e., lack of the competitiveness of corporate activity and lemons-type distortions (incomplete contracting costs due to asset specificities)—are the largest. To gain more insights about causality, I pursue three strategies. First, I control not only for country and year fixed effects, but also for the de-

velopment level, the inclusiveness of political institutions, the strength of state capacity, internal conflicts, and the level of human capital. Considering these observables together leaves the results almost intact. Second, I calculate that the influence of unobservables would have to be on average sixty times greater than that of all observables to explain away the negative links between the protection of property rights and transaction costs. Finally, I use as excluded instruments proxies for both the availability of the latest technologies and the quality of math and science education. Conditional on all observables, the 2SLS estimates are strongly consistent with the OLS ones. In addition, the validity of the exclusion restriction is vindicated by the canonical under-identification and over-identification tests.

I close by highlighting how two central results of my analysis open key avenues for future research. First, the tendency of property rights toward optimality does not imply that the existing legal variation is irrelevant and thus does not warrant reforms. On the contrary, the model reveals that special interests can distort the design of property rights away from optimality when the political process is less than perfect. Second, weak property rights are society's response to the existence of sizable transaction costs, which in turn are driven by either the dispersion in the traders' valuations or the likelihood of a more productive technology, and therefore their negative correlation with economic outcomes might be partly spurious. As a consequence, further research on the relationships among endogenous property rights, endogenous transaction costs, and economic outcomes is needed.

Appendix

Property Rights and Market Power

The first-order condition of society's problem is $-\frac{\hat{\lambda}-\lambda}{2l} \left(\hat{\lambda} + \underline{\lambda} - 2v \right) = 0$, whose left-hand side is the infra-marginal effect of a rise in γ . The latter can be negative only for $v < \lambda_m$. \square

Property Rights and Lemons-type Distortions

The high-valuation potential buyers' expected payoff from buying $\theta \frac{p_L}{2} - p_L$ is weakly greater than her expected payoff from expropriation $(1 - \gamma) \theta \frac{p_L}{2}$ for γ^* higher than $\frac{2}{\theta} < 1$ being $\theta > 2$. The middle(low)-valuation potential buyers instead do not buy because $\frac{\alpha p_L}{2} - p_L \left(\frac{p_L}{2\theta} - p_L \right) < 0$. For $\gamma^* \leq \frac{2}{\theta}$, the derivative of society's objective function with respect to γ is $-\left[(1 - \Delta)(\alpha - 1) + \frac{(\theta-1)^2 \Delta}{\theta} \right] \lambda_m$, which is negative. For $\gamma^* > \frac{2}{\theta}$ instead, it equals $-\left[(1 - \Delta)(\alpha - 1) - \frac{\theta-1}{\theta} \frac{\Delta}{2} \right] \lambda_m$, which falls with α , rises with Δ , is negative for $\Delta \rightarrow 0$, and positive for $\Delta \rightarrow 1$. γ^* possibly jumps from 0 to 1 for α (Δ) sufficiently small (large). \square

Considering a Generic Probability Density Function of the Potential Buyers' Valuation

In the case of exogenous transaction costs, potential buyers value x at $\lambda \in [\underline{\lambda}, \bar{\lambda}]$ distributed according to the log-concave probability density function f with cumulative distribution function F . Then, γ^* maximizes $\int_{\hat{\lambda}}^{\bar{\lambda}} (\lambda - \alpha) dF(\lambda) + \int_{\underline{\lambda}}^{\hat{\lambda}} [(1 - \gamma)\lambda + \gamma v] dF(\lambda)$ for $\hat{\lambda} < \bar{\lambda}$ and W^{FE} otherwise. For $\hat{\lambda} < \bar{\lambda}$, $\gamma^* > 0$ is defined by $\frac{1-\gamma^*}{\gamma^*} v \hat{\lambda} f(\hat{\lambda}) - (\hat{\lambda} - v) F(\hat{\lambda}) + \int_{\underline{\lambda}}^{\hat{\lambda}} F(\lambda) d\lambda = 0$ and society's objective function is sub-modular in γ and α when $\frac{f'(\hat{\lambda})}{f(\hat{\lambda})} < \frac{\alpha}{v(v+\alpha)} \frac{\gamma^*}{1-\gamma^*}$. While the right-hand side of this inequality is greater than $\frac{\alpha}{v(\bar{\lambda}-v-\alpha)}$, its left-hand side is lower than $\frac{f'}{f}(v + \alpha)$ since log-concavity of f implies a decreasing $\frac{f'}{f}$ (Dharmadhikari and Joag-Dev, 1988). Hence, the inequality is true and thus $\frac{d\gamma^*}{d\alpha} \leq 0$ for $\frac{f'}{f}(v + \alpha) < \frac{\alpha}{v(\bar{\lambda}-v-\alpha)}$, i.e., if v is sufficiently large (see section 3.1 for the corresponding restriction in the basic setup). To understand this last remark, notice that the right-hand side of the sufficient condition increases with v for $2v > \bar{\lambda} - \alpha$, whereas its left-hand side is negative for $v + \alpha$ larger than the mode of λ , being every log-concave density function defined on a real support unimodal (Dharmadhikari and Joag-Dev, 1988). For $\hat{\lambda} < \bar{\lambda}$, the infra-marginal effect of a rise in γ is $\left[v - E(\lambda | \lambda \leq \hat{\lambda}) \right] F(\hat{\lambda})$, which can be negative only if $v < \lambda_m = E(\lambda) \geq E(\lambda | \lambda \leq \hat{\lambda})$. For $\hat{\lambda} < \bar{\lambda}$ and $v \geq \lambda_m$ therefore, $\gamma^* = 1$. For $\hat{\lambda} < \bar{\lambda}$ and $v < \lambda_m$ instead, γ^* can jump from 0 to the interior solution whenever $\int_{\hat{\lambda}}^{\bar{\lambda}} (\lambda - \alpha) dF(\lambda) + \int_{\underline{\lambda}}^{\hat{\lambda}} [(1 - \gamma^*)\lambda + \gamma^* v] dF(\lambda) > \lambda_m$.

This last condition is more difficult to satisfy the larger the transaction costs are since the derivative of its left-hand side with respect to α equals $-\frac{1-\gamma^*}{\gamma^*}vf(\hat{\lambda}) - F(\bar{\lambda}) + F(\hat{\lambda}) < 0$.

Next, I show that the results produced by the other setups survive to considering any f .

When the original owners have market power, two observations are key. First, the mark-up α^* maximizes now the original owners' expected payoff $\int_{\hat{\lambda}}^{\bar{\lambda}} (v + \alpha) dF(\lambda) + \int_{\underline{\lambda}}^{\hat{\lambda}} \gamma^* v dF(\lambda)$, whose derivative with respect to α is $1 - F(\hat{\lambda}) - (\hat{\lambda} - v)f(\hat{\lambda})$. Hence, $\frac{d\alpha^*}{d\gamma} = \hat{\lambda}$ and thus $\frac{d\hat{\lambda}}{d\gamma} = \left(\frac{d\alpha^*}{d\gamma}\gamma - v - \alpha^*\right) \frac{1}{\gamma^2} = 0$. Again, the effect of a rise in the strength of optimal property rights on society's objective function $\int_{\hat{\lambda}}^{\bar{\lambda}} \lambda dF(\lambda) + \int_{\underline{\lambda}}^{\hat{\lambda}} [(1-\gamma)\lambda + \gamma v] dF(\lambda)$ equals $-\frac{\hat{\lambda}-\underline{\lambda}}{2}(\hat{\lambda} + \underline{\lambda} - 2v)f(\hat{\lambda})$, which is negative for $\frac{v+\alpha^*}{\gamma^*} + \underline{\lambda} - 2v > 0$ and positive otherwise. As in the baseline case of a uniform distribution f , γ^* jumps from 0 to 1 as α^* , which is either 0 or its maximum value $\bar{\alpha} = \min\{v, \bar{\lambda} - v\}$, becomes sufficiently small.

Turning to the scenario of transaction costs driven by lemon-type distortions, it follows from society's objective function that only the mean of the potential buyers' valuation distribution λ_m matters. This remark highlights the full generality of the analysis.

