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August 2018

M-RCBG Associate Working Paper Series | No. 97

Mossavar-Rahmani Center for Business & Government
Weil Hall | Harvard Kennedy School | www.hks.harvard.edu/mrcbg

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A previous version was submitted 27 March 2018 in partial fulfillment of the requirements for the degree of Master in Public Policy.

Faculty Advisor: Professor Jason Furman
Seminar Leader: Professor John Haigh

Acknowledgements

We would like to thank Professor Jason Furman, Professor John Haigh, and Derek Moore, for their support during this project.

We would also like to acknowledge the following academics and researchers for helpful discussions and advice on this project including:

- Professor Morris Kleiner – Humphrey School of Public Affairs, University of Minnesota
- Professor John Horton – Stern School of Business, New York University
- Professor Chiara Farronato – Harvard Business School
- Professor Scott Kominers – Harvard Business School
- Professor Michael Luca – Harvard Business School
- Professor Brad Larsen – Department of Economics, Stanford University
- Professor Joseph Aldy – Harvard Kennedy School
- Researchers from the European Commission

In preparing this report, we also corresponded with current and former employees of the following organizations: Uber, Airbnb, Facebook, Slack, Upwork and Yelp. We thank them for their assistance, and have respected their wishes to maintain anonymous with regard to their comments.

Contents

Executive summary

Online platforms are rapidly transforming the global economy. These businesses, including six of the world's ten largest companies, have evolved new solutions to overcome trust problems and asymmetries of information inherent in exchange on the Internet. These features are known as **trust mechanisms.**

Trust mechanisms are challenging old approaches to regulation, with new technology rendering many existing regulations unnecessary or unsuitable. Some online platforms have pursued new forms of self-regulation; others have taken an adversarial stance towards government intervention in its entirety. Meanwhile, standard approaches of regulators towards trust mechanisms are yet to be developed.

This report examines some of the benefits and costs of trust mechanisms in the digital economy and develops recommendations for regulators to adapt their approach in response to these new business models.

First, we map the space of trust mechanisms operating today, and propose a classification schema focused on the **participants, informational content and function** of a trust mechanism**.** While online platforms differ in terms of the transparency of their trust mechanisms, we show that design choices depend on the nature of the trust problem faced in the industry. We also demonstrate that firm-level differences in trust mechanisms may impact the competitive dynamics of an industry.

Second, we present evidence on three categories of benefits of trust mechanisms: a reduction in the regulatory burden for businesses, the expansion of markets enabled by trust mechanisms and an enhanced ability of governments to target spending using information gathered by online platforms. The impact of trust mechanisms on occupational licensing alone is estimated to be a decreased regulatory burden of more than $790 million.

Third, we analyze the potential harms to the market that may be associated with trust mechanisms, including new forms of discrimination; the possibility of new market failures and imperfections; and the possibility of strategic manipulation with competitive implications for markets.

Our report concludes with several recommendations for business regulators based on our analysis and findings.

Summary of recommendations

Based on our analysis, we believe regulators should focus on reducing the potential for harms caused by trust mechanisms while maximizing the likelihood of their economic benefits. With this goal in mind, we recommend that regulators:

1. Investigate the development of an online database of information about the characteristics and function of trust mechanisms employed by platforms.

2. Require businesses to release publicly information about the characteristics and functions of trust mechanisms employed on their platform.

3. Issue guidelines to businesses concerning how to minimize potential harms caused by trust mechanisms in online platforms.

4. Write to state and local authorities about areas in which occupational licensing laws could be weakened in response to the emergence of trust mechanisms.

5. Investigate areas where regulators' activities could be better targeted using data from trust mechanisms.

The rise of online platforms

Key takeaways

- Online platforms are rapidly remaking the global economy, with six of the ten largest companies in the world now platform businesses.
- Trust mechanisms are the tools that power online platforms by enabling trust and allowing transactions to occur.
- These trust mechanisms present a suite of new challenges for regulators.

Online platforms – businesses that create value by facilitating exchanges between two or more interdependent groups – are rapidly remaking swathes of the US and global economy. At the time of writing, six of the world's ten largest companies (by market capitalization) possess online platforms as their dominant operating model, or a significant portion of their activities. For some, digital platforms and the outcomes they produce are "little short of miraculous",[1] "the maws into which traditional companies are now disappearing",[2] and a case in point of Karl Marx's 1859 observation about how technology shapes economic institutions.[3] Our operating definition of a platform is contained in **Box 1**.

Platforms are not a recent invention. For example, physical marketplaces, newspapers, stock exchanges, auction houses, and credit cards are all platforms which have existed for many years, and sometimes even centuries. Even certain digital platforms have existed for some time, dating back approximately to the creation of the World Wide Web. For example, Amazon Marketplace and eBay were each founded nearly two decades ago and today retain much of their original operation models.

Despite this, online platforms are rapidly becoming increasingly influential in the US and global economy. This can be seen in recent changes to the distribution of the world's largest companies, as in **Figure 1**. This scale extends beyond these firms' economic size. For instance, Facebook and Google jointly accounted for 99% of all new digital advertising and approximately two-thirds of US digital ad investment in 2017.[4,5] They are also among the world's most visited websites: of the world's 50 most popular websites, all were either online platforms or had platform elements.[6]

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[1] Parker, Geoffrey G., Marshall W. Van Alstyne, and Sangeet Paul Choudary. *Platform Revolution: How Networked Markets Are Transforming the Economy and How to Make Them Work for You*. WW Norton & Company, 2016, p. 5.

[2] Manville, Brook. "Are Platform Businesses Eating the World?," *Forbes*, 14 February, 2016, https://www.forbes.com/sites/brookmanville/2016/02/14/are-platform-businesses-eating-the-world/. (Accessed 14 December 2017).

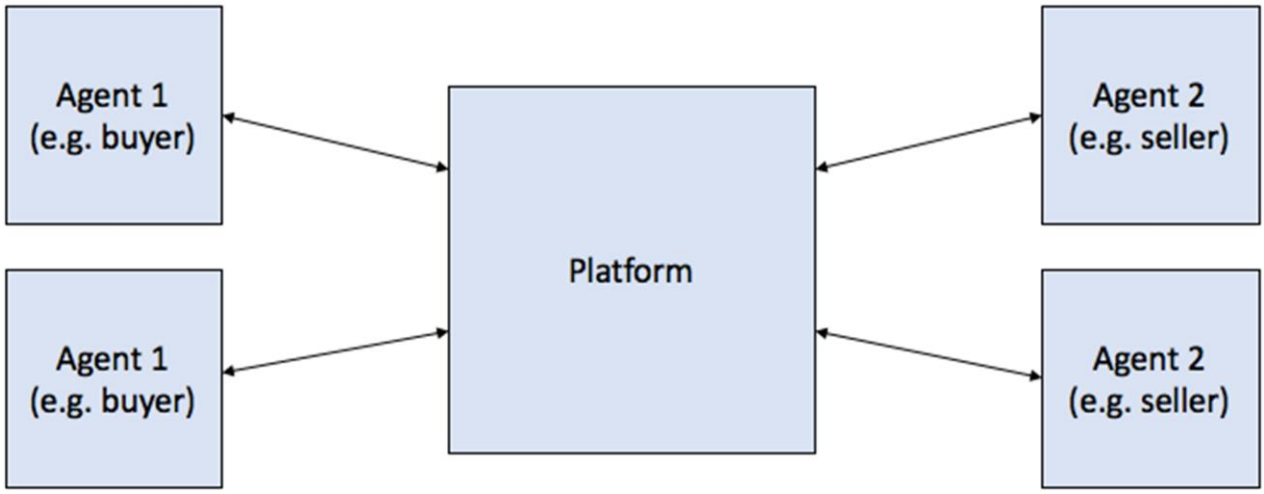
[3] Weyl, E.G. and Alexander White. "Let the Right 'One' Win: Policy Lessons from the New Economics of Platforms." *Coase-Sandor Working Paper Series in Law and Economics No. 709*, 2014, p. 1.

[4] PwC and Interactive Advertising Bureau. *IAB internet advertising revenue report: 2016 full year results*. 2017.

5 "Google and Facebook Tighten Grip on US Digital Ad Market: Duopoly to grab more than 60% of the 2017 digital ad spend." eMarketer, 21 September, 2017, https://www.emarketer.com/Article/Google-Facebook-Tighten-Grip-on-US-Digital-Ad-Market/1016494. (Accessed 21 March 2018).

[6] Alexa Internet. "Alexa Top 500 Global Sites." https://www.alexa.com/topsites, 2018, (Accessed 4 January 2018).

Box 1: What are platforms and online platforms?



A **platform** is a business model that creates value by facilitating exchanges between two or more interdependent groups. Platforms are also known as **two-sided markets** (for two groups) or **multi-sided markets** (for more than two groups).

An **online platform** is a platform that substantively utilizes information technology (such as Internet connectivity) as well as non-physical environments like websites and mobile applications, in order to operate.

Platforms are distinct from **networks**, which enable connections between like groups. An example of the difference between the two is Microsoft Instant Messenger (an online communication network that connects like groups) and Facebook (a platform which in addition to being a communication network also connects individuals with advertisers).

Figure 1: Top five publicly traded companies in the world by market capitalization

Facilitating exchanges on online platforms: the use of trust mechanisms

All transactions require a minimum level of trust between participants in order to occur. This is because any exchange requires a credible before the fact commitment that no parties will renege on their side of the agreement after the fact. Without this, transactions may not occur even if they would benefit both parties.[7] **Box 2** illustrates this in a simple economic game.

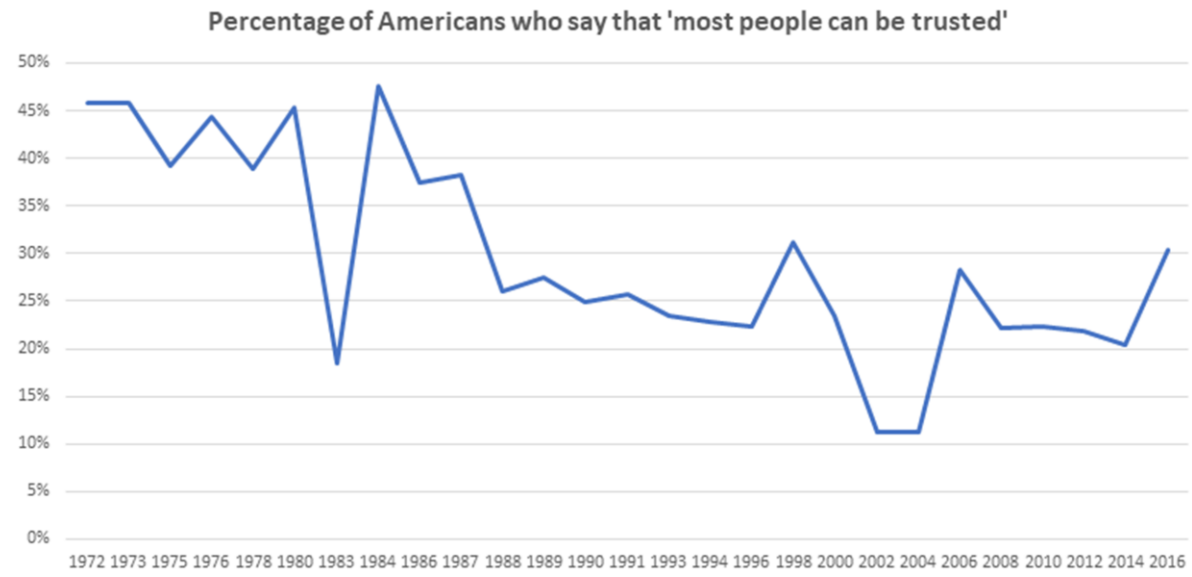
Levels of trust among Americans have fluctuated over time. Most recently, in 2016, some 31% of Americans in the General Social Survey said that 'most people can be trusted'.[8] As **Figure 2** demonstrates, this represents a significant decline in general trust since the 1970s, with an uptick in

recent years that some have attributed to the rise of the 'sharing economy' and its associated increase in trust-dependent exchanges with relative strangers.[9]

Online platforms face (at least) three additional trust challenges that distinguish them from other kinds of firms:

1. **Parties in online environments are often anonymous to each other and decoupled from their offline identities**.[10]

Figure 2: Level of trust among Americans, 1972-2016



[7] See Greif, Avner. "The fundamental problem of exchange: a research agenda in historical institutional analysis." *European Review of Economic History* 4, no. 3 (2000): 251-284.; and Akerlof, George A. "The market for "lemons": Quality uncertainty and the market mechanism." In *Uncertainty in Economics*, pp. 235-251. 1978.

[8] Smith, Tom W, Peter Marsden, Michael Hout, and Jibum Kim. "General Social Surveys." *National Opinions Research Center*. 1972-2016. Data accessed from the GSS Data Explorer website at gssdataexplorer.norc.org.

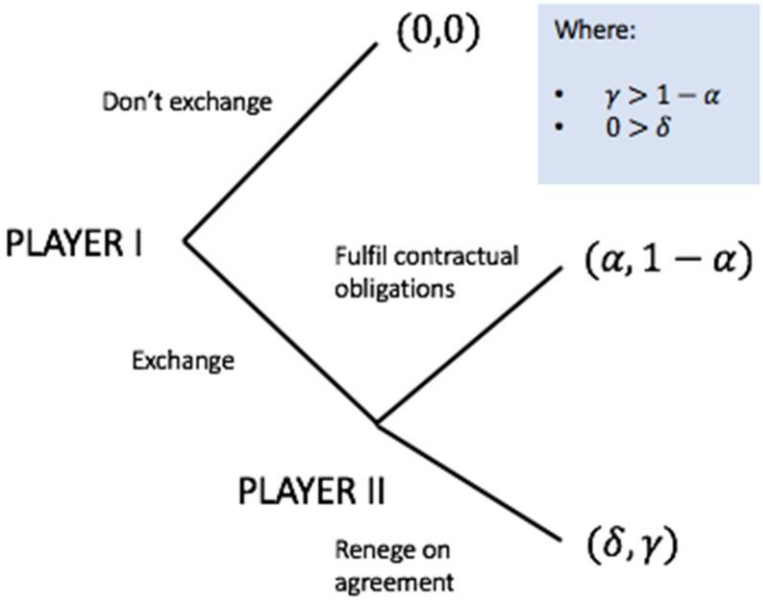
[9] Tanz, Jason. "How Airbnb and Lyft finally got Americans to trust each other." *Wired,* 23 April, 2014, https://www.wired.com/2014/04/trust-in-the-share-economy/. (Accessed 19 March 2018).

[10] Or, as The New Yorker put it in its famous 1993 cartoon by Peter Steiner: "On the Internet, nobody knows you're a dog" (Steiner Peter. '"On the Internet, nobody knows you're a dog"' [Cartoon]. *The New Yorker,* 5 July, 1993).

Box 2: Why trust is needed for transactions to occur

To see why transactions between two parties may not occur on their own, consider the following game, known as the **game of trust**.

Player 1 starts by choosing whether to enter into an exchange with Player 2. If Player 1 chooses to do so, Player 2 then chooses to either fulfil her contractual obligations or to renege on the agreement. Entering into an exchange yields a payoff of 1 that is divided such that both players better off than if they do not choose to exchange.



However, Player 2 can gain more than $1 - \alpha$ by reneging on the agreement. In this occurs, Player 1 receives a payoff $\delta < 0$ and is worse off than had the exchange not been initiated in the first place. Anticipating this, Player 1 will not choose to enter into an exchange with Player 2 to begin with.

2. **Physical interactions that traditionally occur in offline environments are often impossible in an online environment**.
3. **Online platforms possess the ability to collect and use a large amount of data about participants and their activities**.

As a result of factors including these, platforms have developed novel and diverse ways to facilitate exchange between their participants.[11,12] These solutions form a rich world of ratings systems, user-generated reviews, profiles, public transaction histories, centralized guarantees, and many other means to overcome to overcome both the information asymmetries that exist between participants on a platform.

In this report, we call these **trust mechanisms**, with our operational definition discussed in **Box 3** below.

[11] Martens, Bertin. "An Economic Policy Perspective on Online Platforms." *Institute for Prospective Technological Studies, Digital Economy Working Paper 2016/05*. 2016.

[12] Marina Lao et al. "The 'Sharing' Economy: Issues Facing Platforms, Participants & Regulators" *A Federal Trade Commission Staff Report*. 2016, p. 9, 35.

Box 3: What is a trust mechanism?

A **trust mechanism** is a tool used by an online platform to overcome information asymmetries between market participants to facilitate transactions. Trust mechanisms can take many forms, including:

Online platform	**Key participants**	**Trust mechanism[1]**
eBay	Buyers and sellers	• 'Feedback Score' cumulative rating score • Verified Rights Owner (VeRO) program
Uber	Drivers and passengers	• Two-way rating system (star rating + comments on other factors)
Yelp	Restaurants and diners	• Star rating system • User reviews • Recommendation software (an automated "review filter")
Facebook	Users and advertisers	• User profiles
Airbnb	Renters and landlords	• Star ratings on multiple factors • Written reviews
Medium	Readings and writers	• 'Clapping' piece approval system

Trust mechanisms and the role of regulators

Enabling trust and quality in traditional marketplaces has been one of the core goals of trade regulators around the world. Trust mechanisms seek to achieve a similar goal but in a private setting. In this sense, trust mechanisms can be seen as a challenge to the core function of regulators, and has led the US Federal Trade Commissioner (FTC) Maureen Ohlhausen to ask *"Can the trust mechanisms built into some of these new business models replace regulation? If so, where?"* as one of the five most important questions in the sharing economy today.

There is also uncertainty about the appropriate balance of regulation for online platforms, when compared with more traditional firms. Online platforms often compete with traditional suppliers of goods and services, but regulation appropriate to these firms may not work in the online context. On the other hand, many traditional firms also believe that online platforms should be subject to the same or similar level or regulation to ensure a level playing field.

Exploring these roles for regulators is a key goal of this report. Investigation of these problems is also more than a theoretical exercise. For some time already, regulatory challenges relating to trust mechanisms and

online platforms have come into direct contact with the regulators. For example:

- In **December 2017**, Yelp's Vice President of Global Public Policy contacted Federal Trade Commission's Acting Chair Maureen Ohlhausen asserting that Google violated a commitment made to the FTC in 2013 to not scrape content (including pictures and reviews) from certain websites.[13]

- The rollout of Uber and AirBnb in hundreds of international cities has posed challenges for regulators of the passenger transport and accommodation industries in the US and other countries.

- In **May 2017**, the FTC settled a complaint with two online trampoline sellers that deceived consumers by directing them to review websites that falsely claimed to be independent but were in fact wholly owned by the sellers. [14]

[13] Nicas, Jack. "Google Rival Yelp Claims Search Giant Broke Promise Made to Regulators." *The Wall Street Journal*, 11 September, 2017, https://www.wsj.com/articles/google-rival-yelp-claims-search-giant-broke-promise-made-to-regulators-1505167498. (Accessed 9 January 2018).

[14] Federal Trade Commission. "FTC Stops False Advertising, Phony Reviews by Online Trampoline Sellers," https://www.ftc.gov/news-events/press-releases/2017/05/ftc-stops-false-advertising-phony-reviews-online-trampoline (Accessed 8 January 2018).

A new classification strategy for trust mechanisms

Key takeaways

- We propose a new classification scheme for trust mechanisms, based on three categories: participants, content and function.
- We apply this classification scheme to five industries and twenty-nine platforms, with detailed results in **Appendix A**.
- This exercise illuminates several broader results about trust mechanisms which are relevant for regulators, including
  - Online platforms vary in levels of transparency about their trust mechanisms;
  - Characteristics of trust mechanisms vary more between industry than within industry, depending mostly on the nature of the trust problem; and
  - Within-industry variation in trust mechanism design may be driven by competitive forces.

The growing ubiquity of online platforms and the diverse types of the trust problems they face has brought about the development of many different types of trust mechanisms in the market. There have been few attempts to catalog, in a structured way, the many design features of trust mechanisms. [15] However, we argue that in order to appreciate the many implications of trust mechanisms for regulation, a better understanding of the universe of trust mechanisms is vital.

Our approach to classification

Two key methodologies influenced our approach to a classification scheme for trust mechanisms: a theoretical analysis based on mechanism design and field research.

Mechanism design approach

Mechanism design is a field of economics, inspired by engineering, that studies the design

of protocols in systems to incentivize rational agents to act in a desired way. Informally, a **mechanism design problem** in economics is to find the "rules of the game"[16] (i.e. possible actions of players and a way to aggregate these actions) to bring about some outcome in a situation where agents have private information. Trust mechanisms can be thought of as a solution to the mechanism design problem for online platforms, in that they constitute a set of possible actions by platform users and a way for the platform to aggregate these messages and use them to bring about exchange. The trust mechanism is illustrated in the classic Mount-Reiter diagram[17] from mechanism design theory in **Figure 3** below.

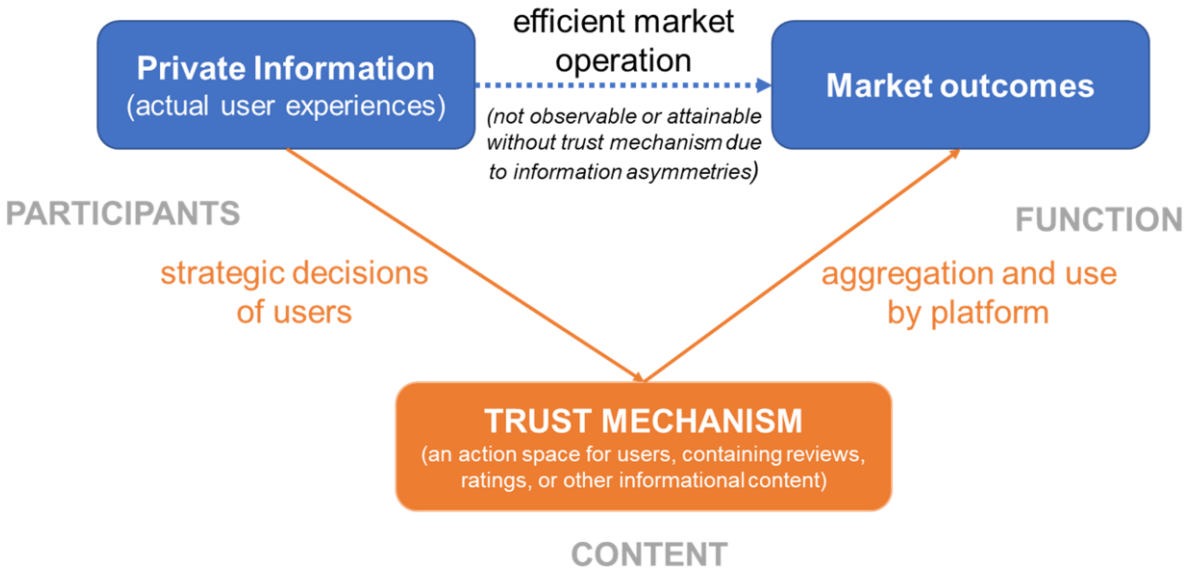
The mechanism design approach to analyzing trust mechanisms suggests that there are three key components to the design decisions of online platforms:

[15] An early example is Dellarocas, Chrysanthos. "The digitization of word of mouth: Promise and challenges of online feedback mechanisms." Management science 49, no. 10 (2003): 1407-1424., but development in online markets has rendered this analysis insufficient.

[16] Parkes, David. "Iterative Combinatorial Auctions: Achieving Economic and Computational Efficiency." Ph.D. dissertation, 2001. University of Pennsylvania.

[17] Mount, Kenneth, and Stanley Reiter. "The informational size of message spaces." *Journal of Economic Theory* 8, no. 2 (1974): 161-192.

Figure 3: Mount-Reiter diagram for trust mechanisms



1. **Participants – who participates in the platform's trust mechanism?**
   This determines the 'type space' of the mechanism design problem – the types of consumers and private information that may be used as part of the platform's trust mechanism.

2. **Content – what information do market participants provide to the platform in the trust mechanism?**
   This determines the 'action space' for the trust mechanism – what information participants must provide as part of the mechanism design and, therefore, what information may be used by the platform to determine outcomes for market participants.

3. **Function – how is the informational content of the trust mechanism used by the online platform?**
   This determines the 'outcome function' for the trust mechanism – the way in which user's actions are aggregated and then used to affect the actual market outcomes on the platform.

Field research

We used field research of existing trust mechanisms in order to refine this broad categorization of trust mechanisms based on economic theory. We analyzed five industries – ecommerce, ride-sharing, accommodation services, online advertising platforms and freelance labor hire – totaling twenty-nine trust mechanisms to determine the specific ways in which the participants, informational content and function of trust mechanisms varied between online platforms.

Detailed analysis of the five industries is contained in **Appendix A**, but the key result of this work is the classification schema itself in **Figure 4.**

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Figure 4: Classification schema for trust mechanisms

Lessons from classification

Our field research on the characteristics of online trust mechanisms also uncovered a number of broader results which we believe should inform regulation in platform markets.

The first important remark is that online platforms differ in the level of transparency of the features of the trust mechanisms they use. In most cases, platforms widely share information concerning the 'participants' and 'informational content' characteristics of their trust mechanisms, but are reticent to share publicly or readily full details on the 'function' characteristics of their trust mechanism. For example, Uber does not share publicly the 'rating floor' for their drivers – the minimum star rating that drivers require to remain on the system. Neither Yelp nor Airbnb share information about *how* ratings and reviews are used to prioritize search results in their algorithm (but do note that these are used as inputs to their algorithm).

There are exceptions to this rule. Some businesses promote widely the trust mechanisms employed on their platform, sharing substantial information about the way their trust mechanisms operate. For example, Toptal – a platform in the online labor industry – define themselves on the basis of their trust mechanism, claiming to offer "the Top 3% of Freelance Talent". Toptal's trust mechanism involves staff within the organization assessing the qualifications and standards of work of contractors on their platform, and directly responding to feedback from the hiring parties.

The different levels of transparency on online platforms served as a challenge for our classification exercise – particularly in determining 'function' characteristics –requiring us to often rely on secondary evidence to determine some characteristics of trust mechanisms. This suggests that certain characteristics of online platforms may be unknown or opaque to members of the general public and platform users. This may prevent users from exercising informed choice on platforms.

A second observation is that the design features of trust mechanisms seem to vary more significantly between industries (rather than within industries). This confirms a premise of the mechanism design approach to trust mechanisms which is that the mechanism depends fundamentally on the nature of the trust problem being addressed. Different industries tend to face different asymmetries of information and thus different mechanism design problems. Firms within a single industry are more likely to face similar trust problems to overcome.

Table 1 contains the key trust problems in the industries analyzed and the common features of trust mechanisms which may be seen as a response to the trust problem encountered by firms in that industry. Some trust problems (for example, safety of market participants) may be common to all online marketplaces, but **Table 1** seeks to highlight the core trust problems that are distinctive to these industries.

Although between-industry variation accounts for many of the differences between trust mechanisms, within certain industries, we have observed that some heterogeneity may be explained by competition between firms. In this way, trust mechanisms may act, in some cases, as a medium of market segmentation or specialization by firms. We observe that firms strategically positioning[18] themselves on the higher end of the market often impose stricter

trust mechanisms on their users. By 'stricter',

[18]We mean "strategic positioning" in the sense of Besanko, David, David Dranove, Mark Shanley, and Scott Schaefer. *Economics of strategy*. John Wiley & Sons, 2009.

we mean that the level of burden associated with the trust mechanism for the user or any threshold used by the platform to qualify users for certain benefits is higher.

For example, in the online retail market, there are real and considerable differences in the burden associated with the trust mechanisms used between platforms. At one end, Craigslist has one of the least burdensome trust mechanisms in use of any platform we analyzed, consisting only of the ability of the platform to block users if severe complaints are received or scam activity is suspected. On the other end of the market, Amazon has a complex trust mechanism including customer reviews of sellers, ratings, meta-ratings of review helpfulness, surveillance activities conducted by Amazon and tiered user benefits on the basis of the trust mechanism. eBay's trust mechanism shares some of these features, but not all of them. We argue that these differences may be explained by the strategic positioning of these firms within the online retailing industry. Craigslist, with a less strict trust mechanism, offers free postings for most users. In comparison, on a $30 sale, Amazon charges fees averaging 18.3% to their sellers, where eBay's fees average 12%[19].

Within a platform, differences in trust mechanisms may also arise as the result of product segmentation. For example, Airbnb's premium product, Airbnb Plus, requires listings to have a minimum rating requirements and to undergo an inspection by an Airbnb employee[20]. This is on top of the usual ratings-based trust mechanism for Airbnb, which is discussed in **Appendix A.2**.

A similar pattern emerges in several of the other industries we analyzed. This result can be illustrated graphically as in **Figure 5**.These

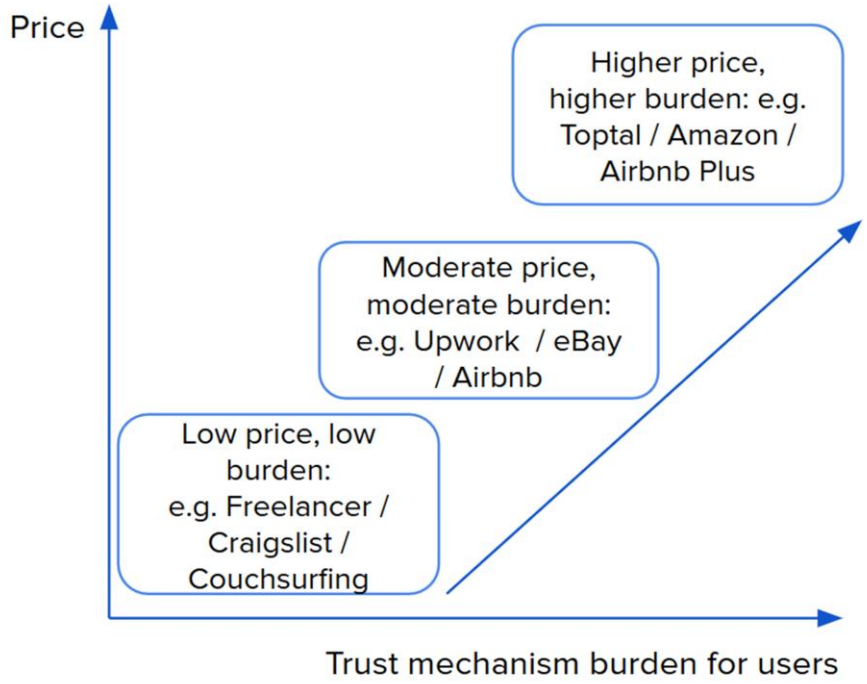
Table 1: Trust problem and design features of trust mechanisms by industry analyzed

Industry	Key trust problem	Common feature
Ride-sharing	Safety of passengers and drivers, and the quality of experience for passengers	Two-sided reviews
Online retail	Ex-ante identification of seller and product/service quality prior to a financial transaction.	Public ratings and feedback
Casual labor	Ensuring freelancers have the capabilities to complete job in the time and of the quality expected by client.	Skills tests and endorsements
Accommodation	Identifying quality and ensuring personal and property safety for travelers and hosts.	Double-blind reviews
Online advertising	Ensuring advertisements are presented to appropriate audiences which will drive engagement and revenue for advertisers	Granular, real-time performance metrics

[19] "Marketplace Seller Fees Example | Where to sell online," 2017, http://www.wheretosellonline.com/seller-fees-example/. (Accessed 12 February 2018)

[20] "Airbnb Plus Host Requirements," *Airbnb,* 2018, https://www.airbnb.com/plus/host/requirements/. (Accessed 25 February 2018)

Figure 5: Relationship between trust mechanism strictness and positioning of firm within industry or market segment



observations have a number of implications for regulators. Firstly, a lack of information about trust mechanisms may act as a barrier, both for consumers to make informed choices and for regulators to determine appropriate regulatory responses. Secondly, a one-size-fits-all approach would be an inappropriate regulatory response to the challenges associated with trust mechanisms, given the considerable variation in trust mechanisms between firms in different industries. Finally, regulating trust mechanisms may have implications on competitive dynamics and industrial organization in industries with platform firms.

Benefits and costs associated with trust mechanisms

Key takeaways

Trust mechanisms have the potential to bring significant economic and social benefits to consumers and businesses in the United States. However, they also bear inherent costs and risks for regulators to manage.

Occupational licensing is a type of regulation where the benefits from trust mechanisms may be broadly estimated. We estimate that trust mechanisms may reduce regulatory burden in occupational licensing by potentially $794m-$1.94bn, depending on the scenario and time horizon.

Trust mechanisms may also help grow markets and increase economic welfare, and also have been used by governments to enable the superior targeting of government spending.

However, possible costs of trust mechanisms include new forms of discrimination on online platforms, the potential for welfare-reducing manipulation of ratings and certain design flaws that may open up new forms of harm on online marketplaces.

The benefits of trust mechanisms

The economic and social benefits arising from trust mechanisms fall into at least three categories:

1. Replacing existing laws and regulations;
2. Growing markets and increasing economic welfare; and
3. Enabling superior targeting of government spending.

Replacing existing laws and regulations

Trust mechanisms may substitute for a number of consumer protection laws and public safety regulations.[21] Since laws and regulations are costly to enforce, one possible benefit of trust mechanisms is to reduce or remove these costs. By replacing regulations with their trust mechanisms in this way, online platforms would exist in a regime of **self-regulation**.

However, it is difficult to measure the size and scope of these benefits. This is partly because **trust mechanisms often interact with many regulations**. Consider for example the case of ridesharing. As was discussed earlier in this report, the trust mechanisms employed by online platforms such as Uber and Lyft share many similarities. However, the regulations they interact with are numerous. For example, the regulations that apply to medallion taxicab services in New York City alone govern factors including but not limited to maintenance and record-keeping requirements, vehicle inspection schedules, public accommodation laws, and licensing fees.[22] Given this, the question of how ridesharing platforms' driver verification

[21] See for example Lao et al., "Sharing Economy," p. 60, 65; Martens, "Online Platforms," p. 60; Cohen, Molly, and Arun Sundararajan. "Self-regulation and innovation in the peer-to-peer sharing economy." *U. Chi. L. Rev. Dialogue* 82 (2015): 116; and Koopman, Christopher, Matthew Mitchell, and Adam Thierer. "The sharing economy and consumer protection regulation: The case for policy change." *J. Bus. Entrepreneurship & L.* 8 (2014): 529.

[22] Jonas, Alexandra. "Share and share dislike: The rise of Uber and Airbnb and how New York City should play nice." *JL & Policy 24* (2015): 205, p. 213.

systems, two-way ratings, and other trust mechanisms interact with each of these individual regulations is not one that can (or should) be easily answered in general even for a single industry within a single city.

An additional problem with identifying the benefits arising from self-regulation is that **there are often inherent costs associated with removing or supplanting existing regulations**. These may attenuate the estimated benefit of trust mechanisms, make these difficult to isolate, or make the prospect of self-regulation practically or politically difficult to realize.

A concrete illustration of this (again from New York City) is the 2010 amendment to the city's Multiple Dwelling Law and its interaction with short-term accommodation agreements facilitated by Airbnb. The Multiple Dwelling Law defines "illegal hotel activity" as "[w]hen permanent residential apartments in buildings with three units or more are rented out for less than thirty days to transient visitors instead of residents."[23] In response to efforts by Airbnb to overturn this law, New York State Senator Liz Krueger highlighted one of the law's purposes to protect the safety of the city residents by restricting strangers' access to residential properties, noting that[24]

> *"Illegal hotel operations mean, at a minimum, a regular stream of relatively un-vetted strangers coming into and out of residential buildings. That can create serious quality-of-life problems and safety for neighbors, at a minimum – sleepless nights caused by overcrowded neighboring apartments packed with loud tourists, for example. But it can get far worse. My office has heard of buildings burglarized and neighbors assaulted by strangers who might never have had access to get inside, were it not for illegal hotel activity."*

Occupational licensing and the benefits of trust mechanisms

Occupational licensing is a key area in which trust mechanisms may enable reduced regulation. Occupational licensing and trust mechanisms on online platforms share a common goal of reducing information asymmetries and establishing a minimum level of safety and quality for consumers in marketplaces[25]. There may thus be some scope for substitution between the two in the modern economy.

Occupational licensing is costly and generates significant regulatory burden in the US economy, with several researchers noting that this form of regulation "has become one of the most significant factors affecting labor markets in the United States."[26] In 2016, approximately a quarter of US workers held an occupational license, [27] (a proportion that has grown roughly five-fold since the 1950s in large part due to new regulations on previously unlicensed occupations). [28] As well as its prevalence,

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[23] Ibid., p 2018.
[24] Krueger, Liz. "Answers for New Yorkers Concerned or Confused About the Illegal Hotel Law | NY State Senate," 27 May, 2014, https://www.nysenate.gov/newsroom/articles/liz-krueger/answers-new-yorkers-concerned-or-confused-about-illegal-hotel-law. (Accessed 15 February 2018).
[25] As discussed below, occupational licensing may also have other objectives that are not achieved by trust mechanisms, e.g. political economy, and the restriction of supply to increase prices.
[26] Hall et al. "Occupational Licensing of Uber Drivers." Unpublished working paper presented at the ASSA 2018 Preliminary Program, 6 January, 2018.
[27] Furman, J. and Laura Giuliano. "New Data Show that Roughly One-Quarter of U.S. Workers Hold an Occupational License," 17 June, 2016, https://obamawhitehouse.archives.gov/blog/2016/06/17/new-data-show-roughly-one-quarter-us-workers-hold-occupational-license. (Accessed 4 December 2017).
[28] U.S. