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A Network Effects Analysis of Private Ordering

Amitai Aviram [*]

The p rivate ordering literature examines how non -government institutions mitigate opportunistic behavior in transactions. It emphasizes two elements that facilitate cooperation and reduce opportunism: repeated play and reputation. This paper explores the implications of a third element : network effects .

Network effects create an incentive for a unique form of opportunism that exists only in network environments – degradation. On the other han d, network effects facilitate mechanisms that may be very effective in mitigating opportunism. Therefore, in certain industries, networks mitigate opportunism , largely displacing in that role the parties to the transaction and the government.

This paper identifies mechanisms used by n etworks to reduce opportunism, and market characteristics that are conducive to the effectiveness of these mechanisms (and therefore to the efficiency of networks as regulators). This helps explain the prevalence o f networks in certain markets as compared to others, and gives tools to assess networks' ability to self -regulate and anticipate the type of opportunism that is more likely to plague a given environment.

Public and private regimes of behavior regulation coexist, i n varying degrees of harmony, in many aspects of life. Law, even under a narrow definition that excludes private regulatory regimes (known as Private Legal Systems), must address the degree of accommodation public regulatory regimes will afford the ir priv ate counterparts. Some fields of law – most notably contract and property laws – enforce forms of private regulation that are perceived as beneficial.

Otherfieldsoflaw(inparticular,antitrust)prohibitformsofprivateregulationthatareperceived ash armful.

Manyotherfieldsoflawdonotdirectlyaddressprivateregulation,butmaybedesigned inwaysthateitherfacilitateorhindercoexistenceofpublicandprivatelawinagivenarea. For example, imposing liability on private institutions t hat unknowingly facilitate illegal activity assists in preventing the illegal activity, but imposes an additional c ost on the private entities . Thisissuehasreceivedmuchattentionrecentlyinconnectionwiththemediaindustry'sattempt toimposeliabi lityforcopyrightviolationsonpeer -to-peerexchanges(notably,Napster), [1]aswell as regulators' attempts to impose liability on online payment systems that facilitate payments involved in illegal gambling. [2] This liability may deter some efficient priv ate schemes. Th e result mayormaynotbesociallybeneficial,dependingonthesocialbenefitsfromtheprivate schemeandtheirrelativeadvantage(ordisadvantage)overpubliccounterparts.

Thelegalscholarshipknownas'privateordering'servesthes ebodiesoflawbyassessing the social benefits and relative advantages of private regulation regimes. In analyzing private institutions, this literature emphasizes two elements that are used to mitigate harmful, opportunistic behavior : repeated play and reputation. This paper discusses a third eleme nt:

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[1] *See A&MRecords,Inc.v.Napster,Inc.* ,239F.3d1004(Ninth Cir.2001)(recordcompaniesandmoviepublishers foundtohavemadeprimafaciecaseofcopyrightinfringementbyNapster,apeer -to-peersystemforonline exchangeoffiles); *Ellisonv.Robertson* ,189F.Supp.2d1051(C.D.Cal.2002)(postingofcopyrig htedmaterialon anAmericaOnlineUSENETnewsgroupfoundtocome within the scopeof the DigitalMillenniumCopyrightAct's safe-harborprovisionfor"int ermediateandtransientstorage ").
[2] *See*, *e.g.*,theNewYorkAttorneyGeneral'sinvestigationofPayP al,Inc.(anonlinepaymentsystem),forits involvementinprocessingpaymentsrelatedtoonlinegamblingactivities."PayPalInc.toStopProcessing PaymentsFromNewYorkers", *TheWallStreetJournal* ,August22,2002,pageB8.

networkeffects. [3]Thereisasignificantliteratureontheeconomi   csofnetworkeffects,andsome

scholarshavediscussedtheapplicationofnetworkeffectsintolegalanalysis.   [4]Privateordering,

however, has examined only passingly the implications of network effects, and rarely

distinguishes between private institutions that are networks (such as exchanges, merchant

coalitions, etc.) and those that are not. As a result, the   private ordering literature does not

examine types of opportunistic behavior that are unique to network environments, and it

emphasizesmechanismsthatarecommontobothnetworkandnon   -networkenvironments(e.g.,

reputation), sometimes neglecting other mechanisms that are very ef   fective in network

environments (e.g., coordinated exclusion from the network, and centralized control of

transactions).

This paper will explore the implications of network effects on the ability (and relative

advantage) of private institutions to   regulate.[5] Whiletheanalysisinthispaperisapplicableto

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[3]Asdiscussed *infra*,in sectionII.1,networkeffects(ornetworkbenefits)aredemand   -sideeconomiesofscale.That is,thephenomenathattheutilitytoauserofagoodorserviceincreasesasadditionalpeopleuseit.Often(though notalways)realizationofnetworkeffects   requiresinterconnectionbetweentheusers.Theinstitutionthatfacilitates interconnectionbetweenusersofagoodorserviceexhibitingnetworkeffects,andthusenablestherealizationofthe networkeffects,iscalleda **network**.

[4] *See*, *e.g.*,Richa rdA.Posner,AntitrustLaw(SecondEd.,2001)245   -256(analyzingexclusionarypracticesinthe "neweconomy",whichischaracterizedbysignificantnetworkeffects);   DavidA.Balto,NetworksandExclusivity: AntitrustAnalysistoPromoteNetworkCompetiti   on,7Geo.MasonL.Rev.523(1999);   MarkA.Lemley&David McGowan, *LegalImplicationsofNetworkEconomicEffects*   ,86Cal.L.Rev.479(1998).

[5]Theterm' **regulation**'hasavarietyofdefinitions,somesobroadastoencompassanyconstraintthatlimits   free choice,otherssonarrowastorelateonlytogovernmentactivitythatmandatestoffirmsincertainindustries consumerprices.Broadly,regulationincludesthecreationofnorms,detectionofviolationsofthosenorms,and enforcementofthenorm ofthedetectedviolators.Tofocusthediscussioninthispaper,theterm'regulation'will regardactivity(byanyinstitutionorindividual)aimedatmitigatingopportunisticbehaviorintransactions.Often, regulationisfacilitatedthroughinterventio   nofanentityotherthanthepartiestothetransaction.However,one formofregulation(whichthispaperwilladdressastransactionregulation)involvesmechanismsimplementedby partiestothetransactionwiththeintenttoprotectagainstundesirabl   ebehaviorwithregardtothetransaction.For example,forminglong -termrelationshipswithcertainpartiesandabstainingfromcontractingwithotherswouldbe consideredaformofregulationagainstopportunisticdefault.Anotherformofregulation(r   eferredtoasself - regulation)involvesself -restraintbythewould -beopportunist.Regulation,therefore,spansawiderangeofforms, fromself -regulationbythepotentiallyopportunisticparty,throughthenon   -opportunisticpartiestothetransaction andthirdparty"gatekeepers"(see   *infra*,textregardingnote14),toregulationbynetworksandfinallytoregulation bygovernment.

the enforcement of any norm, the paper will focus on regulation as the mitigation   of opportunistic behavior in transactions . The implications of network effects analysis on private ordering are three -pronged. First, network effects allow a certain type of opportunistic behavior (which this paper, following recent economic   literature, calls degradation)   that is unprofitable to the opportunistic party in non   -network environments) . Some anti -opportunism mechanisms that are commonly used against 'garden variety' opportunism are ineffective against degradation, making a regime whose strengths lie in these mechanisms less efficient as the regulator if degradation is likely to occur. Second, network effects   make certain mechanisms far more effective in combating opportunistic behavior. The paper classifies four such mechanisms commonly used by networks, and assesses in which market structures they will be most effective. Third, the paper examines the abili   ty of networks to modify themselves so as to become more efficient regulators, when the incumbent network has the ability to mitigate opportunism efficiently, but not the incentive to do so. Such modified networks have been observed and discussed in the a   ntitrust scholarship (where they have been called "middleware"), but have yet to receive significant attention from the private ordering literature.

Part I of this paper   examines the risk of opportunism in transactions, and the institutions that attempt t o mitigate this risk. It analyzes the private ordering literature on the matter, and the two elements that literature has emphasized: repeated play and reputation.   Part II adds network effects into the analysis. It surveys the relevant economic literatu   re and applies it to the private ordering framework. Four types of mechanisms used by networks to mitigate opportunism are classified and discussed, and degradation is explained and distinguished from opportunism that is not unique to networks (which the   paper calls 'breach'). The paper then examines the

relationshipbetweenmarketstructureandopportunism,andtouchesbrieflyonrelevanteffectsof

opportunismofeithertypeonsocialwelfare.

Part III explores the 'competition' between   several opportunism-mitigating regulatory

regimes: government regulation,network regulation(i.e.,enforcement bynetworks),transaction -

regulation(i.e.,enforcement bythespecificpartiestoanygiventransaction)   ,andself -regulation

(i.e., self -restraint driven by   morality). Building on the analysis (made in part II) of types of

opportunism and types of opportunism   -mitigating mechanisms, it predicts the relative

advantagesofeachregulatoryregimeinvariousmarketstructures.Finally,PartIVsummarizes

andconc ludes.

I. **TransactingandOpportunism**

Opportunistic default on obligations   [6] is an inherent risk in any transaction between

partieslackingcompletecontrolovereachother'sactions.   [7] Suchbehaviorharmsthepartiest   o

the transaction by reducing the r   eturn to any investments they had made in reliance on the

defaultedobligations.   Sincethedefaultingpartyisnotharmedbythedevaluationofthereliance

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[6]Opportunismmaybedefinedas"anactinwhichsomeonedestroyspartofthecooperativesurplustosecurea
largershare ofit".RobertD.Cooter,   *TheTheoryofMarketModernizationofLaw*   ,16Int'lRev.L.&Econ.141,
150(1996).Forothergeneraldefinitionsofopportunism,   *see*:MichaelP.VanAlstine,   *TheCostsofLegalChange*   ,
49UCLAL.Rev.789,834(2002)(defining   opportunismas"badfaithexploitationofuncertainty");OliverE.
Williamson, *TheEconomicInstitutionsofCapitalism:Firms,Markets,RelationalContracting*   47(1985)(defining
opportunismas"selfinterestseekingwithguile").Inthecontextofcontr   actlaw,opportunismhasbeendefinedasa
situationinwhichoneparty"behavescontrarytotheotherparty'sunderstandingoftheircontract,butnot
necessarilycontrarytotheagreement'sexplicitterms,leadingtoatransferofwealthfromtheother   party".
TimothyJ.Muris,   *OpportunisticBehaviorandtheLawofContracts*   ,65Minn.L.Rev.521,521   -22(1981).

investments of the other parties to the transaction, it might choose to default (absent some adverse sanction to such behavior) even when this results in a decrease in the combined welfare of all parties to the transaction . T he devaluation of reliance investments is thus a negative externality imposed by opportu nistic default on an obligation .[8]Furth ermore, recognizing the risk of default, parties to a transaction may decide to invest less in reliance on the transaction than they would have if opportunistic default had been less probable or less damaging; this lower investment might result in lower ut ility from the transaction.

Because welfare would be increased by lowering the probability of opportunistic default on obligations or by decreasing the damage caused by such default, potential parties to transactions seek forms of regulation that would ac hieve either or both reduced probability and reduced damage from opportunistic default. Different entities have different advantages and disadvantages as such regulators, and overlapping regulation by different entities may complement, or conflict, with r egulation by other entities.

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[7]This statement assumes that there is no anti -opportunism regulation of the transaction (*e.g.*, enforceable contract law). If such regulation exists, the statement would still be true where the regulating regime has weaknesses (in the case of contract law – where the contract is incomplete).

[8]One may raise a 'Coasian' argument that the negative externality of opportunism is internalized by a d ecrease in the price buyers would be willing to pay in a transaction that is vulnerable to opportunistic behavior. For example, if Abe knows that Ben may act opportunistically and reduce by $2 Abe's benefits from the transaction, Abe will be willing to pa y Ben $2 less, making him no worse and Ben no better by the opportunistic behavior. Of course, in that situation all potential opportunists would have an incentive to act opportunistically (unless they can identify themselves as non -opportunists), since t hey are already penalized by the buyer (and so might as well recoup the penalty by benefiting from opportunistic behavior). For example, Carol, who is also a seller, might have considered not acting opportunistically towards Abe, but since Abe pays $2 les s than market price (assuming the worst of the seller's behavior), Carol can only compete with Ben if she too earns back the $2 by acting opportunistically. This equilibrium, in which all potential opportunistic parties choose to act opportunistically whi le all injured parties reduce price and reliance, is inefficient because it precludes efficient investments that rely on the fair execution of the transaction. Regulators, by mitigating opportunism, allow either direct deterrence of opportunistic behavior or differentiation between opportunistic parties and non -opportunistic parties (enabling Abe to offer a higher price to honest Carol than to opportunistic Ben, thus indirectly deterring Ben from acting opportunistically).

Robert Ellickson identified, in his seminal book   *Order Without Law* , five categories of regulators (which he calls 'controllers'):   first party controller (self -control), second party controller (through promise enforced agreem   ents), and three types of third party controllers: informal controller (social forces), non   -governmental organization controller, and government (the legal system). [9]

Self-control gives the role of regulator to the entity with the greatest ability to both   detect and prevent opportunistic behavior   – the potentially opportunistic party itself. However, this party has the least incentive to regulate, as it is typically the primary beneficiary of the opportunistic behavior.   Furthermore, this form of regulati   on is highly vulnerable to self   - deception (i.e., the would   -be opportunist viewing an opportunistic but self   -serving behavior as legitimate). Finally, self   -control is vulnerable to differences in culture or personal morality   – actions that are morally repu   gnant to one person may be acceptable to another, and so one person's expectations of another's self   -control may be frustrated even in the absence of self   - deception.

Second party control presents a different set of advantages and disadvantages. The second party   has an unbiased incentive to prevent opportunistic default on obligations   (to the extent that the opportunism is at   its expense) ,[10] and it also possess   es intimate knowledge of the transaction's subject matter (e.g., the industry in which it operates   ). However,   its ability to

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[9] Robert C. Ellickson,   *Order With out Law: How Neighbors Settle Disputes*   (Cambridge, Mass: Harvard University Press, 1991) 126 -132.

[10] Some parties may enter a transaction with the intent to defraud, and therefore would not have at any stage an interest in preventing opportunism. However,   if a mechanism was available that would prevent opportunism, the refusal of a party to implement it would signal to other parties a likely intent to defraud. Therefore, at least ex ante, parties to a transaction are likely to agree to implement mechanisms   mitigating opportunism.

punish opportunism is limited since, absent coordination with or assistance   from others, it   can

only deprive the defaulting party of   their future mutual transactions.   [11] If the value of such

transactions is not great (for example   , where the defaulting party will be able to transact with

other, similarly attractive, firms), this sanction would fail to deter some opportunistic behavior.

        Government is a natural candidate for regulating opportunism in transacting. Having a

monopoly on violence and controlling specialized enforcement agencies that can enforce

injunctions, fines and damages awards, the government can impose unique sanctions such as

incarceration,[12] and has better ability to impose fines than do most other potential regu   lators.

Unsurprisingly, therefore, law and government enforcement of it ha   ve a significant role in

regulating (such great a role, in fact, that many view it as the sole, or at least the primary method

of regulation) . Contract law is intended to lend the   power of government's enforcement

machinery to parties injured by breach of obligations. Commercial law provides more specific

rules for certain common types of commercial transactions, intended (among other reasons) to

curb opportunistic frustration of t   he goals of those transactions. Consumer protection law is, to a

significant degree, aimed at correcting information asymmetries that make opportunistic

behavior more likely. Antitrust law similarly addresses opportunism that is caused by the

possession or attempted acquisition of market power.   [13] Industry -specific regulation often

monitors for (and remedies) opportunism by or against the firms it regulates.

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[11] This assumes that the agreements between the first and second parties are enforced by the promesee. If they are enforced by government through private actions (e.g., if the promesee sues in court to enforce the agreement), then the form of regulation is a hybrid in which detection of deviation from the norm is done primarily by the second party controller, while formation of the norm and enforcement against violations are done by government. Thus, it would not be a pure form of   second party regulation.

[12] Government would rarely impose incarceration on even the most guileful opportunism.   *See infra* note 96.

[13] *See, e.g* ., *DigitalEquipmentCorp.v.UniqDigitalTechnologies,Inc.*   , 73 F.3d 756 ,762(7 [th]Cir.1996), distinguishing *EastmanKodakCo.v.ImageTechnicalServices,Inc*   .,504U.S.451,112S.Ct.2072,119L.Ed.2d 265(1992).

Third parties other than government are also enlisted as regulators, if they have relevant advantages over the parties to the transaction and the government. For example, investment banks, accountants, law firms and other financial intermediaries often serve as "gatekeepers", since they have advantageous access to information regarding potential oppor   tunism.[14] While gatekeepers are third parties, regulation through them may be considered more in line with Ellickson's classification of Second Party Control if the gatekeepers' role is limited to providing informational and other services to the second pa   rty, but the actual enforcement is done by the second party (primarily through refusing to deal with the opportunistic party). In such cases, the gatekeeper is not a controller, but merely a provider of a service that is used by the Second Party to regula te.

In contrast, o ther third parties, such as exchanges and trade associations, create   , adjudicate and enforc e norms that are intended to reduce opportunism.   [15] Such third parties (and some others)   typically not only enjoy potential informational advantage   s, but also possess sanctions against offenders, that may rival or surpass the government's in effectiveness (thus deterring opportunism and hence decreasing its likelihood) and are able to replace defaulted transactions with substitute transactions more e   fficiently than the parties to the transaction themselves (thus mitigating the damage from default). These third parties are networks   -

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[14] *See* Reinier H. Kraakman, *Gatekeepers: The Anatomy of a Third -Party Enforcement Strategy* , 2 J.L. Econ. & Org. 53 (1986); Stephen J. Choi, Market Lesso   ns for Gatekeepers, 92 Nw. U. L. Rev. 916 (1998); Ronald J. Mann, *Verification Institutions in Financing Transactions* , 87 Geo. L.J. 2225 (1999).

[15] *See*, *e.g.*, Lisa Bernstein, *Opting Out of the Legal System: Extralegal Contractual Relations in the Diamond Industry*, 21 J. Legal Stud .115 (1992); Lisa Bernstein, Private Commercial Law, in 3 The New Palgrave Dictionary of Economics and the Law 108 (Peter Newman, ed. 1998).

institutionsthatfacilitateinterconnectionbetweenusersofagoodorserviceexhibitingnetwork

effects,andth usen abletherealizationofthenetworkeffects   .[16]

Networks appear in many forms: trade associations, commodity exchanges, electricity

grids, Internet auction sites,   Peer-to-Peer and Business -to-Business exchanges, etc.[17] In most

cases,networks donotexists olelytoregulate.   Rather,they existprimarilyto exploitnetwork

effects and   thus increase members' utility from transacting. This paper does not attempt to

explain networks in general, however, but rather focus on networks as regulators.   In certain

circumstances, networks are better   regulators than the parties to the transaction or other third

parties (such as the government).   I n such cases,   networks will not only facilitate transactions,

butalsoactasregulators.A   nti-opportunismmechanismsinsti tutedbythenetwork   may displace

counterpart measures applied   by other regulators (e.g.,   government regulation , bilateral

contracting, etc.) . Identifying these circumstances and the mechanisms used   by networks to

combatopportunis misagoalofthispape   r.

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[16]Thisdefinitionwasmade   *supra*,note3.Foradiscussionofnetworkeffects   *seeinfra* ,sectionII.1.Ellickson
differentiatesbetweentwocontrollers –informalcontrollersandorganizationalcontrollers –bothofwhichare
usuallynetworks.Thedifferencebetweenthesetwotypesofcontrollersismainlyinthearrayofenforcement
mechanismstheywield.Informalcontrollersmakeuseofinformationandswitchingmechanisms,while
organizationalcontrollersmakeuseofthesetwomechanismsandalsoofexclusionandcontrolmechanisms.These
mechanismswillbeexplained   *infra*,SectionII.2 .Theremaybesomeexceptions,inwhichaspecificinformalor
organizationalcontrollerwouldnotbeanetwork.Butasexplained   *infra*,inSectionsIII.4.andIII.5.,inmany
circumstancesnetworkstendtohaveanadvantageinregulatinggovernon   -networkthirdpartycontrollers,and
thereforenon -networkthirdpartycontrollerstendtobeuncommon.
[17]Examplesofbusinessenvironmentssignificantlyinfluencedbynetworksinclude:exchanges(e.g.,securities
exchanges,commodityexchanges,etc.);financia lnetworks(creditcardnetworks,ATMnetworks,checkclearance,
etc.);communications(longdistanceandinternationaltelephony,cellulartelephony,Internetbackboneservices,
etc.);transportation(air,sea,andlandtransportation);mailandexpresss   ervices(domesticandinternational);and
energynetworks(electricity,gasandoilpipelines).

The literature on private ordering examines regulation by parties other than government: rules, norms and institutions that are self-imposed by private parties (or evolve) [18] to govern their behavior and transactions. [19] Macaulay's seminal work in this field observed that few contractual disputes are litigated, and most are settled without resorting to government-enforced laws. [20] Subsequent research pointed out to advantages in mitigating opportunism that certain non-government institutions may possess. In analyzing the institutions that mitigate opportunism, this literature emphasizes two elements: repeated play and reputation.

The repeated-play element addresses the perception of the parties to a transaction that they are likely to transact again in the future. As a result of this perception, each party's behavior in the current transaction may have consequences in future transactions. [21] For example, if John promises to buy Dan's car, but then reneges on that promise, Dan may refuse to transact with John in the future, or may deal with John in the future under terms less favorable to John (both as punishment and because Dan now takes into account the greater likelihood of John defaulting again). Knowing these are the likely consequences, John will be hesitant to renege on his promise in the first place, at least if he anticipates the loss of future transactions with Dan to be greater than the benefit from reneging on the current promise.

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[18] Some norms are not contemplated and imposed, but evolve. See Eric A. Posner, Law, Economics, and Inefficient Norms, 144 U.Pa.L.Rev. 1697, 1699 (1996) ("The rule-like nature of a norm should not disguise the fact that norms are not enacted or enforced like statutes. It is more plausible to say that when people observe some behavior, they more or less spontaneously approve or disapprove of it (or fail to react), and then reward, penalize, or ignore the actor.").

[19] See, e.g., Stuart Banner, *The Origin of the New York Stock Exchange, 1791-1860*, 27 J.Legal Stud. 113 (1998); Lisa Bernstein, *Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions*, 99 Mich.L.Rev. 1724 (2001); Robert C. Ellickson, *A Hypothesis of Wealth-Maximizing Norms: Evidence from the Whaling Industry*, 5 J.L.Econ.&Org. 83 (1989); Curtis J. Milhaupt & Mark D. West, *The Dark Side of Private Ordering: An Institutional and Empirical Analysis of Organized Crime*, 67 U.Chi.L.Rev. 41 (2000).

[20] Stuart Macaulay, *Non-Contractual Relations in Business: A Preliminary Study*, 28 Am.Soc.Rev. 55 (1963).

[21] See David M. Kreps, *Corporate Culture and Economic Theory*, in *Perspectives on Positive Political Economy* (James Alt & Kenneth Shepsle, eds., 1990).

Reputation expands the scope of future consequenc   es, by enabling   other firms, which were not parties to a given transaction, to learn of the trustworthiness of the p   arties in that transactionandactonthatknowledge.   [22] Returningtotheaboveexample,Johnmightrealizethat renegingonhispromisetoDanwillnotonly   makeDan'sfuturereactionstohimlessfavorable, buthemightexpectasimilarreactionfromanyonewholearnsofJohn'sdefault. Thisreaction hasnot hing todo withsympathyforDan   –itisinthebestinterestofeach   persontobemore averse to dea   ling with another person who is more likely to default on promises.   A c redible accountofpastbehavior   (*i.e*.,reputation)isusuallyperceivedasagoodproxyforassessingthe likelihoodoffuturedefaultonobligations,andthereforeintereststhirdpa   rtiesandaffectstheir dispositiontowardsthepersonwho'sreputationtheyareawareof.

This paper   discusses athirdelementthat   affects theanalysisofopportunism -mitigating institutions – network effects.Private   orderingscholarshiphasexamined   businessenvironments that are dominated by networks, such as merchant coalitions,   [23] or commodity and financial exchanges.[24]   It also notes the use of social networks to combat opportunism in business transactions.[25] However, itrarelydistinguishesbetween   institutionsthatarenetworks(thatis,

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[22] *See,e.g.* ,PaulMilgrom,DouglassNorth&BarryWeingast,   *TheRoleofInstitutionsintheRevivalofTrade:The LawMerchant,PrivateJudges,andtheCha   mpagneFairs* ,2Econ.&Pol.1(1990).

[23] *See*KarenClay, *TradeWithoutLaw:Private -OrderInstitutionsinMexicanCalifornia* ,13J.L.Econ.&Org.202 (1997);AvnerGreif, *ContractEnforceabilityandEconomicInstitutionsinEarlyTrade:TheMaghribiTrade   rs' Coalition*,83Am.Econ.Rev.525(1993);Milgrom,North&Weingast,   *supra*note22.

[24] *See,e.g.* ,Banner, *supra*note19;Bernstein(2001),   *supra*note19;StephenC.Pirrong,   *TheEfficientScopeof PrivateTransactions -Cost-ReducingInstitutions:TheSucc   essesandFailuresofCommoditiesExchanges* ,24J. LegalStud.229(1995);MarkD.West,   *PrivateOrderingattheWorld'sFirstFuturesExchange* ,98Mich.L.Rev. 2574(2000).

[25] *See*, *e.g*.,JanetT.Landa, *ATheoryofTheEthnicallyHomogenousMiddlemanGrou   p:AnInstitutionalAlternative toContractLaw* ,10J.Leg.Stud.349(1981).   *Alsosee* Bernstein(1998), *supra*note15,atp.110;Bernstein(1992), *supra*note15,atp.130;RajaKali,   *EndogenousBusinessNetworks* ,15J.ofL.Econ.&Org.615(1999).

that are characterized by network effects) and those that are not.   [26]   As a result, the literature

usuallydiscussesonlytypesofopportunismthatarecommontobothnetworkandnon   -network

business environments, [27] an d examines primarily regulation mechanisms that are common to

bothoftheseenvironments. [28]

Below Iexaminehowtransactinginanetworkenvironmentinvolvesbothuniquerisk   sof

opportunism and unique (or   at least, in many circumstances, significantly sup   erior) abilities to

regulateagainstopportunism.   I beginbyexaminingtherelevantcharacteristicsofnetworks.

II. **TransactinginaNetworkEnvironment**

1. Network Effects

While networks may enjoy economies of scale and scope   *in production* , the uniqu e

quality of a network   is economies of scale and scope   *in demand* , referred to by economists as

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[26] Someoftheliteraturedoesmakesrelevantdistinctions.Forexample,McMillanandWoodruffdistinguish between"bilateralrelationalcontracting"and"multilateralrelationalcontracting".   *See*JohnMcMillan& ChristopherWoodruff, *PrivateOrderUnderDy sfunctionalPublicOrder* ,98Mich.L.Rev.2421,2430   -2435 (2000).Notallmultilateralcontractsarenecessarilyassociatedwithnetworks.However,mostofthemultilateral contractsexaminedintheliteraturerelatetonetworks,probablyduetotheadv   antagesthatanetworkpossesses (overothermultilateralinstitutions)inregulating.

[27]Typically,theprivateorderingliteratureexaminesopportunismofthetypethispaperdefines,   *infra*insectionII.3, as'breach'.Transactinginnetworkenvironment   smayalsoriskamarkedlydifferenttypeofopportunism,which thispaperdefines(again,   *infra*,insectionII.3)as'degradation'.

[28]Forexample,asmentionedabove,theliteratureemphasizestheroleofreputationinrestrainingopportunism. Networksm aybeabletoexploiteconomiesofscaleandsolvecollectiveactionproblemsinmonitoringreputation (*see*discussionontheinformationmechanism,   *infra* ,sectionII.2),buttheyalsohaveotheropportunism   -reducing mechanismsintheirarsenal,including   theabilitytocoordinateamongthenetworkmemberssothatthe opportunisticpartyfacesacollectivesanctionfromallmembers.Somescholarshaveaddressedtheneedfor coordination. *See,e.g* .,McMillan&Woodruff,   *supra*note26,atp.2438("Providin   ginformationaboutthosewho

'network effects': the value of membership in a network is enhanced by an increase in the number of other members or in the other members' usage of the network.   An example is an Internet marketplace (such as eBay). If I want to sell an item, the probability that I find a potential buyer increases as more people use the same   Internet marketplace. And as a buyer, the probability that I find a person wishing to se   ll the very item I seek increases as more people use the marketplace.

In industries characterized by economies of scale in supply, firms lower their production costs by drawing more demand for their product, allowing them to produce more of the product and thus benefit from the economies of scale   . But in network industries, firms can lower their costs[29] without having to wrest customers from their competitors   – by interconnecting with competitors (*i.e.*, making one's product or service compatible   with the   competitors'), thus allowing each firm's customers to reap demand   -side economies of scale as if the customers of that firm's competitors were its own.   As Richard Posner notes, "[E]conomies of consumption presuppose uniformity rather than a common source."   [30]

For example, the benefit   to customers of a cellular telephone company increase as they are able to talk to more people through their phones. A cellular telephone carrier could, by interconnecting with another carrier, offer its customers the added bene   fits of talking with the other carrier's customers, making each carrier's service as attractive as if one of the carriers acquired all of the other's customers. This characteristic of network industries creates a

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cheat may not suffice to deter cheating when punishment is costly   – coordination may be required…"). However, they have not focused on the connection between network effects and the effectiveness of coordinating mechanisms.
[29] Or increase the consumer's benefit from its products without increasing costs, which is equivalent to lowering costs.

significant incentive for creating inter   -firm networks. [31] It also makes membership in a large

network (i.e., the ability to transact through the network) a valuable asset,   [32] and therefore the

network'sabilitytoexcludeamembermaybeapowerfulsanction.   [33]

Theconceptofnetworkeffectsisnot   atallanovelone.Perhapsthemostancient

exampleofrecognitionoftheenhancedbenefitsthatresultfromconnectivitybetweenentitiesis

foundinthebookofGenesis:"'Heretheyare,onepeoplewithasinglelanguage,andnowthey

havestartedtod   othis[buildingtheTowerofBabel];henceforwardnothingtheyhaveamindto

dowillbebeyondtheirreach   …"[34] Languageischaracterizedbynetworkeffects   –thebenefit

derivedfromcommunicatinginalanguageincreasessignificantlyasmorepeopleare   familiar

withit .[35]Increased"membership"inthisnetwork(*i.e*.,fluencyinthelanguage)allows

communicationandcoordinationamongalargernumberofpeople(whichconfersgreater

benefitstoeachofthem).   Babelwasdestroyedbyundoing   its   linguistic network:" '…Come,let

usgodownthereandconfusetheirspeech,sotheywillnotunderstandwhattheysaytoone

another.'SotheLorddispersedthemfromthereallovertheearth,andtheyleftoffbuildingthe

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[30]Posner, *supra*note4,atp.248.

[31]Forexample,bankscreatedclearinghousestofacilitatetheexchangeandredemptionofbanknotes(a   ndlater
checks). *See*:AlanS.Frankel, *MonopolyandCompetitionintheSupplyandExchangeofMoney*   ,66 AntitrustL.J.
313.Later,bankscreatednetworksfacilitatingATMandcreditcardtransactions.   *Id.*

[32]Thisdoesnotmeanthatnetworkeffectsinevi   tablyresultinnaturalmonopolies.Differencesinthequalityof
competingnetworkgoods,orintheirproductioncostsmayoffsettherelativeadvantageofthelargernetwork.
Furthermore,productioncostsoftenexhibitatacertainpointdecreasingret   urnstoscale(i.e.,theyriseasproduction
increases).Thisincreaseincostmayoffsettheincreasingreturnstoscalederivedfromthenetworkeffect.   *See*S.J.
Liebowitz&StephenE.Margolis, NetworkEffectsandExternalities,in2TheNewPalgrave   Dictionaryof
EconomicsandtheLaw671,672(PeterNewman,ed.1998).

[33] *See, e.g*.,Bernstein(2001), *supra*note19,atpp.1767   -8("Althoughmosttransactorsarewillingtodealwith
nonmembers(albeitsomewhatreluctantlyandonslightlydifferentterms   )aslongastheyhavegoodreputations,
theyareextremelyreluctanttodealwithsomeonewhohasbeenexpelledfromanassociation.Asonemill
explained,foramerchant,"be[ing]expelled[fromashippers'association]isusuallyadeathblowto[his]
business.'")(footnotesomitted,bracketedtextinoriginal).

[34]Genesis,11:6.

[35] . Foramorecontemporaryanalysisofnetworkeffectsoflanguage,   *see*, *e.g*.,JeffreyChurch&IanKing,
BilingualismandNetworkExternalities ,26CanadianJ.Econ.337(199   3).

city.ThatiswhyitiscalledBabel,b ecausetheLordtheremadeababbleofthelanguageofall

theworld." [36]

Significantlylater,economistsmadesimilar,andmorerefined,observationsofindustries

inwhichtheutilitytoaconsumer (amemberofthenetwork) increasedwiththenumberofot her

consumersusingthesameproduct.Forexample, Rohlfsnotednetworkeffectsin

communicationsservicesindustries,andexaminedthe influenceofnetwork effectsonpricing

andbarrierstoentryintotheindustry. [37] Such effectsareconsidereddirectn etworkeffects,as

theyaregeneratedthroughadirectphysicaleffectofthenumberofconsumersonthevalueofa

product.[38]Otherscholarshipidentifiedindirectnetworkeffects – anincreaseinthevalueofa

productasaresultofanincreaseinthep urchaseoruseofacomplementaryproduct. For

example,i fmorepeopleuseExcel,there willbemorepeopleanygivenuser canobtain help

fromandmorebooksandcoursesonhowtouseExcel ; ifmorepeoplecarryMasterCards,more

merchantswilltakeMast erCards,makingthecards morevaluabletobothcardholdersand

merchants.[39]

Assuchobservationsidentifiedanincreasingnumberofindustri esinwhichnetwork

effectssignificantly influencethebehavioroffirms, scholarsdeveloped modelssimulating

networkenvironments.Akeyworkexaminingcompetitioninnetworkenvironmentswas

offeredbyKatzandShapiro. [40]Theirmodeldemonstrated thatthepresenceofnetworkeffects

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[36]Genesis,11:7 -8.

[37]JeffreyRohlfs, *ATheoryofInterdependentDemandforaCommunicationsService* ,5BellJ.Econ.&Man.Sci. 16(1974).

[38] *See*Liebowitz&Margolis, *supra*note32,atp.671 .

[39] DavidS. Evans& RichardSchmalensee , *AGuidetotheAnt itrustEconomicsofNetworks* ,10Antitrust36(1996).

[40]MichaelL.Katz&CarlShapiro, *NetworkExternalities,CompetitionandCompatibility* ,75Am.Econ.Rev.424 (1985).

andtheneedforcompatibilityleadtomultipleequilibria,and   consumers'expect ationsarekeyin

determiningwhich equilibrium emerges.Generally,consumerswillprefer   tojoinanetworkthat

theyperceiveaslikelytobecome(orisalready)themarketleader.Thispreferencemayset   off

consumers'preferencesregardingtheproduct   orserviceitself,sothat(itwasargued)aninferior

productthatisperceivedtobethemarketleader(perhapsbecauseitwasafirst   -moverintothe

market)willbepreferredoversup   eriorbutsmallercompetitors.

      Thisargumentledtoalineofliterat   ureexaminingnetwor keffectsasbarrierstoentry,

andasthecause   oftheallegedpersistenceoflessefficientnetworkgoods.   Anotherpaperby

KatzandShapiroshowedthatthepresenceofnetworkeffectsmayleadtoexcessive

standardization.[41] FarrellandSalonercreatedamodelsuggestingthatnewtechnologymaynot

beadoptedevenifitissuperiortoexistingtechnology,becauseof'excessinertia'causedbythe

presenceofaninstalledbase. [42] Davidofferedtheanecdotalexampleofthepersistence   ofthe

"QWERTY"keyboar dtoarguethatindustriesmay   lock-intoinefficientstandards. [43] Other

scholars rejectedthelikelihoodofaninefficientlock   -in. Liebowitz andMargolisrefutedthe

lock-inhypothesisintheQWERTYanecdote, [44]aswellasinanothe   rmuchcitedanecdote,that

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[41]MichaelL.Katz&CarlShapiro, *TechnologyAdoptioninthePresenceofNetworkExt   ernalities*,94J.Pol.Econ.
822(1986).
[42]JosephFarrell&GarthSaloner, *InstalledBaseandCompatibility:Innovation,ProductPreannouncements,and
Predation*,76Am.Econ.Rev.940(1986).
[43]PaulA. David, *ClioandtheEconomicsofQWERTY*   , 75Am.Econ. Rev. 332(1985).
[44] S.J.Liebowitz&StephenE.Margolis   , *TheFableoftheKeys*   , 33 J.L . & Econ.1 (1990).

regardingtheVHS/Betacompetitionoverthevideocassettestandard.   [45] Thisissueisstill

disputedamongscholars. [46]

AnotherissueemphasizedbyKatzandShapiroisdecisionsregardingcompatibility.

Compatibilitymaybeachie   vedbyjointdecision(e.g.,coordinatedacceptanceofastandard),or

unilaterally,bytheconstructionofan'adapter'byasinglefirm,tomake   itsproduct compatible

withanother. [47]Privateincentivesforcompatibilitymaydifferfrompublicincentives   ,possibly

resultinginprivateactionthatfailstomaximizesocialwelfarefromthenetworkeffects.One

strandoftheliteratureexaminedthechoicebetweenunilateralandcoordinatedfacilitationof

compatibility.[48]Thisissueisofconsiderableimpor   tancetoantitrustscholarship,ascoordinated

facilitationofcompatibilityisusuallymoresuspectofbeingusedforanti   -competitiveendsthan

itsunilateralcounterpart,anditisthereforeimportanttounderstandwhetherithasaredeeming

advantagei nincreasingsocialwelfarethroughexploitationofnetworkeffects.   [49]

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[45] S.J.Liebowitz&StephenE.Margolis   , *PathDependency,Lock   -inandHistory* ,11L.Econ.&Org.205(1995).
Onthesetwoanecdotesandafewothe   rs *alsosee* : S.J.Liebowitz&StephenE.Margolis   , *ShouldTechnology
ChoicebeaConcerntoAntitrustPolicy?*   ,9Harv.J.L.&Tech.283(1996);MichaelI.Krauss,   *Regulationv.
MarketsintheDevelopmentofStandards*   ,3S.Cal.Inter.L.J.781(1994).
[46] *See*, *e.g.*,WilliamE.Cohen,   *CompetitionandForeclosureintheContextofInstalledBaseandCompatibility
Effects*,64AntitrustL.J.535,539   -546(1996).
[47]Katz&Shapiro(1985),   *supra*note40,atpp.434   -439.
[48] *See*, *e.g.*,JosephFarrell&GarthSaloner   , *CoordinationThroughCommitteesandMarkets*   ,19RandJ.Econ.235
(1988)(comparingcommitteeagreementonstandards;unilateraldeclarationsofstandardsbysinglefirms,followed
byindependentdecisionsbyotherfirmswhichstandardtofollow;andah   ybridsystemadaptingfeaturesofboththe
committeeandthemarketleadershipmechanisms);JosephFarrell&GarthSaloner,   *Converters,Compatibility,and
theControlofInterfaces* ,40J.Ind.Econ.9(1992)(findingthatwhenadaptersdonotfacilitatepe   rfect
compatibility,theirintroductionmightreducesocialwelfarebelowthatinanindustrywithoutadaptersatall).
[49] *See*:UnitedStatesDepartmentofJusticeandFederalTradeCommission,   *AntitrustGuidelinesforCollaborations
AmongCompetitors* ; *EliasonCorp.v.NationalSanitationFoundation*   ,614F.2d126(6   [th]Cir.1980)(statingthat
allegedboycottsarisingfromindustryself   -regulationdonotgiverisetoaShermanActviolationabsent
discriminationormanifestlyanticompetitiveandunreasonable   conduct).Butcompare: *FashionOriginators'Guild
ofAmericav.FTC* ,312U.S.457(1941)(condemningcoordinatedactivityaimedatpreventingandpunishing"style
piracy"andstatingthat"evenifcopyingwereanacknowledgedtortunderthelawofeverys   tate,thatsituation
wouldnotjustifypetitionersincombiningtogethertoregulateandrestraininterstatecommerce…").

Another strand of the compatibility literature examines the incentives for a decision not to be compatible with others, and the effect of such decisions on social welfare. Compatibility is not always efficient. Network effects (i.e., demand-side increasing return to scale) are usually reduced and might even reverse above a certain point (e.g., due to congestion on the network, or relative advantages of one system over another, that have to be sacrificed to ensure compatibility).[50] Therefore, there may be a maximum efficient size for a network, and a refusal to allow compatibility with other systems may be designed to prevent network from expanding beyond its efficient size. Furthermore, facilitating compatibility has various costs (e.g., actual costs of coordination, loss of freedom to vary due to the need to remain compatible, forced disclosure of proprietary information, and facilitating anti-competitive coordination). For this reason, a refusal to be compatible may at times increase social welfare.

However, firms may have incentives to refuse to be compatible even when compatibility would increase social welfare. Farell and Saloner observed that in decisions whether to make two technologies compatible, when one technology is supplied by a single firm, that firm may

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[50] Congestion is a major limit on efficient scales in rivalrous networks (networks in which, besides the positive network externality, there is a negative externality imposed by an additional member of the network on the other members. Rivalrous networks include, inter alia, cellular phones, broadband Internet and peer-to-peer information networks. Non-rivalrous networks, such as languages, PC or videocassette standards, etc., do not suffer from congestion (e.g., it is no more difficult for me to express myself in English merely because many millions of additional people also express themselves in English). However, other traits might impose a limit on the efficient size of the network. For example, certain languages may express some matters in greater precision than others, and compatibility, meaning integrating one language into another or creating a one-to-one translation for each word, will result in losing those nuances. Eskimos are said to have hundreds of words describing types of ice; to allow complete compatibility with other languages, all these nuanced differences must be sacrificed and the various words translated into the general word "ice". The same is true for standards. For example, the JPEG computer graphic file standard is better than the competing GIF standard for multi-color images, but poorer when the image contains large areas with the same color. *See*: "GIF vs .JPEG", *available at*: http://hotwired.lycos.com/webmonkey/geektalk/97/30/index3a.html?tw=design. The choice between standards or languages will depend on which nuances or special advantages are more commonly used by each prospective member of the network. Those with a strong preference to a nuance or specific advantage will prefer to maintain this advantage even at the price of foregoing additional network benefits (e.g., people who care for minute differentiation when referring to types of ice might prefer to speak a more obscure, but also more exacting language).

haveanincentivetomakeconversioncostly.   [51]Cremer,ReyandTiroleexpandedonthisinsight,

termingthisincreaseinthecostofcompatibility(orareductioninit   squality)"degradation". [52]

Theyrefertocompatibilityas"connectivity"andexaminetheplausibilityofsuchastrategyand

itseffectonsocialwelfare. Thispaperexamines   (amongotherissues) "degradation"asaform

ofopportunisticbehavior.

While thesocialwelfareimplicationsof   network effectshavebeenandcontinuetobe

examinedthoroughly,lessattention   hasbeen giventotheimplicationsofnetworkeffectsonthe

formoforganization. Evenlessattention   hasbeen given,within thislatteri ssue,tothe

implicationsofnetworkeffectsoninstitutionsthatmitigateopportunism(i.e.,hownetwork

effectsareusedtofight   "gardenvariety" opportunism,andhow institutionscombatopportunism

thatisu niquetonetworkenvironments).

Muchofthe   researchfollowingMacauley'sobservationonoptingoutofthe

governmentallegalsystemexamined   bilateral, relationship-basedtransacting,inwhich

reputationalinvestmentsintherelationshipserveascollateralagainstopportunism:Geertznoted

thatbuyersandsellersin   bazaarstendtopairoffinrecurrenttransactions.   [53]Posner pointedtoa

similarpatternof"barterfriendships"withinprimitivesocieties,whichobligethepartiesto

similarstandardsofloyaltyastheyowetheirkinsmen   .[54]Suchas tatusanditsattached

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[51]Farrell&Saloner(1992),   *supra*note48,atpp.26   -28.
[52]JacquesCremer,PatrickRey&JeanTirole,   *ConnectivityinTheCommercialInternet*   ,48J.Indus.Econ.433
(2000).
[53]CliffordGeertz, *TheBazaarEconomy:InformationandSearchinPeasantMarketing*   ,68Am.Econ.Rev.28
(1978).Forsimilarobservationsalso   *see*:CyrilBelshaw, *TraditionalExchange sandModernMarkets* (1965)
(Notingthattradersintraditionalmarketstendtopersonalizetheirexchangerelationstomitigatecontractual
uncertainty(i.e.,opportunism)).
[54]RichardA.Posner, *ATheoryofPrimitiveSociety,withSpecialReferencetoLaw*   ,23J.Law&Econ.1(1980).

obligationsservetomitigateopportunismdespitetheabsenceofpublicenforcement. [55] Landa

expandedGeertz'sandPosner'sobservations   byconsiderin gawider,networkrelationship,

whichshe identified as an"ethnicallyhomogenous middlemangroup" .[56] Thisgroupfacilitates

exchangeswhere governmentenforcementoflawisdeficient(andthereforethecertaintyof

abidingtocontractsislacking)   ,bytakingadvantageofthehighbarrierstoentryintoanethnic

socialgroup (andthere foretheneedtostayongoodtermswithone'sexistingethnicgroup)   .[57]

LandafollowsthemethodofanalysisusedearlierbyAkerloftoexplainthecastesystemin

India:[58]anethnicgroupcanimposeanefficientcodeofbehaviorthroughthethreatofexcl   usion,

anditcanprovidelow   -cost,accurateinformationonthetrustworthinessofitsmembersby

economizingoninformation -collection.Landa'sfocus,therefore,isonnetworks   'mitigationof

informationalasymmetries.

   Afewscholarsexaminedtheeffect   snetworkshaveincoordinatingpunishmentagainst

opportunists. Greifmodeled a"MultilateralPunishmentS   trategy"patternedaftertheMaghribi

merchantcoalitions. [59] Hismodelconsidered   whatiseffectively adecentralizednetwork,in

whichthedecision s(mainly,whethertopunishorexcludeopportunists)aremadebyeach

memberseparately,andthe   network facilitatestheexchangeofinformationthatidentifiesa

memberasanopportunist(therefore,itisanextensionofthereputationelement).   Claymo dified

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[55] *Id.*,atp.26.

[56]Landa, *supra*note25.

[57]Itisworthwhiletonotethatthebarrierstoentryintoanethnicsocialgrouparegenerallynotdirectlyrelatedto networkeffects.Thedifficultyofjoiningsuchagroupdoesnot   tendtohavearelationshiptothesizeofthegroup, butrathertoitscustomsofrecognizingkinship.Ethnicgroupsrarelyacceptaskinpeoplewhoareunrelatedby bloodormarriage(though,asPosnernotesinhispaper,   *supra*note54,thisoccasional lyoccurs).Sinceitisdifficult tojoinanewethnicgroup,severingtieswithone'soriginalethnicgroupisharmful,especiallyinasocietyinwhich mostpeopledonotdealwithotherswhoarenotoftheirethnicgroup.

[58] *See*:GeorgeAkerlof, *TheEco nomicsofCasteandoftheRatRaceandOtherWoefulTales*   ,90Q.J.Econ.599, 608-611(1977).

[59]Greif, *supra*note23.

thismodel,patternedaftermerchantcoalitionsinearly19   [th]CenturyMexicanCalifornia,to
incorporatedifferentstrategiesofspecificmerchantsregardingdealingwithpeoplewhomother
membersofthenetworktaggedas'dishonest'.   [60] McMillanand Woodruffpointtotheroleof
private-orderorganizationsincoordinatingresponsestoopportunism(inadditiontocollecting
informationtodetectsuchopportunism).   [61]

This paper   classifiesthemechanismsthatnetworksusetomitigateopportunism,from   a
perspective of manipulation of network effects.   Besides classifying the observations of the
abovementioned literature in two categories ("information mechanisms" and "exclusion
mechanisms",s uchaperspectiveshedslightontwoother   typesof mechanismsthatareusedby
networksforthesamepurpose   ("controlmechanisms"and"switchingmechanisms")   .

2. Mechanismsfor RegulationinNetworks

Network effectsarethesourceofseveral   comparative advantagesthatnetworkspossess
in regulating , compared to   regulation by other institutions   . First, the network is often able to
mitigate the damage caused by opportunistically defaulted transactions, by quickly and
inexpensively finding an alternative to the defaulting party   (in the terms and context of the
Uniform Commercial Code, this would be considered "covering" for a breached transaction)   .
The ability to find an alternative transaction   not only mitigates the damage from the
opportunisticdefault(bytransferringsomeoftherelianceinvestmentinthedefau   ltedtransaction
to another transaction), but also deters some types of opportunism that are based on re   -

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[60]Clay, *supra*note23.
[61]McMillan&Woodruff,   *supra*note26.

negotiating an agreement with captive customers.   This paper will refer to   this form of

opportunism-reduction as the *SwitchingMechanism* .

For example,   John and Jane are dealers in premium widgets. Premium widgets are very

expensive luxury items, and rare (and foolish) is the dealer that deals with a partner that lacks an

established reputation. Furthermore, the size of the deal (and therefore the amou   nt of risk a

default on it would pose to the injured party) depend   s on the degree to which the other party's

reputation has been establis   hed, so deals with new partners are initially small, and grow as the

partner's reputation is established. [62] If no netwo   rk (i.e., exchange) exists,   John and Jane would

be sensible to concentrate   their transactions with   each other, building their respective reputations

and giving them the assurance required to risk bigger (and more profitable) transactions.   In fact,

that's precisely what they did, and John has dealt to date exclusively with Jane. Now, having

reached sizable (and therefore both very risky and very profitable) transactions,   Jane reneges on

an agreement and offers to renegotiate it in a manner much more favora   ble to her (she may find

it profitable to do so if she, unlike John, has alternative trading partners, or if the stakes in this

deal are so great as to dwarf her future expected gain from dealing with John).   John can either

acquiesce to the   renegotiated d eal, or lick his wounds and begin trading with someone else,

expending time and foregone profits as he builds his reputation anew.

John could fair better if premium widgets were traded on the Premium Widget Exchange,

which like many exchanges   has an effi cient switching mechanism: reput   ation is exchange -wide,

perhaps because the exchange collects and reliably assesses each member's past behavior, and

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[62] This dynamic is hardly unique to the hypothetical example. Rather, it ha   s been commonly observed by scholars.
See, *e.g.*, Geertz, *supra* note 53; Belshaw,   *supra* note 53; Posner,   *supra* note 54.

each exchange member consults with their potential partner's reputation record, which the

exchangeprovides ,inordertodecidewhetherthepotentialpartneristrustworthyenoughforthe

sizeofthedealcontemplated.   [63]UponJane'srenegingontheagreement,Johncould,ifhewerea

memberoftheexchange,easilytradewithanotherexchangemember,foilingJan   e'sattemptto

renegotiate. OtherexchangememberswouldregardJohn'sreputationasestablished,basedon

hispreviousdealingswithJane,whichwererecordedandpositivelyassessedbytheexchange.

The exchange's sy stem of network -wide reputation lowe rs the barriers to exchange with

someone other than the opportunistic party. Techniques allowing this, which   this paper   terms

switchingmechanism s,are   notuniquetonetworks. Aswitching   mechanismhasbeenfoundto

deteropportunismandincreaserelianc   einbilateralrelationshipsinnon   -networkenvironments. [64]

Absent elaborate   and accessible   reputation-assessing and distributing   systems, network

transactions may sometimes be more anonymous than bilateral transactions.   But when it is

feasibleforn etworkstoconstructsuchsystems,they   havetwoadvantagesoverotherinstitutions

inusingtheswitchingmechanism.First,   innetworkenvironmentsmanyinvestmentstendtobe

network-specificratherthantransaction   -specific,andthereforetheyaresalvageab   lethroughthe

switchingmechanism .[65]Second,networks   usuallyfacilitateatransactingenvironmentthatmore

closely resembles the hypothetical perfectly competitive market than do discrete bilateral

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[63]Anexampleofasimilarexchange   -widereputationdatabaseiseBay'sfeedbackforum.   *See*:
http://pages.ebay.com/services/forum/feedback.html.

[64] *See*:ThomasM.Palay,   *ComparativeInstitutionalEconomics:TheGovernanceofRailFreightContracting*   ,13J.
ofL.&Econ.265,271   -273(1984).

[65]Forexample,alargeportionofone'sreputationmaybenetwork   -specificifdealinginanetwork,an   dtransaction -
specificifdealingbilaterally.Toillustrate,onemightthinkofanindustryinwhich,duetotheriskexposure
involved,onetransactsonlywithpartnerswhohaveestablishedgoodreputations.IfItradebilaterallyandmy
partnerdefaul tsonme,Iwillneedtoestablishagoodreputationwithanotherpotentialpartner(acostlyandtime   -
consumingprocess)beforeIcancoverforthedefaultedtransaction.Werethetransactionsprocessedthrougha
network,myreputationwouldhave,mostl   ikely,beennetwork -wide,soanyothermemberofthenetworkwould
alreadyknowofmyreputationandbewillingtodealwithme,withnocostofre   -establishingmytrustworthiness.

arrangements. Therefore, the   switching mechanism tends   to be more effective in network

environmentsthaninnon   -networkcounterparts.

Network effectsalsoenablenetworkstou   seasecondmechanismtoenforceregulation   ,

which the paper will call   the *Exclusion Mechanism* . Since network   effects, when significa nt,

grantsignificantutilityanddecreasemarkedlythecostoftransacting,amemberinthenetwork

may be greatly harmed by ceasing to have access to it. Therefore, the network wields a

significant sanction over its members, in the form of exclusion (or   suspension) [66] from the

network.   Exclusion in possible, of course, not only in networked transactions but in bilateral

transactions as well (e.g., Jane may refuse to transact with John). However, the exclusion

mechanism is more effective when employed by   networks than by individual parties to the

transaction because a network coordinates the exclusion decision among all its members.   As

mentioned above, [67] coordination of anti   -opportunism measures enhances the effectiveness of

these measures. A network is i   n excellent position to coordinate members' sanctions, and

throughexclusion denies from the offending party the network   benefits conferred by the other

members. In some industries, most business is conducted through the network, and therefore

exclusion f rom the network precludes a firm from most potential transactions. In many

industries, exclusion from certain networks results in non   -members' refusal to deal with the

excludedfirm. [68]Hence,exclusionfromanetworkmayresultinexclusionfromtheentir   elineof

business;thisisaverypowerfulsa   nction,rivalingthegovernment   'sineffectiveness. [69]

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[66]Theuseofapenaltyofsuspension,ratherthanexclusion,issometimesp   referredinordertoavoidan'endgame'
situationinwhichtheexpelledpartyhasnothingtoloseonceitactedopportunisticallyinacertaininstance.   *See*
Bernstein(1992), *supra*note15,atp.129.
[67]CitingMcMillan&Woodruff,   *supra*note26.
[68]Non -members'refusalstodealmaybeindependent,duetoviewingtheexpulsionasasignalregardingthe
trustworthinessoftheexpelledmember.Alternatively,non   -membersmighthaveundertakenanobligationtorefuse
todealwithpersonsexpelledorotherwises   anctionedbythenetwork.Suchobligationsdefactoexpandthesizeof

Besides denying the opportunistic member of the network's benefits, exclusion also reducesthevalueof(oreliminates)thenetwork   -specificinvestmentstha tthememberhasmade. The nature and value of these investments varies from   network to network. Investments may include physical elements required to connect with the network (which may be unsalvageable, anduselessifconnectiontothenetworkisdenie   d),network -widereputation,etc.   Viewedfrom thisperspective,theassetsoverwhichamembersurronderscontroltothenetworkareaformof bond,[70]ora"hostage". [71] Anexampleisthechargeofadmissionfeesbytradeassociations,and their control ove r information provided by them to their members. Trade associations may confiscatethesefeesandotherassetsoverwhichthenetworkhascontrol,assanctionsagainsta member'sopportunisticbehavior. [72]

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thenetworkthatisbeingregulated.AnexampleofsuchanobligationisabylawoftheWorldFederationof
DiamondBourses,requiringallmemberstoenforcearbitrationjudgmentsof   othermembers. *See*Bernstein(1992),
*supra*note15,atp.121.
[69] *See*Bernstein(1998), *supra*note15,atp.109("Inmostindustries,however,itisrarelynecessaryforapartyto
seekjudicialenforcementofan[arbitration   –A.A.]award.Merchanttrib unalsareabletoplacetheirownpressures
onthepartiestocomplypromptlywiththeirdecisions.Inthediamondindustry,forexample,whenapartydoesnot
complywithanarbitrationaward,everydiamondbourseintheworldpostshispicturealongwit   hastatement
detailinghisnoncompliance.Hemayalsobesuspendedorexpelledfromtheboursethatrenderedthejudgmentand
bannedfromenteringallboursesintheWorldFederationofDiamondBourses.Beingsubjecttothesetypesof
sanctionsmakesit unlikelythatatraderwillbeabletoremaininthediamondbusiness.").
[70] *See*RachelE.Kranton, *TheFormationofCooperativeRelationships* ,12J.ofL.Econ.&Org.214(1996).
[71] *See*OliverE.Williamson, *CredibleCommitments:UsingHostagestoSupport   Exchange* ,73Am.Econ.Rev.519
(1983).
[72]Forexample,suchamechanismexistsinthecottonindustry.   *See*Bernstein(2001), *supra*note19,atp.1737,
footnote69("Inadditiontopayingtheannualmembershipfee,membersarerequiredtopurchaseamemb   ershipin
theExchange.TheBy -Lawsprovidethatwhenamemberfailstopayanarbitrationaward,theprevailingpartyhasa
righttomakeaclaimagainsthismembership.Ifthenoncomplyingpartystillrefusestopay,hismembershipis
auctionedoffandt heawardispaidfromtheproceeds"),andp.1768("…whenatransactorisexpelledfroman
association,hemustforfeithismembershipfeeaswellasothertangiblebenefitsofassociationmembershipsuchas
pricesheets,technologycirculars,andaccesst   othegroup'sinformationservices").

A network's ability to prevent opportunism is also   enhanced by a characteristic that is common to most (but not all) networks   – centralized control [73] over the facilities used   for transacting(" *ControlMechanism* ").[74] Insocialnetworks,thesefacilitiesmightbereputationor accruedgoodwill. Intransport ationnetworksthese mightbeterminalsandjointlyusedtracksor roads;inexchanges ,clearinghousesandfundsthatarecontrolledbythenetworkastheirtransfer isprocessed.

The primary   effect of the control mechanism is prevent   ative – control over   network facilitiesallowsthenetworktobettermonitortransactionsforopportunism,andpossiblyprevent ormodifythesetransactions.Forexample,transactingthroughInternetauctionwebsitesusually involvestheuseofcentralizedservers,controlled   bytheoperatorofthenetwork.Thiscontrol enables both monitoring by the operator for opportunistic (usually, fraudulent) behavior, and preventing transactions that are likely to be fraudulent.   [75] As with the other enforcement mechanisms,thecontrolm   echanismmay,incertaincasesbeemployedinbilateraltransactions. An independent, centralized transacting facility that can serve the control mechanism is expensive,however,andthereforeitismorelikelytobeeconomicallyfeasibletocreatesucha facilityfornetworktransacting,inwhichtheaggregatevolumeoftransactingtendstobelarger andthecomplexityofthetransactionmaybegreater.

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[73]In'centralizedcontrol'Imeantheabilityofthenetworktoeithermonitorordirectactivityoverfacilitiesusedfor transacting.

[74]Theremightbeotherincentivesforcentralizedcontroloffacilitiesandassets   ,besidesefficientregulation.For example,creationormaintenanceofmarketpowermaybefacilitatedbycentralizedcontrol.   *See,e.g.* , *Pursuinga RemedyinMicrosoft:TheDecliningNeedforCentralizedCoordinationinaNetworkedWorld*   ,Universityof ChicagoLaw&Economics,OlinWorkingPaperNo.130(availableat: http://www.law.uchicago.edu/faculty/picker/publications.html;revisedversionforthcominginJournalof InstitutionalandTheoreticalEconomics).

[75]OntheactionsofInternetauctionsites   tocombatopportunism   *see,e.g* .:JamesM.Snyder, *OnlineAuctionFraud: AretheAuctionHousesDoingAllTheyShouldorCouldtoStopOnlineFraud?*   , 52Fed.Comm.L.J.453   ,460 -462 (March2000) .

A fourth regulation   enforcement mechanism which is employed by networks is the *Information Mechanism* – collecting and disseminating among members and non   -members information on the credibility of firms (mainly firms that are members of the network). The information mechanism facilitates independent decisions by firms, whether to deal with a firm that the network reports as having acted opportunistically. This mechanism complements the exclusion mechanism, by expanding the scope of exclusion beyond members   of the network, to non-members (and among the network members, to sanctions that are not imposed col   lectively by the network).

The information mechanism is not unique to networks. Independent firms invest in collecting information on potential business partners and may monitor their behavior. However, there are significant economies of scale to monit   oring transactions, collecting and verifying information on trustworthiness, and private parties may have too small a transaction volume stake to justify extensive collection of information. Private information collection firms (such as credit rating agen cies) can exploit these economies of scale just as well as networks, by specializing in monitoring and collecting information, and selling the information to many interested parties.   Yet n etworks may have an advantage over information collection firms (regarding information on their members)   , particularly when their control mechanism is effective (*i.e*., members transact mostly over the network's transacting facilities, and those facilities   allow the network to monitor the transactions). Networks also have   an interest in maintaining credibility among non -members, in order to induce the non   -members to join the network's own decision to exclude a member (and therefore increase the magnitude of the sanction, deterring

future opportunism). Therefore, networks   are often able to efficiently induce non   -members to

follow the network's assessment of a member's trustworthiness.

3. Types of Opportunism in Network Environments

Most of the literature regarding private ordering addresses opportunistic behavior that

shares certain traits: There is a large benefit to the opportunistic party from defaulting on a

specific transaction, there is a loss   to the same party from potential future transactions that are

affected by the default on the specific transaction   (or, at l   east, a probability of such a loss

depending on whether the opportunistic behavior is detected)   , yet the benefit from defaulting on

the specific transaction outweighs the losses in future transactions.   This paper classifies

opportunistic behavior that has   these characteristics   as *breach* (in order to distinguish it from

another type of opportunism, which   is describe d below). [76] A typical example of breach is failure

to pay: the fraudulent party receives the good or service provided to it without incurring it   s cost,

therefore gaining its value. It loses future transactions   – most likely, all future transactions with

the party which with it contracted, and possibly transactions with others who have heard of the

fraudulent party's actions, or don't suspect the   fraudulent party specifically, but have heard of

the fraud and cease to deal with unfamiliar parties due to the increase in this risk. When the

party chooses to defraud,   it would be reasonable to   assume that it expects the gain from the

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[76] Despite the term's implied relationship to breach in contr   acts or torts, opportunistic behavior of the 'breach' type need not involve a legal breach of duty or contract. Nor does it require certainty of, or intent to, default. For example, this paper would consider insolvency to be breach   -type opportunism, sinc e the potentially insolvent party gains from the specific transaction on which it defaulted, loses potential future transactions, and imposes losses on other parties on both the defaulted transaction, and on the lost future transactions.

specific transacti on it defaults on to be greater than the (discounted) aggregate loss of potential futuretransactions.

Breach is not the only type of opportunistic behavior in network environments. Another type of opportunism, which   this paper calls *degradation*, is uniq ue to network environments. Degradation is a predatory act that weakens the network, harming smaller firms more than larger ones, and therefore giving the larger firms an advantage over smaller competitors   . One might view degradation as a form of the str   ategy known as   raising rivals' costs,[77] adapted to prey on firms more dependent on network effects than the degrading firm.

Degradation has different characteristics than breach   – when degrading , the payoff from defaulting on a specific transaction is nega   tive. However, the default raises   all the network members' risks of transacting over the network and therefore decreases network   benefits, and the defaulting party stands to gain from the decrease in the efficiency of the network.   This may be the case wh   en a member of the network is much larger than other members. The demand   -side economies of scale and scope, which characterize network environments, cause access to larger networks to be more desirable than to smaller ones. Therefore, members of a large   network are advantaged in competing with members of smaller networks or with firms that are not members of any network. In networks containing both larger and smaller firms, the larger firms may gain from weakening the network and competing with the small   er members in conditions closer to

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[77]On the strategy of Raising Rivals' Costs, *see*: Steven Salop & Scheffman, *Raising Rivals' Costs* , 73 Amer. Econ. Rev. 267 (1983).

those that would have existed had there not been a network.   [78] This can be done by excluding others from their network [79] or by degrading connectivity wi   th other members of the network.

For example,   Goliath Corp. is a telep   hone company with a 70% market share. Goliath makes modifications to the facilities connecting it with other telephone companies, so that   any call between a customer of Goliath and a customer of a competing company suffers from static noise.   Calls in whi   ch both parties are Goliath customers, and calls not involving Goliath customers, are not affected.   Betty is a customer of David Inc., a small competitor of Goliath. Approximately 70% of the people she calls are Goliath customers (correlating with Goliat   h's market share). This means that if she remains a customer of David, 70% of her calls will suffer from static noise. If she switches from David to Goliath, static noise will affect only 30% of her calls (those to non   -Goliath customers). Therefore, Bet   ty is likely to switch to Goliath. This is precisely the reason Goliath adopted a strategy of degradation   – though the quality of its service suffers from the degradation (as 30% of the calls are of lower quality than before), it hurts the quality of the   competitors' services much more (70% of their calls are affected, in our example). The migration of customers to the larger network compensates it for the loss resulting from the reduced quality of its own service cause   d by the degradation.

Similar strat egies have been observed   (or at least alleged)   , *inter alia* , in the credit card industry,[80] the Internet backbone industry,   [81] and the telephone industry.   [82]

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[78]In most cases, the degrading firm is limited to depriving the other network members of the marginal network benefits attributable to the trans   actions contributed by the degrading firm. Only in rare cases could a degrading firm deprive other network members from network effects they confer on each other. In all other cases, victims of degradation still benefit from network effects created colle   ctively by them. Therefore, unless the degrading firm is the only significant participant in the network, degradation usually cannot cause market conditions to be as if the network did not at all exist.

[79] *See* A. Douglas Melamed, *Network Industries and Ant   itrust*, 23 Harv. J.L. & Pub. Pol'y   147 (1999).

With two exceptions noted below, degradation is likely to be a viable strategy only when the degrading firm cannot withdraw from the network (since withdrawal from the network would be the equivalent of absolute degradation – zero connectivity with the other (former) network members). Barriers to withdrawal from the network could be due to legal requirements (e.g., antitrust or regulatory mandates), or due to physical impracticability (for example, railroad companies cannot completely cut themselves out of a network, since the passengers could always walk from one railroad's terminal to the other's; however, they can degrade by refusing to share terminal facilities, by refusing to sell joint through tickets, etc.).

The two exceptions are: (1) When degradation is feasible against some network members but not against others (i.e., reducing connectivity will harm the degrading firm less than some network members, but more than other network members). In that case, the degrading firm's competitive position against the less vulnerable firms would be weakened. The degrading firm would prefer selective degradation against the more vulnerable firms, while maintaining efficient connectivity with the less vulnerable firms. (2) When the degrading firm is less vulnerable than its rivals to some degradation, but more vulnerable to greater degrees of degradation. Network

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[80] *See* Amitai Aviram, *Accommodating a New Tenant in the House of Cards: Introducing Competition Into a Network Industry* (unpublished manuscript, 2002).

[81] *See* Cremer, Rey & Tirole, *supra* note 52.

[82] *See, e.g.*, *Cavalier Telephone, LLC v. Verizon Virginia, Inc.*, 108 F.Supp.2d 608 (E.D.Va. 2002) (Entrant phone company alleges, among other things, that incumbent mis-routed its calls, provided inferior databases and web-based interfaces for ordering loops or last-mile facilities, made the process of ordering last-mile facilities (which it controlled) "lengthy, complex, and expensive," and intentionally made the billing process for loops costly for its competitors); *Goldwasser v. Ameritech Corp.*, 222 F.3d 390 (7th Cir 2000) (customers of incumbent telephone company allege, among other things, that incumbent "has failed to provide interconnection between its network and those of competitors that is equal to the interconnection it gives itself", that incumbent's competitors "have experienced undue delays (presumably caused by Ameritech) in acquiring unbundled elements, and those delays have precluded them from offering services as attractive as the incumbent's", and that incumbent "has continued to bill customers of competitors who have converted from Ameritech's services, and hence some customers are being double-billed, thereby harming the competitors' goodwill").

benefits are not necessarily directly proportional to the amount of connectivity, nor are they

identicalforallfirms.Itispossiblethatbyreducingconnectivityalittle,thedegradingfirmwill

harm itself less than its rivals, but upon a greater   amount of degradation (such as complete

withdrawal from the network) the situation will reverse and the harm to the degrading

(withdrawing)firmwillbegreaterthantheharmtotheremainingnetworkmembers.Naturally,

ifthisisthesituation,afirmma   ychoosetodegrade,yetnottowithdrawfromthenetwork.

          Degradationisdifficulttoidentifyevenwhentheactualbehaviorisobserved,sincethe

"correct"degreeofconnectivityisverydifficulttodetermine.   [83] Toasignificantextent,thisis

causedbypoorlydefineddutiesofconnectivity.Theeaseofdetectingbreachdepends(atleast

interalia)onclearlydefinedpropertyandcontractualrightsinthegoodorserviceinpoint.For

example, wemay observeAnn'sdefaultonanobligationto   Alice. Itwouldbeea sytoidentify

whether this actionis opportunistic breach if clearrulesdeterminewhetherAnn' sobligationis

binding. The laws of contract and property generally define rights to tangible property more

clearlythanantitrustandregulat   orylawsdefinerightstoaccessanother'snetworkfacilities.

          Thelooserdefinition ofthelatter isnotduetoneglect.Itisdifficult   (particularlyforan

"outsider"suchasaregulatororthecourts)   toassesswhattheefficientdegreeofconnectivi   ty

shouldbe ,andthisefficientdegreevarieswidelywiththepeculiaritiesofeachcase.Imposinga

dutyofabsoluteconnectivitywouldbemeaningless;   connectivitycouldalwaysbeenhanced(so

degradation might take the form of inaction, or failure to   upgrade connectivitywhen efficient

connectivity requiresupgrading).Itispossiblenottoimposeanydutyofconnectivity,andthis

policywouldbe   clearlydefined,butthisrulewouldneverpreventdegradation,evenwhensuch

strategy is feasible to a   specific firm and harmful to social welfare.   [84] Lacking a clear guide,

courtsandregulatorsoftenusethestatusquoasabenchmark,andperceivedecreasesfromthat

levelofconnectivityasimpermissibledegradation.   [85] Whilethereissomemerittoeconomi   zing

oninformationcostsbydeferringtothepresumedefficiencyofthestatusquo,thisruleofthumb

may be misleading, especially in industries characterized by   rapid change (as many network

industries are). In such industries, change may affect the e   fficient level of connectivity, and

yesterday's efficient level (which has been the status quo) may become inefficient.   A

connectivity benchmark based on the status quo may punish firms that adjust their level of

connectivitytosuchchanges.

Whilemost   networksfaceprimarilyeitherone   opportunism typeortheother,breachand

degradationarenotmutuallyexclusive.Itistheoreticallypossiblethatsomemarketswouldbe

susceptible to both breach and degradation concerns.   [86] Furthermore, in several ind   ustries,

different aspects of the industry involve different   opportunism types. For example, the credit

card industry is concerned with dishonor   (default on credit card payments)   and fraud issues

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[83]Thispaperassumesthatthe"correct"levelofconnectivityistheonethatmaximizesoverallsocialwelfa   re.While
thisisthemainstreampresumption,itisbynomeansuncontested.Evenifthisstandardisagreedupon,determining
thecorrectlevelofconnectivityisnotsimple.

[84] *See*Posner, *supra*note4,atpp.251   -255(demonstratinghowanexclusionfro   manetworkmayprolongthe
existenceofamonopolyandthereforebebothfeasibletotheincumbentmonopolyandharmfultosocialwelfare).

[85] *See*, *e.g.*, *AspenSkiingCo.v.AspenHighlandsSkiingCorp.*   472U.S.585,105S.Ct.2847   (1985)(condemninga
firm'srefusaltoselljointticketswithasmallerrival,aftersuchjointticketshavebeensoldforseveralyears).But
cf. LittleRock&MemphisR.Co.v.St.Louis,IronMountain&SouthernR.Co.   ,2I.C.C.763(E.D.Ark.1890),
*aff'd*4I.C.C.854(8   [th] Cir.1894).Inthiscase,theSt.Louis,IronMountain&SouthernRailroadusedtoconnectat
LittleRock,ARwiththeLittleRock&MemphisRailroad.Uponcompletingatrackofitsowntomemphis,
SLIM&SRailroadrefusedtohonorthroughticketstoMemp   hisusingtheLR&MRailroad,insteadcarrying
passengerstoMemphisoveritsownlines.Thecourtdeclinedtoprohibitthisaction.

[86]Asdiscussed *infra*,insectionII.5,thetypeofopportunismaninindustryispronetosufferfromissignificantly
affectedbythemarketstructureofthatindustry.Industrieswithcharacteristicsthatareconducivetobothbreach
anddegradationmaybesusceptibletoboth.Forexample,itispossibletoenvisionamarketwithonelargefirmand

(whichareofthe'breach'type).Atthesametime,incou   ntriesinwhichthatindustryconsistsof

fewissuersandmerchantacquirers,largerissuersmayattemptadegradationstrategy(*e.g.*,slow

anderror -proneprocessingoftransactionsbetweenitandotherissuers)toslowtheexpansionof

smallercompetitor s.[87]

4. MarketStructureandOpportunism

Market structure (e.g., the number and relative size of network members) significantly

affects the type of opportunistic behavior an industry is prone to suffer from. Industries

consistingofmanysmallfirmsare   likelytosufferfrombreach;industriesconsistingofasmall

number of large firms   , and industries in which firms have a   high vulnerability variance (i.e.,

widedifferentiationinthe   expectedharmtoeach   firm fromopportunisticbehavior), arelikelyt o

sufferfromdegradation.

Thereasonforthe   relationshipbetween firmsize andthety peofopportunisticbehavior

is rather straightforward: A breach decreases   connectivity and therefore reduces network

benefits.Smallnetworkmembers   whobreach donot sufferasmuchfromthere   ductioninsuch

benefits (since the burden is divided among all members   according to their share   of the

transactionvolume ,whilethepayofffromthefraudgoesonlytothebreachingmember).Asfor

degradation,suchastrategy   isusuallyonlybeneficialtolargerfirms(smallerfirmsarelikelyto

be disadvantaged, and possibly ineffective, when employing a degradation strategy, as they

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manysmallcompetitors.Th   elargefirmmayattempttodegradeagainstthesmallerrivals,whilethesmallfirms
maycommitbreach.

cannoteffectivelycompetealoneagainstlargerfirms,andtheyarenotattractiveforother firms toconnectwith).

The relationship between the vulnerability variance in an industry and the risk of degradationstemsfromthedrivingmotivefordegradation –raisingthecoststoone'srivalmore thantheriseinone'sowncosts,inordertogai nacompetitiveadvantageovertherival,thevalue of which offsets the harm to oneself. Naturally, degradation is more profitable the greater the differenceinvulnerabilitybetweenthedegradingfirmanditsvictim. Whenallfirmssufferthe same harm from degradation, no firm will attempt to degrade, since it will not gain anything from it. As disparities in vulnerability to degradation increase, so does the payoff from degradationtothedegradingfirm. Thegreaterthepayoff,themorelikelyandm orefrequently degradationwilloccur.

Marketstructurehasaneffectnotonlyonthetypeofopportunisticbehaviorthemarketis moresusceptibleto,butalsoontheabilityofanetworktoregulateconductinordertomitigate opportunism. Thisrelati onshipwillbeexploredbelow, [88] followingashortexaminationof how opportunism,bothbreachanddegradation,affectssocialwelfare.

5.SocialWelfareEffectsofOpportunisminNetworkEnvironments

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[87] *See*Aviram, *supra*note80 .
[88] *Infra*,sectionsIII.3andIII.4ofthispaper.

Breach and degradation may differ in their effects on   social welfare. The   risk of breach raises the cost of transacting and therefore leads to a decrease in the number of beneficial transactions that take place. Furthermore, parties to the remaining transactions may take action to decrease the risk of brea   ch, and the cost of these actions further decreases social welfare.

Complete prevention of breaches   may result in the enforcement of some inefficient deals (since, if the network is successful in preventing all breaches, a member might not be able to "buy" its way out of an inefficient deal). However,   there is good reason to believe that the regulator will be able to identify and allow efficient breaches.   [89] Also, due to the degree of reliance on deals in a network (which increases the social cost of breac   h), efficient breaches are likely to be uncommon in comparison with inefficient breaches   . Furthermore, a firm that repeatedly finds itself committed to inefficient deals can opt out of the network.

Assessment of the effects of d   egradation on social welfa   re is different . Degradation lowers the utility of interconnection or imposes costs on it, and therefore   decreases network benefits.   This reduced utility or added cost leads to a decrease in the number of beneficial transactions that take place on the ne   twork. This results in a loss not only to the parties that no longer find a transaction gainful after the added risk of degradation, but also to all members of the network who share in the loss of network   benefits due to the decrease in transacting over t   he network. The added risk of degradation and   the decrease in network   benefits may cause some members to cease to transact through the network   (perhaps seeking relative advantage by creating an alternative network in which members do not degrade   , and perh aps withdrawing

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[89] The regulator may require a portion of the gain from the efficient brea   ch in order to allow it. It would, however, be in its interest not to demand a portion so large as to induce the firm not to commit efficient breach.

from the market because their small size does   not enable them to compete). This reduction of

transactions over the network further decreases network   benefits, and where it results in less

competition, also increases the deadweight loss.   All of those effects reduce   social welfare.

Not every unilateral reduction in connectivity is degradation. Some actions that reduce

connectivity do not reduce net social welfare, and are not a form of degradation.   Added

connectivity is not always welfar   e enhancing. Like supply   -side economies of scale, network

effects may peak at a certain level. Above that level, more connectivity may reduce social

welfare (e.g., due to the cost of the added complexity). Therefore,   connectivity above the

maximum effic ient scale of the network may be welfare   -reducing even if it is costless to enforce.

Furthermore, p reventing a reduction in connectivity   has costs as well. A prohibition of   any

reduction in connectivity   is akin to an open access requirement. Like open a   ccess mandates, a

limitation on the ability to   reduce connectivity   decreases the incentive of network members to

invest in growing, since the open access allows competitors to free   -ride on their success. As a

result, incentives to compete among network me   mbers decline. [90] Another concern with

prohibiting degradation is that to make such a prohibition meaningful, someone needs to

prescribe what is   the 'right' level of connectivity   , a decrease from which would be considered

degradation.   As discussed above, [91] the study and constant monitoring needed to assess the

'correct' level   are very costly, and as with   all forms of price or access pricing regulation, it is

subject to a significant risk of error and to (wasteful   ) expenditures of resources on influencing

the regulator.

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[90] *See LittleRock&MemphisR.Co.v.St.Louis,IronMountain&SouthernR.Co.   , supra* note 85, at. p.7   65-6
("Competing lines afford the best and surest protection the public can have against oppressive rates…Is it, under
these circumstances, an unfair or unjust discrimination for the defendant in the sale of tickets to prefer its own lines
to that of the   plaintiff? If it is, the incentive to the construction of competing lines will be very much lessened.").

Can government rely on the quality of connectivity prescribed by the network, and lend its enforcement mechanisms to impose those standards? This depends on whether networks treat welfare-reducing degradation differently from welfare -enhancing reductions in connectivity . At the time the alleged degradation takes place, the network is likely to condemn any reduction in connectivity regardless of its effects on social welfare , just as it doesn't distinguish between cheating a partner to a tran saction and cheating a cartel (both formally seeming to be "breach", though the latter is welfare -enhancing and therefore not viewed as opportunism). However, at the time of forming the network and determining the duties of its members, network members are likely to determine an efficient level of connectivity (i.e., allow "efficient degradation", which is not degradation at all). There would still be a problem when changing circumstances modify the efficient level of connectivity. Absent government inte rvention, the network might renegotiate its obligations. But when private sanctions are ineffective, lack of government intervention would allow the large firm to degrad e. The refore, independent government assessment of the "correct" level of connectivit y should be appropriate when: (1) the network is an inefficient regulator against degradation, either because it lacks the ability or the incentive to prohibit degradation ; (2) circumstances have changed since the formation of the network so that the effic ient level of connectivity may now be different; and (3) analysis of the practice that allegedly amounts to degradation indicates that it reduces social welfare.

III. **NetworksasEfficientRegulators**

1.TheSpectrum ofRegulation

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[91] *Supra*, inpartII(3).

As mentioned above, several entities may act as regulators. At the level closest to the would be opportunistic behavior, each party may rely on the other's morality, or self -control. This could be referred to as *Self-Regulation* (in Ellickson's terms, first party control). [92] As we mentioned above, this regulatory regime gives the role of regulator to the entity with the greatest ability to both detect and prevent oppo rtunistic behavior. However, this regulator has the least incentive to regulate, and is susceptible to self -deception and discrepancies in culture and personal morality.

The regulators next in proximity to the opportunistic behavior are non -opportunistic parties to the transaction . Regulation by these entities (referred to by Ellickson as second party controllers), may be referred to as *Transaction Regulation* . Trans action regulation includes relationship-building measures (such as bilateral bonds [93] or integration [94]), the use of third party guarantors, [95] etc. Transaction regulation benefits from the familiarity of th e parties with the regulated transaction and their ability to monitor it closely, but suffers from weak sanctions against offending parties.

On the other end of the spectrum, furthest awa y from the opportunistic behavior , regulation may be attempted by th e government. *Government Regulation* benefits from

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[92] *See* Ellickson, *supra* note 9, at pp. 243 -246. The term self -regulation is frequently used to describe all forms of non-government regulation. This paper, however, differentiates between the various types of non -government regulation: self -regulation (facilitated by first party controllers, in Ellickson's terms); transaction regulation (facilitated by second party controllers), and network regulation (facilitated by informal and organizational controllers).

[93] *See, e.g.*, Kranton, *supra* note 70.

[94] *See, e.g.*, Andy C.M. Chen & Keith N. Hylton , *Procompetitive Theories of Vertical Control* , 50 Hastings L.J. 573, 588 -591 (1999).

[95] *See* Avery Wiener Katz, *An Economic Analysis of the Guaranty Contract* , 66 U.Chi.L.Rev.47 (1999) .

relatively powerful sanctions, but monitoring costs (and the cost of error) are significant. Government attempts to reduce monitoring costs either by creating a specialized regulator or, morecommonly,by allowingprivaterightsofaction(whichutilizethelowermonitoringcosts   of transactionregulation and,afterverificationbyacourtoragency,allowtheuseofgovernment   's sanctions).

Bothtechniquessufferfromsignificantflaws.Regulatorsarev   eryexpensive,subjectto capture,andevenunderoptimalconditionshavegreatermonitoringcoststhan   thepartiestothe transaction.   Private rights of action are subject to abuse, since regardless of their merit they imposecosts(legal,reputational,   temporal,etc.)onthedefendant,andthereforemaybeusedby aplaintiffmanipulativelytoextract   apayofffromthedefendant.Furthermore,thegovernmental verification system, usually a tri   al before a court, is imperfect, as   judges often lack the information,expertiseortimetoproperl   yverifysuits.

An alternative to   self-regulation, transaction regulation and government regulation is *Network Regulation*   – the mitigation of opportunism by networks.   Networks often have a monitoring ability compara ble to (or surpassing) that of the parties to the transaction. Their strongest sanction   – exclusion from the network   – may be more deterring than governmental sanctions(especiallyiflawenforcementislackingorifasanctionofimprisonmentisunlikely   , asitisformanyformsofopportunisticbehaviorinbusiness).   [96]

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[96]Fewformsofopportunismarepunishablebyincarceration.Notalloutlawedopportunisticbehavioriscriminal; somegiveriseonlytocivilsanctions.Even   amongcriminalopportunisticbehavior,veryoftentheoffenderis sentencedtoafine,ratherthanimprisonment.Thecriminalsystemdealswithmanyformsofharmfulbehavior,

Oneadvantagethat   some networkregulationhasoveritsgovernmentcounterpartisinits ability to prevent some forms of opportunistic actions, rather than prohibit and punish as the government does. The control mechanism in some cases enables the network to intercept and block transactions that are deemed unwanted (e.g., eBay can delete listings of items which are illegal to trade on its website). The switching mechanism also prevents   opportunistic behavior (in addition to deterring it), by preventing would   -be victims from becoming captive to an opportunistic party. The exclusion mechanism, while punishing and deterring, also prevents opportunists from trading opportunistically in the   future in industries where most trading is done on an exchange. The only similar remedy the government has is incarceration, which not only punishes and deters, but also physically prevents the opportunistic party from transacting in the future. However,   as mentioned above, incarceration is unlikely to be imposed for most forms of opportunistic business behavior. Another government remedy   – injunctive relief   – while intended to prevent (rather than merely deter or punish) behavior, is not a barrier in it   self to an action, but merely a threat of court sanction if the order is violated. As such,   additional enforcement costs are   required to enforce the injunction (e.g.,   detection of the violation,   proving the violation in contempt proceedings, etc.). Event   hen, to prevent a given conduct the penalty must either be   incarceration (as fines would merely put a price tag on the violation)   , or it must be targeted not at the violator but at a private entity that has the ability to physically prevent conduct (e.g., requiring eBay to delete listings of illegal items). The former alternative is unlikely (violators of injunctions who do not pose a physical threat are rare   ly incarcerated); the la   tter merely commandeers network regulation.

many of which threaten society more than opportunism does. Since sanctions are   determined in proportion to the severity of the crime, the most deterring of government sanctions are rarely used against opportunism.

Forms of regulation that physi   cally prevent a would   -be opportunist from acting in a harmful way (rather than deterring or punishing such behavior) can be analogized to rules of physics,which ,unlikerulesoflaw,cannotbebroken.Thepossessionofsuch'rulesofphysics' gives netwo rks a significant advantage over other potential regulators. Like rules of physics, however, these mechanisms are difficult to artificially create   – they will not exist if efficient market structure dictates that a given network does not have the ability   to track and block transactions,orifmanytransactionsinagivenindustryaredoneoutsideofnetworks.Incontrast torulesofphysics,rulesoflawareeasiertoartificiallyimposewheretheydidnotexistbefore.   [97]

Anotheradvantagethatsomenetw   orkspossessisacommonculturesharedbymembers. Common culture reduces costs involved in regulati   on in several ways. It widens the scope of servicesprovidedbythenetworktoincludesocialgratification.Therefore,thedeterringcostof exclusion from the network is greater (as it includes not only loss of business with network members, but also loss of social standing). Common culture also provides members with knowledgeaboutmattersrelevanttothebusin   esstransactedoverthenetwork,andstan   dardizes thisknowledgeamongthenetworkmembers,thusreducing   informationasymmetry . Further,a commonculturecreatesauniquegood   – esteem(socialstandinginthegroup),whichcanbea powerful motivator to follow the norms of the group (including   refraining from opportunistic behavior against other group members)   .[98] C ommon culture   may also add a psychological elementtothemitigationofopportunism,asopportunismtowardsone'ssocialgroup   (andwith whichoneempathizesoridentifies)   maybe   perceivedbyoneselfandbyothers   asmoremorally

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[97] Foranextensivediscussionofregulationthrough"rulesoflaw"and"rulesofphysics"   *see*:LawrenceLessig, *Codeand OtherLawsofCyberspace*   (1999).Lessigusestheterm"code"toregardthevarious"rulesofphysics" methodsofregulation.

wrongthanopportunisminapurebusinesscontext.   Furthermore,membershipinanetworkmay

induce a sense of kinship that would both increase guilt when acting opportunistically against

one's 'kin', and elim   inate the ability to justify opportunism with an antipathy to 'outsiders'.   [99]

Forallthesereasons,commonculturereducesregulationcosts.

Itisthereforeunsurprisingthatnetworks(andotherinstitutions)haveattemptedtocreate

common cultures that   facilitate the underlying business transactions.   [100] Part of the value in

belonging to a common culture   , however, is the difficulty in artificially producing it.   The

difficulty in finding   or creating   an alternative, equally attractive social group   is what   makes

membership in the current   group so valuable. It is difficult to create a common culture where

therewasnonebefore,butifanexistingculturalnetworkexists,it   may expand its role   and act to

mitigate opportunism in business transactions, exploit   ing its enhanced ability to regulate. As

addressedinthenextsection,whennetworkshavetheabilitytobetheefficientregulators,they

oftenreformtoacceptthatrole.

Regulation by one regulator   is not mutually exclusive with   other regulators . V ery often

each regulatorreliesonregulationofsomeaspectsbyanother,whileitregulatesthoseaspectsin

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[98] *See*:RichardH.McAdams,CooperationandConflict:TheEconomicsofGroupStatusProductionandRace Discrimination,108Harv.   L.Rev.1003(1995).

[99]Onguiltalleviationasanincentivetocooperate(andreciprocategoodbehavior)   *see*:LiorStrahilevitz, *CharismaticCode,SocialNorms,andtheEmergenceofCooperationontheFile   -SwappingNetworks* ,89Va. L. Rev.___(forthcoming),atsectionIII.D.1.

[100] *See,e.g.* ,Bernstein(1998),   *supra*note15,atp.110("They[tradeassociations   –A.A.]havealsoencouragedthe emergenceofinformalinformationchannelsbycreatingopportunitiesforsocialinteractionamongmembersand theirf amilies.Manyassociationssponsorclubsforspousesandhostregularsportingeventsandgaladinners… Theyalsolinksocialreputationtocommercialreputation,therebyincreasingthecosttotransactorsofsacrificing reputationbondsandgivingthems   trongerincentivestoabidebytheircommercialcommitments");Bernstein (1992), *supra*note15,atp.130("Anotherenforcementmechanismsometimesinvokedbythearbitratorsisa proceedinginJewishrabbinicalcourtsagainstthepartywhorefusestocomp   ly.Becausethesecourtshavethe authoritytobananindividualfromparticipationintheJewishcommunity,thisisapowerfulthreatagainstOrthodox membersofthediamondindustry.").   *Alsosee* Landa, *supra*note25.

which it is most efficient. For example, transaction regulation very often operates "in the

shadow of the law", efficiently mitigating opportunis   m in transactions with lower value, while

relying on the ability to sue in court for opportunism in higher   -value transactions (in which the

costs and delays of the government   regulation do not dissipate most of the value of the dispute   ).

However, to a cer   tain extent, each   regulator's activity may weaken another   regulator's

ability to regulate.   Self-regulation (i.e., morality and self   -control) may be more lax in a strict

environment that is rife with rules enforced by other regulators (one may obey the ext   ernally-

enforced rules, but not exercise significant self   -restraint in matters not prohibited by the rules).   [101]

Network regulation is often biased by the existence of government regulation, because   activities

may now be aimed at either appeasing the governm   ent regulator or 'capturing' him, either of

which may diverge from the course of action needed to efficiently mitigate opportunism. Where

government regulation is more efficient, but the government lacked the means to enforce its

regulation (as is the cas   e in some   developing countries , and sometimes in certain areas of

developed countries), n etwork regulation may become redundant when   the government increases

enforcement.[102]   Likewise, network regulation can reduce the effectiveness of transaction

regulation by decreasing the quality of partners to bilateral contracting (who remain outside the

network).[103] The reverse is also true   - transaction regulation may reduce the effectiveness of

network regulation, by diverting transactions away from the network, and t   herefore decreasing

the effect of the exclusion and   switching mechanisms (due to a decrease in network   benefits) and

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[101] On the weakening of corporate mor   ality as a result of increased rule   -based regulation *see*: Lawrence E. Mitchell ,
Cooperation and Constraint in the Modern Corporation: An Inquiry into the Causes of Corporate Immorality   , 73
Tex.L.Rev. 477 (1995).
[102] *See* McMillan & Woodruff,   *supra* note 26(discussing network regulation in the face of poor law enforcement by
the government); Milhaupt & West,   *supra* note 19 (discussing organized crime (which is a form of network
regulation) when law enforcement by the government is lacking).
[103] *See* Kali, *supra* n ote 25.

the control and information mechanisms (due to lack of network control over the bilateral transactions).

Below I will discuss when networks are the optimal regulators. This depends on the network having comparative advantages in both the incentive and the ability to regulate. When either is not the case, other would-be regulators develop to displace the network, unless the network adapts to improve its incentive or ability. This qualification, as to a network's ability to adapt, will be addressed first.

2. Networks' Resilience – Middleware as an Adaptation

As noted above, [104] there is a demand for efficient regulation. This allows networks to displace other institutions (such as the parties to the transaction or government) when the former institution is the more efficient regulator. Similarly, when networks are not efficient regulators, demand for regulation creates pressures to replace the ineffective network with other institutions. However, networks are very resilient, and often adapt in response to demand for regulation, to a form that is better suited to mitigate opportunism.

This adaptation often takes the form of an institution recent antitrust case law and literature has called '*middleware*'.[105] Middleware is a facility that connects to independent

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[104] *Supra* section I.
[105] *See, e.g.*, Howard A. Shelanski & J. Gregory Sidak, *Antitrust Divestiture in Network Industries*, 68 U. Chi. L. Rev. 1 (2001); *United States v. Microsoft Corp*., 87 F. Supp. 2d 30 (D.D.C. 2000), *aff'd in part, rev'd in part* 253

networks in order to maintain access between those networks   . It can be analogized to a hub, the spokes of which are independent netw   orks and the purpose of which is to combine the independent spokes into a single network.

Middleware has been discussed in depth in the context of the Microsoft trial. In that context, the middleware was software (such as Sun's Java and Netscape's Naviga   tor) that could operate on various operating systems, while allowing application developers to develop applications operating on it. An application written for the middleware would then operate on any of the various operating systems that   supported the mi ddleware. Thus, the middleware connected independent networks (operating systems), allowing one application to operate on all.

Much of the discussion in the discussion in the Microsoft trial and in the literature that analyzed middleware in the aftermath   of that trial examined the effects of middleware on market power and market definition.   Market power   may be a cause to the demand for middleware, because it biases the existing network's incentive to regulate efficiently. But there may be other reasons for the emergence of middleware (such as limitations to the current networks' ability   – rather than incentive   – to regulate). A key utility of middleware is its ability to ensure efficient connectivity between   formerly independent networks .[106]

It seems tha t one of the benefits of the middleware discussed in the Microsoft trial (though certainly not the only benefit and perhaps not the most important one)   ,was its ability to

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F.3d 34 ,53 -4 (D.C.Cir.2001),   *cert.denied* 122 S.Ct.350, 151,L.Ed.2d 264 (2001)(hereinafter:"the Microsoft trial").
[106]Middleware often has other, functional utilities that have nothing to do with regulation. For example, the Internet browser serves as a n interface between the user and the Internet.

allow a single application to operate on several operating systems.   Arguably, the m arket power

possessed by Microsoft's Windows operating system biased its incentive to regulate efficiently

(perhaps instead giving it an incentive to attempt to maintain or enhance   its market power, for

example by excluding or degrading). The middleware (Java and Navigator), on the other hand,

did not suffer from this bias, and could more efficiently regulate.

Middleware may also emerge when existing networks lack the ability to properly

regulate. This seems to have been the case, for example, with an ol   der type of middleware   –

express companies. These companies formed in the mid   -nineteenth century, when traveling a

significant distance by train required connecting through many small railroads.   A small number

of railroads operated in each region, making   a regional network less effective as a regulator.   [107]

Express companies took upon themselves to deliver freight, and coordinated among the railroads

that carried that freight. As Dennis Carlton and Mark Klammer point out,   [108] express companies

offered this co ordination until railroad companies consolidated and were able to offer

comparable coordination.

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[107] As discussed   *infra*, in section III.4, high concentration (i.e., a market composed of a few large firms) reduces the ability of a network to regulate. It is noteworthy that there was another obstacle to self   -coordination by the railroads, due to a possible bias in incentives caused by possession of market power. There were not many railroads competing from any given destination, and therefore many of the railroad companies possessed some market power

[108] Dennis W. Carlton   & J. Mark Klamer , *The Need for Coordination Among Firms, With Special Reference to NetworkIndustries* , 50 U. Chi. L. Rev. 446   , 457 (1983) (" Some of the uniform operating procedures were spurred by outside competition. During the thirty   -year pe riod beginning in 1850, independent freight companies, such as Wells Fargo, began to serve as intermediaries between railroads and customers who desired to ship goods. These freight companies handled the complicated transactions with all the different rail   roads…By the 1880's, the railroads had little need for freight express companies   ."). On consolidation as a response to the need for greater coordination *see* Alfred D. Chandler, *The Visible Hand: The Managerial Revolution in American Business*   81 -82, 89 (H arvard, 1977).

The resilience of networks is not without limits. As discussed above [109] network effects may raise to some extent barriers to entry, and therefore some "biase d" networks would not be replaced by smaller, unbiased alternatives. However, even if proponents of inefficient lock -in are correct in their analysis, the barriers to entry raised by network effects are not infinite, and therefore a concern on the part of biased networks of being replaced by non -biased alternatives serves as a check on the degree to which they use their ability to regulate in a manner that is socially inefficient.

It is also important to note that m iddleware is not necessarily welfare enh ancing. For example, it may free -ride on investments in the independent networks it connects. However, where network regulation can be efficient, yet the existing network lacks the incentive or ability to regulate efficiently, middleware is likely to app ear in response to demand for welfare enhancing regulation.

3. Networks' Incentive to Regulate

Opportunism, broadly defined, is "an act in which someone destroys part of the cooperative surplus to secure a larger share of it" .[110] Regulation is aimed at m itigating opportunism, yet no potential regulator has the incentives to always deter opportunism. First party controllers (i.e., self -regulators) have perhaps the least incentive to regulate efficiently,

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[109] *Supra*, text relating to notes 41 -46.
[110] Cooter, *supra* note 6, at p.150.

sincetheregulatorisalsothewould   -beopportunis t,andislikelytobethedirectbeneficiaryof theopportunisticbehavioritisregulating.

Second party controllers (i.e., transaction regulators)   are directly affected by any opportunismtargetedatthem,but   donotcareaboutthe   effectsonothers.   Therefore,theydonot have a sufficient incentive to   regulate efficiently when   opportunism imposes externalities on others,and they mightevenregulateinawaythat   benefitsthembutharmsothers   (asmaybethe casewithcartels,groupboycotts,etc.   ).

Government has broader incentives,   usually extending to the interests of all of its constituents.   However, the incentives are indirect. As public choice theory observes,   the interests of certainconstituentsinfluencegovernmentmorethanothers.   Gover nmentmayalso haveotherinterestsbesidesmitigatingopportunism,whichmightcontradictwithefficient   anti opportunismenforcement. [111]

Networks havesimilarincentivestothoseofthe   partiestothetransaction.Beingalarger group, the array of inter   ests networks are concerned with is wider than that o   f transaction regulators. Unlike   the government, the network is directly a   ffected by opportunism, since opportunism usually decreases network   benefits,reduces activity and reliance on   the network. Like transaction regulators, networks may disregard, or even exploit, the interests of non   -

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[111]Forexample,asmentionedbefore,government'sinterestindeterringviolentcrimes,andtheneedtoassign sanctionsinproportionwiththeirgravity,requiresthat   governmentnotuseitsmostpowerfulsanctionsagainst personswhoactopportunisticallyinbusinesstransactions(sincethisisconsideredasignificantlylessseriouscrime thanmurderorrape).Ifprivatepartiescanrelyonthegovernment'sdeterrenc   eofmoreseriouscrimes,theywill imposethestrongestsanctionstheyhaveagainstlessserious,butstillharmful,behaviorsuchasopportunismin businesstransactions.

members. The literature has termed this as the "dark side of private ordering". [112] For example, some networks discriminate of the basis of race, ethnicity, g ender, or o ther characteristics; in certain cas es (typically, where government regulation is lacking) , networks utilize physical violence as a sanction. More commonly, they may attempt to create, enhance or maintain the marketpoweroftheirmembers.

The possession of market power by a network, or of the ability to maintain that market power, significantly biases the network's incentives. The same mechanisms that are used to mitigate opportunism can be used to facilitate collusion. From the perspective of the netw ork members (but not, of course, from the perspective of overall social welfare) cheating on a cartel agreement is no different from defrauding – both reduce the network members' benefit, and the prevention of both is beneficial to the network.

Pirrong p oints to other potential bia ses that may cause networks to lack the incentive to regulate in a socially efficient manner .[113] First, collective action problems and rent seeking among network members impa irs incentives to self -regulate. Second, some types o f opportunism mainly affect inframarginal customers of the network, while the network members' wealth depends on the marginal customers.[114] The strength of these arguments seems to be

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[112] *See*:Milhaupt&West, *supra* note19;McMillan&Woodruff, *supra* note26,atp.24 54-2458; EllenD.Katz , *PrivateOrderandPublicInstitutions* ,98Mich.L.Rev.2481,2482 -2485(2000).
[113] StephenCraigPirrong, *TheSelf -RegulationofCommodityExchanges:TheCaseofMarketManipulation* ,38J. L.&Econ.141(1995).
[114] Pirrongmakestwoo therargumentsaswell:(a)networksmaynotfacesignificantcompetitionandthereforemay lacktheincentivetoimproveefficiencyintransactingthroughthem;and(b)thereisasignificantnegative externalityonnon -memberswhorelyonpriceinformati onfromtransactionsonthenetwork.Bothofthese argumentsseemdifficulttodefend.
        Theargumentregardinglackofcompetitionamongnetworksisunconvincingbecauseevenifanetwork facesnocompetition,itwouldstillviewopportunismthatharmsit 'scustomersasacost,ratherthanamonopolistic rent(unlessitprofitsthenetworkitself,whichwouldmakethe"opportunistic"actionanexploitationofmarket

highly dependent on the characteristics of the specific network (Pirrong's focus was on commodity exchanges). Even in instances where they have validity, this only means that networks are imperfect regulators. As seen above, government – as well as any other potential regulator – suffers from imperfections in its incentives and ability to regulate, and therefore networks may be the most efficient regulators even where they suffer from some bias in their incentives.

Furthermore, as mentioned above, [115] networks adapt to biases that hinder regulation by evolving through middleware into a network with either decentralized control or centralized control by a firm that does not possess market power (both alone or with others in the network).[116] Typically, this is because the "hub" firm that controls the expanded network does not operate in the industry in which the market-power possessing members operate – an express company in the hub of a network of railroads; a programming language in a hub of a network of operating systems, etc. [117]

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power by the network, rather than an opportunistic act done over the network). If opportunism is a cost, a monopolist would have an incentive to mitigate it and replace it without right extraction of monopolistic rent (as long as the cost of mitigation is lower than the loss of profits from the decline in demand due to this cost). However, one instance in which this would not be the case is when the network is regulated by government and limited in its ability to receive payments from its customers. In this case the monopolist would have no incentive to diminish opportunism. Furthermore, in the case of such regulation, to the degree that this opportunism is beneficial to the network members, the network might favor opportunism, as a form of "gold plating" evasion of regulatory caps on rent extraction. But this seems not to be the common case of most networks.

     Regarding the reliance on price information – non-members should, and probably do, take into account the degree of opportunism policing when they decide whether and to what degree to rely on the network or the information generated by it. If a network lacks an incentive to self-regulate efficiently, non-members will seek another, more accurate indicator; rely less on the price information; or pay the network in order to self-regulate (assuming the network is the institution with the best ability to mitigate opportunism).

[115] *Supra*, section III.2.

[116] The network possessing market power may attempt to prevent middleware from forming or from connecting to the network, since it benefits more from maintaining its market power than from enhancing regulation.

[117] Perhaps the popularity of industry-sponsored networks in some industries, and of independent networks in other industries, may be explained by the need (in the latter group of industries) to create a network that is free of market

4. <u>Networks' Ability to Regulate</u>

The mechanisms that networks use to regulate –the switching mechanism, the exclusion mechanism, the control mechanism and the information mechanism – were described above. The effectiveness of these mechanisms, and therefore the effectiveness of the network as a regulator, is dependent on market structure.

The effectiveness of a network's switching mecha nism is great er in markets that are characterized by significant network benefits and lo w concentration. As concentration rises, the market becomes more susceptible to collusion (so the network's prices are less likely to mimic a perfectly competitive market) and fewer alternative firms are available to contract with when a transaction fails.

Similarly, the effectiveness of a network's exclusion mechanism is greater i n markets that are characterized by significant network benefits and low concentration . The greater the network benefits, the greater the value conferred on the network member, and therefore the greater the cost of canceling the membership in the network. [118] Larger firms, however, are less threatened by exclusion. First, the larger the firm, the greater the loss to the network from its exclusion (since the size of the network decreases significantly, and with it the network benefits). The

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power bias in the incentive to regulate. The issue may warrant significant additional attention, which exceeds the scope of this paper.

[118] For a similar point, *see* Bernstein (1998), *supra* note 15, at p.111, *citing* Benjamin Klein & Keith B. Leffer, *The Role of Market Forces in Assuring Contractual Performance* , 89 J.Pol.Econ.615 (1981) ("When market transactors share a common view about what constitutes acceptable business behavior, a given instance of misbehavior will result in more transactors imposing the sanctio n. It gives transactors an added incentive to abide

network's threat of exclusion is less credible the greater the loss it suffers from the exclusion.

Second, some firms may be large enough to become indispensable to other firms, and therefore

exclusion from the network may force those dependent member   s to contract with t   he excluded

firm. This both decreases the transactions processed through the network (further harming

network members) and decreases the amount of business the excluded firm is deprived of.

Third, as mentioned above,   [119] large firms may actually find it pro   fitable to adopt a degradation

strategy, under which the firm weakens the network in order to gain an advantage in competing

against smaller firms. Exclusion from the network is the ultimate form of degradation (since it

degrades to nothing the connectivi   ty with the excluded firm), and   therefore would be a boon, not

a bane, to large firms that benefit from degradation.   [120]

The information mechanism is an extension of the exclusion mechanism and decreases in

effectiveness in similar situations: Private parti   es are less likely to boycott larger firms, even if

provided with credible information by the network, because the harm from boycotting a larger

firm tends to be greater. Specifically, large firms tend to have more captive partners, who find it

very costl y to switch away from the large firm, and are therefore less likely to do it.

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by their commercial commitments by making it in each transactor's individual best   -interest to perform rather than
breach over a wide range of contingencies and market conditions.").

[119] *See* Cremer, Rey & T   irole, *supra* note 52, and section II.3 of this paper.

[120] Some large firms do not benefit from degradation, because network benefits gained from operating within the
network outweigh the possible benefits of competing against a degraded network. For such fi   rms, the third
argument regarding the effectiveness of the exclusion mechanism would not apply, and perhaps the threat of
exclusion will deter them from breach. However, the other two arguments (regarding the credibility of the threat to
exclude and the '   stranded partners' that cannot stop transacting with the firm) still apply, and may weaken the
networks ability to discipline that firm's behavior.

Finally, the control mechanism is also more efficient in markets that are characterized by significant network benefits and low concentration. [121] The control mechanism is effective when the network's transacting facilities cannot be feasibly replaced by opportunistic members. If the transacting facilities can be replaced easily, then the opportunistic members can do so immediately before behaving opportunistically (to evade the network's ability to monitor and prevent the behavior), or immediately after behaving opportunistically (to null the effect of the network's denial of access to the facilities). Creating independent transacting facilities has the same effect as being excl uded from the network, and therefore the effects of network benefits and firm size on the effectiveness of the control mechanism are the same as those mentioned in the discussion above on the exclusion mechanism: The g reater the network benefits conferred by the network, the larger the difference between it and any alternative facility create d by the opportunistic member.

In sum, networks' ability to regulate should increase as network benefits rise and the size of the firms in the market decreases.

5. Summary - Market Structure and Opportunism Revisited

As discussed in section II.4 of this paper, markets with low concentration (containing many small firms) are prone to suffer from the breach type of opportunism, while markets with high concentration and high vulnerability variance are likely to suffer from degradation. Section

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[121] Some networks have a decentralized structure that does not involve centralized control of transacting faci lities, in which case the control mechanism will not be available regardless of network benefits or the size of firms in the

III.4 observed thatnetworksarelikelytobeefficientregulators(giventheincentivetodoso)in marketscharacterizedbysignificantnetwork   benefitsandlowconcentration.

A very brief and preliminary   look at a few   network industries seems to support these expectations. The diamond exchange industry,   the cotton exch ange industry, and I nternet auctionwebsitesallinvolvemanyrelativelysmallfirms   ,a swellas significant network benefits. Itseemsthemainopportunisticthreatstheseindustriesareconcernedwithareofthebreachtype (primarily fraud and insolvency).   In these circumstances, n   etworks are expected   to be good regulators. I ndeed,networkstakeactiverole   sinmonitoring,deterringandpunishingbreachin eachoftheseindustries. [122]Government   regulationisnotasintensive;noneoftheseindustriesis closelyregulated,andthoughtheFTCisactiveinprosecut   ing Internetfraud,thelargerI   nternet websites(suchaseBay)aretakealeadingroleininstitutinganti   -fraudmechanisms. [123]

Ontheothe rhand,theI   nternetbackboneindustry and thecreditcardindustry(incertain countries) tendtobedominated(ineachrelevantgeographicmarket)byafewlarge   firms. So was,inmanyregions,the   pre -regulation(i.e., 19[th]Century)Americanrailindustry. [124] Inthese industries,degradation(ratherthanbreach)   isexpected tobetheprimaryconcern. [125] Networks would also be expected, in these circumstances,   to b e poor regulators, and therefore networks should be less prevalent   in the se industries than collections of bilateral or small multilateral

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market.
[122] *See*Bernstein(1992), *supra*note15;Bernstein(2001),   *supra*note19;Snyder, *supra*note75.
[123] *See*Snyder, *supra*note75 .
[124]The19 [th]Centuryrailindustryisexamined,ratherthanthecontemporaryonebecauseregulation(whichwas significantlyincreasedinthelate19   [th]Centuryandearly20 [th]Century)affectstheindustrystructure.Therefore,the industrystructureobserv edinaregulatedindustrymayhavemoretodowitharegulator'spresenceandpreferences thanwithprivateordering.
[125] *See*Cremer,Rey&Tirole,   *supra*note52(regardingdegradationconcernsintheInternetbackboneindustry); Aviram, *supra*note80(rega   rdingdegradationallegationsintheIsraelicreditcardindustry).

connections, which can be governed by transaction   regulation. [126] The framework discussed in

this paper would   also   predict that the se industries   would be less resistant to governme   nt

regulation, since government   regulation would be   more effective than the network   counterpart.

Indeed, all these industries are regulated by government, and at least in the rail industry, scho   lars

indicate that gov   ernmen regulation was welcomed by the railroad companies.   [127]

This is but an initial observation. The analysis offered in this paper provides guidelines

to future detailed empirical examination of the utilization of network effects i   n creating

institutions that mitigate opportunism.

To what extent does   the existence or absence of a network as a regulator   affect market

structure? Market structure is primarily shaped by c   haracteristics such as barriers to entry, the

existence of netw   ork effects or supply   -side economies of scale,   etc. Government   regulation may

also affect market structure (for example, by creating barriers to entry).

Network regulation, however,   due to its resilience,   [128] may not   have significant long   -

lasting effect s o n market structure (i.e., the e   xistence of inefficient network   regulation, or

absence of such regulation where it would have been efficient, will not significantly affect

market structure), because: (a) to the extent that network   regulation evolves into an   inefficient

system (or market c   onditions change in a way that renders ineffici   ent a formerly adequate

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[126] For a discussion of the circumstances in which transaction regulation is preferable to network regulation (in the context of the natural gas industry) see: Thomas P. Lyon & Steven C. Hac   kett *Bottlenecks and Governance Structures: Open Access and Long   -term Contracting in Natural Gas* , 9 J.L. Econ. & Org. 380, 384   -385 (1993).
[127] *See* Gabriel Kolko, *Railroads and Regulation 1877 -1916* (Norton, 1970); Susan Perviant Lee & Peter Passell,   *A New E conomic View of American History*   324 -325 (Norton, 1979); Paul MacAvoy,   *The Economic Effects of Regulation* (MIT, 1965).
[128] *See supra* , Section III.2.

network regulator), self -correction through defection from the   network (and possibly the

formation of a more   efficient, alternative network   regulator) wi ll most likely weaken it   much

before the existence of inefficient regulation   could change market structure; (b) in the inverse

case, where   network regulation would be efficient but does not currently exist   , a network

regulator may is expected to evolve if   unless government regulation prevents it (in which case,

the determinant of   market structure would be government   regulation, not the lack of   network

regulation).

This analysis requires two   caveats. First, point (a) could be wrong if the   re is a significan t

'lock-in' effect keeping an inefficient incumbent network from withering or being replaced by

more efficient "middleware" .[129]   For example, a monopolist network that locks in because it

offers far greater network effects than any entrant network, may have   market power -driven

biases that prevent it from regulating effectively.   If it remains in place for   a long period, its

actions may affect market structure (e.g., it may erect barriers to entry, or raise concentration in

the industry) . But   a monopolistic n etwork would unlikely enjoy both monopolistic rents and

longevity: the competitive advantage conferred on it by the network effects can be used to deter

entry of competing networks   (by regulating efficiently), or to regulate inefficiently for a short

time (gaining monopolistic rents, but likely declining before market structure can be permanently

affected). As   discussed above, inefficient   networks invite the creation of middleware, which

eventually displaces the market power   -driven network. [130] Therefore, th e lock in qualification to

point (a) is not of significant effect on market structure.

[129] For discussion on the plausibility of a "lock   -in" effect resulting from network effects   *see supra*, text rel ating to
notes 41 -46.

Second, both points (a) and (b)   impliedly assume a   spontaneous creation of   network regulators in response to a demand for such regulation. The creation of private lega   l systems is often not spontaneous, but rather develops in   phases.[131] Impediments to the creation of private legal syste ms may slow the entry of network   regulators, and if this delay is long enough, it   may force pa rties to enter into transaction   regulation, including horizontal and vertical integration that affects market structure.   For example,   excessively strict antitrust regulation   may prohibit welfare-enhancing information exchanges or trade association rules that reduce opportunism. The lack of such p   rivate regulation may force firms to merge (horizontally or vertically) to ensure risk -free transactions in what has become a riskier transacting environment.   [132] Usually, however, the obstacles to the development of the private regulator stem from   government regulation, making it, rather than the   network regulation, the cause of modification in market structure.

Before concluding this issue, it is worthwhile to note the dual effect that middleware has on a network's ability to regulate. On one hand, as dis   cussed at length above, middleware has the effect of correcting the network's incentive to regulate efficiently, since the incumbent network is threatened by entry or expansion of middleware if it does not regulate efficiently, it is either "kept honest" b   y the middleware, or displaced by it. On the other hand, middleware weakens the network's ability to regulate, as it undermines the exclusion mechanism (exclusion from the network does not deprive of its network benefits, since the middleware provides the   m) and often also the control mechanism (tracking behavior on the network's central facilities is not

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[130] *See supra* , Section III.2.
[131] Amitai Aviram, *Non-Spontaneous Evolution of Private Legal Systems*   , 22 Yale L. & Pol'y Rev.___ (forthcoming), working paper *available at* : http://papers.ssrn.com/sol3/papers.cfm?abstract_id=391780.
[132] *Id.*

helpful if the central facility can be bypassed by using the middleware, especially if the middleware is more lenient in its enforcement or if the middlew   are abides to and enforces different norms). This dual effect makes it impossible to assess as a general matter whether middleware increases or reduces the ability of networks to regulate (in a social welfare maximizingmanner).

IV.**Conclusion**

Transactionsaresubjecttorisksofopportunisticbehavior.Manytransactionstakeplace inenvironmentsthatcontain'networks'   -institutionscharacterizedbynetwork   benefits.Insuch environments,networkscompetewiththepartiestothetransactionandwit   hentitiesexternalto thenetwork(primarilythegovernmentandcreatorsofmiddleware)inprovidingregulation (institutingmechanismsthatmitigateopportunism).

Networksemploy fourmechan ismstodecreaseopportunism:a   switchingmechanism (efficient replacementoffailedtransactionswithalternativeones);anexclusionmechanism (deprivingamemberofaccesstothenetwork);acontrolmechanism(centralizedcontrolof transactingfacilitiesandothermembers'assets)   ;andaninformationmechanism(co   llectionand disseminationofinformationonthecredibilityoffirms,inordertofacilitateindependent decisionsonthefeasibilityoftransacting)   .

Inanetworkenvironment,twotypesofopportunisticbehaviorcanbedistinguished: Breachisatransac   tion-specificdefaultinwhichthelargepositivepayoffatthetimeofdefault outweighsfuturegainslostduetothedefault;Degradationisastrategyofdefaulting   notfor immediategain,butinordertoweakenthenetwork,inanticipationof   long -term benefits tothe defaultingparty from theabsence(ordecreasedeffect)ofthenetwork   .Marketstructure(e.g., thenumberandrelativesizeofnetworkmembers)   affectsthetypeofopportunisticbehaviorthe networkispronetosufferfrom.Marketscomp   osedofmanysmallfirmsaremoresusceptibleto breach,whilemarketscontainingafewlargefirms   withhighvulnerabilityvariance   are susceptibletodegradation.

Marketstructure is also akeyfactorindeterminingthenetwork'sutilityasaregulator relativetoregulationbyotherentities,sinceitaffectstheeffectivenessofthesemechanismsand thetypeofopportunisticbehaviorthenetworkispronetosufferfrom.Networksinmarkets consistingofmanysmallfirmspossess   a powerfulexclusionsa nctionandarelikelytooffera viable switchingmechanism andeffectivecontrolandinformationmechanisms   .Asaresult,in suchmarketsregulationbythenetworkdisplacesregulationbythegovernmentorthepartiesto thetransactions.Ontheotherh   and,networksinmarketsthatconsistofafewlargefirmshave weaksanctionsagainstopportunisticfirmsandarelesslikelytofacilitateeffective   switching, controlandinformation mechanism s.Therefore,inthesecircumstancesnetwo   rksaredisplaced bygovernment,gatekeepersorthepartiestothetransaction   inregulating.Networks,however, areresilient,andwhentheyarenottheefficientregulatorstheyoftenreform(commonly, throughtheemergenceofmiddleware)toastructureinwhichtheyhav   eboththeincentive   and theabilitytoregulate.