For what finally concerns the case of transaction costs determined by incomplete contracting inefficiencies, society maximizes $\alpha \int_{\hat{\lambda}}^{\bar{\lambda}} (\lambda - v) dF(\lambda) + (1 - \alpha) \int_{\hat{\lambda}}^{\bar{\lambda}} (\delta\lambda - v) dF(\lambda) + \int_{\underline{\lambda}}^{\hat{\lambda}} \delta\lambda dF(\lambda)$, which strictly increases with γ when $-\frac{d\hat{\lambda}}{d\gamma} [\alpha\hat{\lambda} + (1 - \alpha)\delta\hat{\lambda} - v - \delta\hat{\lambda}] f(\hat{\lambda}) = -\frac{v^2(\alpha-1+\gamma)}{(1-\delta)(1-\gamma)^3} f(\hat{\lambda}) > 0 \leftrightarrow \gamma < 1 - \alpha$ and weakly decreases otherwise. Hence, the unique and global solution is $\gamma^* = 1 - \alpha$ as in the baseline scenario of a uniform distribution f . \square

The Political Economy of Property Rights Protection

In the case of exogenous transaction costs and excluded low-valuation potential buyers, the derivative of the objective function is $\frac{v^2-\alpha^2}{(\gamma^*)^2} + (\underline{\lambda} + \epsilon)^2 - 2v\underline{\lambda} = 0$ for $\hat{\lambda} < \bar{\lambda}$ and $v - \lambda_m + \frac{2\epsilon\underline{\lambda} + \epsilon^2}{2l}$ otherwise, the infra-marginal effect of a rise in γ for $\hat{\lambda} < \bar{\lambda}$ is $-\frac{(\hat{\lambda}-\underline{\lambda}-\epsilon)(\hat{\lambda}+\underline{\lambda}+\epsilon-2v)}{2l} + \frac{2v\epsilon}{2l}$, and the second-order conditions are as in the basic setup. Thus, γ^* is set inefficiently high, falls with α provided that $(\underline{\lambda} + \epsilon)^2 - 2v\underline{\lambda} < 0$, i.e., ϵ not too large, and possibly jumps from 0 to the interior solution for α sufficiently small under the same condition discussed in the basic setup. When instead to be excluded are high-valuation potential buyers, society maximizes $\int_{\hat{\lambda}}^{\bar{\lambda}-\epsilon} \frac{\lambda-\alpha}{l} d\lambda + \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{(1-\gamma)\lambda+\gamma v}{l} d\lambda$ for $\hat{\lambda} < \bar{\lambda}$ and $W^{FE} - (1-\gamma) \frac{2\epsilon\bar{\lambda}-\epsilon^2}{2l}$ otherwise. Both the infra-marginal effect of a rise in γ and the first and second-order conditions for a positive solution are as in the baseline analysis, whereas for $\hat{\lambda} \geq \bar{\lambda}$ the first-order condition is $v - \lambda_m + \frac{2\epsilon\bar{\lambda}-\epsilon^2}{2l}$

and thus leads again to an inefficiently large γ^* . The condition such that γ^* possibly jumps from 0 to the positive solution is easier to satisfy the smaller α is for $\alpha < \gamma^* (\bar{\lambda} - v - \epsilon)$ and thus under the basic model restrictions on α for ϵ small.

When original owners have market power, the only relevant case is $\lambda < \hat{\lambda}$ and society maximizes $\int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda}{l} d\lambda + \int_{\lambda+\epsilon}^{\hat{\lambda}} \frac{(1-\gamma)\lambda+\gamma v}{l} d\lambda$, whose derivative with respect to γ is $-\frac{(\hat{\lambda}-\lambda-\epsilon)(\hat{\lambda}+\lambda+\epsilon-2v)}{2l} + \frac{2v\epsilon}{2l}$. Hence, equilibrium property rights jump from 0 to 1 for α^* and ϵ sufficiently small.

Turning to the case of transaction costs driven by lemon-type distortions and low(high)-valuation potential buyers not participating in the institutional design, society's objective function is that of the basic setup with $(1-\gamma) \frac{\lambda_m}{\theta} (\frac{\Delta}{2} - \epsilon)$ in place of $(1-\gamma) \frac{\lambda_m}{\theta} \frac{\Delta}{2}$ ($(1-\gamma) \theta \lambda_m (\frac{\Delta}{2} - \epsilon)$ in place of $(1-\gamma) \theta \lambda_m \frac{\Delta}{2}$ for $\gamma^* \leq \frac{2}{\theta}$ and $\theta \lambda_m (\frac{\Delta}{2} - \epsilon)$ in place of $\theta \lambda_m \frac{\Delta}{2}$ otherwise). While for $\gamma^* \leq \frac{2}{\theta}$ the first-order condition of society's problem equals $-\left[(1-\Delta)(\alpha-1) + \frac{(\theta-1)^2}{\theta} \frac{\Delta}{2} - \frac{\epsilon}{\theta}\right] \lambda_m$ ($-\left[(1-\Delta)(\alpha-1) + \frac{(\theta-1)^2}{\theta} \frac{\Delta}{2} - \epsilon\theta\right] \lambda_m$) and so it is negative for ϵ not too large, for $\gamma^* > \frac{2}{\theta}$ it equals $-\left[(1-\Delta)(\alpha-1) - \frac{\theta-1}{\theta} \frac{\Delta}{2} - \frac{\epsilon}{\theta}\right] \lambda_m$ and thus is negative for Δ and ϵ small and α large (the baseline case analysis applies).

For what finally concerns the case of transaction costs determined by incomplete contracting inefficiencies, the equilibrium is the same whether or not a sufficiently small group of either high- or low- λ downstream firms is kept out of the institutional design.

Crucially, the political economy case can be generalized to the consideration of generic distributions of λ and/or the inclusion of production and investment activities. \square

Production

In the case of exogenous transaction costs, the original owners' expected utility equals $\frac{v(\bar{\lambda}-\hat{\lambda})}{l} + \frac{\gamma^* v(\hat{\lambda}-\lambda)}{l} - \kappa$ and thus $\tilde{\gamma}$ is implicitly defined by $\frac{v[\bar{\lambda}-(v+\alpha)\tilde{\gamma}^{-1}]}{l} + \frac{\tilde{\gamma} v[(v+\alpha)\tilde{\gamma}^{-1}-\lambda]}{l} = \kappa$, whose left-hand side rises with $\tilde{\gamma}$ because $-\frac{d\hat{\lambda}}{d\tilde{\gamma}} \frac{v}{l} (1-\tilde{\gamma}) + \frac{v(\hat{\lambda}-\lambda)}{l} = \frac{v\hat{\lambda}}{\tilde{\gamma}l} (1-\tilde{\gamma}) + \frac{v(\hat{\lambda}-\lambda)}{l} \geq 0$. Thus, production realizes for $\gamma^* \geq \tilde{\gamma}$. When the original owners have market power, their expected utility is $\frac{(v+\alpha^*)(\bar{\lambda}-\hat{\lambda})}{l} + \frac{\gamma^* v(\hat{\lambda}-\lambda)}{l} - \kappa$, and $\tilde{\gamma}$ is defined by $\frac{(v+\alpha^*)[\bar{\lambda}-(v+\alpha^*)\tilde{\gamma}^{-1}]}{l} + \frac{\tilde{\gamma} v[(v+\alpha^*)\tilde{\gamma}^{-1}-\lambda]}{l} = \kappa$, whose left-hand side rises with $\tilde{\gamma}$ because $-\frac{d\hat{\lambda}}{d\tilde{\gamma}} \frac{v(1-\tilde{\gamma})+\alpha^*}{l} + \frac{v(\hat{\lambda}-\lambda)}{l} = \frac{\hat{\lambda}}{\tilde{\gamma}l} [v(1-\tilde{\gamma})+\alpha^*] + \frac{v(\hat{\lambda}-\lambda)}{l} \geq 0$ and rises with α if $-\frac{d\hat{\lambda}}{d\alpha} \frac{v(1-\tilde{\gamma})+\alpha^*}{l} + \frac{\bar{\lambda}-\hat{\lambda}}{l} = -\frac{v(1-\tilde{\gamma})+\alpha^*}{\tilde{\gamma}l} + \frac{\bar{\lambda}-\hat{\lambda}}{l} \geq 0$, i.e., for $\bar{\lambda}$ large and v not too small compared to α^* and so $\gamma^* \rightarrow 1$. Hence, production realizes for $\gamma^* \geq \tilde{\gamma}$, and $\frac{d\tilde{\gamma}}{d\alpha} \leq 0$. For what concerns the scenario of transaction costs driven by lemon-type distortions, the original owners' expected payoff is $\frac{\Delta}{2} p_L + (1 - \frac{\Delta}{2}) \gamma^* \lambda_m - \kappa$ and $\tilde{\gamma}$ is

independent of α being equal to $\frac{2\kappa - \Delta p_L}{(2 - \Delta)\lambda_m}$. Once again, x is produced if $\gamma^* \geq \tilde{\gamma}$. \square

Investment

With exogenous transaction costs, potential buyers buy if $\lambda(1 + \rho) - v(1 + \rho) - \alpha \geq (1 - \gamma_I)\lambda \leftrightarrow \lambda \geq \hat{\lambda}_I \equiv \frac{v + \alpha(1 + \rho)^{-1}}{\gamma_I}$ and thus society's objective function is $\int_{\hat{\lambda}_I}^{\bar{\lambda}} \frac{\lambda(1 + \rho) - \alpha}{l} d\lambda + (1 + \rho) \int_{\underline{\lambda}}^{\hat{\lambda}_I} \frac{(1 - \gamma)\lambda + \gamma v}{l} d\lambda$, $\gamma_I^* = \frac{v^2 - (\frac{\alpha}{1 + \rho})^2}{\lambda(2v - \lambda)}$, and the original owners' expected payoff from investment equals $v(1 + \rho) \frac{(\bar{\lambda} - \hat{\lambda}_I)}{l} + \gamma_I^* v(1 + \rho) \frac{\hat{\lambda}_I - \underline{\lambda}}{l} - \zeta$, whose derivative with respect to γ_I^* is $-\frac{d\hat{\lambda}_I}{d\gamma_I^*} v(1 + \rho) \frac{(1 - \gamma_I^*)}{l} + v(1 + \rho) \frac{\hat{\lambda}_I - \underline{\lambda}}{l} \geq 0$. For $\gamma_I^* > \tilde{\gamma}_I$, society picks γ_I^* if the social welfare is larger at γ_I^* with investment than it is at γ^* without, i.e., whenever the inequality $\int_{\hat{\lambda}_I}^{\bar{\lambda}} \frac{\lambda(1 + \rho) - \alpha}{l} d\lambda - \int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda - \alpha}{l} d\lambda + (1 + \rho) \int_{\underline{\lambda}}^{\hat{\lambda}_I} \frac{(1 - \gamma_I^*)\lambda + \gamma_I^* v}{l} d\lambda - \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{(1 - \gamma^*)\lambda + \gamma^* v}{l} d\lambda - \zeta \geq 0$ holds. The left hand side of this condition is larger than $(1 + \rho) \left(\gamma^* \hat{\lambda}^2 - \gamma_I^* \hat{\lambda}_I^2 \right) + (\gamma_I^* - \gamma^*) \underline{\lambda}^2 (1 + \rho) + 2v \left[(1 + \rho) \gamma_I^* \left(\hat{\lambda}_I - \underline{\lambda} \right) - \gamma^* \left(\hat{\lambda} - \underline{\lambda} \right) \right] - 2\alpha \left(\hat{\lambda} - \hat{\lambda}_I \right) - \zeta l$, which is positive for α sufficiently small compared to v and so $\gamma_I^* \rightarrow \gamma^*$ and for ρ (ζ) not too small (large). A similar analysis applies to the $\gamma_I^* \leq \tilde{\gamma}_I$ scenario when society chooses $\tilde{\gamma}_I$ and not γ^* if the social welfare is larger at $\tilde{\gamma}_I$ with investment than it is at γ^* without investment. In the former case, $\hat{\lambda}_I$ is evaluated at $\tilde{\gamma}_I$. If $v \geq \lambda_m$ finally, then $\gamma^* = 1$ and investment is certain.

When the original owners have market power, their expected utility rises with and falls with α if $-\frac{d\hat{\lambda}}{d\alpha} \frac{v(1 - \tilde{\gamma}_I)(1 + \rho) + \alpha^*}{l} + \frac{\bar{\lambda} - \hat{\lambda}}{l} = -\frac{v(1 - \tilde{\gamma}_I) + \alpha^*}{\tilde{\gamma}_I(1 + \rho)l} + \frac{\bar{\lambda} - \hat{\lambda}}{l} \geq 0$, i.e., if v is not too small compared to α^* since then $\gamma^* \rightarrow 1$. Hence, $\tilde{\gamma}_I$ falls with α when the mark-up is sufficiently small compared to v and society selects $\hat{\gamma}_I$ if investment is welfare enhancing. For $\gamma^* > \tilde{\gamma}_I$, this is the case if $\rho \int_{\hat{\lambda}}^{\bar{\lambda}} \frac{\lambda}{l} d\lambda + \rho \int_{\underline{\lambda}}^{\hat{\lambda}} \frac{(1 - \gamma^*)\lambda + \gamma^* v}{l} d\lambda - \zeta \geq 0$ and therefore for ρ (ζ) not too small (large). For $\gamma^* \leq \tilde{\gamma}_I$ instead, the analysis is as in the exogenous transaction costs case and $\tilde{\gamma}_I$ is selected for α small compared to v and so $\gamma_I^* \rightarrow \gamma^*$ and for ρ (ζ) not too small (large).

For what finally concerns the scenario of transaction costs driven by lemon-type distortions, the original owners' expected utility is $\frac{\Delta}{2} p_L (1 + \rho) + \left(1 - \frac{\Delta}{2}\right) \gamma^* \lambda_m (1 + \rho) - \kappa$, and $\tilde{\gamma}_I = \frac{2\kappa - \Delta p_L (1 + \rho)}{(2 - \Delta)\lambda_m (1 + \rho)}$, and γ_I^* is as in the basic setup. Investment prevails only if optimal property rights are larger than $\tilde{\gamma}_I$, and society then selects $\hat{\gamma}_I$ if investment is welfare enhancing. For $\gamma^* > \tilde{\gamma}_I$, this is the case if $\theta \lambda_m \frac{\Delta}{2} + (1 - \Delta) [(1 - \gamma^*) \alpha \lambda_m + \gamma^* \lambda_m] + [(1 - \gamma^*) \frac{\lambda_m}{\theta} + \gamma^* \lambda_m] \frac{\Delta}{2} \geq \zeta \rho^{-1}$ and so for ρ (ζ) not too small (large). For $\gamma^* \leq \tilde{\gamma}_I$ instead, society selects $\tilde{\gamma}_I$ if $\rho \theta \lambda_m \frac{\Delta}{2} + [(1 + \rho) (1 - \tilde{\gamma}_I) - (1 - \gamma^*)] [(1 - \Delta) \alpha \lambda_m + \frac{\lambda_m}{\theta} \frac{\Delta}{2}] + \left(1 - \frac{\Delta}{2}\right) (\tilde{\gamma}_I - \gamma^*) \lambda_m - \zeta \geq 0$ and so for α small relative to v and so $\gamma_I^* \rightarrow \gamma^*$ and for ρ (ζ) not too small (large). \square

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Tables and Figures

Table 1: Full Sample

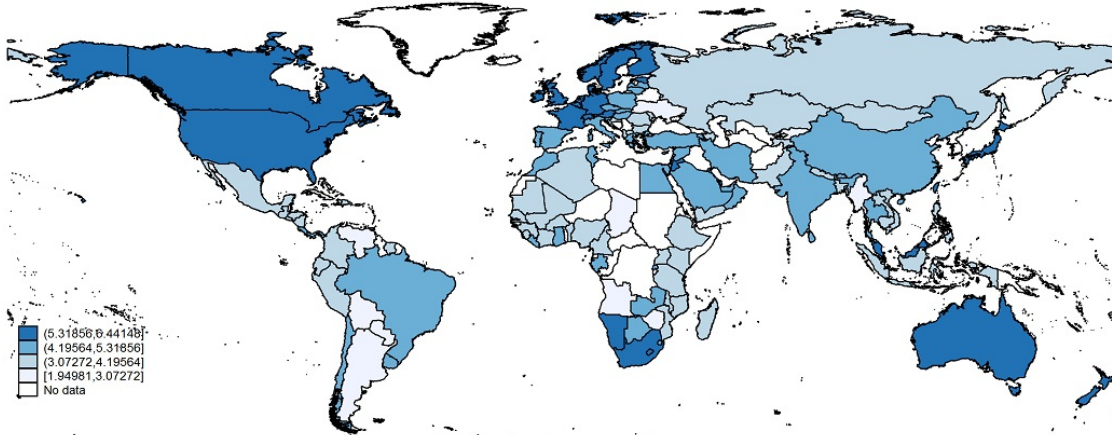
Albania; Algeria; Angola; Argentina; Armenia; Australia; Austria; Azerbaijan; Bahrain; Bangladesh; Belgium; Benin; Bhutan; Bolivia; Botswana; Brazil; Bulgaria; Burkina Faso; Burundi; Cambodia; Cameroon; Canada; Chad; Chile; China; Colombia; Costa Rica; Cote d'Ivoire; Croatia; Cyprus; Czech Republic; Denmark; Dominican Republic; Ecuador; Egypt; El Salvador; Estonia; Ethiopia; Finland; France; Gabon; Gambia; Germany; Ghana; Greece; Guatemala; Guinea; Honduras; Hungary; India; Indonesia; Iran; Ireland; Israel; Italy; Jamaica; Japan; Jordan; Kazakhstan; Kenya; Kuwait; Kyrgyz Republic; Lao; Latvia; Lebanon; Lesotho; Liberia; Lithuania; Luxembourg; Macedonia; Madagascar; Malawi; Malaysia; Mali; Mauritania; Mauritius; Mexico; Moldova; Mongolia; Montenegro; Morocco; Mozambique; Myanmar; Namibia; Nepal; Netherlands; New Zealand; Nicaragua; Nigeria; Norway; Oman; Pakistan; Panama; Paraguay; Peru; Philippines; Poland; Portugal; Qatar; Romania; Russia; Rwanda; Saudi Arabia; Senegal; Serbia; Sierra Leone; Singapore; Slovak Republic; Slovenia; South Africa; Spain; Sri Lanka; Suriname; Swaziland; Sweden; Switzerland; Syria; Taiwan; Tajikistan; Tanzania; Thailand; Trinidad & Tobago; Tunisia; Turkey; Uganda; Ukraine; United Arab Emirates; United Kingdom; United States; Uruguay; Venezuela; Vietnam; Yemen; Zambia; Zimbabwe.
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Table 2: Summary of Variables

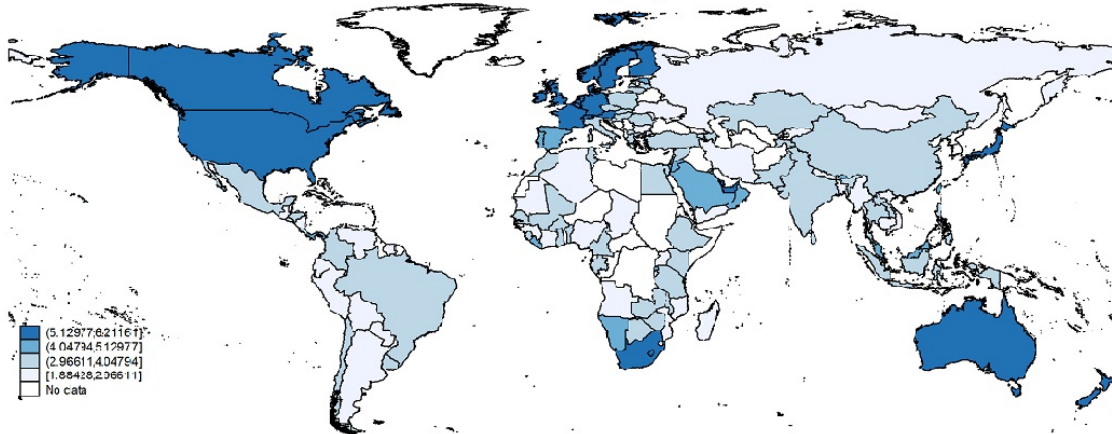
Variable	Definition and Sources	Statistics
Property rights:	<i>Property-Rights:</i>	Index ranging between one and seven and gaging the strength of generic property rights. Source: 2006-2015 EOS, available at https://www.weforum.org/reports/ 4.388 (1.034)
	<i>Intellectual-Property:</i>	Index ranging between one and seven and gaging how strong are intellectual property rights. Source: 2006-2015 EOS. 3.713 (1.124)
	<i>Shareholders-Protection:</i>	Index ranging between one and seven and gaging to what extent are the interests of minority shareholders protected by the legal system. Source: 2006-2015 EOS. 4.305 (0.750)
Transaction costs:	<i>Over-Regulation:</i>	Index ranging between one and seven and gaging how burdensome is for firms to comply with governmental administrative requirements. Source: 2006-2015 EOS. 3.708 (0.658)
	<i>Unavailability-Financing:</i>	Index ranging between one and seven and gaging the financial sector difficulties in providing products and services to businesses. Source: 2006-2015 EOS. 2.489 (0.955)
	<i>Market-Dominance:</i>	Index ranging between one and seven and falling with the competitiveness of corporate activity. Source: 2006-2015 EOS. 3.168 (0.837)
	<i>Trade-Barriers:</i>	Index ranging between one and seven and gaging how much non-tariff barriers curb imported goods ability to compete with domestic ones. Source: 2006-2015 EOS. 2.545 (0.685)
	<i>Asymmetric-Information:</i>	Index ranging between one and seven and falling with the extent of information used by buyers to make purchasing decisions. Source: 2006-2015 EOS. 3.447 (0.835)
	<i>Asset-Specificities:</i>	Index ranging between one and seven and gaging the competitive advantage of the country's companies in international markets. Source: 2006-2015 EOS. 3.595 (1.015)
Other controls:	<i>Income:</i>	Natural logarithm of the output-side real GDP at chained PPPs in 2011 US dollar per capita. Source: Penn World Table 9.0, available at https://pwt.sas.upenn.edu/ 9.213 (1.194)
	<i>Democracy:</i>	Polity IV constraints on the executive authority score ranging between one and seven. Source: POLITY IV dataset, available at http://www.systemicpeace.org 5.303 (1.875)
	<i>Reserves:</i>	Crude oil proved reserves in barrels per capita. Source: Energy Information Administration, available at http://www.eia.gov/ 1895.327 (9400.035)
	<i>Conflict-External:</i>	Share of previous half-century in which the country was involved in external military conflicts. Source: http://www.correlatesofwar.org/ 0.014 (0.050)
	<i>Conflict-Internal:</i>	Share of previous half-century in which the country was involved in internal military conflicts. Source: http://www.correlatesofwar.org/ 0.064 (0.120)
	<i>Human-Capital:</i>	Ratio of total tertiary enrollment, regardless of age, to the population of the relative age group. Source: 2006-2015 EOS. 33.758 (25.843)
Excluded instruments:	<i>Technology-Availability:</i>	Index ranging between one and seven and gaging the availability of the latest technologies. Source: 2006-2015 EOS. 4.634 (1.033)
	<i>Math-Science:</i>	Index ranging between one and seven and gaging the quality of math and science education. Source: 2006-2015 EOS. 3.943 (0.975)

Note: 1. The last column reports the mean value and, in parentheses, the standard deviation of each variable. Both are computed for the 1350 observations used in tables 2 to 6.

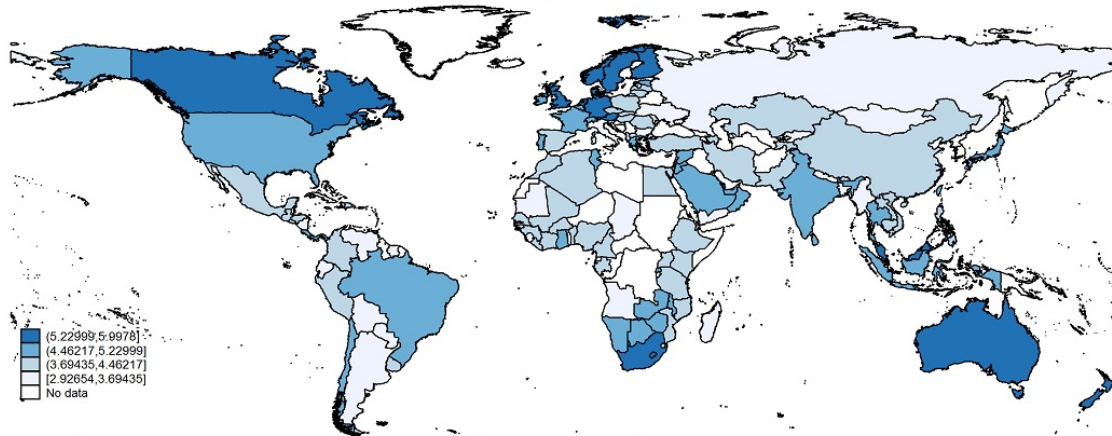
Figure 1: Strength of Property Rights Protection
Property-Rights



Intellectual-Property

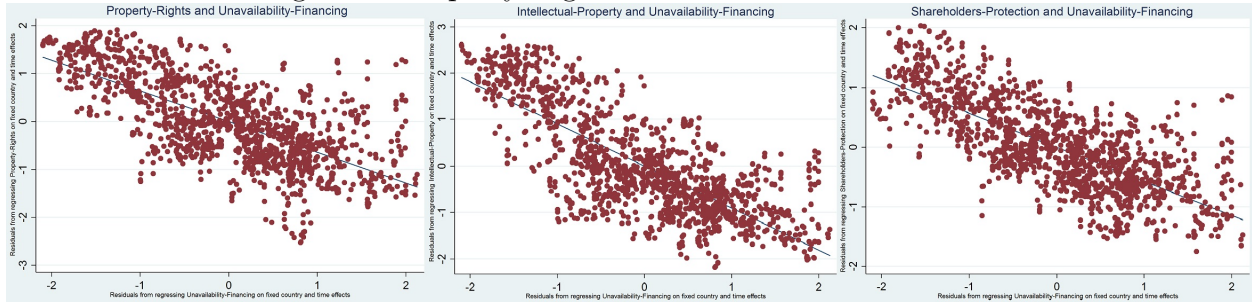


Shareholders-Protection



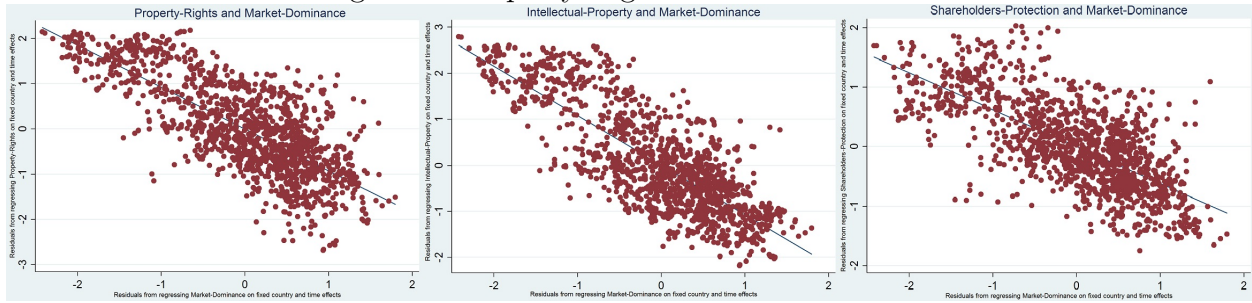
Note: 1. Here, I divide the range of each of the four variables, whose definitions and sources are listed in table 2, into four equal intervals.

Figure 2: Property Rights and Financial Inefficiencies



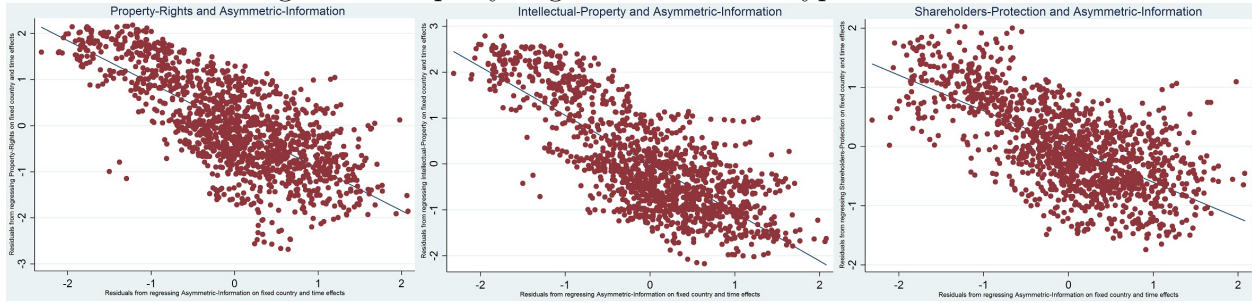
Note: 1. Residuals and fitted values lines are obtained from the sample employed in table 3.

Figure 3: Property Rights and Market Power



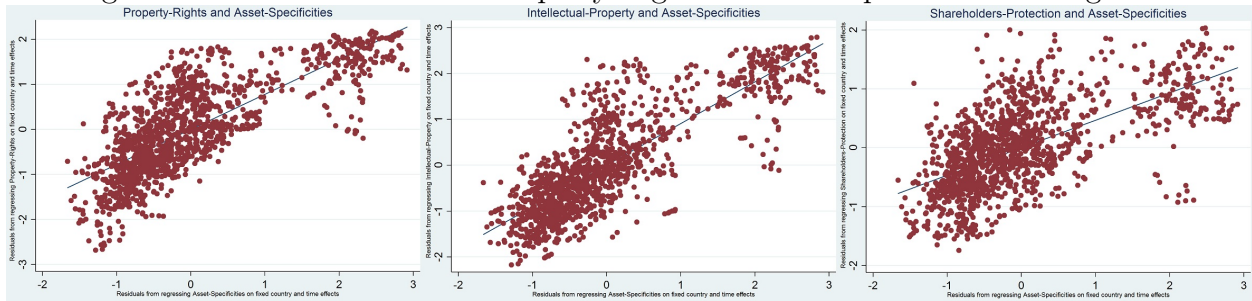
Note: 1. Residuals and fitted values lines are obtained from the sample employed in table 3.

Figure 4: Property Rights and Lemons-type Distortions



Note: 1. Residuals and fitted values lines are obtained from the sample employed in table 3.

Figure 5: Downstream Firm's Property Rights and Incomplete Contracting Costs



Note: 1. Residuals and fitted values lines are obtained from the sample employed in table 3.

Figure 6: Property Rights and Transaction Costs

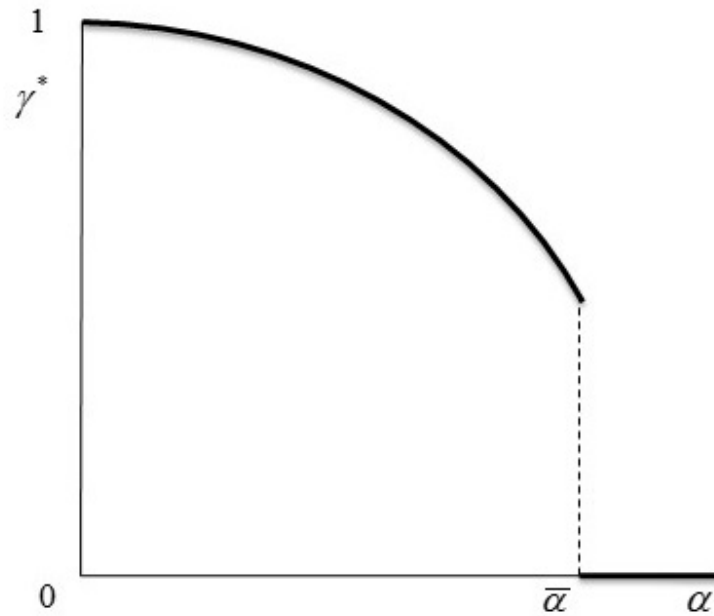


Table 3: Property Rights and Transaction Costs

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 0.445 (0.049)***					
<i>Unavailability-Financing</i>		- 0.190 (0.078)**				
<i>Market-Dominance</i>			- 0.370 (0.061)***			
<i>Trade-Barriers</i>				- 0.238 (0.047)***		
<i>Asymmetric-Information</i>					- 0.314 (0.044)***	
<i>Asset-Specificities</i>						0.290 (0.059)***
Estimation	OLS					
R ²	0.40	0.28	0.37	0.31	0.36	0.29
Number of observations	1350	1350	1350	1350	1350	1350
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 0.495 (0.063)***					
<i>Unavailability-Financing</i>		- 0.161 (0.080)**				
<i>Market-Dominance</i>			- 0.470 (0.065)***			
<i>Trade-Barriers</i>				- 0.181 (0.054)***		
<i>Asymmetric-Information</i>					- 0.425 (0.053)***	
<i>Asset-Specificities</i>						0.492 (0.078)***
Estimation	OLS					
R ²	0.24	0.06	0.26	0.07	0.25	0.18
Number of observations	1350	1350	1350	1350	1350	1350
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 0.337 (0.060)***					
<i>Unavailability-Financing</i>		- 0.243 (0.102)**				
<i>Market-Dominance</i>			- 0.356 (0.067)***			
<i>Trade-Barriers</i>				- 0.329 (0.052)***		
<i>Asymmetric-Information</i>					- 0.317 (0.056)***	
<i>Asset-Specificities</i>						0.367 (0.071)***
Estimation	OLS					
R ²	0.25	0.23	0.28	0.28	0.28	0.24
Number of observations	1350	1350	1350	1350	1350	1350
Notes:	1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%. 2. All specifications include country and year fixed effects.					

