A Positive Theory of Red Tape*

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Abstract

We develop a model in which red tape can be welfare improving in the presence of an imperfect legal system. We show that when the legal system is ineffective in preventing opportunistic behavior from taking place in business relationships, increasing the cost of setting up relationships can be welfare improving. By making business relationships costlier to form, red tape drives out less productive individuals who are only willing to form relationships because they can engage in opportunistic behavior. Thus, red tape can arise as an endogenous response to institutional failure.

Keywords: Red Tape, Opportunistic Behavior, Institutional Failure.

JEL Codes: D73, K20, L51.

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1 Introduction

According to the World Economic Forum's Global Competitiveness Report, countries vary greatly on the time required to open a business. For instance, in 2010 it took 119 days to start an enterprise in Brazil while in Australia it took only two. Time-consuming procedures to start enterprises might discourage business creation which, in turn, can hamper economic development.[1] This fact begs the question. Why does red tape exist and why does it vary so much across countries? In this paper, we show that red tape can arise as an endogenous response to a malfunctioning legal system and that the amount of red tape one observes can depend on the efficiency of the legal system.

The environment we consider is as follows. Society consists of a continuum of mass one of infinitely lived agents. Agents can either form bilateral business relationships with other agents or they can collect an outside option. The agents who choose to form a relationship are randomly and anonymously matched in pairs. Relationships are costly to form and last until the agents involved decide to undo them or an exogenous breakdown occurs.

The output in a relationship depends on the joint effort of the agents involved. Agents differ in their cost of exerting effort. They either are productive and have a low cost of exerting effort or are unproductive and have a high cost of exerting effort. An agent's type, that is, his cost of exerting effort, is his private information. Both types of agent have a short-term incentive to behave opportunistically in a relationship: holding his partner's effort constant, an agent's payoff increases if he lowers his effort. However, while unproductive agents can benefit from forming relationships only if they engage in opportunistic behavior, productive agents benefit if they form relationships with other productive agents and exert effort.

In our setting, the social optimum is for unproductive agents to collect their outside options and for productive agents to form relationships, exert effort, and, since relationships are costly to form, stay in a relationship until it is exogenously dissolved. However, if unproductive agents anticipate that everyone else in society behaves as above, then they have an incentive to form relationships and engage in opportunistic behavior. Thus, in the absence of some institution that prevents unproductive agents from forming relationships to engage in opportunistic behavior, society cannot

[1] See Boedo and Mukoyama (2012) and Bah and Fang (2015).

implement the social optimum.

We model the legal system as an institution that punishes opportunistic behavior in relationships. If the expected punishment for opportunistic behavior is high enough, then this discourages unproductive agents from forming relationships, allowing society to implement the social optimum. If, on the other hand, the legal system is inefficient in punishing opportunistic behavior, then society can no longer implement the first-best. In this case, society can benefit from an increase in the cost of setting up relationships, which can be achieved by the introduction of red tape.

The intuition for why red tape can be socially beneficial is as follows. Red tape makes it more costly for both types of agent to form relationships. However, productive and unproductive agents are affected differently by an increase in the cost of setting up a relationship. While productive agents find it in their interest to form long-term relationships and terminate them only if they observe opportunistic behavior, unproductive agents find it optimal to engage in short-term, "fly-by-night," relationships. Thus, red tape affects unproductive agents more adversely than productive agents, as the former pay the cost of setting up relationships more often than the latter. So, red tape can discourage unproductive agents from forming relationships, benefiting the productive agents in the process. We show that this indirect benefit to the productive agents can be greater than the direct cost of red tape and that the amount of red tape necessary to discourage unproductive agents from forming relationships is decreasing in the effectiveness of the legal system.

The rest of the paper is organized as follows. In the remainder of this section we discuss the related literature. In Section 2 we present suggestive evidence that the quality of the legal system might be a determinant of red tape. Section 3 presents our model. Section 4 determines the socially optimal allocation and discusses the cases in which society can implement this allocation. Section 5 analyzes the main case in which the legal system does not prevent unproductive agents from forming relationships in order to engage in opportunistic behavior. Section 6 discusses how red tape can lead to welfare improvements in the presence of a malfunctioning legal system. Section 6 concludes. The Appendix contains all omitted proofs and details.

Related Literature Explanations for the existence of (government) regulation fall into two broad categories: *grabbing hand* theories and *helping hand* theories.

Djankov et al. (2002) sort grabbing hand theories into two distinct groups, theories of regulatory capture and *tollbooth* theories. Tullock (1967) and Stigler (1971) are the seminal references on theories of regulatory capture. They develop models in which regulation is lobbied into existence by large firms in order to raise entry costs and deter entry of new competitors. More recently, Acemoglu (2008) develops a model in which entry barriers are created when the political system is oligarchic. Existing entrepreneurs concentrate political power and use it to prevent new entrepreneurs from entering the market. The "tollbooth" view of regulation has its origin in DeSoto (1990), who argues that regulation is used by politicians to favor friendly firms and other political constituencies. Shleifer and Vishny (1993) argue that time-consuming procedures necessary to process requests and give licenses are difficulties created so that public officials can "sell" favors in order to speed up the licensing process.

Helping hand theories have their origin in Pigou (1938), who argues that regulation and the costs associated with it are necessary because of market failures. Bureaucratic procedures are the instruments governments use to screen businesses in order to ensure product quality and safety.[2] Banerjee (1997) develops a model in which the government has to assign scarce slots to cash-constrained individuals who have private information about how much they value this slot. He shows that in some cases red tape is more effective than a price mechanism in allowing bureaucrats to extract rents from the agents. Atkeson, Hellwig, and Ordoñez (2014) consider a general equilibrium model of entry and exit of firms in which firm dynamics is governed by reputation considerations and before entry firms can make a costly but socially efficient unobservable investment in quality. They show that regulating entry can be welfare improving since it discourages firms from entering the market without investing in quality and free riding on their initial reputation. They do not tie regulation costs/distortions with the efficiency of the legal system, though.

Guriev (2004) combines both grabbing hand and helping hand theories. In his model, bureaucrats act as intermediaries between the government and the public. The government uses regulation as a principal who wants to uncover information about individuals (the agents) demanding a government service. The bureaucrats implement the necessary regulation, but create red tape in order

[2] Arruñada (2007) argues that simplifying procedures to engage in business activities has the collateral effect of suppressing relevant information about firms, increasing transaction costs as a result.

to extract rents from the agents.

Shleifer (2005, 2010) argues that both grabbing hand helping hand theories are not satisfactory explanations for the existence of regulation. He points out that even countries with low corruption levels have many regulations enacted by the government and that market failures can be corrected by contracts if transaction costs are low. Instead, Shleifer argues that regulation can arise as a consequence of imperfect legal institutions. Even if contracts could mitigate market failures and tort law could account for contingencies outside of contracts, such instruments are ineffective if the legal system is imperfect, in which case the introduction of regulation could be beneficial.

Schwartzstein and Shleifer (2013) presents an *activity-generating* theory of regulation. In their model, imperfect courts can make tort litigation errors so large that socially desirable investments by new firms are discouraged. They describe an environment in which firms engage in potentially risky investments, such as the creation of a new drug or the construction of a nuclear power plant. The function of regulation is to verify if firms undertake the appropriate precautions to ensure reasonable safety. Regulatory compliance informs courts and thus reduces significantly the possibility of error in case of tort litigation. The authors show that if the social returns of new investments are larger than the private returns, then regulation will generate efficient investment levels.

Our model differs from the model in Schwartzstein and Shleifer (2013) in that while in their case regulation generates socially useful information, in our setting red tape is a pure deadweight loss imposed on society. We show that society can nevertheless prefer this deadweight loss since it corrects a market failure that an imperfect legal system fails to address.

2 Determinants of Red Tape

We begin our analysis by providing suggestive cross-country evidence that red tape is causally related to legal system quality. Our identification strategy relies on an instrumental variable to identify the effect of an exogenous change in the quality of a country's legal system on the amount of red tape in the country. Our basic specification is:

$$\kappa_c = \beta R_c + \boldsymbol{X}'_c\boldsymbol{\eta} + \varepsilon_c; \tag{1}$$

$$R_c = \psi I_c + \boldsymbol{X}'_c\boldsymbol{\varphi} + \mu_c. \tag{2}$$

Equations (1) and (2) are, respectively, the second- and first-stage regressions of our instrumental variable strategy. The variables κ_c and R_c are, respectively, a measure of the amount of red tape and quality of the legal system in country c, while $\boldsymbol{X}_c$ is a vector of controls. The variable I_c is our instrumental variable. We first describe the data we use and then present our results.

2.1 The Data

We use as our instrument a variable that denotes whether a country's legal system is based on (French) Civil Law or (English) Common Law.[3] Legal origin has been widely used as source of exogenous variation in the literature.[4] Our strategy borrows from the strategy used by Acemoglu and Johnson (2005). We restrict our sample to countries that were either colonized by Britain or by the continental European powers.[5] The idea is that the former countries inherited a common-law system, while the latter inherited a civil-law system. Our identification assumption is that this imposition by the Colonial Powers generated an exogenous variation in our measures of legal system quality. In support of this assumption, Djankov et al. (2003) shows that civil-law systems are associated with "higher expected duration of judicial proceedings, less consistency, less honesty, less fairness in judicial decisions, and more corruption (Djankov et al., 2003, p. 453)."

In order to construct our measures of the quality of a country's legal system, we rely on the World Justice Project (WJP) Rule of Law index, an initiative that aims at capturing how the rule of law is perceived by individuals of different countries. The Rule of Law index is composed of nine factors and 47 sub-factors.[6] The scores for each sub-factor are computed based on responses to five different questionnaires. One questionnaire is applied to a country's general population and the other four are applied to specialists of following areas: Civil and Commercial Law, Criminal

[3]La Porta et al. (1999) sort countries in five groups according to their legal origin: (1) English Common Law; (2) French Commercial Code; (3) German Commercial Code; (4) Scandinavian Commercial Code; and (5) Socialist Law.

[4]La Porta et al. (1997a) started an influential line of research that is concerned with the effects of a country's legal origin on several outcome variables such as financial development, quality of government, and contracting institutions; see La Porta et al. (2008) for a thorough presentation of this literature.

[5]Belgium, France, Germany, Italy, The Netherlands, Portugal, and Spain.

[6]The factors are: (1) Constrains on Government Powers; (2) Absence of Corruption; (3) Open Government; (4) Fundamental Rights; (5) Order and Security; (6) Regulatory Enforcement; (7) Civil Justice; (8) Criminal Justice; and (9) Informal Justice.

Justice, Labor Law, and Public Health.[7] The scores for each sub-factor are normalized between zero and one, with one being the highest score a country can be assigned in that sub-factor.[8]

We consider factor 7, Civil Justice, as this is the aspect of a country's legal system that is most closely related to our model. In our environment, legal disputes happen in civil courts since they commercial and business related in nature. We use sub-factors 7.3, 7.5, and 7.6 in our regressions. They are, respectively, measures of the extent to which "Civil justice is not subject to unreasonable delay", "Civil justice is free of corruption", and "Civil justice is effectively enforced."[9] These sub-factors capture the three main potential sources of inefficiency in the legal system that we emphasize in our model: corruption, delay, and lack of enforceability.

In order to construct our measure of red tape, we rely on the Doing Business project. Similarly to the World Justice Project, the Doing Business project builds its indicators from data obtained by questioning local experts about business regulations in their respective countries. We use the monetary cost required to start a business (as % of GDP per capita) as our measure of red tape.

As controls, we use GDP per capita (measured in 2011 PPP US Dollars) and population size as controls. Mulligan and Shleifer (2005) argue that there are fixed costs required to implement regulations and institutions. Thus, the size of a country's market matters since it is only in big enough markets that implementation of regulatory institutions becomes affordable. They also argue that income per capita matters because in richer countries the fixed cost is greater due to higher wages (regulation is non-tradable). We use the GDP per capita variable lagged five years, as GDP per capita of the same year might itself be an outcome variable of our empirical exercise.

[7]The questionnaires consist of multiple choice questions about different aspects of a country's legal system. For instance, in the Civil and Commercial law questionnaire, a hypothetical scenario about a legal dispute is proposed and questions are asked about the time it takes to obtain a decision on that particular case. The questionnaires are available at https://worldjusticeproject.org/our-work/wjp-rule-law-index/wjp-rule-law-index-2016/2016-rule-law-index-questionnaires.

[8]For a detailed description of the methodology used to compute the WJP Rule of Law index, see https://worldjusticeproject.org/our-work/wjp-rule-law-index/wjp-rule-law-index-2016/methodology.

[9]The remaining sub-factors are: (7.1) "People can access and afford civil justice;" (7.2) "Civil justice is free of discrimination;" (7.4) "Civil justice is free of improper government influence;" and (7.7) "Alternative dispute resolution mechanisms are accessible, impartial, and effective."

2.2 Results

Our measures of the quality of the legal system are available only for the years 2014-2016. Due to small changes in the methodology, the measures are not comparable between the years. Therefore we run regressions for the three years separately. In what follows we report the results for the year 2015. We obtain similar results for the other years; see Appendix C for these results.

Table 1 below reports the results of our second-state regressions. Columns (1) to (3) show the results of our OLS estimates. They show that the better the quality of the legal system, the lower the amount of red tape. This correlation is statistically significant at least at the 10% level. In column (4), we present a reduced-form version of our model in which we show that in countries with a civil-law system the cost to start a business is 86% higher than countries with a common-law system. Finally, in columns (5) to (7) we present the results of our IV estimates. The coefficients have the same as sign in the OLS estimates, but are greater in magnitude. The first stage regressions are in Table 2. The F-statistic of our instrument shows that in the following two cases the instrument is strong: civil justice is effectively enforced and civil justice is free of corruption.

Insert Tables 1 and 2 around here

The literature on regulation emphasizes the role of corruption on explaining the existence of regulation (see, e.g., Djankov et al. (2002) and Djankov (2009)). Given this, we incorporate in our empirical exercise a variable that captures government corruption. We use the Corruption Perception Index (CPI) computed by the Transparency International. The CPI ranges from zero to 100, with a country with an index of 100 being perceived as being "very clean" regarding corruption. This index captures endemic corruption in the public sector in general and is constructed using a number of different sources.[10]

Figure 1 below shows that the CPI has a relatively high correlation with sub-factor 7.3 in the WJP Rule of Law index, civil justice is free of corruption. This suggests that the overall effect of corruption on red tape might be bundling together two different channels: the grabbing hand

[10] In particular, the CPI uses four sub-factors of the WJP Rule of Law index: "Government officials in the executive branch do not use public office for private gain;" Government officials in the judicial branch do not use public office for private gain;" Government officials in the police and the military do not use public office for private gain;" and "Government officials in the legislature do not use public office for private gain."

channel in which corruption is the source of red tape and the judicial inefficiency channel that is the object of our analysis.

Insert Figure 1 around here

In order to separate these two effects, we include as a control in our regressions a variable that measures corruption in the executive branch. We use the sub-factor of the WJP Rule of Law index that captures the extent to which "Government officials in the executive branch do not use public office for private gain." The idea is that this variable captures the grabbing-hand channel in which government officials use their position to create red tape so as to extract rents from business people. We use the variable with an one year lag in order to avoid endogeneity.

The results of this second set of regressions are in Tables 3 and 4. Columns (1) to (3) of Table 3 report the OLS estimates of our second-stage regression, while columns (5) to (7) report the IV estimates for the same regression. As in Table 1, the signs of both estimates are the same, with the IV estimates being of greater magnitude for all three measures of legal system quality. However, controlling for corruption at the executive branch reduces the statistical significance of all measures. The variable civil justice delay is no longer statistically significant, while the variable civil justice is effectively enforced is significant only at the 10 % level (albeit with a p-value of 0.08). Table 4 presents our first-stage regressions. Our instrument is strong for the same two variables as before.

Insert Tables 3 and 4 around here

Even though our empirical exercise has limitations such as a small sample size and a relatively strong identification hypothesis, our evidence is suggestive of a non-spurious relationship between the quality of a country's legal system, measured by the effectiveness of and lack of corruption in its civil justice system, and the amount of red tape required to start a business in the country.

3 Model

We first describe the environment and how the legal system works. Then we describe strategies and define equilibria. We conclude with a discussion of our model.

Environment

Time is discrete and ranges from $t = -\infty$ to $t = +\infty$.[11] Society consists of a continuum of mass one of infinitely-lived agents with a common discount factor $\delta \in (0, 1)$. At any point in time agents can engage in one of two activities. They can either form bilateral relationships with other agents or they can choose an outside option. We say that an agent is *matched* if he is in a relationship with another agent, otherwise we say that the agent is *unmatched*. The agents' flow payoff from the outside option is $A > 0$. We describe how relationships work next.

Relationships are costly to form, with a per-capita setup cost $\kappa > 0$. A relationship between two agents lasts until either one of them decides to terminate it or an exogenous separation shock occurs. Separation shocks are independent across time and relationships and happen with probability $\lambda \in (0, 1)$. The (flow) output in a relationship between two agents is divided evenly among them and depends on their effort. Agents in a relationship can either exert no effort, $e = \ell$, or exert costly effort, $e = h$. The per-capita output in an relationship when both agents do not exert effort is zero. Let π be the per-capita output in a relationship when both agents exert effort and $0 < \gamma < \pi$ be the same output when only one agent exerts effort. An agent's choice of effort in a relationship is observable by his partner but is not observable by other agents in society.

Agents differ in their cost of exerting effort in a relationship. There are two types of agent in society: productive (p) and unproductive (u). The cost of effort for an agent of type $\tau \in \{p, u\}$ is c_τ, with $c_u > c_p > 0$. An agent's type is his private information and the fraction of productive agents in society is $\theta \in (0, 1)$. We make the following assumption:

(A1) $\gamma > \pi - c_p$ and $0 > \gamma - c_p$.

Assumption (A1) implies that agents in a relationship have a short-term incentive to engage in opportunistic behavior: regardless of his type and the other agent's effort, an agent increases his payoff in a relationship by not exerting effort. This gives rise to a moral hazard problem that a legal system can potentially correct.

We also make the following two assumptions concerning the production technology:

[11] The assumption that there is no first period in the economy simplifies the definition of equilibria. We discuss how to adapt our equilibrium notion to the case in which time starts at $t = 0$ at the end of the section.

(A2) $2(\pi - \gamma) > c_u$;

(A3) $2(\pi - c_p) > 2A > \pi - c_u + \pi - c_p$.

Assumption (A2) implies that it is inefficient for only one agent in a relationship to exert effort. Indeed, $2(\pi - \gamma)$ is the output gain when one more agent exerts effort, while c_u is the highest cost increase when this happens. Assumption (A3) implies that a productive agent can benefit from forming a relationship with another productive agent but, since $2\gamma < 2\pi - c_u$ by Assumption (A2), relationships with at least one unproductive agent or relationships in which at least one agent exerts no effort are not beneficial to at least one of the agents involved (and so are not socially efficient). It follows from Assumptions (A1) and (A3) that $\pi - c_u < A < \gamma$. So, unproductive agents can benefit from forming relationships only if they engage in opportunistic behavior.

We make one additional assumption:

(A4) $\kappa > \pi - c_p - A > \lambda\kappa$.

The assumption that $\kappa > \pi - c_p - A$ implies that forming relationships is costly enough that productive agents can only benefit from doing so if relationships are not short-lived. On the other hand, the assumption that $\lambda\kappa < \pi - c_p - A$ implies that productive agents can benefit from forming relationships with other productive agents as long as these relationships last long enough.[12] The second inequality in Assumption (A4) is satisfied as long as exogenous separation shocks are sufficiently unlikely.

The timing of events in a period is as follows. Consider matched agents first. Agents in a relationship first simultaneously choose their effort and output is realized. They then simultaneously decide whether to terminate the relationship or not—the relationship ends if at least one of them decides to do so. Finally, separation shocks occur. Consider now unmatched agents. First, they decide whether to take the outside option or search for a partner to form a relationship. The agents who search for a partner are randomly and anonymously matched in pairs, after which the timing of events that of agents in a relationship. The assumption that relationships are formed immediately

[12]Indeed, suppose that two productive agents form a relationship and exert effort as long as the relationship is in place. The expected present discount payoff gain to these agents is $\sum_{t=1}^{\infty} \delta^{t-1}(1-\lambda)^{t-1}[\pi - c_p - A]$, which is greater than κ by Assumption (A4) when δ is sufficiently close to one.

after agents search for a partner is done for simplicity and is immaterial for our results.

Legal System

Society has in place a legal system to discourage opportunistic behavior in relationships. An agent in a relationship who does not exert effort while his partner does is forced to compensate his partner with a transfer ρf, where $f = \pi - \gamma$ is the payoff loss the agent imposes on his partner and $\rho \geq 0$. The case in which ρ is less than one corresponds to a society in which the legal system offers agents less than full insurance against opportunistic behavior in relationships. There are several reasons why this could be the case. For instance, the legal system may be inefficiently slow in punishing an agent who behaves opportunistically in a relationship. Alternatively, the legal system may not always be able to detect opportunistic behavior in relationships.[13] A third possibility is that the legal system may be corrupt: an agent may have to bribe members of the judiciary in order to be compensated by a partner who behaves opportunistically. The parameter ρ measures the effectiveness of the legal system.

The legal system affects payoffs in a relationship between two agents. The following matrix describes the payoffs of a type-τ agent as a function of his and his partner's choices of effort:

		Partner	
		h	ℓ
Agent	h	$\pi - c_\tau$	$\gamma - c_\tau + \rho f$
	ℓ	$\gamma - \rho f$	0

Notice that $\gamma - c_\tau + \rho f \leq \pi - c_\tau$ if $\rho \leq 1$, and so an agent who exerts effort in a relationship is better off if his partner also exerts effort. Also notice that since $2\gamma - \pi < \pi - c_u$ by Assumption (A2), an agent in a relationship finds it optimal to exert effort when his partner does so as long as ρ is close enough to one. Thus, a sufficiently effective legal system can inhibit opportunistic behavior in relationships.

[13] In this case, we should view ρf as an expected compensation.

Strategies and Equilibria

A strategy for an agent is a sequence of decision rules specifying the following choices for the agent in each period. First, if the agent is unmatched, whether he collects his outside option or searches for a partner to form a relationship. Second, if the agent is matched, his choice of effort and then whether he maintains the relationship or not. A belief for a matched agent specifies the probability that he assigns to the event that his partner is productive given his and his partner's previous choices of effort in the relationship. For an agent who starts a relationship, this belief is the probability he assigns to the event that he is matched with a productive partner.

We consider assessments, that is, pairs of strategy profiles and belief systems, which constitute perfect Bayesian equilibria. Given a strategy profile, we can compute for each $t \in \mathbb{Z}$ the period-t fraction of productive agents in the set of unmatched agents who search for a partner. Denote this fraction by $\widetilde{\theta}_t$. Bayes' rule implies that $\widetilde{\theta}_t$ is the probability that an agent who starts a relationship with another agent in period t assigns to the event that his partner is productive. We restrict attention to stationary equilibria in which $\widetilde{\theta}_t$ is constant over time and let $\widetilde{\theta}$ denote this fraction.[14]

Discussion

TO BE WRITTEN

4 First Best

In this section we determine the first best and show that society can implement it if, and only if, the legal system is sufficiently effective.

4.1 Determining the First Best

Consider the problem of a planner who wants to maximize average flow playoffs in society. We know that only relationships between productive agents can lead to welfare gains and that in such relationships it is socially optimal for the agents involved to exert effort. There are then two

[14]If time starts at $t = 0$, then we need to amend the definition of a stationary equilibrium to include an initial mass of agents of each type who are in a relationship at $t = 0$.

alternatives for the first best. First, both types of agent collect the outside option. Second, only productive agents form relationships, productive agents always exert effort in a relationship, and, since relationships are costly to form, a relationship between two productive agents lasts until dissolved by a separation shock. Whether the first or the second alternative constitutes the first best depends on the cost of forming relationships.

Suppose that agents behave according to the second alternative. Let U^p be the expected present discounted lifetime payoff to a productive agent who forms a relationship and V^p be the same payoff to a productive agent who is already in a relationship. Then:

$$U^p = V^p - \kappa;$$
$$V^p = \pi - c_p + \delta\lambda U^p + \delta(1-\lambda)V^p.$$

Solving the above system of equations for V^p we obtain that

$$V^p = \frac{\pi - c_p - \delta\lambda\kappa}{1-\delta}. \tag{3}$$

The expression for V^p is intuitive. Since productive agents are always in a relationship with another productive agent and always exert effort, their per-period payoff is $\pi - c_p$. The term $\delta\lambda\kappa/(1-\delta)$ is the present discounted expected lifetime cost of setting up new relationships after exogenous separations take place. It follows that

$$U^p = \frac{\pi - c_p - [1-\delta(1-\lambda)]\kappa}{1-\delta}. \tag{4}$$

Let W_0 be the average flow payoff in society when agents behave according to the first alternative and W_1 be the same payoff when agents behave according to the second alternative. Then $W_0 = A$ and

$$W_1 = (1-\theta)A + \theta(1-\delta)\left[\lambda U^p + (1-\lambda)V^p\right];$$

since in the second alternative productive agents always form relationships and never terminate one, a fraction λ of the productive agents is unmatched at the beginning of every period. Now let $\overline{\delta} \in (0,1)$ be the unique value of δ such that $[1-\delta(1-\lambda)]\kappa = \pi - c_p - A$. The following result is an immediate consequence of the preceding discussion.

Lemma 1. *It is never socially optimal for unproductive agents to form relationships. It is socially optimal for productive agents to always form relationships, always exert effort in a relationship, and never terminate a relationship if, and only if,* $\delta \geq \overline{\delta}$.

4.2 Implementing the First-Best

First notice that if $\delta < \underline{\delta}$, then there exists no equilibrium in which agents enter the market. Indeed, if two agents form a relationship, then Assumptions (A2) and (A3) imply that the total gross flow payoff gain from this relationship is bounded above by $2(\pi - c_p - A)$. Let τ be the (random) number of periods this relationship lasts. Then the expected presented discounted total net gain from this relationship is

$$G = \mathbb{E}\left[\sum_{t=1}^{\tau} \delta^{t-1} 2(\pi - c_p - A)\right] - 2\kappa.$$

In the Appendix we establish the intuitive fact that

$$\mathbb{E}\left[\sum_{t=1}^{\tau} \delta^{t-1}\right] \leq \frac{1}{1-\delta(1-\lambda)}; \tag{5}$$

because of the exogenous separation shocks, in any equilibrium the probability that a relationship survives from one period to the next is at most $1 - \lambda$. Therefore,

$$G \leq 2\left(\frac{\pi - c_p - A}{1-\delta(1-\lambda)} - \kappa\right),$$

and so $G < 0$ when $\delta < \overline{\delta}$, in which case at least one of the two agents does not gain by forming the relationship.

We now show that when $\delta > \overline{\delta}$, society can implement the first-best if, and only if, ρ is above a certain threshold, that is, society can implement the first-best if, and only if, the legal system is sufficiently effective. Let $\underline{\rho} = \underline{\rho}(\kappa) \geq 0$ be the unique value of ρ such that $\gamma - \rho f - \kappa = A$ if $\kappa < \gamma - A$ and let $\underline{\rho} = 0$ otherwise. Notice that $\underline{\rho} < 1$ when $\kappa < \gamma - A$ since $2\gamma - \pi < A$ by Assumptions (A1) and (A2). Also notice that $\underline{\rho}$ is strictly decreasing in κ as long as $\underline{\rho}$ is positive.

First observe that if $\rho < \underline{\rho}$, then there exists no equilibrium that implements the first best. Indeed, consider a strategy profile that implements the first best. One option for an unproductive agent is to in every period form a relationship, behave opportunistically, and then terminate the relationship. Since only productive agents form relationships on the path of play, the flow payoff to an unproductive agent from behaving as described is $\gamma - \rho f - \kappa > A$. So, unproductive agents have a profitable deviation.

Now suppose that $\rho \geq \underline{\rho}$ and consider the following assessment: (*i*) unproductive agents always choose the outside option; (*ii*) unmatched productive agents always form a relationship; (*iii*) matched productive agents always exert effort; (*iv*) a matched productive agent does not terminate a relationship if, and only if, him and his partner always exerted effort in the relationship; and (*v*) an unmatched agent who forms a relationship believes that his partner is productive. We show that this assessment is an equilibrium when $\delta \geq \overline{\delta}$.

It is immediate to see that Bayes' rule holds on the path of play. Let U^b and V^b be, respectively, the expected present discounted lifetime payoff to a productive agent who forms a relationship and the expected present discounted lifetime payoff to a productive agent who already is in a relationship. Since the strategy profile under consideration implements the first-best, U^b and V^b are given by equations (4) and (3), respectively. Then $\delta \geq \overline{\delta}$ implies that $U^p \geq A$, and so productive agents find it optimal to form relationships. Moreover, since $V^p > U^p$, a matched productive agent does not find it optimal to terminate a relationship on the path of play. Now observe that a matched productive agent is willing to exert effort on the path of play if

$$V^p \geq \gamma - \rho f + \delta U^p. \tag{6}$$

From the definition of V^p and the fact that $V^p - U^p = \kappa$, it follows that (6) is equivalent to

$$\pi - c_p + \delta(1-\lambda)(V^p - U^p) = \pi - c_p + \delta(1-\lambda)\kappa \geq \gamma - \rho f.$$

Given that $\gamma - \rho f \leq \kappa + A$ and $\kappa[1 - \delta(1-\lambda)] \leq \pi - c_p - A$ by assumption, condition (6) holds. To conclude, notice that since an unproductive agent only gains from forming a relationship if he behaves opportunistically, $\gamma - \rho f - \kappa \leq A$ implies that these agents have no incentive to deviate.

We have thus established the following result. Proposition 1 provides a benchmark for comparison when we analyze the case of a malfunctioning legal system in the next section.

Proposition 1. *Suppose that $\delta > \overline{\delta}$. Society can implement the first best if, and only if, $\rho \geq \overline{\rho}$.*

Since $\underline{\rho} = 0$ if $\kappa \geq \gamma - A$, society can implement the first best even in the absence of a legal system when the cost of forming relationships is large enough. This result is intuitive. If the cost of setting up a relationship is large, then unproductive agents do not gain from engaging in short-term opportunistic relationships even when opportunistic behavior entails no legal sanction, as this implies paying a high setup cost in every period. In light of this observation, in what follows we assume that $\kappa < \gamma - A$, so that society cannot implement the first-best if ρ is sufficiently small. Since $\pi - c_p < \gamma$, the assumption that $\kappa < \gamma - A$ is consistent with Assumption (A4).

5 Malfunctioning Legal System

We now consider the case in which $0 \leq \rho < \underline{\rho}$, so that the legal system is ineffective enough that society cannot implement the first best when $\delta > \overline{\delta}$. We focus on equilibria in which: (*i*) unmatched productive agents always form relationships and matched productive agents always exert effort; (*ii*) unmatched productive agents form a relationship with probability $p \in (0, 1]$ and matched unproductive agents do not exert effort; and (*iii*) a matched agent does not terminate his relationship if, and only if, him and his partner always exerted effort in the relationship. In such equilibria, productive agents behave as in the first best but unproductive agents engage in opportunistic behavior with positive probability. The equilibrium value p measures the extent to which society deviates from the first best. We will see that this value is related to both κ and ρ.

In what follows, we first determine the fraction $\widetilde{\theta}$ of productive agents in the set of unmatched agents who search for a partner; Bayes' rule implies that $\widetilde{\theta}$ is the probability that an agent who forms a relationship attaches to the event that his partner is productive. We then discuss the behavior of unproductive agents. After that, we discuss the behavior of the productive agents. We conclude by providing a characterization of equilibria.

We focus on the case in which λ is small, and so relationships between productive agents are long-lived. This is the natural case to consider: if exogenous separation shocks are sufficiently frequent, then even productive agents have no incentive to exert effort in a relationship.

5.1 The Fraction $\widetilde{\theta}$

In equilibrium, the set of agents who are unmatched at the beginning of a period consists of all unproductive agents and the productive agents who either were matched to an unproductive agent in the previous period or were in a relationship that was dissolved by a separation shock. The fraction $\widetilde{\theta}$ of productive agents in the set of unmatched agents who search for a partner in a given period is endogenous and depends on the probability p that unproductive agents search for other agents to form a relationship. The next result shows that the fraction $\widetilde{\theta}$ is uniquely defined and provides an equation for this fraction. See the Appendix for a proof.

Lemma 2. *The fraction $\widetilde{\theta}$ is the unique solution to*

$$\widetilde{\theta} = \frac{\lambda\theta}{\lambda\theta + p(1-\theta)[\lambda + \widetilde{\theta}(1-\lambda)]}. \tag{7}$$

It follows immediately from (7) that $\widetilde{\theta} = 1$ if $p = 0$ and so no unproductive agents searches for other agents to form relationship. It also follows from (7) that $\widetilde{\theta}$ is strictly decreasing in p and that $\widetilde{\theta}$ is strictly increasing in λ if $p > 0$.[15] Both results are intuitive. If more unproductive agents search for a partner to form a relationship, then it is more likely that an agent who searches for a partner to form a relationship forms one with an unproductive agent. Likewise, if $p > 0$, and so unproductive agents form relationships with positive probability, and increase in λ increases the availability of productive agents in the set of unmatched agents. Finally, it follows from (7) that if $p > 0$, then $\widetilde{\theta}$ converges to zero as λ decreases to zero.[16] Indeed, if unproductive agents search for other agents to form a relationship with positive probability, then at any point in time most agents who search for a partner are unproductive if relationships between productive agents are long-lived.

5.2 Unproductive Agents

Unproductive agents have no incentive to exert effort in a relationship, as this entails a short-run loss and no long-term gain. The flow payoff to an unproductive agent who forms a relationship is

$$\widetilde{\theta}(p)(\gamma - \rho f) - \kappa, \tag{8}$$

[15]The right side of (7) is strictly decreasing in p and is strictly increasing in λ if $p > 0$.

[16]It follows from (7) that $\widetilde{\theta}(1) < \lambda\theta/p(1-\theta)(1-\lambda)\widetilde{\theta}(1)$, and so $\widetilde{\theta}(1) \leq (\lambda\theta/p(1-\theta)(1-\lambda))^{1/2}$.

where we make the dependence of $\widetilde{\theta}$ on p explicit. Thus, if $p > 0$ is such that the (8) is smaller than A, then an unproductive agent who forms a relationship is better off by collecting the outside option. On the other hand, if $p < 1$ is such that (8) is greater than A, then an unproductive agent who collects the outside option is better off by forming a relationship. The next result follows immediately from this discussion and the fact that $\widetilde{\theta}$ is strictly decreasing in p, with $\widetilde{\theta} = 1$ when $p = 0$, and so unproductive agents do not form relationships.

Lemma 3. *In equilibrium unproductive agents enter with probability p^*, where $p^* \in (0,1)$ is the unique solution to $\widetilde{\theta}(p^*)(\gamma - \rho f) - \kappa = A$ when $\widetilde{\theta}(1)(\gamma - \rho f) - \kappa < A$ and $p^* = 1$ otherwise.*

Since $\widetilde{\theta}(1)$ is strictly increasing in λ with $\lim_{\lambda \to 0} \widetilde{\theta}(1) = 0$, it follows from Lemma 3 that there exists a unique $\overline{\lambda} \in (0,1]$ such that p^* is interior if $\lambda < \overline{\lambda}$. In this case, unproductive agents are indifferent between forming relationships and collecting the outside option in equilibrium. The next result follows immediately from Lemma 3 and the fact that the flow payoff (8) is strictly decreasing in both ρ and κ. Corollary 1 is important when we discuss red tape in the next section.

Corollary 1. *Suppose that $\lambda < \overline{\lambda}$. Then p^* is strictly decreasing in ρ and κ.*

5.3 Productive Agents

In a slight abuse of notation, let U^p and V^p be, respectively, the expected present discounted lifetime payoff to an unmatched productive agent who forms a relationship and the expected present discounted lifetime payoff to a productive agent who begins a period in a relationship (and so is at least in the second period of the relationship). Since on the path of play only relationships between productive agents can last for more than one period, Bayes' rule implies that a productive agent who starts a period in a relationship assigns probability one to the event that his partner is productive. It then follows that:

$$V^p = \pi - c_p + \delta\lambda U^p + \delta(1-\lambda)V^p; \tag{9}$$

$$U^p = -\kappa + \widetilde{\theta}\,[\pi - c_p + \delta\lambda U^p + \delta(1-\lambda)V^p] + (1-\widetilde{\theta})(\gamma + \rho f - c_p + \delta U^p). \tag{10}$$

Subtracting (10) from (9), we obtain that

$$V^p - U^p = \kappa + (1-\widetilde{\theta})\,[\pi - \gamma - \rho f + \delta(1-\lambda)(V^p - U^p)]\,,$$

and so

$$V^p - U^p = \frac{\kappa + (1-\widetilde{\theta})\,[\pi - \gamma - \rho f]}{1 - \delta(1-\widetilde{\theta})(1-\lambda)}. \tag{11}$$

In particular, $V^p - U^p > \kappa$. This reflects the fact that now the cost to a productive agent from terminating a relationship is more than just the cost of setting up a new relationship. Since the legal system is not effective in preventing unproductive agents from forming relationships and engaging in opportunistic behavior, now an unmatched productive agent may form a relationship with an unproductive agent, which entails an additional payoff loss.

We now discuss incentives. Given that $V^p > U^p$, a productive agent only has an incentive to terminate a relationship if either him or his partner behaved opportunistically in the relationship. The participation constraint for a productive agent is still given by

$$U^p \geq A + \delta U^p. \tag{12}$$

On the other hand, now there are two incentive compatibility constraints for effort for a productive agent. First, these agents must be willing to exert effort in the first period of a relationship:

$$\widetilde{\theta}(\pi - c_p + \delta\lambda U^p + \delta(1-\lambda)V^p) + (1-\widetilde{\theta})(\gamma + \rho f - c_p + \delta U^p) \geq \widetilde{\theta}(\gamma - \rho f) + \delta U^p. \tag{13}$$

Second, these agents must also be willing to exert effort in a relationship after its first period:

$$\pi - c_p + \delta\lambda U^p + \delta(1-\lambda)V^p \geq \gamma - \rho f + \delta U^p. \tag{14}$$

Since $\widetilde{\theta}(\gamma - \rho f) \geq A + \kappa$ in equilibrium, it follows that (13) implies (12).

5.4 Equilibria

6 Red Tape

We now discuss red tape in the presence of a malfunctioning legal system. We assume that λ is small enough and δ is large enough that the equilibrium characterization in Proposition **??** holds. Clearly, if there is full sorting in equilibrium, then red tape is welfare reducing. However, we know from Corollary **??** that if there is partial sorting in equilibrium, then an increase in the cost of setting up relationships decreases the probability that unproductive agents form relationships.

This, in turn, can benefit productive agents. In what follows, we show that red tape can be welfare improving when there is partial sorting in equilibrium.

Suppose that $\kappa \in [0, \overline{\kappa}^u)$. Since at the beginning of every period unproductive agents are indifferent between collecting their outside options and forming relationships and productive agents are either unmatched or matched to another productive agent, welfare in society is

$$W = (1-\theta)\frac{A}{1-\delta} + \theta\left[f_U U^p + f_P V_1^p\right],$$

where f_U is the fraction of productive agents who are unmatched and $f_P = 1 - f_U$ is the fraction of productive agents who are matched to another productive agent. An increase in κ has three effects. First, by increasing $\widetilde{\theta}$, it reduces the fraction f_U of productive agents who are unmatched, which is beneficial since $V_1^p > U^p$. Second, by increasing $\widetilde{\theta}$, it also increases both U^p and V_1^p, as it makes it more likely that a productive agent is matched to another productive agent. Finally, the increase in κ has a direct negative effect on both U^p and V_1^p. The next result provides conditions under which the second, positive, effect dominates the third, negative, effect, so that both U^p and V_1^p are increasing in κ, and thus welfare is increasing in κ as well. See the Appendix for a proof.

Lemma 4. *Suppose that $\pi > 2\gamma$. Then welfare is strictly increasing in κ when $\kappa \in [0, \overline{\kappa}^u)$.*

Suppose in what follows that $\pi > 2\gamma$. Given that welfare is strictly decreasing in κ when $\kappa > \overline{\kappa}^u$, we can then conclude that welfare is maximized when $\kappa = \overline{\kappa}^u$.

Proposition 2. *Welfare is maximized when $\kappa = \overline{\kappa}^u$.*

Let τ be amount of red tape, that is, the increase in κ. It follows immediately from Proposition 2 that if $\kappa \geq \overline{\kappa}^u$, then the welfare maximizing amount of red tape is $\tau^* = 0$, while if $\kappa \in [0, \overline{\kappa}^u)$, then the welfare maximizing amount of red tape is $\tau^* = \overline{\kappa}^u - \kappa$. Since $\overline{\kappa}^u$ is strictly decreasing in ρ, we can then conclude that the welfare maximizing amount of red tape is non-increasing in ρ and is strictly decreasing in ρ as long as there is partial sorting in equilibrium. The next result summarizes this discussion.

Corollary 2. *An increase in the efficiency of the legal system never leads to more red tape and it leads to less red tape as long as there is partial sorting in equilibrium.*

7 Conclusion

We develop a model in which red tape can be welfare improving in the presence of an imperfect legal system. We show that when the legal system is ineffective in preventing opportunistic behavior from taking place in business relationships, increasing the cost of setting up relationships can be welfare improving. By making business relationships costlier to form, red tape drives out less productive individuals who are only willing to form relationships because they can engage in opportunistic behavior. Thus, red tape can arise as an endogenous response to institutional failure.

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Appendix A: Figures and Tables

Table 1: Effect of legal system quality on Cost to Start a Business (% of GDP per capita) - 2015

	(1) OLS	(2) OLS	(3) OLS	(4) Reduced Form	(5) IV	(6) IV	(7) IV
Civil Justice Delay	-2.558*				-7.945**		
	(0.056)				(0.029)		
Civil Justive Effecitvely Enforced		-2.403**				-6.774**	
		(0.031)				(0.018)	
Civil justice is free of corruption			-3.834***				-6.021***
			(0.000)				(0.002)
Ln of Population	-0.105	-0.110	-0.142	-0.00818	-0.208	-0.206*	-0.188*
	(0.336)	(0.322)	(0.107)	(0.932)	(0.109)	(0.088)	(0.078)
Ln of GDP per capita (five year lag)	-0.971***	-0.923***	-0.569***	-1.050***	-0.822***	-0.710***	-0.306
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.251)
French Comm. Code				0.860**			
				(0.011)			
Constant	14.07***	13.81***	12.04***	11.57***	16.74***	15.65***	11.63***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	52	52	52	51	51	51	51
F-test	17.18	17.99	24.16	16.02	9.144	13.19	17.29
R^2	0.549	0.544	0.625	0.567	0.332	0.395	0.572

p-values in parentheses

$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table 2: First Stage Regressions (2015)

	(1) Civil Just. Delay	(2) Civil Just. Eff. Enforced	(3) Civil Just. is free of corruption
Ln of Population	-0.0252*	-0.0292**	-0.0299**
	(0.082)	(0.022)	(0.014)
Ln of GDP per capita (five year lag)	0.0287*	0.0502***	0.124***
	(0.062)	(0.001)	(0.000)
French Comm. Code	-0.108***	-0.127***	-0.143***
	(0.004)	(0.000)	(0.000)
Constant	0.650**	0.602**	0.00905
	(0.021)	(0.028)	(0.973)
No. of Obs.	51	51	51
F-test	3.418	9.434	29.67
F-statistic of Instrument	9.452	14.34	19.40

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of legal system quality on Cost to Start a Business (% of GDP per capita) - 2015

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	Reduced Form	IV	IV	IV
Civil Justice Delay	-0.726				-8.764		
	(0.613)				(0.144)		
Civil Justive Effecitvely Enforced		-0.856				-6.132*	
		(0.449)				(0.082)	
Civil justice is free of corruption			-3.070**				-6.078**
			(0.027)				(0.042)
Ln of Population	-0.175*	-0.175*	-0.157*	-0.139	-0.203	-0.201*	-0.137*
	(0.079)	(0.076)	(0.055)	(0.117)	(0.172)	(0.083)	(0.080)
Ln of GDP per capita (five year lag)	-0.556**	-0.539**	-0.462**	-0.557**	-0.943*	-0.628**	-0.422**
	(0.022)	(0.013)	(0.011)	(0.016)	(0.053)	(0.022)	(0.033)
Corruption Executive (one year lag)	-4.297**	-4.251**	-1.906	-4.357**	1.353	-0.946	1.026
	(0.040)	(0.038)	(0.400)	(0.014)	(0.791)	(0.772)	(0.789)
French Comm. Code				0.651*			
				(0.053)			
Constant	12.96***	12.90***	11.90***	11.71***	17.41***	14.98***	11.27***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	50	50	50	49	49	49	49
F-test	20.02	17.50	18.34	15.05	6.268	10.98	15.14
R^2	0.594	0.596	0.636	0.628	0.271	0.436	0.580

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

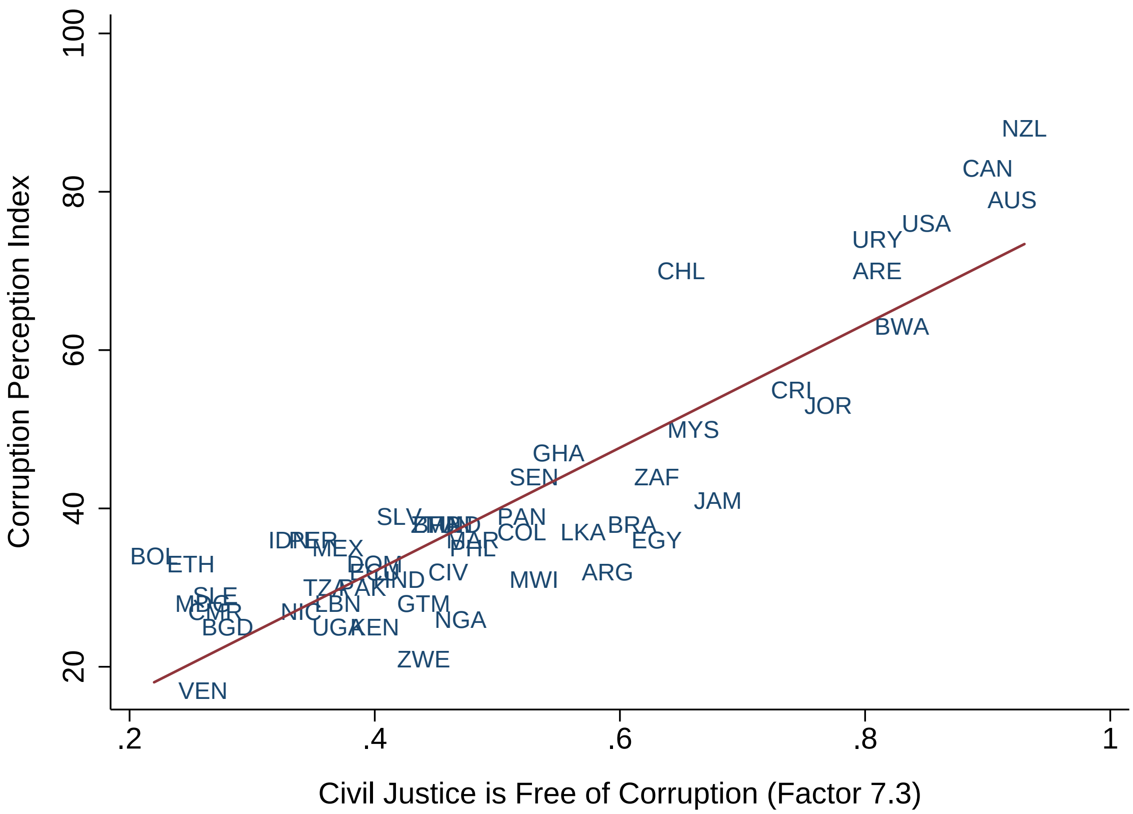
Table 4: First Stage: Cost to Start a Business (% of GDP per capita) - 2015

	(1) Civil Just. Delay	(2) Civil Just. Eff. Enforced	(3) Civil justice is free of corruption
Ln of Population	-0.00735	-0.0102	0.000403
	(0.620)	(0.421)	(0.968)
Ln of GDP per capita (five year lag)	-0.0440**	-0.0115	0.0222
	(0.033)	(0.607)	(0.269)
Corruption Executive	0.652***	0.556***	0.886***
	(0.000)	(0.000)	(0.000)
French Comm. Code	-0.0743**	-0.106***	-0.107***
	(0.030)	(0.002)	(0.000)
Constant	0.650***	0.533**	-0.0728
	(0.010)	(0.037)	(0.754)
No. of Obs.	49	49	49
F-test	16.55	18.48	82.64
F-statistic of Instrument	4.999	11.34	14.83

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1: Correlation between Corruption Perception and Civil Justice Corruption - 2015



Appendix B: Omitted Proofs and Details

Proof of Inequality (5)

First notice that

$$\mathbb{E}\left[\sum_{t=1}^{T}\delta^{t-1}\right] = \lim_{T\to\infty}\sum_{s=1}^{T}\mathbb{P}\{\tau = s\}\sum_{t=1}^{s}\delta^{t-1}.$$

Now observe that for each $T \geq 1$,

$$\begin{aligned}
\sum_{s=1}^{T}\mathbb{P}\{\tau = s\}\sum_{t=1}^{s}\delta^{t-1} &= \sum_{s=1}^{T}\left[\mathbb{P}\{\tau \leq s\} - \mathbb{P}\{\tau \leq s-1\}\right]\sum_{t=1}^{s}\delta^{t-1} \\
&= \sum_{s=1}^{T}\mathbb{P}\{\tau \leq s\}\sum_{t=1}^{s}\delta^{t-1} - \sum_{s=0}^{T-1}\mathbb{P}\{\tau \leq s\}\sum_{t=1}^{s+1}\delta^{t-1} \\
&= -\sum_{t=1}^{T-1}\delta^{t}\mathbb{P}\{\tau \leq t\} + \mathbb{P}\{\tau \leq T\}\sum_{t=1}^{T}\delta^{t-1},
\end{aligned}$$

where the second equality follows from the change of variable $s \mapsto s+1$ and the last equality follows from the fact that $\mathbb{P}\{\tau \leq 0\} = 0$. Hence,

$$\mathbb{E}\left[\sum_{t=1}^{T}\delta^{t-1}\right] = \sum_{t=1}^{t-1}(1 - \delta\mathbb{P}\{\tau \leq t\}).$$

Given that the exogenous separation shocks imply that at most a relationship survives from one period to the next with probability λ, it follows that $\mathbb{P}\{\tau \leq t\} \geq 1 - (1-\lambda)^t$. Hence,

$$\mathbb{E}\left[\sum_{t=1}^{T}\delta^{t-1}\right] \leq \sum_{t=1}^{t-1}(1 - \delta + \delta(1-\lambda)^t) = \frac{1}{1-\delta(1-\lambda)}.$$

Proof of Lemma 2

Let $M_t \leq \theta$ and $\theta - M_t$ be, respectively, the mass of productive agents who are unmatched at the beginning of period t and the mass of productive agents who are matched at the beginning of period t. Notice that

$$M_{t+1} = \lambda(\theta - M_t) + (1 - \widetilde{\theta}_t)M_t + \lambda\widetilde{\theta}_t M_t \tag{15}$$

for all t. Indeed, given that a productive agent is matched at the beginning of period t only if his partner is productive and an unmatched productive agent always searches for a partner, the mass of productive agents who are unmatched at the beginning of period $t+1$ is the sum of three terms: (*i*) the mass of productive agents matched at the beginning of period t who had their matches dissolved exogenously; (*ii*) the mass of productive agents unmatched at the beginning of period t who are matched with an unproductive agent; and (*iii*) the mass of productive agents unmatched at the beginning of period t who are matched with a productive agent and have their matches dissolved exogenously.

Now observe that since all unproductive agents are unmatched at the beginning of every period but only a fraction p of them searches for a partner, the fraction $\widetilde{\theta}_t$ is given by

$$\widetilde{\theta}_t = \frac{M_t}{M_t + p(1-\theta)}. \tag{16}$$

Given that $\widetilde{\theta}_t$ is constant over time (and equal to $\widetilde{\theta}$), we have that M_t is constant over time as well. Let $M \equiv M_t$. It follows from equation (15) that

$$M = \lambda(\theta - M) + (1-\widetilde{\theta})M + \lambda\widetilde{\theta}M.$$

Solving for M, we obtain that

$$M = \frac{\lambda\theta}{\lambda + \widetilde{\theta}(1-\lambda)}.$$

Substituting $M \equiv M_t$ in (16), we obtain the desired expression for $\widetilde{\theta}$.

To conclude, observe that the left side of (7) is continuous, strictly decreasing in $\widetilde{\theta}$, greater than zero when $\widetilde{\theta} = 0$ and smaller than one when $\widetilde{\theta} = 1$. So, (7) has a unique solution.

Proof of Lemma 4

Notice that

$$\frac{dW}{d\kappa} = \theta\left[\frac{df_U}{d\kappa}(U^p - V_1^p) + f_U\frac{dU^p}{d\kappa} + f_P\frac{dV_1^p}{d\kappa}\right].$$

Then W is strictly increasing in κ if $df_U/d\kappa < 0$, $dU^p/d\kappa > 0$, and $dV_1^p/d\kappa > 0$. We first show that $df_U/d\kappa < 0$ and then show $dU^p/d\kappa > 0$ and $dV_1^p/d\kappa > 0$ if $\pi > 2\gamma$.

(*i*) By the Chain Rule,

$$\frac{df_U}{d\kappa} = \frac{\partial f_U}{\partial\widetilde{\theta}}\frac{\partial\widetilde{\theta}}{\partial\kappa}.$$

Since $\kappa \in [0, \overline{\kappa}^u)$, we have that $\widetilde{\theta} = (A + \kappa)/(\gamma - \rho f)$, and so $\partial\widetilde{\theta}/\partial\kappa > 0$. Now observe that $f_U = M_U/\theta$, where M_U is the mass of productive agents who are unmatched at the beginning of any period. Hence, by Lemma 2, we have that

$$f_U = \frac{1}{\lambda + \widetilde{\theta}(1-\lambda)},$$

which is strictly decreasing in $\widetilde{\theta}$. Thus, $df_U/d\kappa < 0$.

(*ii*) By the Chain Rule,

$$\frac{dU^p}{d\kappa} = \frac{\partial U^p}{\partial\widetilde{\theta}}\frac{\partial\widetilde{\theta}}{\partial\kappa} + \frac{\partial U^p}{\partial\kappa}.$$

Notice from (10) to (9) that:

$$\frac{\partial U^p}{\partial\kappa} = -1 + \frac{\partial V_0^p}{\partial\kappa}; \tag{17}$$

$$\frac{\partial V_0^p}{\partial\kappa} = \delta\widetilde{\theta}(1-\lambda)\left[\frac{\partial V_1^p}{\partial\kappa} - \frac{\partial U^p}{\partial\kappa}\right] + \delta\frac{\partial V_0^p}{\partial\kappa}; \tag{18}$$

$$\frac{\partial V_1^p}{\partial\kappa} = \delta\lambda\frac{\partial U^p}{\partial\kappa} + \delta(1-\lambda)\frac{\partial V_1^p}{\partial\kappa}. \tag{19}$$

Substituting (17) into (19), we obtain that

$$\frac{\partial V_1^p}{\partial\kappa} = \frac{\delta\lambda}{1-\delta(1-\lambda)}\left[-1 + \frac{\partial V_0^p}{\partial\kappa}\right] = \frac{\delta\lambda}{1-\delta(1-\lambda)}\frac{\partial U^p}{\partial\kappa}. \tag{20}$$

In turn, substituting (20) and (17) into (18), we obtain that

$$\frac{\partial V_0^p}{\partial\kappa} = \frac{-\delta\left[1 - \dfrac{(1-\delta)(1-\lambda)\widetilde{\theta}}{1-\delta(1-\lambda)}\right]}{1 - \delta\left[1 - \dfrac{(1-\delta)(1-\lambda)\widetilde{\theta}}{1-\delta(1-\lambda)}\right]},$$

and so

$$\frac{\partial U^p}{\partial\kappa} = -\frac{1}{1 - \delta\left[1 - \dfrac{(1-\delta)(1-\lambda)\widetilde{\theta}}{1-\delta(1-\lambda)}\right]},$$

Now notice from (10) to (9) that:

$$\frac{\partial U^p}{\partial \widetilde{\theta}} = \frac{\partial V_0^p}{\partial \widetilde{\theta}}; \tag{21}$$

$$\frac{\partial V_0^p}{\partial \widetilde{\theta}} = \pi - \gamma - \rho f + \delta(1-\lambda)(V_1^p - U^p) + \widetilde{\theta}(1-\lambda)\left[\frac{\partial V_1^p}{\partial \widetilde{\theta}} - \frac{\partial U^p}{\partial \widetilde{\theta}}\right] + \delta\frac{\partial U^p}{\partial \widetilde{\theta}}; \tag{22}$$

$$\frac{\partial V_1^p}{\partial \widetilde{\theta}} = \delta(1-\lambda)\left[\frac{\partial V_1^p}{\partial \widetilde{\theta}} - \frac{\partial U^p}{\partial \widetilde{\theta}}\right] + \delta\frac{\partial U^p}{\partial \widetilde{\theta}}. \tag{23}$$

From (23), we obtain that

$$\frac{\partial V_1^p}{\partial \widetilde{\theta}} = \frac{\delta\lambda}{1-\delta(1-\lambda)}\frac{\partial U^p}{\partial \widetilde{\theta}}. \tag{24}$$

Let $\Delta = \pi - \gamma - \rho f + \delta(1-\lambda)(V_1^p - U^p)$. Substituting (21) and (24) into (22), we obtain that

$$\frac{\partial U^p}{\partial \widetilde{\theta}} = \frac{\partial V_0^p}{\partial \widetilde{\theta}} = \frac{\Delta}{1-\delta\left[1-\dfrac{(1-\delta)(1-\lambda)\widetilde{\theta}}{1-\delta(1-\lambda)}\right]}.$$

Given that $\partial\widetilde{\theta}/\partial\kappa = 1/(\gamma-\rho f)$, we then have that

$$\frac{dU^p}{d\kappa} = \frac{1}{1-\delta\left[1-\dfrac{(1-\delta)(1-\lambda)\widetilde{\theta}}{1-\delta(1-\lambda)}\right]}\left\{\frac{\Delta}{\gamma-\rho f} - 1\right\}.$$

To conclude, observe from (**??**) that

$$\frac{\Delta}{\gamma-\rho f} - 1 > \frac{\pi-\gamma-\rho f}{\gamma-\rho f} - 1 = \frac{\pi-2\gamma}{\gamma-\rho f},$$

and so $dU^k/d\kappa > 0$.

(*iii*) By the Chain Rule,

$$\frac{dV_1^p}{d\kappa} = \frac{\partial V_1^p}{\partial \widetilde{\theta}}\frac{\partial\widetilde{\theta}}{\partial\kappa} + \frac{\partial V_1^p}{\partial\kappa}.$$

Thus, from (20) and (24), we have that

$$\frac{dV_1^p}{d\kappa} = \frac{\delta\lambda}{1-\delta(1-\lambda)}\frac{dU^p}{d\kappa} > 0.$$

This concludes the proof.

Appendix C: Regressions for the Years 2014 and 2016

Table 5: Effect of legal system quality on Cost to Start a Business (% of GDP per capita) - 2014

	(1) OLS	(2) OLS	(3) OLS	(4) Reduced Form	(5) IV	(6) IV	(7) IV
Civil Justice Delay	-2.939**				-8.333**		
	(0.020)				(0.034)		
Civil Justive Effecitvely Enforced		-2.586***				-5.430**	
		(0.007)				(0.014)	
Civil justice is free of corruption			-3.773***				-6.111***
			(0.000)				(0.005)
Ln of Population	-0.0869	-0.118	-0.0810	0.0247	-0.223	-0.232*	-0.126
	(0.429)	(0.316)	(0.426)	(0.815)	(0.104)	(0.091)	(0.306)
Ln of GDP per capita (five year lag)	-0.995***	-0.961***	-0.640***	-1.080***	-0.859***	-0.850***	-0.368
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.173)
French Comm. Code				0.831**			
				(0.015)			
Constant	14.23***	14.30***	11.70***	11.36***	17.66***	16.46***	11.28***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	50	50	50	49	49	49	49
F-test	17.00	19.75	23.39	15.46	8.966	15.20	18.65
R^2	0.575	0.577	0.615	0.569	0.358	0.486	0.565

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Effect of legal system quality on Cost to Start a Business (% of GDP per capita) - 2016

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	Reduced Form	IV	IV	IV
Civil Justice Delay	-2.412**				-11.76*		
	(0.027)				(0.055)		
Civil Justive Effecitvely Enforced		-2.541**				-9.189**	
		(0.020)				(0.016)	
Civil justice is free of corruption			-3.991***				-5.596***
			(0.000)				(0.001)
Ln of Population	-0.152**	-0.121**	-0.245***	-0.149**	-0.302**	-0.169**	-0.303***
	(0.012)	(0.030)	(0.000)	(0.012)	(0.038)	(0.038)	(0.001)
Ln of GDP per capita (five year lag)	-0.967***	-0.953***	-0.561***	-1.028***	-0.636**	-0.690***	-0.367
	(0.000)	(0.000)	(0.001)	(0.000)	(0.034)	(0.005)	(0.109)
French Comm. Code				0.872***			
				(0.003)			
Constant	14.69***	14.34***	13.78***	13.78***	17.87***	16.01***	13.87***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	60	60	60	58	58	58	58
F-test	16.31	17.85	22.58	15.39	4.425	9.848	17.58
R^2	0.513	0.509	0.587	0.526	-0.382	0.146	0.554

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: First Stage Regressions (2014)

	(1) Civil Just. Delay	(2) Civil Just. Eff. Enforced	(3) Civil Just. is free of corruption
Ln of Population	-0.0297**	-0.0473***	-0.0247**
	(0.035)	(0.002)	(0.039)
Ln of GDP per capita (five year lag)	0.0266	0.0425**	0.117***
	(0.109)	(0.024)	(0.000)
French Comm. Code	-0.0998***	-0.153***	-0.136***
	(0.010)	(0.000)	(0.000)
Constant	0.756***	0.940***	-0.0132
	(0.008)	(0.003)	(0.960)
No. of Obs.	49	49	49
F-test	3.196	7.417	21.80
F-statistic of Instrument	7.281	14.25	17.78

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: First Stage Regressions (2016)

	(1) Civil Just. Delay	(2) Civil Just. Eff. Enforced	(3) Civil Just. is free of corruption
Ln of Population	-0.0130	-0.00217	-0.0275***
	(0.137)	(0.785)	(0.000)
Ln of GDP per capita (five year lag)	0.0334	0.0368**	0.118***
	(0.136)	(0.047)	(0.000)
French Comm. Code	-0.0742*	-0.0949***	-0.156***
	(0.063)	(0.008)	(0.000)
Constant	0.348	0.243	0.0150
	(0.201)	(0.299)	(0.941)
No. of Obs.	58	58	58
F-test	3.394	4.606	56.47
F-statistic of Instrument	3.614	7.509	26.52

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Effect of legal system quality on Cost to Start a Business (% of GDP per capita) - 2016

	(1) OLS	(2) OLS	(3) OLS	(4) Reduced Form	(5) IV	(6) IV	(7) IV
Civil Justice Delay	-1.011				-9.790		
	(0.402)				(0.159)		
Civil Justive Effecitvely Enforced		-1.626				-5.968*	
		(0.157)				(0.052)	
Civil justice is free of corruption			-3.497**				-5.244**
			(0.013)				(0.017)
Ln of Population	-0.213**	-0.213**	-0.192**	-0.164*	-0.256	-0.248**	-0.184**
	(0.044)	(0.039)	(0.031)	(0.090)	(0.153)	(0.024)	(0.033)
Ln of GDP per capita (five year lag)	-0.580**	-0.569**	-0.409**	-0.499**	-1.189*	-0.647**	-0.355**
	(0.021)	(0.011)	(0.014)	(0.021)	(0.097)	(0.016)	(0.033)
Corruption Executive (one year lag)	-3.991**	-3.849**	-1.889	-4.711***	4.385	-1.323	-0.381
	(0.048)	(0.043)	(0.335)	(0.004)	(0.573)	(0.615)	(0.886)
French Comm. Code				0.703**			
				(0.033)			
Constant	13.69***	13.93***	12.16***	11.66***	19.19***	16.09***	11.71***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Obs.	51	51	51	50	50	50	50
F-test	18.62	16.35	17.74	14.55	5.216	12.00	15.32
R^2	0.585	0.596	0.644	0.625	0.0261	0.466	0.617

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: First Stage: Cost to Start a Business (% of GDP per capita) - 2016

	(1) Civil Just. Delay	(2) Civil Just. Eff. Enforced	(3) Civil justice is free of corruption
Ln of Population	-0.00946	-0.0141	-0.00397
	(0.608)	(0.310)	(0.700)
Ln of GDP per capita (five year lag)	-0.0704**	-0.0247	0.0275
	(0.025)	(0.339)	(0.213)
Corruption Executive	0.929***	0.568***	0.826***
	(0.000)	(0.001)	(0.000)
French Comm. Code	-0.0718*	-0.118***	-0.134***
	(0.082)	(0.002)	(0.000)
Constant	0.769**	0.743***	0.00972
	(0.012)	(0.008)	(0.967)
No. of Obs.	50	50	50
F-test	16.50	15.50	92.09
F-statistic of Instrument	3.171	10.83	25.52

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$