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THE PROPERTY-CONTRACT BALANCE.*

Giuseppe Dari-Mattiacci, Carmine Guerriero, and Zhenxing Huang

November 2, 2015

Abstract

We identify a key trade-off between protecting property rights and enhancing reliance on contracts. For instance, when a dishonest intermediary transfers a good to an innocent buyer without the owners consent, should the buyer or the owner retain the good? We show that the optimal rule maximizes the agents valuation of the good rather than their incentives to protect property and inquire about title. Furthermore, enhancing reliance on contracts is comparatively more appealing in countries where fewer intermediaries are honest and law enforcement is more efficient. This is consistent with novel comparative-law data on the acquisition of ownership over movables.

Keywords: property rights; contracts; expropriation; takings; culture; law enforcement.

JEL classification: P14; L11; Z10; K11.

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1 Introduction

The importance of protecting property rights and enhancing reliance on contracts for investment and trade has been stressed by a vast literature, which primarily focuses on “illegal takings” of private property by the state, powerful elites and special interest groups (Glaeser and Shleifer, 2003; Acemoglu and Johnson, 2005; Piccione and Rubinstein, 2007; Acemoglu and Wolitzky, 2011), and untrustworthy fellow citizens (Aghion et al., 2010). Within this framework, there is no potential conflict between protecting property from grabbing hands and enforcing contracts between private parties. Hence, both goals can be advanced simultaneously. Nevertheless, challenges to private property often come from other private parties rather than the state, as when a good is transferred to a buyer without the original owner’s consent. In this case, the buyer’s reliance on the contract conflicts with the original owner’s property right and hence it is impossible to protect both.¹ We call this fundamental trade-off the “property-contract balance” and we study it through a model, which helps shed light on recent cross-country evidence on the determinants of the very diverse rules that concern the acquisition of ownership over personal property—movable goods, in civil law parlance—around the world (Dari-Mattiacci and Guerriero, 2015).

While the law and economics literature on remedies has studied direct takings involving only an original owner and a taker (Calabresi and Melamed, 1972; Kaplow and Shavell, 1996; Bar-Gill and Persico, 2012), the property-contract balance concerns indirect takings and solves the conflict between the owner and an innocent buyer from an abusive intermediary. Crucially, after the resale of the property taken from the original owner, the intermediary is usually missing or insolvent and it is impossible to reconstruct and undo all the steps along the chain of transfers that brought about the conflict. To illustrate, Casner and Leach (1950: 179) refer to the purchase of stolen goods as the “eternal triangle of the law,” where the owner and the buyer are the honest parties in a lawsuit, while the thief is gone (see also Mautner 1991, p. 96; Hawkins, Rothman, and Goldstein 1995, p. 50). In the limited set of cases in which the thief can be found, the problem reduces to a series of concatenated direct

¹We do not consider enforcement of contracts, which is relevant only for the two contracting parties, but instead the more general notion of enhancing “reliance on contract,” which applies to third parties as well. Note that the original owner and the buyer are not in a contractual relationship.

transfers, which can be approached through the lens of Calabresi and Melamed’s framework.

The property-contract balance emerges especially in primary markets cleared by intermediaries and in all secondary markets, but also applies to many other instances. If an intermediary forges a financial instrument before transferring it, the current bearer and the issuer will hold incompatible rights and obligations. The same happens if a debtor pledges the same asset as security to two creditors, if an agent sells a service that she is not allowed to sell, or if an owner sells the same property to two buyers. All these situations can potentially generate a property-contract conflict. To gauge the importance of these cases, note that according to the FBI the stolen art market alone “is a looming criminal enterprise with estimated losses running as high as \$6 billion annually.”² More generally, the sectors in which intermediation is more widespread—i.e., finance, insurance, and real estate—accounted for 19.9% of the United States’ GDP in 2011. Adding retail (6.1%) and wholesale (5.6%) trade brings the estimated relevance of the sectors potentially affected by the property-contract balance to over 30% of the United States’ GDP in 2011 (Kim, Gilmore, and Jolliff, 2012).

Among these many possible applications, we specifically focus on the purchase of stolen movable goods for three crucial reasons. First, it is the most primitive form of transfer without consent and can be unambiguously defined in any legal system against a background of homogeneous prohibition of theft. The code of Hammurabi, the Talmud, Athenian law, and Roman law all provided rules to solve the conflict between the dispossessed owner and the innocent buyer of a stolen good (Levmore, 1987; Thuer, 2015). Second, it does not require us to take into account the role of registries, which is key in the case of real property (Arrunada, 2012). Finally, there are substantial differences in the rules dealing with stolen movable goods across different jurisdictions and none of the extant theories of good-faith purchase produces testable hypotheses about the determinants of this comparative variation.

Some scholars (Levmore 1987; Landes and Posner, 1996; Ben-Shahar, 1997; Schwartz and Scott, 2011) adopt an incentive approach, starting from the observation that stronger owner protection fosters the buyers’ incentives to inquire about title while diluting the owners’ incentives to protect their property. Hence, the optimal regime cannot coincide with the existing remedies, which do not condition the assignment of the good on incentives. In

²See <http://www.fbi.gov>, last accessed on February 14, 2012.

contrast, other scholars claim that the optimal rule should both maximize the expected value of ownership and mitigate the risk of right violation (Medina 2003). Nevertheless, neither of the two elements constitutes a condition determining the final assignment of good-faith purchases. Our key result is that, whenever both prices and theft are endogenously determined, value-allocation is more relevant than incentive-inducement and observable features of intermediation can be used to understand comparative variation. The intuition for the first result is as follows. Protecting original owners lowers the benefits of private protection but also its costs, because goods can be resold only at lower prices and hence thieves are less aggressive. Thus, private protection does not monotonically decrease with the legal protection of original owners. Likewise, owner protection increases the need to inquire about title but also buyer protection can make it worthwhile to do so if conditioned on good-faith. Given such patterns, the law has little control over incentives. To the contrary, we show that it has a great effect on allocative efficiency. In doing so, we link the property-contract balance to the two key determinants of transactions without consent and, in particular, the intermediaries' honesty and the quality of the public enforcement of the law.

Formally, we study a society in which homogeneous goods can be transferred to buyers only by intermediaries, who in turn can either buy or steal from original owners. Intermediaries are either “moral” and thus unwilling to steal or “immoral.” The fraction of moral intermediaries in the population measures the culture of morality. The intermediary's type is private information. Each intermediary first decides whether to steal, buy, or exit the market and then possibly announces a selling price. Next, once randomly matched to an intermediary, each buyer observes a costless, public, and imperfect signal on whether title is defective—i.e., the good was stolen—or proper—i.e., the good was bought from an original owner. Then, she chooses whether to buy the good or exit the market. The signal is verifiable in court and captures the legal notion of good-faith. Finally, with an exogenous probability embedding the quality of law enforcement, the legal system observes the title of each good and enforces the law according to the rule in place. We consider three rules: under *owner protection*, stolen goods are returned to original owners; under *good-faith buyer protection*, only good-faith buyers—i.e., those who received an uninformative signal—can keep stolen goods; and under *full buyer protection*, all buyers can retain stolen goods. If buyers value the

good more than original owners do, under the first two rules, there are separating equilibria in which moral intermediaries signal their proper title by setting prices higher than those set for stolen goods by immoral intermediaries. This pattern stresses the difference between the buyer's actual knowledge as possibly driven by the price and the legal notion of good-faith as determined by the signal. This feature of the model captures the fact that the parties have more information than that verifiable in court. If original owners have the highest valuation instead, the market shrinks since moral intermediaries refrain from stealing.

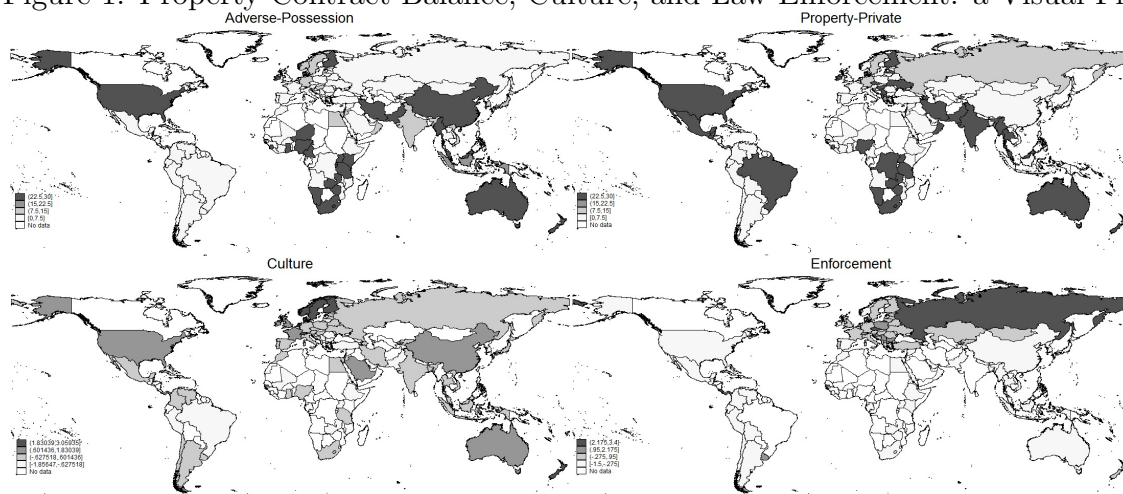
Thus, the agents' behaviour crucially depends on who has the highest valuation. In characterizing the institutional design, we focus on markets in which buyers have the highest valuation since these turn out to yield the largest gains to intermediaries, who will consequently self select into them. Moreover, a primary function of intermediaries is to match original owners with higher-valuation buyers. Anyway, the pith of the model survives when we introduce a minority of low-valuation buyers. In addition, since in reality every buyer will be at a point in time an owner and every owner was once a buyer, we concentrate on socially optimal rules. Since buyers value the good more than original owners do, the ownership of stolen goods should in principle be given to buyers. Yet, the law will typically consider also other factors pushing for more owner protection, such as incentives or risk allocation (see also Weinberg, 1980), which we model as a random pro-buyer stance of society. These factors allow for legal variation and thus protecting original owners is comparatively more appealing when more intermediaries are honest and when law enforcement is less efficient.

The intuition is as follows. In a society with a strong culture of morality, only few intermediaries are dishonest and thus most goods for sale have proper title; therefore, condoning non-consensual transfers through buyer protection is not important. Accordingly, countries with a strong culture of morality should prefer owner protection. In contrast, a very efficient law enforcement combined with owner protection returns most goods to original owners, which is undesirable if buyers have the highest valuation. Thus, countries with efficient enforcement should refrain from owner protection. Finally, the impact of culture and enforcement on the institutional choice is stronger when the difference between the owner's and the buyer's valuations is larger, i.e., misallocations produce larger welfare costs.

There is a large variation in the rules concerning the acquisition of ownership over mov-

ables. While the United States fully protects owners (“the theft rule,” *Solomon R. Guggenheim Found. v. Lubell*, 569 N.E.2d 426, N.Y. 1991) and Italy fully protects buyers (Italian Civil Code, art. 1153), many countries, such as France, Germany and England, afford buyers an intermediate protection level barring recovery by the owner only after a number of years from the purchase, i.e., three (French Civil Code, art. 2276), six (Sale of Goods Act 1979, s. 21; Limitation Act 1980, ss. 2-5), and ten years (German Civil Code, ss. 935 and 937).

Figure 1: Property-Contract Balance, Culture, and Law Enforcement: a Visual Fix



Note: We have divided the range of each variable into four equal intervals. See table 4 for variable definitions and sources.

Recently, two of us have built a novel dataset describing the distribution of these rules in 126 jurisdictions over the 1981-2011 period and documenting, at the same time, the lack of any significant reform over this period (Dari-Mattiacci and Guerriero, 2015). These data are based on questionnaires filled by experts from each jurisdiction and can be summarized in six variables assuming higher values the higher is the relative protection afforded to the original owner *vis-à-vis* the good-faith buyer.³ The first variable is the number of years after which a good-faith possessor of a movable good acquires ownership, *Adverse-Possession* (upper-left map in figure 1).⁴ The longer this period, the stronger the relative protection afforded to

³The questionnaire was drafted by Giuseppe Dari-Mattiacci, Carmine Guerriero, and Arthur Salomons, while the data were collected by Giuseppe Dari-Mattiacci and Carmine Guerriero. The contributors are members of Lex Mundi and HG.org (see Djankov et al., 2003), contributors to the World Bank doing business project (World Bank, 2010), and academics affiliated with the top law schools around the world.

⁴If the law prescribes that the good-faith buyer can never acquire property rights, a value of thirty is assigned to the adverse possession term. This is the maximum observed elsewhere in the sample.

the original owner. The next variables refer to the purchase of stolen goods and indicate the number of years after which the buyer definitively acquires ownership of a stolen good purchased respectively in a private sale, *Property-Private* (upper-right map in figure 1), in a public market, *Property-Market*, from a professional seller, *Property-Professional*, and in an auction, *Property-Auction* (see figure I in the Internet appendix). Finally, the dummy *Good-Faith* equals 0 when good-faith is presumed (see again figure I). Clearly, a buyer whose good-faith is presumed receives more protection than a buyer who has to prove it.

A glance to figure 1, which is drawn by dividing the range of each variable into four equal intervals, reveals two crucial aspects. First, there is a wide variation in the distribution of pro-owner rules and thus, for instance, the protection of a good-faith possessor is complete in Italy and null in the United States (see figure 1). Second, the property-contract balance across different legal features and trade environments is highly consistent. For 77 of the 126 jurisdictions (see table 1), it is also possible to construct a proxy for a culture of morality, defined as the first principal component extracted from the self-reported norms of trust and respect for others, and a proxy for the quality of law enforcement, defined as the first principal component extracted from the numbers of police personnel and professional judges.

Table 1: Sample

Albania; Argentina; Armenia; Australia; Austria; Azerbaijan; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Chile; China; Colombia; Croatia; Cyprus; Czech Republic; Denmark; Dominican Republic; Egypt; El Salvador; Estonia; Ethiopia; Finland; France; Georgia; Germany; Great Britain; Greece; Guatemala; Hong Kong; Hungary; Indonesia; Ireland; Israel; Italy; Japan; Kyrgyz Republic; Latvia; Lithuania; Luxembourg; Macedonia; Malaysia; Malta; Mexico; Moldova; Montenegro; Morocco; Netherlands; New Zealand; Northern Ireland; Norway; Pakistan; Peru; Philippines; Poland; Portugal; Romania; Russia; Rwanda; Scotland; Singapore; Slovak Republic; Slovenia; South Africa; South Korea; Spain; Sweden; Switzerland; Thailand; Trinidad and Tobago; Turkey; Uganda; Ukraine; United States; Uruguay; Venezuela; Zambia.
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Consistent with our model and the idea that buyers tend to have higher valuations, the original owner’s property is protected the most in jurisdictions endowed with the strongest culture of morality and/or the weakest law enforcement and the role of both features is more relevant in more competitive trade environments. To illustrate these findings, the USA exhibits a much stronger culture of morality and a much weaker enforcement than Italy and, hence, protects owners while Italy protects buyers. These results remain robust even after accounting for the endogeneity of both culture and law enforcement and after controlling for a battery of observable features like the pro-owner attitude of the jurisdiction, the settlement strategy of the colonizers, and the strength of the jurisdiction’s enforcement capacity.

The paper proceeds as follows. In section 2, we present the basic model and we study the relationship between value misallocation and the property-contract balance. In addition, we show that the results we obtain remain robust to the consideration of several alternative assumptions, e.g., buyers can be moral or there exists a buy-back option for the original owner and thus the buyer's interests are protected through a liability rule. In section 3, we clarify why value misallocation is more relevant than the original owner's incentives to protect property and the buyer's willingness to inquire about title. In section 4 instead, we discuss more thoroughly the existing empirical evidence on the property-contract balance. Finally, we conclude in section 5 highlighting the policy implications generated by our theoretical framework and relevant for the ongoing international process of legal harmonization. We gather proofs and additional figures and tables in an Internet appendix.

2 Property-Contract Balance and Value Misallocation

We consider a society composed of a continuum of original owners of a homogeneous good, a continuum of intermediaries of mass one, and a continuum of potential buyers of mass one. Original owners have a mass equal to one plus an atomistic agent and can interact with the buyers only through the intermediaries because, for instance, original owners and buyers are unable to locate each other or communicate. Each intermediary can store at most one good and meets only one randomly drawn buyer. This hypothesis spares us a set of essentially arbitrary assumptions about the mechanism that should assign a buyer who refuses to buy from her match to another intermediary. Agents have linear utility functions and we assume that there is Bertrand competition among original owners and thus intermediaries can always buy the good by paying an original owner his valuation. Intermediaries value the good at 0, original owners at $U > 0$, and buyers at $V > 0$. All valuations are common knowledge.

We consider both the $V > U$ and the $V < U$ case. For the sake of simplicity, in the former case $V = \bar{V} \equiv U + \Delta$, whereas in the latter scenario $V = \underline{V} \equiv U - \Delta$, where $\Delta > 0$ measures the difference between the owner's and the buyer's valuations. \underline{V} and \bar{V} can be made asymmetric around U at the cost of a more cumbersome algebra. In characterizing the institutional design, we focus on the $V = \bar{V}$ case since we show in sections 2.1 and 2.2

that markets in which buyers have the highest valuation yield larger gains for the intermediaries, who will thus self select into them (see footnote 9). In addition, a key function of intermediation is to inform original owners of resale opportunities and thus ease the match with higher-valuation buyers. Finally, our results will be the same should the economy be populated by both types of buyers provided that the share of high-valuation ones is sufficiently higher and V is observable (see footnote 10). Then, each intermediary will announce a price conditional on the type she is going to meet and social welfare will be a weighted average of the welfare levels attained under the two regimes with weights equal to each group's size. Hence, the comparative statics holding in the $V = \underline{V}$ case will still deliver the model message. If instead the buyer's type is unobservable, the price should not only signal title but also avoid that a high-valuation buyer pretends to have a \underline{V} type. Again, the gist of the model holds true because of the linearity of preferences (see Laffont and Tirole, 1993).

A share $\mu > 0$ of the intermediaries is moral and bears a psychological cost m from stealing, whereas the remainder is numb to guilt.⁵ The guilt cost is such that

A1: $m > U$.

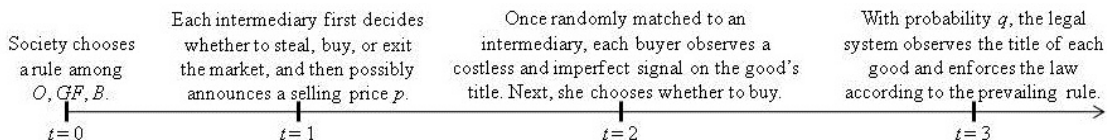
A1 incorporates into the model the burgeoning evidence about the impact of a culture of morality on economic exchange (Tabellini, 2008) and implies that moral intermediaries never steal. We maintain that no buyer feels guilty when buying a defective title good because of the cognitive dissonance due to the lack of direct experience of a taking (Cooper, 2007). We discuss the effect of relaxing this hypothesis together with assumption A1 in section 2.4.

The timing of the game is as follows (see figure 2). At time $t = 0$, society chooses the rule among those described below maximizing the sum of the expected trade-related social welfare W and a pro-buyer shock introduced below. W is the change in the sum of the three agents' utilities with respect to the situation in which there are no transfers of goods. At time $t = 1$, each intermediary first decides whether to steal, buy, or exit the market, and then possibly announces a selling price p . At time $t = 2$, once randomly assigned to an intermediary, each buyer observes a costless and public signal. If the good was stolen, the signal reveals its defective title with probability $s \leq 1$. If the good was bought, the signal

⁵Should the difference between the payoff of a moral intermediary and that of an immoral one be a psychological reward for not stealing, the algebra will be more complex but it will not deliver new insights.

is uninformative. Thus, the presence of an informative signal makes the buyer sure that the good was stolen, while the absence of a signal conveys imperfect information (see also Ben-Shahar, 1997). Next, the buyer chooses whether to buy or not. At time $t = 3$, with probability q , the legal system observes the title of each good and enforces the existing law.⁶

Figure 2: Timing



Even if legal systems also offer a series of contract, tort, or unjust enrichment remedies allowing the losing buyer to reclaim the price from the intermediary, we do not consider the case in which the intermediary is caught since she could be insolvent. Ayotte and Bolton (2011), who analyze financial contracting with insolvent intermediaries, make a similar choice.⁷

We analyze three rules: 1. owner protection prescribes that a good recognized as stolen is returned to the original owner; 2. good-faith buyer protection allows only good-faith buyers to retain a good recognized as stolen; 3. full buyer protection permits also bad-faith buyers to keep a good recognized as stolen. A buyer is considered in bad-faith for legal purposes if she sees an informative signal. Hence, while the signal is observable and verifiable in court, the price paid is not verifiable. This assumption squares with the fact that most transactions are not subject to registration and resale prices are difficult to recover. Accordingly, only in four—i.e., Belgium, China, Congo, and Israel—out of the 126 jurisdictions analyzed by Dari-Mattiacci and Guerriero (2015), the law explicitly conditions good-faith on the price. Our hypothesis captures for the first time the important idea that good-faith is a legal notion, which differs from the buyer's actual knowledge. All in all, the probability that a stolen good purchased by a buyer is returned to its original owner is $q < 1$ under owner protection, the joint probability of law enforcement and informative signal $sq < q$ under good-faith buyer protection, and zero under full buyer protection. The signal's precision is such that

⁶ q is the probability that the good is located and that the original owner proves his case in court. The legal system makes asymmetric errors: it may fail to return a stolen good but never returns legitimate goods.

⁷They focus on the conflict between two subsequent lenders to the same borrower and investigate the optimal protection of the first lender's contract given that she might remain hidden to the second lender. While the borrower contracts with both lenders, in our model the thief does not contract with the owner.

A2: $s > q$.