Table 4: Property Rights and Transaction Costs — Controlling for Observables

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 0.442 (0.049)***					
<i>Unavailability-Financing</i>		- 0.202 (0.071)***				
<i>Market-Dominance</i>			- 0.357 (0.061)***			
<i>Trade-Barriers</i>				- 0.226 (0.049)***		
<i>Asymmetric-Information</i>					- 0.307 (0.048)***	
<i>Asset-Specificities</i>						0.272 (0.058)***
P-value for all extra controls	0.08	0.07	0.33	0.31	0.56	0.27
Estimation	OLS					
R ²	0.42	0.31	0.38	0.32	0.37	0.31
Number of observations	1350	1350	1350	1350	1350	1350
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 0.482 (0.063)***					
<i>Unavailability-Financing</i>		- 0.163 (0.077)**				
<i>Market-Dominance</i>			- 0.460 (0.065)***			
<i>Trade-Barriers</i>				- 0.174 (0.055)***		
<i>Asymmetric-Information</i>					- 0.414 (0.055)***	
<i>Asset-Specificities</i>						0.469 (0.078)***
P-value for all extra controls	0.04	0.10	0.08	0.14	0.56	0.17
Estimation	OLS					
R ²	0.26	0.10	0.28	0.11	0.26	0.20
Number of observations	1350	1350	1350	1350	1350	1350
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 0.340 (0.059)***					
<i>Unavailability-Financing</i>		- 0.268 (0.108)**				
<i>Market-Dominance</i>			- 0.357 (0.063)***			
<i>Trade-Barriers</i>				- 0.340 (0.053)***		
<i>Asymmetric-Information</i>					- 0.329 (0.055)***	
<i>Asset-Specificities</i>						0.352 (0.068)***
P-value for all extra controls	0.03	0.01	0.01	0.04	0.01	0.11
Estimation	OLS					
R ²	0.27	0.25	0.30	0.30	0.30	0.25
Number of observations	1350	1350	1350	1350	1350	1350
Notes:	1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%. 2. All specifications include country and year fixed effects, <i>Income</i> , <i>Democracy</i> , <i>Reserves</i> , <i>Conflict-External</i> , <i>Conflict-Internal</i> , and <i>Human-Capital</i> .					

Table 5: Using Selection on Observables to Assess the Bias from Unobservables

	(1)	(2)	(3)
	<i>Property-Rights</i>	The dependent variable is <i>Intellectual-Property</i>	<i>Shareholders-Protection</i>
The measure of transaction cost is:			
<i>Over-Regulation</i>	147.33	37.08	113.33
<i>Unavailability-Financing</i>	16.83	81.50	10.72
<i>Market-Dominance</i>	27.46	46	357
<i>Trade-Barriers</i>	18.83	24.86	30.91
<i>Asymmetric-Information</i>	43.86	37.64	27.42
<i>Asset-Specificities</i>	15.11	20.39	23.47

Note: 1. Each cell reports an index constructed as explained in section 4.1.2 and based on the coefficients attached to the measure of transaction costs listed on the left and obtained from two regressions. In one, the covariates include only country and year fixed effects. In the other, the “full set” of covariates gathers country and year fixed effects, *Income*, *Democracy*, *Reserves*, *Conflict-External*, *Conflict-Internal*, and *Human-Capital*. The number of observations is 1350.

Table 6: Property Rights and Endogenous Transaction Costs

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 0.945 (0.166)***					
<i>Unavailability-Financing</i>		- 1.625 (0.396)***				
<i>Market-Dominance</i>			- 0.219 (0.047)***			
<i>Trade-Barriers</i>				- 1.185 (0.271)***		
<i>Asymmetric-Information</i>					- 0.776 (0.122)***	
<i>Asset-Specificities</i>						2.043 (0.647)***
P-value for all extra controls	0.00	0.17	0.67	0.35	0.18	0.79
First Stage for the Transaction Costs Measure						
<i>Technology-Availability</i>	- 0.139 (0.051)***	- 0.112 (0.038)***	- 0.219 (0.047)***	- 0.168 (0.049)***	- 0.100 (0.055)*	0.023 (0.034)
<i>Math-Science</i>	- 0.294 (0.053)***	- 0.126 (0.057)**	- 0.379 (0.058)***	- 0.137 (0.074)*	- 0.411 (0.062)***	0.162 (0.051)***
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.00
P-value of over-identification test	0.49	0.15	0.24	0.07	0.65	0.46
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 1.342 (0.206)***					
<i>Unavailability-Financing</i>		- 2.344 (0.613)***				
<i>Market-Dominance</i>			- 0.971 (0.103)***			
<i>Trade-Barriers</i>				- 1.725 (0.403)***		
<i>Asymmetric-Information</i>					- 1.088 (0.137)***	
<i>Asset-Specificities</i>						2.846 (0.774)***
P-value for all extra controls	0.05	0.33	0.15	0.14	0.21	0.67
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.01
P-value of over-identification test	0.81	0.24	0.37	0.16	0.30	0.23
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 0.630 (0.163)***					
<i>Unavailability-Financing</i>		- 1.182 (0.296)***				
<i>Market-Dominance</i>			- 0.466 (0.108)***			
<i>Trade-Barriers</i>				- 0.902 (0.232)***		
<i>Asymmetric-Information</i>					- 0.481 (0.128)***	
<i>Asset-Specificities</i>						1.217 (0.467)***
P-value for all extra controls	0.00	0.03	0.00	0.00	0.01	0.62
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.01
P-value of over-identification test	0.29	0.86	0.41	0.79	0.08	0.05
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350

Notes: 1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; ** 5%; *, 10%.
 2. All specifications include country and year fixed effects, *Income*, *Democracy*, *Reserves*, *Conflict-External*, *Conflict-Internal*, and *Human-Capital*. The endogenous variable in columns (1) to (6) is respectively *Over-Regulation*, *Unavailability-Financing*, *Market-Dominance*, *Trade-Barriers*, *Asymmetric-Information*, and *Asset-Specificities*, whereas the excluded instruments are *Technology-Availability* and *Math-Science*.
 3. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor.
 4. The null hypothesis of the Hansen test of over-identifying restrictions is that the excluded instruments, as a group, are exogenous.

APPENDIX (NOT FOR PUBLICATION)

References

Dari-Mattiacci, Giuseppe, and Carmine Guerriero. 2017. “A Novel Dataset on Horizontal Property Rights in 126 Jurisdictions.” *Data in Brief*, 11: 557-561.

Supplementary Tables

Table I: Summary of Variables

	Variable	Definition and Sources	Statistics
Property rights:	<i>Adverse-Possession:</i>	Years needed for adverse possession by any good-faith possessor of a movable good. Source: Dari-Mattiacci and Guerriero (2017).	9.066 (10.570) [53]
	<i>Investors-Protection</i>	Index ranging between 1 and 10 and gaging the quality of both conflict of interest regulation and shareholder governance. Source: World Bank, Doing Business Project 2006-2015, available at http://www.doingbusiness.org/data	5.101 (1.575) [1350]
Transaction costs:	<i>Bribery:</i>	Index ranging between one and seven and rising with the extent to which making bribes in connection with their daily activities is common for firms. Source: 2006-2015 EOS.	2.902 (1.198) [1350]
	<i>Unavailability-Loans:</i>	Index ranging between one and seven and rising with the difficulty to obtain a bank loan with only a good business plan and no collateral. Source: 2006-2015 EOS.	3.995 (0.874) [1350]
	<i>Unavailability-Equity:</i>	Index ranging between one and seven and rising with how difficult is it for companies to raise money by issuing shares on the stock market. Source: 2006-2015 EOS.	3.254 (1.105) [1350]
	<i>Market-Power:</i>	Index ranging between one and seven and falling with the intensity of competition in the local markets. Source: 2006-2015 EOS.	2.165 (0.667) [1350]
	<i>Production-Sophistication:</i>	Index ranging between one and seven and gaging the extent of production sophistication. A value of one (seven) suggests that production uses labor-intensive (sophisticated and knowledge-intensive) processes. Source: 2006-2015 EOS.	3.792 (1.064) [1350]
	<i>Site-Specificity:</i>	Index ranging between one and seven and gaging the state of infrastructure. A value of one suggests an extremely underdeveloped overall infrastructure, whereas a value of seven implies an extensive and efficient infrastructure. Source: 2006-2015 EOS.	4.047 (1.217) [1350]
Other controls:	<i>Enforcement:</i>	See text. Source: United Nations, Surveys of Crime Trends and the Operations of Criminal Justice Systems 2005-2015, available at https://www.unodc.org/	- 0.007 (1.012) [740]
	<i>Culture:</i>	See text. Sources: European Value Study and World Value Survey available at http://www.europeanvaluesstudy.eu/ and http://www.worldvaluessurvey.org/	- 0.0004 (1.030) [590]

Note: 1. The last column reports the mean value and, in parentheses, the standard deviation of each variable. Both are computed starting from the 1350 observations used in tables III to VI, except in the case of *Adverse-Possession* for which they are calculated building on the 91 observations employed in table II as detailed in the square brackets.

Table II: Property Rights and Endogenous Transaction Costs — Cross-Section

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Adverse-Possession</i>						
<i>Over-Regulation</i>	- 14.204 (4.986)***					
<i>Unavailability-Financing</i>		- 6.370 (3.149)**				
<i>Market-Dominance</i>			- 11.314 (4.060)***			
<i>Trade-Barriers</i>				- 11.827 (6.805)*		
<i>Asymmetric-Information</i>					- 15.717 (6.552)**	
<i>Asset-Specificities</i>						8.742 (2.988)***
P-value of under-identification test	0.20	0.00	0.00	0.01	0.00	0.00
P-value of over-identification test	0.82	0.19	0.81	0.21	0.82	0.97
P-value of endogeneity test	0.08	0.02	0.11	0.15	0.06	0.06
Estimation				2SLS		
Number of observations	53	53	53	53	53	53
Panel B. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 1.880 (0.639)***					
<i>Unavailability-Financing</i>		- 1.135 (0.252)***				
<i>Market-Dominance</i>			- 1.514 (0.411)***			
<i>Trade-Barriers</i>				- 2.088 (0.722)***		
<i>Asymmetric-Information</i>					- 2.108 (0.705)***	
<i>Asset-Specificities</i>						1.126 (0.277)***
P-value of under-identification test	0.20	0.00	0.00	0.01	0.00	0.00
P-value of over-identification test	0.17	0.32	0.18	0.40	0.14	0.09
P-value of endogeneity test	0.01	0.01	0.01	0.02	0.03	0.04
Estimation				2SLS		
Number of observations	53	53	53	53	53	53
Panel C. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 2.297 (0.878)***					
<i>Unavailability-Financing</i>		- 1.232 (0.265)***				
<i>Market-Dominance</i>			- 1.841 (0.382)***			
<i>Trade-Barriers</i>				- 2.273 (0.827)***		
<i>Asymmetric-Information</i>					- 2.561 (0.717)***	
<i>Asset-Specificities</i>						1.392 (0.288)***
P-value of under-identification test	0.20	0.00	0.00	0.01	0.00	0.00
P-value of over-identification test	0.57	0.07	0.45	0.18	0.56	0.20
P-value of endogeneity test	0.00	0.13	0.00	0.09	0.00	0.01
Estimation				2SLS		
Number of observations	53	53	53	53	53	53
Panel D. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 1.465 (0.682)**					
<i>Unavailability-Financing</i>		- 0.959 (0.141)***				
<i>Market-Dominance</i>			- 1.184 (0.267)***			
<i>Trade-Barriers</i>				- 1.761 (0.543)***		
<i>Asymmetric-Information</i>					- 1.650 (0.411)***	
<i>Asset-Specificities</i>						0.870 (0.273)***
P-value of under-identification test	0.20	0.00	0.00	0.01	0.00	0.00
P-value of over-identification test	0.11	0.45	0.08	0.65	0.03	0.04
P-value of endogeneity test	0.01	0.01	0.03	0.00	0.06	0.05
Estimation				2SLS		
Number of observations	53	53	53	53	53	53
Notes:	<ol style="list-style-type: none"> Robust standard errors in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%. All specifications include country and year fixed effects, <i>Income</i>, <i>Democracy</i>, <i>Reserves</i>, <i>Conflict-External</i>, <i>Conflict-Internal</i>, <i>Human-Capital</i>, <i>Enforcement</i>, and <i>Culture</i>. The endogenous variable in columns (1) to (6) is respectively <i>Over-Regulation</i>, <i>Unavailability-Financing</i>, <i>Market-Dominance</i>, <i>Trade-Barriers</i>, <i>Asymmetric-Information</i>, and <i>Asset-Specificities</i>, whereas the excluded instruments are <i>Technology-Availability</i> and <i>Math-Science</i>. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor. The null hypothesis of the Hansen test of over-identifying restrictions is that the excluded instruments, as a group, are exogenous. The null hypothesis of the endogeneity test is that the endogenous regressor can be treated as exogenous. 					

Table III: Investors Protection and Endogenous Transaction Costs

	(1)	(2)	(3)	(4)	(5)	(6)
The dependent variable is <i>Investors-Protection</i>						
<i>Over-Regulation</i>	- 0.241 (0.150)*					
<i>Unavailability-Financing</i>		- 0.469 (0.287)*				
<i>Market-Dominance</i>			- 0.180 (0.110)*			
<i>Trade-Barriers</i>				- 0.364 (0.213)*		
<i>Asymmetric-Information</i>					- 0.178 (0.127)	
<i>Asset-Specificities</i>						0.442 (0.344)
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.00
P-value of over-identification test	0.49	0.75	0.56	0.90	0.33	0.28
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350
Notes:	<ol style="list-style-type: none"> Robust standard errors in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%. All specifications include country and year fixed effects, <i>Income</i>, <i>Democracy</i>, <i>Reserves</i>, <i>Conflict-External</i>, <i>Conflict-Internal</i>, and <i>Human-Capital</i>. The endogenous variable in columns (1) to (6) is respectively <i>Over-Regulation</i>, <i>Unavailability-Financing</i>, <i>Market-Dominance</i>, <i>Trade-Barriers</i>, <i>Asymmetric-Information</i>, and <i>Asset-Specificities</i>, whereas the excluded instruments are <i>Technology-Availability</i> and <i>Math-Science</i>. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor. The null hypothesis of the Hansen test of over-identifying restrictions is that the excluded instruments, as a group, are exogenous. 					

Table IV: Property Rights and Other Measures of Endogenous Transaction Costs

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Bribery</i>	- 1.427 (0.321)***					
<i>Unavailability-Loans</i>		- 0.763 (0.141)***				
<i>Unavailability-Equity</i>			- 0.617 (0.175)***			
<i>Market-Power</i>				- 0.622 (0.144)***		
<i>Production-Sophistication</i>					0.817 (0.127)***	
<i>Site-Specificity</i>						0.404 (0.084)***
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.00
P-value of over-identification test	0.60	0.07	0.00	0.00	0.53	0.00
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Bribery</i>	- 2.027 (0.454)***					
<i>Unavailability-Loans</i>		- 1.051 (0.174)***				
<i>Unavailability-Equity</i>			- 0.802 (0.202)***			
<i>Market-Power</i>				- 0.937 (0.173)***		
<i>Production-Sophistication</i>					1.159 (0.123)***	
<i>Site-Specificity</i>						0.603 (0.085)***
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.00
P-value of over-identification test	0.82	0.02	0.00	0.00	0.81	0.00
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Bribery</i>	- 0.953 (0.258)***					
<i>Unavailability-Loans</i>		- 0.422 (0.135)***				
<i>Unavailability-Equity</i>			- 0.216 (0.164)			
<i>Market-Power</i>				- 0.557 (0.154)***		
<i>Production-Sophistication</i>					0.543 (0.139)***	
<i>Site-Specificity</i>						0.349 (0.089)***
P-value of under-identification test	0.00	0.00	0.00	0.00	0.00	0.00
P-value of over-identification test	0.28	0.01	0.00	0.08	0.28	0.18
Estimation				2SLS		
Number of observations	1350	1350	1350	1350	1350	1350

- Notes:
1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%.
 2. All specifications include country and year fixed effects, *Income*, *Democracy*, *Reserves*, *Conflict-External*, *Conflict-Internal*, and *Human-Capital*. The endogenous variables in columns (1) to (5) is respectively *Bribery*, *Unavailability-Loans*, *Unavailability-Equity*, *Market-Power*, *Production-Sophistication*, and *Site-Specificity*, whereas the excluded instruments are *Technology-Availability* and *Math-Science*.
 3. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor.
 4. The null hypothesis of the Hansen test of over-identifying restrictions is that the excluded instruments, as a group, are exogenous.

Table V: Controlling for the Intermediation Technology

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 0.906 (0.376)**					
<i>Unavailability-Financing</i>		- 1.591 (0.454)***				
<i>Market-Dominance</i>			- 1.013 (0.293)***			
<i>Trade-Barriers</i>				- 1.340 (0.610)**		
<i>Asymmetric-Information</i>					- 0.753 (0.307)**	
<i>Asset-Specificities</i>						- 8.719 (16.529)
P-value of under-identification test	0.06	0.07	0.04	0.06	0.10	0.86
P-value of over-identification test	0.11	0.29	0.02	0.83	0.06	0.81
Estimation				2SLS		
Number of observations	310	310	310	310	310	310
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 1.452 (0.401)***					
<i>Unavailability-Financing</i>		- 2.150 (0.600)***				
<i>Market-Dominance</i>			- 1.665 (0.417)***			
<i>Trade-Barriers</i>				- 1.891 (0.780)**		
<i>Asymmetric-Information</i>					- 1.291 (0.423)***	
<i>Asset-Specificities</i>						- 14.025 (27.297)
P-value of under-identification test	0.06	0.07	0.04	0.06	0.10	0.86
P-value of over-identification test	0.26	0.12	0.07	0.68	0.06	0.88
Estimation				2SLS		
Number of observations	310	310	310	310	310	310
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 0.620 (0.393)					
<i>Unavailability-Financing</i>		- 1.681 (0.487)***				
<i>Market-Dominance</i>			- 0.635 (0.438)			
<i>Trade-Barriers</i>				- 1.298 (0.479)***		
<i>Asymmetric-Information</i>					- 0.391 (0.421)	
<i>Asset-Specificities</i>						- 5.901 (11.821)
P-value of under-identification test	0.06	0.07	0.04	0.06	0.10	0.86
P-value of over-identification test	0.07	0.93	0.03	0.65	0.04	0.60
Estimation				2SLS		
Number of observations	310	310	310	310	310	310
Notes:	<ol style="list-style-type: none"> 1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; **, 5%; *, 10%. 2. All specifications include country and year fixed effects, <i>Income</i>, <i>Democracy</i>, <i>Reserves</i>, <i>Conflict-External</i>, <i>Conflict-Internal</i>, <i>Human-Capital</i>, <i>Enforcement</i>, and <i>Culture</i>. The endogenous variable in columns (1) to (6) is respectively <i>Over-Regulation</i>, <i>Unavailability-Financing</i>, <i>Market-Dominance</i>, <i>Trade-Barriers</i>, <i>Asymmetric-Information</i>, and <i>Asset-Specificities</i>, whereas the excluded instruments are <i>Technology-Availability</i> and <i>Math-Science</i>. 3. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor. 4. The null hypothesis of the Hansen test of over-identifying restrictions is that the excluded instruments, as a group, are exogenous. 					

Table VI: Property Rights and Endogenous Transaction Costs — Semi-reduced Forms

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 1.031 (0.200)***					
<i>Unavailability-Financing</i>		- 2.403 (1.008)**				
<i>Market-Dominance</i>			- 0.800 (0.125)***			
<i>Trade-Barriers</i>				- 2.212 (1.127)**		
<i>Asymmetric-Information</i>					- 0.738 (0.140)***	
<i>Asset-Specificities</i>						1.870 (0.601)***
<i>Technology-Availability</i>	- 0.041 (0.062)	- 0.168 (0.156)	- 0.073 (0.064)	- 0.269 (0.254)	0.029 (0.062)	0.059 (0.075)
P-value of under-identification test	0.00	0.03	0.00	0.07	0.00	0.00
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350
Panel B. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 1.383 (0.253)***					
<i>Unavailability-Financing</i>		- 3.224 (1.433)**				
<i>Market-Dominance</i>			- 1.073 (0.161)***			
<i>Trade-Barriers</i>				- 2.967 (1.669)*		
<i>Asymmetric-Information</i>					- 0.990 (0.142)***	
<i>Asset-Specificities</i>						2.508 (0.707)***
<i>Technology-Availability</i>	- 0.020 (0.085)	- 0.190 (0.210)	- 0.062 (0.073)	- 0.326 (0.367)	0.074 (0.067)	0.114 (0.084)
P-value of under-identification test	0.00	0.03	0.00	0.07	0.00	0.00
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350
Panel C. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 0.474 (0.219)**					
<i>Unavailability-Financing</i>		- 1.104 (0.570)**				
<i>Market-Dominance</i>			- 0.368 (0.160)**			
<i>Trade-Barriers</i>				- 1.017 (0.520)**		
<i>Asymmetric-Information</i>					- 0.339 (0.152)**	
<i>Asset-Specificities</i>						0.859 (0.417)**
<i>Technology-Availability</i>	0.075 (0.069)	0.017 (0.096)	0.060 (0.072)	- 0.030 (0.122)	0.107 (0.059)*	0.121 (0.056)**
P-value of under-identification test	0.00	0.03	0.00	0.07	0.00	0.00
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350
Panel D. The dependent variable is <i>Property-Rights</i>						
<i>Over-Regulation</i>	- 0.735 (0.331)**					
<i>Unavailability-Financing</i>		- 0.909 (0.430)**				
<i>Market-Dominance</i>			- 0.467 (0.203)**			
<i>Trade-Barriers</i>				- 0.609 (0.301)**		
<i>Asymmetric-Information</i>					- 1.024 (0.660)	
<i>Asset-Specificities</i>						4.388 (6.399)
<i>Math-Science</i>	0.087 (0.115)	0.189 (0.092)**	0.126 (0.100)	0.220 (0.081)***	- 0.117 (0.299)	- 0.409 (1.067)
P-value of under-identification test	0.01	0.01	0.00	0.00	0.07	0.49
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350
Panel E. The dependent variable is <i>Intellectual-Property</i>						
<i>Over-Regulation</i>	- 1.241 (0.470)***					
<i>Unavailability-Financing</i>		- 1.535 (0.570)***				
<i>Market-Dominance</i>			- 0.788 (0.213)***			
<i>Trade-Barriers</i>				- 1.028 (0.399)***		
<i>Asymmetric-Information</i>					- 1.729 (0.930)*	
<i>Asset-Specificities</i>						7.409 (10.093)
<i>Math-Science</i>	0.042 (0.166)	0.213 (0.127)*	0.108 (0.110)	0.266 (0.127)**	- 0.303 (0.414)	- 0.795 (1.707)
P-value of under-identification test	0.01	0.01	0.00	0.00	0.07	0.49
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350
Panel F. The dependent variable is <i>Shareholders-Protection</i>						
<i>Over-Regulation</i>	- 1.012 (0.453)**					
<i>Unavailability-Financing</i>		- 1.253 (0.470)***				
<i>Market-Dominance</i>			- 0.643 (0.249)***			
<i>Trade-Barriers</i>				- 0.838 (0.338)**		
<i>Asymmetric-Information</i>					- 1.410 (0.813)*	
<i>Asset-Specificities</i>						6.045 (8.391)
<i>Math-Science</i>	- 0.158 (0.169)	- 0.019 (0.112)	- 0.105 (0.129)	0.024 (0.091)	- 0.440 (0.365)	- 0.841 (1.395)
P-value of under-identification test	0.01	0.01	0.00	0.00	0.07	0.49
Estimation	2SLS					
Number of observations	1350	1350	1350	1350	1350	1350

Notes: 1. Robust standard errors allowing for clustering by country in parentheses. *** significant at the 1% confidence level; ** 5%; * 10%.
 2. All specifications include country and year fixed effects, *Income*, *Democracy*, *Reserves*, *Conflict-External*, *Conflict-Internal*, and *Human-Capital*. The endogenous variables in columns (1) to (6) is respectively *Over-Regulation*, *Unavailability-Financing*, *Market-Dominance*, *Trade-Barriers*, *Asymmetric-Information*, and *Asset-Specificities*, whereas the excluded instruments are *Math-Science* in panels A to C and *Technology-Availability* otherwise.
 3. The null hypothesis of the Kleibergen-Paap test is that the excluded instruments are uncorrelated with the endogenous regressor.