It is easier for the buyer to verify the title of the good at purchase than it is for the legal system to do it later on. In section 2.4 not only do we relax A2, but we also study four generalizations: 1. owners can protect their property; 2. the signal is costly; 3. some buyers are moral; 4. buyer protection entitles the buyer to receive a monetary compensation rather than the good. Another possible extension of our framework is to envision that the share of moral types and law enforcement are affected by the property-contract balance. Yet, this possibility is of limited relevance for two reasons. First, a tighter law enforcement may sometimes reinforce and sometimes undermine the strength of norms of moral conduct (Gneezy and Rustichini, 2000). Second, there is evidence documenting the extreme stickiness of a culture of morality (Tabellini, 2010; Boranbay and Guerriero, 2015). Accordingly, Dari-Mattiacci and Guerriero (2015) exploit empirically the long-lasting components of a society's cultural and enforcement capacity. Finally, we assume that $\theta \equiv \frac{\Delta}{U} \in (0, 1]$ is not too large or

A3: $\theta < \theta^* \equiv (1 - q)q^{-1}$.

At a closer look, θ should be considered an inverse measure of the intermediary's incentive to steal relative to either buy when $V = \bar{V}$ or exit the market when $V = \underline{V}$.⁸ For $V = \bar{V}$, θ is the ratio of the potential profit from trading a good with proper title to the cost of acquiring it. For $V = \underline{V}$ instead, θ turns out to be the ratio of the loss that an intermediary willing to obtain a proper title avoids by exiting the market to the maximum price chargeable for a stolen good. If A3 holds, immoral intermediaries never buy the good and so prices have an informational content. If A3 fails, all intermediaries buy and the institutional design is no longer a function of either μ or q : this is the scenario considered by the existing literature. The following three remarks emphasize the generality of our setup. First, as clarified by a growing literature on property rights, U captures economic value in general. It can incorporate the owner's investment effort and his utility from pledging the good as collateral, or it can be an input (see Besley and Ghatak, 2010). Second, a stronger owner protection could raise U . Yet, the valuation of a buyer successfully acquiring property would move in the same direction. Thus, neither the agents' valuations nor the production and investment decisions of producers should be asymmetrically affected by legal rules. Finally,

⁸Assumption A3 is easier to satisfy (without loss of generality) if preferences are less polarized (when $q < 1/2$).

the model prediction will stand should a potential buyer be able to repurchase the good once the legal system has returned it back to its original owner (see footnote 11).

We focus on strong perfect Bayesian equilibria, PBE hereafter. There are four regularities in any such equilibrium. First, if an intermediary chooses to buy, she will always pay U because of Bertrand competition among original owners. Second, since buyers can only meet one intermediary, the only sequentially rational prices an intermediary may announce are those leaving a buyer indifferent between buying or not: $\bar{p}^h \equiv \bar{V}$ or $\bar{p}^l \equiv (1 - q)\bar{V}$ for $V = \bar{V}$ and $\underline{p}^h \equiv \underline{V}$ or $\underline{p}^l \equiv (1 - q)\underline{V}$ for $V = \underline{V}$. Third, since $m > U$ by assumption A1, a moral intermediary exits the market for $V = \underline{V}$ and possibly buys the good if $V = \bar{V}$. In this last case, since no one will ever announce \underline{p}^h for a good with proper title, she strictly prefers to play \bar{p}^h . Finally, because $(1 - q)\bar{V} > \bar{V} - U$ by assumption A3, for $V = \bar{V}$ an immoral intermediary will always prefer stealing, announcing \bar{p}^l , and thus selling for sure to buying, announcing \bar{p}^h , and possibly selling (see table 2). A PBE of our economy is a tuple composed of a strategy—i.e., either buy and announce \bar{p}^h or exit the market—for the moral intermediary, a choice—i.e., steal—and a selling price for the immoral intermediary, a strategy—i.e., either buy or exit the market—for the buyer, and the buyer’s belief γ about whether, given an uninformative signal, a matched intermediary, who announced \bar{p}^h , is moral.

Table 2: Intermediary’s Payoffs Under Owner and Good-Faith Buyer Protection if $V = \bar{V}$

	<i>Moral Intermediary</i>		<i>Immoral Intermediary</i>	
	\bar{p}^h	\bar{p}^l	\bar{p}^h	\bar{p}^l
Buy	$\bar{V} - U$	$(1 - q)\bar{V} - U$	$\bar{V} - U$	$(1 - q)\bar{V} - U$
Steal	$(1 - s)\bar{V} - m$	$(1 - q)\bar{V} - m$	$(1 - s)\bar{V}$	$(1 - q)\bar{V}$

2.1 An Economy Where Buyers Have the Highest Valuation

Owner protection.—The unique PBE is separating and prescribes that a moral intermediary buys the good and announces \bar{p}^h , an immoral intermediary steals and announces \bar{p}^l , a buyer buys always, and $\gamma = 1$. There is no restriction on out-of-equilibrium belief. This PBE is supported by the following facts. First, given the intermediaries’ strategies, the buyer is indifferent between buying or not. Second, given a buyer’s strategy and belief, a moral intermediary strictly prefers to buy and announce \bar{p}^h . Finally, given a buyer’s strategy and belief,

an immoral intermediary's sequentially rational strategy is to steal, announce \bar{p}^l , and obtain the payoff $(1 - q)\bar{V}$. This is greater than the expected utility from stealing and announcing \bar{p}^h , which equals $(1 - s)\bar{V}$ since a share s of the buyers would see an informative signal and refuse to buy, because $(1 - s)\bar{V} < (1 - q)\bar{V}$ by assumption A2. As seen above, buying and announcing \bar{p}^h is a dominated strategy since $\bar{V} - U < (1 - q)\bar{V}$ by assumption A3. Because of this comparison (see also table 2), it is not possible to sustain any pooling equilibrium in which both the moral and the immoral intermediaries buy the good and select \bar{p}^h , the buyer buys, and $\gamma = \mu$. In such a scenario, an immoral intermediary would have a profitable deviation represented by stealing and setting \bar{p}^l . Similarly, there is no semi-separating equilibria because an immoral intermediary always prefers the strategy prescribing to steal the good and set \bar{p}^l for any mixed strategy of the buyer (see figure II in the Internet appendix).

The change in social welfare is equal to $\bar{W}_O = \mu(\bar{V} - U) + (1 - \mu)(1 - q)(\bar{V} - U)$, where the first term captures the payoff originating from the consensual transactions realized by moral intermediaries and the second term the payoff spurring from the non-consensual transfers finalized by immoral intermediaries and not overturned by the legal system. \bar{W}_O rises with μ and falls with q since, for $V = \bar{V}$, enforcing the law induces a misallocation of the good.

Good-faith buyer protection.—A reasoning similar to the one used above reveals that the only PBE is the same as under owner protection. Crucially, s does not affect the price since the signal is revealed after the intermediary's offer. Hence, an immoral intermediary does not know whether the buyer will be willing to pay \bar{p}^h because uninformed or will receive an informative signal and thus her willingness to pay will fall to \bar{p}^l . Being forced to insure the buyer against bad-faith, the immoral intermediary picks \bar{p}^l (see figure III in the Internet appendix). This time, $\bar{W}_{GF} = \mu(\bar{V} - U) + (1 - \mu)(1 - sq)(\bar{V} - U)$, which falls with s because an informative signal nullifies a welfare-increasing transfer with probability q .

Full buyer protection.—Since the buyer can always retain a stolen good, she is always willing to pay \bar{V} . The unique PBE is pooling with price \bar{p}^h , $\gamma = \mu$, and no no restriction on out-of-equilibrium belief. The expected trade-related social welfare is maximal, i.e., $\bar{W}_B = \bar{V} - U$, and does not depend on either μ or q . Lemma 1 summarizes the equilibria for $V = \bar{V}$:

Lemma 1: *Given A1-A3, if $V = \bar{V}$, moral intermediaries buy the good at U and immoral intermediaries steal it. Under both owner and good-faith buyer protection, the only*

equilibrium is separating, i.e., legitimate goods are sold at \bar{p}^h and stolen ones at \bar{p}^l . Under full buyer protection, the only equilibrium is pooling and the unique price is \bar{p}^h . The expected trade-related social welfare is the highest (lowest) under full buyer (owner) protection.

2.2 An Economy Where Buyers Have the Lowest Valuation

If buyers have low valuation, moral intermediaries stay out of the market because the highest possible resale price \underline{V} is lower than the purchase price U by assumption.

Owner protection.—The price equals the buyer’s expected value $\underline{p}^l \equiv (1 - q)\underline{V}$ and $\underline{W}_O = -(1 - \mu)(1 - q)(U - \underline{V})$. Since, for $V = \underline{V}$, any transfer results in a social loss a rise in either μ or q will increase the expected trade-related social welfare by shrinking the market.

Good-faith buyer protection.—Since buyers have to return the good only if the signal is informative, immoral intermediaries choose between always selling the good at \underline{p}^l or selling it only when the signal is not informative by setting $\underline{p}^h \equiv \underline{V}$. They strictly prefer the former strategy and consequently $\underline{W}_{GF} = -(1 - \mu)(1 - sq)(U - \underline{V})$.

Full buyer protection.—Because buyers never have to return the good, the price is \underline{p}^h and the expected trade-related social welfare is $\underline{W}_B = -(1 - \mu)(U - \underline{V})$.⁹ Summarizing:¹⁰

Lemma 2: *Given A1-A3, if $V = \underline{V}$ only immoral intermediaries stay in the market. They steal the good and sell it at $\underline{p}^l \equiv (1 - q)\underline{V}$ under owner protection and good-faith buyer protection and at $\underline{p}^h \equiv \underline{V}$ under full buyer protection. The expected trade-related social welfare is highest (lowest) under owner (full buyer) protection.¹¹*

2.3 Endogenous Legal Institutions Selection

At time $t = 0$, society chooses a rule on the basis of the expected trade-related social welfare W_i , with $i \in \{O, GF, B\}$, and a zero-mean shock ε to its preferences for buyer protection distributed according to the density f on the support $[-\infty, \infty]$. For instance, the probability that good-faith owner protection is preferred to owner protection for $V = \bar{V}$ is

⁹Notice that the expected utility of a moral (immoral) intermediary is higher in the $V = \bar{V}$ case than it is in the $V = \underline{V}$ scenario, i.e., $\bar{V} - U$ (either $(1 - q)\bar{V}$ or \bar{V}) instead of 0 (either $(1 - q)\underline{V}$ or \underline{V}).

¹⁰In an economy with a share $\omega > 1/2$ of high-valuation buyers and the remainder with $V = \underline{V}$, the equilibria will be the same except for the fact that moral intermediaries will announce the same pooling price charged by immoral ones for low-valuation buyers provided that their expected utility is positive. A sufficient condition is $\omega\Delta - (1 - \omega)[(1 - q)\underline{V} - U] > 0$ or ω sufficiently large. Moral intermediaries will buy the good upfront.

¹¹A potential buyer with defective title never repurchases the good once the original owner has been identified since her willingness to pay is too low for $V = \bar{V}$ because of assumption A3 and lower than U for $V = \underline{V}$.

$Pr(GF \succ O) = Pr(\overline{W}_{GF} - \overline{W}_O + \varepsilon \geq 0) = Pr((1 - \mu)(1 - s)q\Delta + \varepsilon \geq 0)$. The shock ε captures other efficiency drivers of the property-contract balance, such as incentives or risk allocation (see also Weinberg, 1980). Furthermore, Guerriero (2015) documents that the relative protection of property rights is stronger when transaction costs are more important and the buyers' preferences are more disperse.¹² By taking the derivatives with respect to the exogenous parameters of the three pairwise comparisons for the two economies (see table 3), we can assess how the institutional choice is affected by the two dimensions μ and q :

Proposition 1: *Given A1-A3, the probability that society selects a stronger protection of the buyer: 1. decreases with the share of moral intermediaries μ and increases with the quality of law enforcement q when the potential buyers have high valuation; 2. increases with μ and decreases with q when the potential buyers have low valuation; 3. increases with the scope of trade Δ . 4. The higher Δ is, the stronger are the impact of μ and q .*

Table 3: Pairwise Comparisons for the Two Possible Economies

$V = \overline{V}$		$V = \underline{V}$	
$\overline{W}_B - \overline{W}_O$	$(1 - \mu)q\Delta$	$\underline{W}_B - \underline{W}_O$	$-(1 - \mu)q\Delta$
$\overline{W}_B - \overline{W}_{GF}$	$(1 - \mu)sq\Delta$	$\underline{W}_B - \underline{W}_{GF}$	$-(1 - \mu)sq\Delta$
$\overline{W}_{GF} - \overline{W}_O$	$(1 - \mu)(1 - s)q\Delta$	$\underline{W}_{GF} - \underline{W}_O$	$-(1 - \mu)(1 - s)q\Delta$

If $\varepsilon = 0$, the rule that most often allocates the good to the agent with the highest valuation always prevails. To elaborate, society would pick owner protection when the buyers have low valuation and buyer protection when the buyers have high valuation. This last result belongs to a series of findings revealing that insecure property rights can enhance welfare when, due to hold-up or market frictions, valuable assets or efforts are misallocated if left in the original owner's hands (Calabresi and Melamed, 1972; Besley and Ghatak, 2010).

Preference shocks transform this deterministic choice into a probabilistic comparison giving a role to μ and q . In particular, for $V = \overline{V}$, the greater the share of moral intermediaries, the lower the likelihood of theft which, in turn, decreases the comparative advantage of buyer protection. In contrast, the greater the probability of law enforcement, the more efficiently owner protection reverses desirable transfers and, hence, the larger is the comparative advantage of buyer protection. The magnitude of all these comparative statics results increases

¹²The analysis will be of course the same should we allow for rule-specific shocks, i.e., ε_{GF} and ε_B .

with Δ , which is a measure of the social impact of misallocation.¹³ Finally, a greater scope of trade pushes towards more pro-buyers rules since non-consensual transactions have a higher welfare-enhancing effect. These results are reversed when $V = \underline{V}$.

Next, we test the robustness of the model predictions to a series of alternative assumptions. The proofs of these and the remaining results are gathered in the Internet appendix.

2.4 Robustness to Alternative Assumptions

Moral buyers.—Let us now assume that a share μ of buyers are moral and suffer a loss m if they buy a good they know for sure is stolen because of the purchasing price or because they received an informative signal. The remaining buyers are insensitive to guilt. Because an intermediary has either a legitimate good or a stolen good, the price cannot be used to screen different types of buyers. Yet, two novel patterns arise: 1. for θ sufficiently large, the prospect of being matched with a moral buyer and hence not selling induces immoral intermediaries to buy the good; and 2. the model endogenously produces a loss due to the possible match between an immoral intermediary and a moral buyer. The loss is driven by the fact that every intermediary values the good at zero. Since under a slightly stricter version of assumption A2, this social cost affect symmetrically all rules whether V equals \underline{V} or \bar{V} , proposition 1 continues to hold true in the most likely case of a θ not too large.

The original owner has a buy-back option.—Some legal systems allow ex post reallocations by affording buyers “liability-rule protection,” i.e., the owner can recover the good only if she compensates the buyer (Dari-Mattiacci and Guerriero, 2015). None of the legal systems we study instead gives liability-rule protection to owners. To study what is the impact of these rules on institutional design, we assume that, under good-faith buyer protection, the good-faith buyer receives a compensatory award if the owner decides to exercise his buy-back option and retains the good otherwise. We consider two commonly used award levels: the purchase price and the market price, i.e., the buyer’s valuation of the good, which is the price at which legitimate goods are sold on the market by moral intermediaries. When $V = \bar{V}$, the owner does not exercise the buy-back option unless compensation equals a purchase price of

¹³If $V = \bar{V}$, a rise in s decreases the odds that society moves toward good-faith buyer protection since it decreases the probability that a good is returned to the original owner. The opposite is true for $V = \underline{V}$.

$\bar{p}^l = (1 - q)\bar{V} < U$. When $V = \underline{V}$, original owners always exercise their buy-back option. Whenever exercised, the original owner's buy-back option makes the trade-related social welfare under good-faith buyer protection equal to that prevailing under owner protection. This difference, however, leaves our testable predictions essentially unchanged.

Relaxing assumptions A1, A2, and A3.—Relaxing our three key assumptions increases the number of equilibria without affecting the testable predictions. The key new features of the equilibria are the following: 1. if m is sufficiently small, both types of intermediaries steal and moral costs accrue to the trade-related social welfare; 2. if assumption A2 is relaxed, a separating equilibrium can no longer be supported and there can be an equilibrium in which moral intermediaries buy, immoral ones steal, and the pooling price is such that uninformed buyers buy; and 3. if assumption A3 also fails, immoral intermediaries also buy.

3 Value Misallocation Versus Incentive-inducement

Next, we establish the primacy of the value approach we have discussed so far over the incentive approach put forward by the existing literature (see for a review Schwartz and Scott, 2011). In particular, we show that the original owner's incentives to protect property and the buyer's incentive to inquire about title are non-monotonic in the level of legal protection.

3.1 The Owner's Incentives to Protect His Property

The original owner can now impose a cost of stealing C on the intermediary by spending C , e.g., buying an alarm or a lock or placing his property in a safe. Since the buyer's payoff is not directly affected by C , the equilibrium prices are unaffected. In addition, the original owner sets C equal to either a value deterring theft or zero. In an economy with high-valuation buyers, an original owner willing to deter theft should impose on the immoral intermediary a loss equal to the difference between the resale price of stolen goods and the net payoff from legal resale. In an economy with low-valuation buyers, instead, legal resale is not an option and the minimum level of private protection deterring theft has to match the resale price. Thus, a stronger legal protection of the original owner reduces, at the same time, the benefits and the costs of private protection. The former effect is due to the lower expected loss from theft, the latter is driven by the lower price charged for stolen

goods. The combination of these two effects produces a non-monotonic relationship between the protection afforded to the original owner by the law and the original owner's private protection effort. Lemma 3 formalizes these observations:

Lemma 3: *Given A1-A3, if $V = \bar{V}$, there are two values of θ , i.e., $\bar{\theta}_{GF}$ and $\bar{\theta}_O$ with $\bar{\theta}_{GF} \leq \bar{\theta}_O \leq \theta^*$, such that the original owner: 1. never protects his property if $\theta < \bar{\theta}_{GF}$; 2. protects his property only under good-faith buyer protection if $\bar{\theta}_{GF} \leq \theta < \bar{\theta}_O$; and 3. protects his property under both owner and good-faith buyer protection if $\theta \geq \bar{\theta}_O$.*

This non-monotonicity is evident when $\bar{\theta}_{GF} \leq \theta < \bar{\theta}_O$. Here, a shift from full buyer protection to good-faith buyer protection induces the owner to protect his property: that is, legal and private protection are complements. Yet, an even stronger legal protection, i.e., a reform toward owner protection, completely discourages private protection, making the two decisions substitutes. Our conclusions differ from Schwartz and Scott's (2011) result that the two forms of protection are always substitutes because endogenizing the market structure unveils key feedbacks of the law on prices. Also, a higher θ boosts private protection because it makes buying relatively more convenient than stealing even for immoral intermediaries. The analysis is similar when $V = \underline{V}$ with the caveat that the thresholds we identify could not be in the relevant parameter ranges when either q or μ are sufficiently large:

Lemma 4: *Given A1-A3, if $V = \underline{V}$, there are values of θ , i.e., $\underline{\theta}_{GF}$, $\underline{\theta}_B$ and $\underline{\theta}_O$ with $\underline{\theta}_{GF} \leq \underline{\theta}_B = \underline{\theta}_O = \mu$, such that the original owner: 1. never protects his property if $\theta < \underline{\theta}_{GF}$; 2. protects his property only under good-faith buyer protection if $\underline{\theta}_{GF} \leq \theta < \underline{\theta}_B$; and 3. always protects his property if $\theta \geq \underline{\theta}_B$.*

Thus, proposition 1 remains unaffected in the most likely case in which θ is sufficiently small, i.e., either $\theta < \bar{\theta}_{GF}$ or $\theta < \underline{\theta}_{GF}$, and the following exceptions arise otherwise:

i) For $V = \bar{V}$ and $\bar{\theta}_{GF} \leq \theta < \bar{\theta}_O$, the probability that society prefers good-faith buyer protection to owner protection increases with the quality of law enforcement q ;

ii) For $V = \bar{V}$ and $\theta \geq \bar{\theta}_O$, the probability that society moves away from full buyer protection increases with q and is insensitive to changes in μ ;

iii) For $V = \underline{V}$ and $\underline{\theta}_{GF} \leq \theta < \underline{\theta}_B$, the probability that society moves toward full buyer protection increases with μ ;

iv) For $V = \underline{V}$ and $\theta \geq \underline{\theta}_B$, μ has no impact on the institutional design.¹⁴

3.2 The Buyer's Incentives to Costly Inquire About Title

We now assume that the buyer receives the signal only if she invests $K > 0$ in information gathering before dealing with the intermediary. Here, a buyer is considered in bad-faith if she did not invest in information given that the cost of information gathering was reasonably low or if she invested in information and the signal was informative. Inspection of the equilibria discussed in lemmas 1 and 2 reveals that buyers obtain a strictly positive expected payoff, i.e., $(1 - \mu)(1 - s)q\bar{V}$ for $V = \bar{V}$ and $(1 - s)q\underline{V}$ for $V = \underline{V}$ —only under good-faith buyer protection. Hence, provided that the cost of acquiring information is lower than $(1 - \mu)(1 - s)q\bar{V}$ for $V = \bar{V}$ and lower than $(1 - s)q\underline{V}$ for $V = \underline{V}$, the buyer pays for the signal only under good-faith buyer protection. For $V = \bar{V}$, the cost of information eliminates the separating equilibrium since the moral intermediary cannot offer a price lower than $\bar{V} - K$ in order to induce the buyer to pay for the signal. Thus, the immoral intermediary mimics the moral one and the equilibrium pooling price is either high enough to allow both types to stay on the market and the buyer to have a weakly positive expected payoff, i.e., $\bar{p}^{h,S} \equiv \mu\bar{V} + (1 - \mu)(1 - q)\bar{V}$, or equal to \bar{p}^l and thus the moral intermediary exits the market because buying is unprofitable. While the latter happens if $\bar{p}^{h,S} < U$ or $\theta < \theta^S \equiv \frac{q(1-\mu)}{1-q(1-\mu)}$, the former is the case if $\theta \geq \theta^S$.¹⁵ Similar to the case of private protection by the owner, the buyer's information gathering effort is non-monotonic in the corresponding protection afforded by the legal system. For $V = \bar{V}$ and $\theta < \theta^S$ and for $V = \underline{V}$ the trade-related social welfare remains the same as in the benchmark case under owner and full buyer protection, while it falls by K under good-faith buyer protection: this leaves proposition 1 unchanged. For $V = \bar{V}$ and $\theta \geq \theta^S$, all goods for sale are stolen and the trade-related social welfare is $(1 - \mu)(1 - q)(\bar{V} - U)$ and thus the probability of a reform toward more buyer protection now rises with μ . Yet, once again, this happens in the less realistic range of parameters.

¹⁴To understand the first two patterns, note that, contrary to the basic set up, when original owners protect their property, a rise in q raises the trade-related welfare by decreasing protection costs. The second part of result ii), and results iii) and iv) are due instead to the fact that μ plays a role, i.e., it reduces theft, only when original owners do not protect their property and so transfers without consent materialize.

¹⁵Note that the $\theta \geq \theta^S$ scenario can be possible only when $\theta^S \leq \theta^*$ or $\mu \geq q^{-1}(2q - 1)$.

4 Cross-Country Evidence

Our model suggests that markets in which buyers have the highest valuation are the most likely since they yield the largest gains to intermediaries, who will consequently self select into them. Moreover, a primary function of intermediaries is exactly to match original owners with higher-valuation buyers. Because of these fundamental features of markets with intermediaries, our framework produces a clear-cut testable prediction: the extent of legal protection of the original owner’s property rights *vis-à-vis* the good-faith buyer’s reliance on contract should rise with the share of moral intermediaries and fall with the quality of law enforcement. Moreover, both the effects of a culture of morality and law enforcement should be stronger the wider the difference between the owner’s and the buyer’s valuation is.

Table 4: Summary of Variables

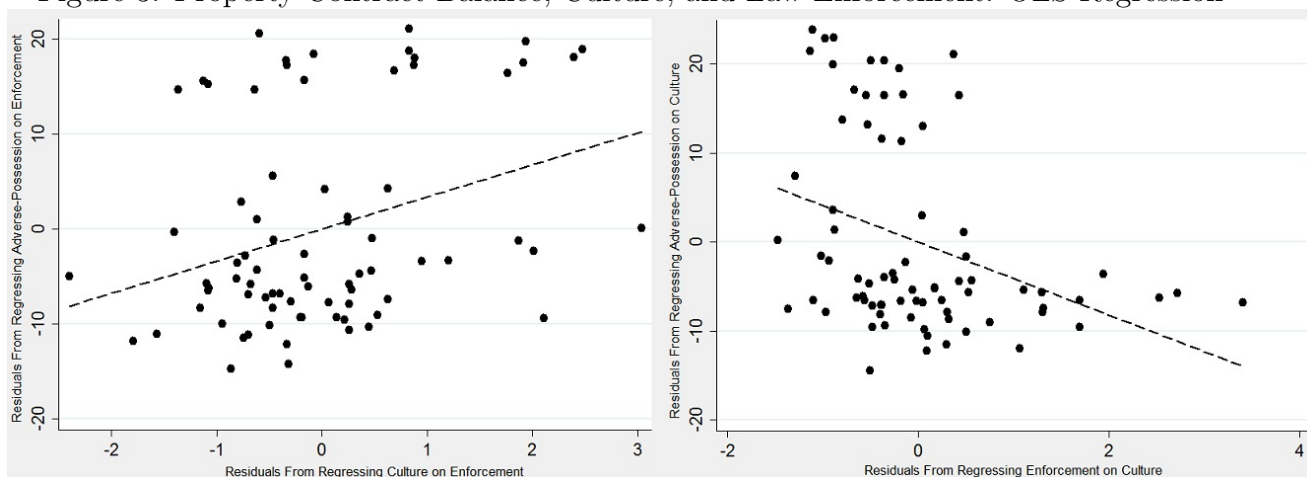
Variable	Definition and Sources	Mean (Standard Deviation)
Pro-Owner legal institutions:	<i>Adverse-Possession:</i>	Years needed for adverse possession by a good-faith possessor of a movable good. Source: see text. 10.786 (11.494)
	<i>Property-Private:</i>	Years after which a good-faith buyer definitively acquires ownership of a stolen movable good purchased within a private sale. Source: see text. 13.013 (12.826)
	<i>Property-Market:</i>	Years after which a good-faith buyer definitively acquires ownership of a stolen movable good purchased within a public market. Source: see text. 10.961 (12.677)
	<i>Property-Professional:</i>	Years after which a good-faith buyer definitively acquires ownership of a stolen movable good purchased from a professional seller. Source: see text. 9.390 (12.068)
	<i>Property-Auction:</i>	Years after which a good-faith buyer definitively acquires ownership of a stolen movable good purchased within an auction sale. Source: see text. 8.610 (12.066)
	<i>Good-Faith:</i>	Dummy equal to 0 when good-faith is presumed and 1 otherwise. Source: see text. 0.273 (0.448)
Culture and quality of public enforcement:	<i>Culture:</i>	See text. Source: World Value Survey and European Value Study, all available waves. Source: Inglehart (2010). 0.012 (1.053)
	<i>Enforcement:</i>	See text. Source: United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, all available waves. 0.041 (0.942)

Note: All the statistics are computed for the sample used to draw the graphs.

Testing such predictions brings two challenges. On the one hand, it is necessary to observe the relative extent of protection of the original owner’s property rights, the strength of a culture of morality, and the quality of law enforcement for a sufficiently wide sample of jurisdictions. On the other hand, the possible reverse causality linking stronger property rights to a more robust culture of morality and a more limited need of law enforcement must be addressed. Both issues are tackled by two of us in a companion paper (Dari-Mattiacci and Guerriero, 2015). For 77 of the 126 jurisdictions in which we measure the property-contract balance, we also construct a proxy for a culture of morality and one for the quality of law enforcement. Starting from the former, we consider the first principal component extracted from the level of generalized trust and the importance of respect for other people self-reported to all the World Value Surveys and European Value Study up to

the 2008, *Culture* (see table 4 for the definitions, sources, and statistics of the variables we discuss).¹⁶ Differently from other values affecting mainly the propensity to exert effort or invest, these features mostly drive “the extension of anonymous market exchange and [...] the need for external enforcement of contractual agreements” (Tabellini, 2010). Turning to law enforcement, a long literature has linked its quality and, in general, the probability of apprehension to the resources allocated to the justice system (Levitt, 2004). Accordingly, we look at the first principal component extracted from the number of police personnel and the number of professional judges per 100,000 inhabitants both averaged between 1973 and 2009, *Enforcement*. These data are collected from all the waves of the United Nations Survey of Crime Trends and Operations of Criminal Justice Systems (see UNODC, 2006).¹⁷

Figure 3: Property-Contract Balance, Culture, and Law Enforcement: OLS Regression



Note: The p-value of the t-test that the coefficient get by regressing the vertical axis variable on the horizontal axis variable equals 0 is always 0.00.

A glance at figure 1 already reveals that our model implications and the idea that buyers tend to have higher valuations are together powerful predictors of the patterns intrinsic in the data. To elaborate, the cross-country variation of both *Adverse-Possession* and *Property-Private* in the upper maps of figure 1 is strikingly similar to (different from) that of a

¹⁶The former (latter) is the share of answers “Most people can be trusted” to the question “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” (mentioning “tolerance and respect for other(s)” as key qualities that children should be prompted to learn).

¹⁷The empirical results will be very similar if one focuses instead on measures of the perceived quality of law enforcement such as the law sub-component of the International Country Risk index or the total estimated duration of the procedure involved in collecting a commercial debt or a bounced check (Djankov et al., 2003).

culture of morality (quality of law enforcement) in the bottom-left (right) map of the same figure. OLS regressions confirm this intuition (Dari-Mattiacci and Guerriero, 2015). Figure 3 illustrates this result for the general adverse possession term applied to movable goods in the 77 jurisdictions for which data on the independent variables are available. Here, we plot in the left (right) graph the residuals from regressing *Adverse-Possession* on *Enforcement (Culture)* over the residuals from regressing *Culture (Enforcement)* on *Enforcement (Culture)* plus the regression line.¹⁸ The original owner’s property is protected the most in jurisdictions endowed with the strongest culture of morality and/or the weakest law enforcement. The coefficients attached to *Culture* and *Enforcement* behave similarly when the dependent variable is one of the other measures of the property-contract balance and, moreover, gain a larger magnitude when the regressand is either *Property-Auction* or *Property-Professional*. Accordingly, as prompted by our model, the wider is the scope of trade the stronger is the impact on the institutional choice of the two fundamental features of intermediation we put at the center of our theoretical framework.¹⁹ Since the correlation between *Culture* and *Enforcement* is only 0.05, multicollinearity is not an issue. It is more difficult however to exclude reverse causality and, in particular, that jurisdictions protecting the most the original owner’s property rights also end up enjoying a more robust culture of morality and to need a softer law enforcement. Furthermore, there may be other historical factors, such as the settlement strategy of the colonizers, correlated with both the property-contract balance and its determinants.

To deal with these issues, we build on a recent literature linking (in)formal institutions to the emphasis of the prevailing culture on autonomy (Licht, Goldschmidt, and Schwartz, 2007) to identify exogenous instruments. “Societies whose cultures emphasize individual uniqueness and view individual persons as moral equals are likely to develop norms that promote societal transparency as a means for social coordination [. . .]. In contrast, societies [that] view the individual as an embedded part of hierarchically organized groups [. . .] accommodate exercise of power from above” [Licht, Goldschmidt, and Schwartz 2007, p. 663]. Since language is the key mechanism of cultural transmission, Kashima and Kashima (1998,

¹⁸In particular, the coefficient attached to *Culture (Enforcement)* is 3.380 (- 4.102) and its standard error is 1.162 (1.008) and thus its significance level is 1%. The R^2 of this regression is 0.20.

¹⁹Once could imagine that markets in which the intermediaries are either professional sellers or auctioneers are characterized by a lower scope of trade because of their competitiveness; yet, exactly this feature widens in these cases the wedge between owner’s and buyer’s valuation (Hawkins, Rothman, and Goldstein, 1995).

2005) propose the idea that grammatical rules embed the importance of these two cultural features. Languages that forbid dropping the first-person pronoun emphasize the individual relative to her social context and thus induce mutual respect; languages that allow a speaker to choose among several second-person pronouns according to the social distance between him/her and another speaker, instead, favor the organization of a centralized system that controls deviant behaviors (Licht, Goldschmidt, and Schwartz, 2007).²⁰ Hence, we use as an instrument for *Culture (Enforcement)* the indicator *Pronoun-Drop (Pronoun-Diff)* equal to one when the language spoken by the plurality group in the jurisdiction lacks (has) the first (second) of the two grammatical features just mentioned, and 0 otherwise. The relation between *Culture (Enforcement)* and *Pronoun-Drop (Pronoun-Diff)* is negative (positive) and strongly significant. The exclusion restrictions are vindicated by the fact that the vast majority of jurisdictions received the language spoken by their plurality group through a fairly exogenous process of colonization or invasion by a foreign power (Guerriero, 2014). Thus, it is difficult to envision a link between the drivers of the foreign power’s grammatical rules, which are mainly geographic, and the unobserved determinants of the property-contract balance in the jurisdiction and above all its geography conditional on observables.²¹

The coefficients estimated through 2SLS have the same sign and are larger and more significant than those obtained via OLS. Moreover, the semi-reduced form estimates exclude that the instruments have a direct impact on the property-contract balance, and the Kleibergen-Paap test rejects the null hypothesis of underidentification at a level nowhere higher than 0.03. These results remain quite stable even after controlling for a battery of observable features possibly shaping the property-contract balance through other channels like the pro-owner attitude of the jurisdiction, the settlement strategy of the colonizers, and the strength of the jurisdiction’s enforcement capacity (Dari-Mattiacci and Guerriero, 2015).²²

²⁰Linguists point out that this distinction originally was present in many languages and was associated with a hierarchy of power, e.g., in Latin the higher (lower) ranked individual would address the lower (higher) ranked as “Tu” (“Vos”). Later some languages dropped this feature (Kashima and Kashima, 1998; 2005).

²¹A broad legacy of cross-cultural psychology has proposed evidence according to which grammatical rules evolved slowly over time in response to the prevalent pathogen-load (Murray and Schaller, 2010).

²²To the first group belong the percentages of the population that were respectively Catholic and Muslim and the legal tradition of the jurisdiction in 2000 (see La Porta et al., 1999). The second group gathers a measure of the historical pathogen load and the identity of the colonizer (see Acemoglu and Johnson, 2005). The observables capturing the enforcement capacity are the inclusiveness of political institutions, the perceived level of corruption, and the share of the years between 1816—or the independence year—and 1975 during

5 Conclusions

This paper develops a theory of “endogenous legal institutions” characterizing how societies, heterogeneous in their endowments of moral and enforcement capacity, balance the protection of original owners’ property rights with the enhancement of the buyers’ reliance on contracts when non-consensual transfers are possible. This is the case of any secondary markets and primary markets with intermediaries. Here, either the protection of the owner’s property or the enhancement of the buyer’s reliance on contracts misallocates value depending on whether the buyer values the good more than the original owner or the other way around. Our model focuses on the former case and produces two implications about environments where the legal system has a random pro-buyer stance. First, protecting the owners is comparatively more appealing when more intermediaries are honest, since then condoning non-consensual transfers is less useful, and when law enforcement is less efficient, since then less goods would be returned to low-valuing owners. Second, the impact of culture and enforcement on the institutional choice is stronger when the difference between the owner’s and the buyer’s valuations is higher, i.e., misallocations produce larger welfare costs.

These predictions are consistent with the evidence two of us obtain in a companion paper based on a novel dataset that measures the large variation existing in the rules that concern the acquisition of ownership over movable goods in 77 jurisdictions (Dari-Mattiacci and Guerriero, 2015). The original owner’s property is protected the most in the jurisdictions endowed with the weakest law enforcement and/or the strongest culture of morality and the role of both features is stronger in more competitive trade settings. This evidence remains robust even after accounting for the endogeneity of culture and law enforcement and controlling for relevant observables like the pro-owner attitude of the jurisdiction, the settlement strategy of colonizers, and the strength of the jurisdiction’s enforcement capacity.

As seen above, our theoretical framework produces testable predictions relevant for a series of other fields of law, such as for instance financial regulation. Accordingly, our analysis delivers policy implications that are key for the current process of international legal harmonization. Different views of comparative legal variation prescribe different strategies.

which the jurisdiction was involved in an external military conflict (see Besley and Ghatak, 2010).

If comparative variation is due to random noise, harmonization is beneficial since it curbs legal uncertainty. If instead comparative variation is an optimal response to long-lasting differences across jurisdictions, as in the case of the property-contract balance, pushing harmonization induces countries to deviate from their ideal rules and hence brings about large losses. Our analysis speaks against the unqualified elimination of legal differences.

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Internet Appendix

Moral Buyers

For the sake of simplicity and symmetry with the basic set up we assume that $s \geq q + \mu(1 - q)$: this implies that, for $V = \bar{V}$, an immoral intermediary weakly prefers stealing and then charging \bar{p}^l to stealing and then charging \bar{p}^h . Should the latter not be the case, the analysis will be similar but more cumbersome since there could be pooling equilibria around $\tilde{p} \equiv \Pr(\text{proper title} | \hat{s} = 0) \bar{V} + \Pr(\text{defective title} | \hat{s} = 0) (1 - q) \bar{V} = (1 - q) \bar{V} + \frac{q\mu}{1-s(1-\mu)} \bar{V}$.¹ which is the price making all buyers indifferent between buying or not when the signal is uninformative and both types of intermediaries are in the market. Let's start with the $V = \bar{V}$ case by checking whether there is a separating equilibrium under owner protection. To avoid the cost m , moral buyers will not pay \bar{p}^l since this price signals a good stolen for sure (see table I). Also, immoral intermediaries will not lower the price to $(1 - q) \bar{V} - m < \Delta$ in order to sell for sure since this strategy is dominated by the one of buying the good and then charging \bar{p}^h (see table I).

Therefore, there is a value of θ —i.e., $\bar{\theta}_O^M \equiv \frac{1-[q+\mu(1-q)]}{q+\mu(1-q)} \leq \frac{1-q}{q} \equiv \theta^*$ such that:²

1. If $\theta < \bar{\theta}_O^M$, immoral intermediaries choose to steal and charge \bar{p}^l and thus the equilibrium is separating with prices \bar{p}^l and \bar{p}^h , moral buyers only buy legal goods, and the change in social welfare is $\mu\Delta + (1 - \mu)^2 (1 - q) \Delta - \mu(1 - \mu)U$, where the last term is an endogenous loss from theft due to the unsold stolen goods;
2. If $\theta \geq \bar{\theta}_O^M$, immoral intermediaries choose to buy and charge \bar{p}^h and thus all intermediaries buy and sell for \bar{p}^h and the change in social welfare is Δ .

Similarly, under good-faith buyer protection, we have that:

1. If $\theta < \bar{\theta}_O^M$, the only equilibrium is separating with prices \bar{p}^l and \bar{p}^h and the change in social welfare is $\mu\Delta + (1 - \mu)^2 (1 - sq) \Delta - \mu(1 - \mu)U$;

¹ $\Pr(\text{proper title} | \hat{s} = 0) = \frac{\Pr(\hat{s}=0|\text{proper title})\Pr(\text{proper title})}{\Pr(\hat{s}=0)} = \frac{\mu}{1-s(1-\mu)} = 1 - \Pr(\text{defective title} | \hat{s} = 0)$,

²Note that the function $g(x) \equiv (1 - x)x^{-1}$ is strictly decreasing in x and $q + \mu(1 - q) \geq q$.

2. If $\theta \geq \bar{\theta}_O^M$, all intermediaries buy and sell at \bar{p}^h and the change in social welfare is Δ .

Under full buyer protection, since a separating equilibrium is not possible, moral buyers remain in the market and buy if the signal they receive is not informative. In particular, there is a value of θ —i.e., $\bar{\theta}_B^M \equiv \frac{1-\mu s}{\mu s} \geq \bar{\theta}_O^M$ but lower than θ^* —such that:

1. If $\theta < \bar{\theta}_B^M$, immoral intermediaries choose to steal and all the goods are charged at \bar{p}^h and go unsold only when an immoral intermediary meets a moral buyer who happens to be informed and thus the change in social welfare is $[1 - \mu(1 - \mu)s] \Delta - \mu(1 - \mu)sU$;³
2. If $\theta \geq \bar{\theta}_B^M$, immoral intermediaries choose to buy and charge \bar{p}^h and thus all intermediaries buy and sell for \bar{p}^h and the change in social welfare is Δ .

For $V = \underline{V}$, there are neither moral intermediaries nor moral buyers on the market. Only stolen goods are sold to immoral buyers for \underline{p}^l under both owner and good-faith buyer protection and for \underline{p}^h under full buyer protection. The changes in social welfare are:

$$\underline{W}_O^M = -(1 - \mu)^2(1 - q)\Delta - \mu(1 - \mu)U; \quad \underline{W}_{GF}^M = -(1 - \mu)^2(1 - sq)\Delta - \mu(1 - \mu)U;$$

$$\underline{W}_B^M = -(1 - \mu)^2\Delta - \mu(1 - \mu)U.$$

Endogenous Institutions Selection

For $V = \bar{V}$ and $\theta \geq \bar{\theta}_B^M$, we have that:

$$P(B \succ O) = P(\varepsilon \geq 0); \quad P(B \succ GF) = P(\varepsilon \geq 0); \quad P(GF \succ O) = P(\varepsilon \geq 0).$$

Since the scope of trade is completely exploited, the probability that society will move toward more protection of the buyer is insensitive to both μ and q . For $\bar{\theta}_O^M \leq \theta < \bar{\theta}_B^M$, instead:

$$P(B \succ O) = P(\varepsilon - \mu(1 - \mu)s(U + \Delta) \geq 0);$$

$$P(B \succ GF) = P(\varepsilon - \mu(1 - \mu)s(U + \Delta) \geq 0); \quad P(GF \succ O) = P(\varepsilon \geq 0).$$

Because, this time, the price will always equal \underline{p}^h and goods will go unsold when an immoral intermediary meets an informed moral buyer, the probability that society will move toward more protection of the buyer will be a function of the odds of this match—i.e., $\mu(1 - \mu)$. Hence, it will fall (increase) with the share of moral agents when the latter is sufficiently small (big)—i.e., $\mu < 1/2$ ($\mu \geq 1/2$). Turning to the $\theta < \bar{\theta}_O^M$ case, it is true that $P(B \succ O) = P([1 - \mu - \mu(1 - \mu)s - (1 - \mu)^2(1 - q)]\Delta + \mu(1 - \mu)(1 - s)U + \varepsilon \geq 0)$; $P(B \succ GF) =$

³Again a price convincing moral buyers to buy also stolen goods is not viable because $(1 - q)\bar{V} - m < U$.

$$P\left([1 - \mu - \mu(1 - \mu)s - (1 - \mu)^2(1 - sq)]\Delta + \mu(1 - \mu)(1 - s)U + \varepsilon - \varepsilon \geq 0\right);$$

$$P(GF \succ O) = P\left((1 - \mu)^2(1 - s)q\Delta + \varepsilon \geq 0\right).$$

Consistently with proposition 1, the probability that society will move toward more protection of the buyer will rise with q and fall, in the most likely case, with μ .⁴ Finally, for $V = \underline{V}$:
 $P(B \succ O) = P(\varepsilon - (1 - \mu)^2q\Delta \geq 0)$; $P(B \succ GF) = P(\varepsilon - (1 - \mu)^2sq\Delta \geq 0)$;
 $P(GF \succ O) = P(\varepsilon - (1 - \mu)^2(1 - s)q\Delta \geq 0)$,

which imply that the comparative statics discussed in proposition 1 remain unaffected. \square

The Original Owner Has a Buy-back Option

Noting changes under owner protection. If $V = \bar{V}$, under good-faith buyer protection a buyer in bad-faith has to return the good, while a buyer in good-faith is subject to the owner's buy-back option. Since buyers in bad-faith have to return the good, the equilibrium does not change with respect to Lemma 1. If the compensation to be paid by the owner is equal to the market price, owners do not reclaim stolen property from good-faith buyers and hence nothing changes with respect to the basic model. If instead the compensation is equal to the purchase price, owners reclaim stolen property if the purchase price is low enough: $\bar{p}^l < U$.⁵ In this case, the change in social welfare is reduced to $\bar{W}_{GF}^L = \mu\Delta + (1 - \mu)(1 - q)\Delta = \bar{W}_O$: when goods revert to the original owner irrespective of the good-faith of the buyer, this rule performs in the same way as owner protection. Under full buyer protection, owners do not exercise the buy-back option because both the purchase price and the market price are equal to $\bar{V} > U$. Thus, goods remain with the buyer and model message remains.

If $V = \underline{V}$, under good-faith buyer protection only immoral intermediaries remain on the market: they steal the good and sell it for \underline{p}^l . Owners reclaim stolen property under both compensation measures, because $\underline{p}^l = (1 - q)\underline{V} < \underline{V} < U$. Thus, the change in social welfare improves to $\underline{W}_{GF}^L = -(1 - \mu)(1 - q)\Delta = \underline{W}_O$, since goods revert to the original owner irrespective of the good-faith of the buyer. Under full buyer protection, only stolen goods are on the market and they are sold for a high price. Owners exercise the option to buy back and hence all goods are reverted to them if found and $\underline{W}_B^L = \underline{W}_O$.

⁴Indeed, $\frac{\partial P(B \succ O)}{\partial \mu} < 0$ ($\frac{\partial P(B \succ GF)}{\partial \mu} < 0$) whenever $\theta < \frac{(2\mu-1)(1-s)}{2\mu s-1-s+2(1-\mu)(1-q)}$ ($\theta < \frac{(2\mu-1)(1-s)}{2\mu s-1-s+2(1-\mu)(1-sq)}$).

⁵Note that this condition is always verified if $q \geq \frac{1}{2}$ (see Assumption A3).

Relaxing Assumptions A1, A2, and A3

We first relax A1 and A3 holding A2 and then assess how restrictive the latter is.

Relaxing assumptions A1 and A3

Table II illustrates the equilibria arising in the $V = \bar{V}$ case.⁶ The key patterns can be summarized as follows: 1. being $s > q$ the intermediary's choice under owner and good-faith buyer protection is always between buying and then charging \bar{p}^h and stealing and then selling at \bar{p}^l ; 2. the equilibria under owner and good-faith buyer protection are the same; 3. if $m < U - q\bar{V}$ ($m < U$) both types of intermediaries steal and then sell for \bar{p}^l (\bar{p}^h) under owner and good-faith buyer (full buyer) protection; 4. if $m \geq 0 > U - q\bar{V}$ both types of intermediaries buy and charge \bar{p}^h ; 5. moral costs induce social losses. As table III shows, in the $V = \underline{V}$ case, if $m < (1 - q)\underline{V}$ both types will steal and sell at either \underline{p}^l or \underline{p}^h ; if $(1 - q)\underline{V} \leq m < U$ the equilibria are the same as in Lemma 2 except under full buyer protection when every intermediary steals and charges \underline{p}^h . Again moral costs produce a social loss. Turning to the institutional design, for $V = \bar{V}$, we have that:

(i) $0 \leq m < U - q\bar{V}$: $P(B \succ O) = P(q\Delta + \varepsilon \geq 0)$, $P(B \succ GF) = P(sq\Delta + \varepsilon \geq 0)$,
 $P(GF \succ O) = P((q(1 - s))\Delta + \varepsilon \geq 0)$, which are insensitive to μ and increasing with q .

(ii) $U - q\bar{V} < 0 \leq m < U$: $P(B \succ O) = P(\varepsilon - \mu m \geq 0)$,
 $P(B \succ GF) = P(\varepsilon - \mu m \geq 0)$,

$P(GF \succ O) = P(\varepsilon \geq 0)$, which are insensitive to q and falling with μ .

(iii) $0 < U - q\bar{V} \leq m < U$: $P(B \succ O) = P((1 - \mu)q\Delta - \mu m + \varepsilon \geq 0)$;
 $P(B \succ GF) = P((1 - \mu)sq\Delta - \mu m + \varepsilon \geq 0)$;
 $P(GF \succ O) = P((1 - \mu)(1 - s)q\Delta + \varepsilon \geq 0)$, which are falling with μ and rising with q .

(iv) $U < \min\{m, q\bar{V}\}$:
 $P(B \succ O) = P(\varepsilon \geq 0)$; $P(B \succ GF) = P(\varepsilon \geq 0)$; $P(GF \succ O) = P(\varepsilon \geq 0)$;

which are insensitive to both q and μ .

All in all, when $V = \underline{V}$ we have that:

(i) $m < (1 - q)\underline{V}$: $P(B \succ O) = P(\varepsilon - q\Delta \geq 0)$; $P(B \succ GF) = P(\varepsilon - sq\Delta \geq 0)$;
 $P(GF \succ O) = P(\varepsilon - (1 - s)q\Delta \geq 0)$, which are insensitive to μ and decreasing with q .

⁶Here two categories are excluded from the table: the benchmark case—i.e., $m > U > q\bar{V}$ —and the $m < U - q\bar{V} < 0$ case which is ruled out by the non negativity of m .

(ii) $m \geq (1 - q) \underline{V}$:

$$P(B \succ O) = P(\varepsilon - (1 - (1 - \mu)(1 - q)) \Delta - \mu m \geq 0);$$

$$P(B \succ GF) = P(\varepsilon - (1 - (1 - \mu)(1 - sq)) \Delta - \mu m \geq 0);$$

$P(GF \succ O) = P(\varepsilon - (1 - \mu)(1 - s)q\Delta \geq 0)$, which implies a drift towards good-faith buyer protection as μ (q) rises (falls) because of the moral loss under full buyer protection.

Relaxing assumptions A2

While the analysis would remain completely equal to the case just discussed for $V = \underline{V}$, for $V = \bar{V}$ a separating equilibrium cannot be enforced anymore. This means that in the third range of m analyzed in table II—i.e., $0 < U - q\bar{V} \leq m < U$ —the equilibria under owner and good-faith buyer protection will be different. In particular, two sub-cases arise depending on whether $U - q\bar{V} \leq m < U - s\bar{V}$ or $m > U - s\bar{V} > U - q\bar{V}$.⁷ For $U - q\bar{V} \leq m < U - s\bar{V}$ all the intermediaries will steal and the analysis will resemble exactly the case $0 \leq m < U - q\bar{V}$ in table II. For $U > m > U - s\bar{V} > U - q\bar{V}$, instead, the moral intermediaries will prefer to buy and the immoral ones to steal. This means that if the moral intermediaries remain in the market—i.e., if $\tilde{p} - U \geq 0$ or $\theta \geq (1 - \alpha) \alpha^{-1}$ where $\alpha \equiv (1 - q) + \frac{q\mu}{1 - s(1 - \mu)}$ —both types will charge \tilde{p} ; if instead the moral intermediaries find the pooling price impossible to sustain—i.e., if $\theta < (1 - \alpha) \alpha^{-1}$ —only goods stolen by the immoral intermediaries will be sold at \underline{p}^l . For $U > m > U - s\bar{V} > U - q\bar{V}$ and $\theta \geq (1 - \alpha) \alpha^{-1}$ the changes in social welfare will equal $\mu\Delta + (1 - \mu)((1 - s)(1 - q)\Delta - sU)$ under owner protection, $\mu\Delta + (1 - \mu)((1 - s)(1 - sq)\Delta - sU)$ under good-faith buyer protection, and $\Delta - \mu m$ under full buyer protection and thus

$$P(B \succ O) = P((1 - \mu)(1 - (1 - s)(1 - q)) \Delta + (1 - \mu) sU - \mu m + \varepsilon \geq 0);$$

$$P(B \succ GF) = P((1 - \mu)(1 - (1 - s)(1 - sq)) \Delta + (1 - \mu) sU - \mu m + \varepsilon \geq 0);$$

$$P(GF \succ O) = P((1 - \mu)(1 - s)^2 q \Delta + \varepsilon \geq 0),$$

which entail that the comparative statics discussed in proposition 1 remain unaffected. If $U > m > U - s\bar{V} > U - q\bar{V}$ and $\theta < (1 - \alpha) \alpha^{-1}$, instead, the changes in social welfare will equal $(1 - \mu)(1 - q) \Delta$ under owner protection, $(1 - \mu)(1 - sq) \Delta$ under good-faith buyer protection, and $\Delta - \mu m$ under full buyer protection. As a consequence:

$$P(B \succ O) = P((1 - (1 - \mu)(1 - q)) \Delta - \mu m + \varepsilon \geq 0);$$

⁷Since buyers never buy at \bar{p}^h a possibly stolen good, the following cannot constitute an equilibrium: 1. moral intermediaries buy and immoral ones steal and both charge \bar{p}^h ; 2. all intermediaries steal and charge \bar{p}^h .

$$P(B \succ GF) = P((1 - (1 - \mu)(1 - sq))\Delta - \mu m + \varepsilon \geq 0);$$

$$P(GF \succ O) = P((1 - \mu)(1 - s)q\Delta + \varepsilon \geq 0),$$

which imply that only the first (second) comparative statics with respect to μ can differ from that stated in proposition 1 when $U - s\bar{V} < m < (1 - q)\Delta$ ($U - s\bar{V} < m < (1 - qs)\Delta$). \square

The Owner's Incentives to Protect His Property

While the first (second) column of the table IV shows the minimum levels of private protection needed for deterrence when buyers have high (low) valuation, the third column lists the expected loss from theft to the original owner. For $V = \bar{V}$, the original owner will protect his property when $\bar{C}_i \leq L_i$ —i.e., under owner protection if $\theta \geq \mu \frac{1-q}{q} \equiv \bar{\theta}_O$, under good-faith buyer protection if $\theta \geq \mu \frac{1-sq}{q} - 1 + s \equiv \bar{\theta}_{GF}$, and never under full buyer protection. Note that $\bar{\theta}_{GF}$ increases with s reaching $\bar{\theta}_O$ when s tends to 1; thus, $\bar{\theta}_{GF} \leq \bar{\theta}_O$. There are three cases: 1. if $\theta < \bar{\theta}_{GF}$, the original owner never protects his property; 2. if $\bar{\theta}_{GF} \leq \theta < \bar{\theta}_O$, the original owner protects his property only under good-faith buyer protection; 3. if $\bar{\theta}_O \leq \theta \leq \frac{1-q}{q} \equiv \theta^*$, the original owner protects his property under both owner and good-faith buyer protection. For $V = \underline{V}$, private protection materializes if $\underline{C}_i \leq L_i$. This time, the owner will protect his property under owner protection if $\theta \geq \mu \equiv \underline{\theta}_O$, under good-faith buyer protection if $\theta \geq 1 - (1 - \mu) \frac{1-sq}{1-q} \equiv \underline{\theta}_{GF}$, and under full buyer protection if $\theta \geq \mu \equiv \underline{\theta}_B$. Note that $\underline{\theta}_{GF}$ increases with s and approaches $\underline{\theta}_O$ as s goes to 1; thus, $\underline{\theta}_{GF} \leq \underline{\theta}_O = \underline{\theta}_B$. We have three cases: 1. if $\theta < \underline{\theta}_{GF}$, the original owner never protects his property; 2. if $\underline{\theta}_{GF} \leq \theta < \underline{\theta}_B$, the original owner protects his property only under good-faith buyer protection; 3. if $\underline{\theta}_B \leq \theta$ the original owner always protects his property.

The changes in social welfare and the institutional design will be affected only when the original owners protect property. When the latter happens and $V = \bar{V}$, the good will be purchased both by moral and immoral intermediaries and resold for \bar{V} and thus the social welfare equals $\bar{V} - U$ minus the cost of protection \bar{C}_i or $(1 + q)\Delta - (1 - q)U$. If $\bar{\theta}_{GF} \leq \theta < \bar{\theta}_O$, private protection materializes only under good-faith buyer protection and

$$P(B \succ O) = P((1 - \mu)q\Delta + \varepsilon \geq 0); P(B \succ GF) = P((1 - q)U - q\Delta + \varepsilon \geq 0);$$

$$P(GF \succ O) = P((2 - \mu)q\Delta - (1 - q)U + \varepsilon \geq 0).$$

Straightforward algebra applied to these and the following conditions produces the remarks

discussed in the paper. If $\theta \geq \bar{\theta}_O$, the original owner protects his property under both good-faith buyer and owner protection and thus:

$$P(B \succ O) = P((1 - q)U - q\Delta + \varepsilon \geq 0);$$

$$P(B \succ GF) = P((1 - q)U - q\Delta + \varepsilon \geq 0); P(GF \succ O) = P(\varepsilon \geq 0).$$

If $V = \underline{V}$ and original owners choose to invest in private protection, the good will neither be stolen nor purchased. Thus, social welfare is the cost of private protection \underline{C}_i and thus either $-(1 - q)(U - \Delta)$ under owner and good-faith buyer protection or $-U + \Delta$ under buyer protection. If $\theta < \underline{\theta}_{GF}$, there is no private protection under all rules and proposition 1 applies unchanged. If $\underline{\theta}_{GF} \leq \theta < \underline{\theta}_B$, the original owner protects only under good-faith buyer protection and thus

$$P(B \succ O) = P(\varepsilon - (1 - \mu)q\Delta \geq 0);$$

$$P(B \succ GF) = P((1 - q)(U - \Delta) - (1 - \mu)\Delta + \varepsilon \geq 0);$$

$$P(GF \succ O) = P((1 - q)[(2 - \mu)\Delta - U] + \varepsilon \geq 0).$$

If $\theta \geq \underline{\theta}_B$, the original owner always invest and: $P(B \succ O) = P(\varepsilon - q(U - \Delta) \geq 0);$

$$P(B \succ GF) = P(\varepsilon - q(U - \Delta) \geq 0); P(GF \succ O) = P(\varepsilon \geq 0). \quad \square$$

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For $V = \bar{V}$ and $\theta < \theta^S$, we have that: $P(B \succ O) = P((\mu + q - \mu q)\Delta + \varepsilon \geq 0);$

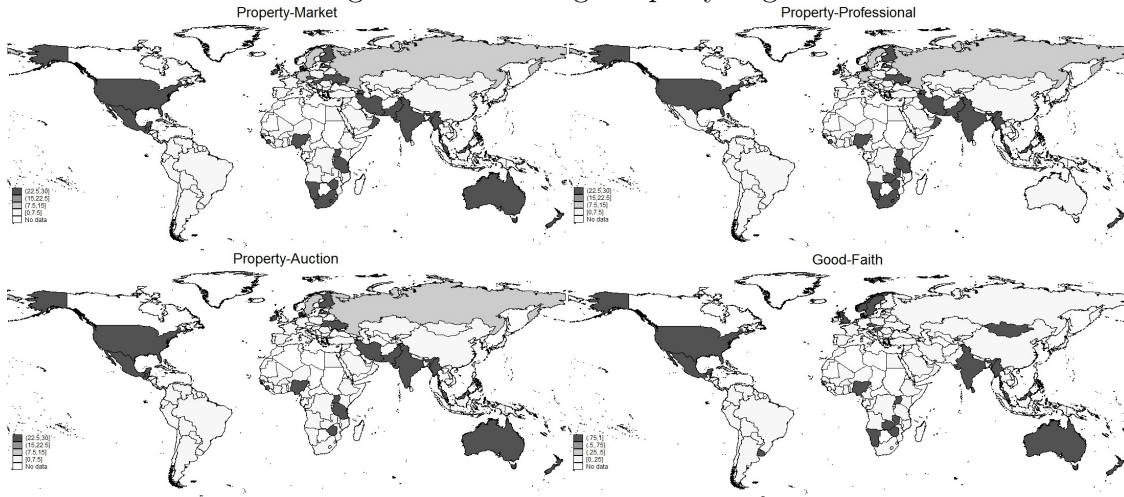
$$P(B \succ GF) = P((1 - \mu)sq\Delta - k + \varepsilon \geq 0);$$

$$P(GF \succ O) = P((\mu + q(1 - \mu)(1 - s))\Delta - k + \varepsilon \geq 0).$$

The difference with respect to Proposition 1 is that owner protection becomes comparatively less attractive if the share of moral intermediaries increases, due to the fact that the only way to transfer goods to high-value buyers under owner protection is through theft. \square

Additional Figures and Tables

Figure I: Measuring Property Rights



Note: We have divided the range of each variable into four equal intervals. See table 4 for variable definitions and sources.

Figure II: Extensive Form Game Under Owner Protection

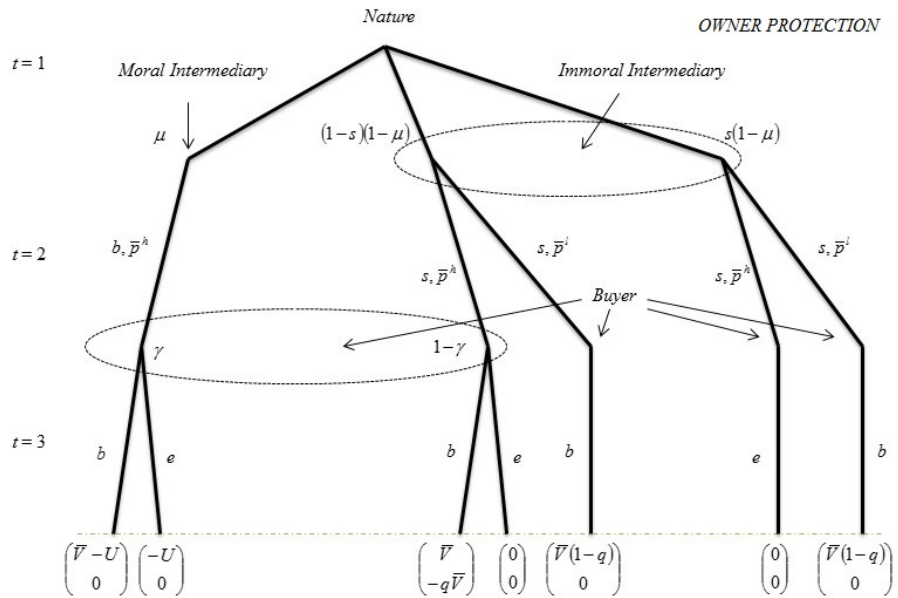


Figure III: Extensive Form Game Under Good-Faith Buyer Protection

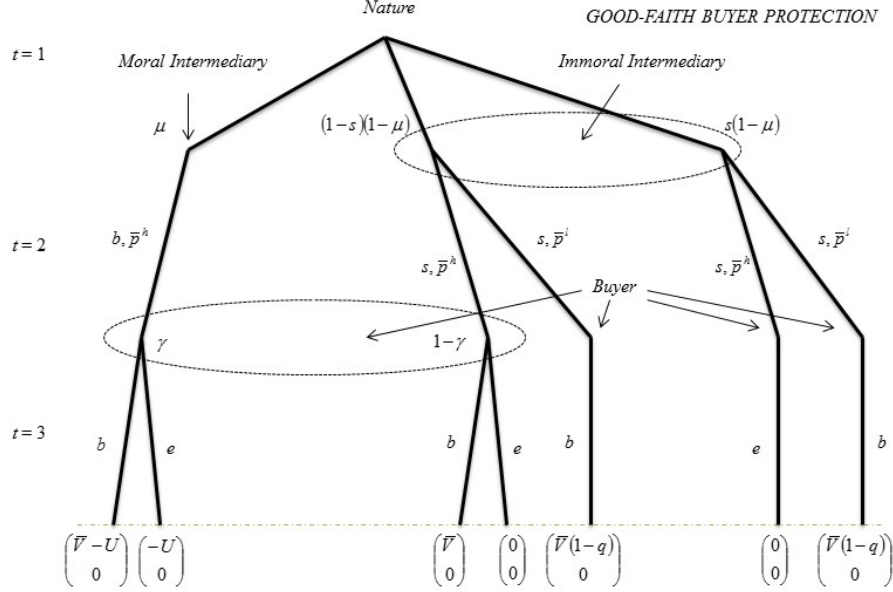


Table I: Immoral Intermediary's Payoffs When Buyers Can Be Moral, $i = O$, And $V = \bar{V}$

	\bar{p}^h	\bar{p}^l
Buy	$\bar{V} - U$	$(1 - \mu)(1 - q)\bar{V} - U$
Steal	$(1 - s)\bar{V}$	$(1 - \mu)(1 - q)\bar{V}$

Table II: Moral and Immoral Intermediaries' Acts and Welfare Changes if $s \geq q$ and $V = \bar{V}$

	$0 \leq m < U - q\bar{V}$	$U - q\bar{V} < 0 \leq m < U$	$0 < U - q\bar{V} \leq m < U$	$U \leq \min\{m, q\bar{V}\}$
O	Steal, Steal, \bar{p}^l , $(1 - q)\Delta - \mu m$	Buy, Buy, \bar{p}^h , Δ	Lemma 1	Buy, Buy, \bar{p}^h , Δ
GF	Steal, Steal, \bar{p}^l , $(1 - sq)\Delta - \mu m$	Buy, Buy, \bar{p}^h , Δ	Lemma 1	Buy, Buy, \bar{p}^h , Δ
B	Steal, Steal, \bar{p}^h , $\Delta - \mu m$	Steal, Steal, \bar{p}^h , $\Delta - \mu m$	Steal, Steal, \bar{p}^h , $\Delta - \mu m$	Lemma 1

Table III: Moral and Immoral Intermediaries' Acts and Welfare Changes if $s \geq q$ and $V = \underline{V}$

	$m < (1 - q)\underline{V}$	$(1 - q)\underline{V} \leq m < U$
O	Steal, Steal, \underline{p}^l , $-(1 - q)\Delta - \mu m$	Lemma 2
GF	Steal, Steal, \underline{p}^l , $-(1 - sq)\Delta - \mu m$	Lemma 2
B	Steal, Steal, \underline{p}^h , $-\Delta - \mu m$	Steal, Steal, \underline{p}^h , $-\Delta - \mu m$

Table IV: Costs of Protection and Losses from Theft

i	\overline{C}_i	\underline{C}_i	L_i
O	$U - q\overline{V}$	$(1 - q)\underline{V}$	$(1 - \mu)(1 - q)U$
GF	$U - q\overline{V}$	$(1 - q)\underline{V}$	$(1 - \mu)(1 - sq)U$
B	U	\underline{V}	$(1 - \mu)U$

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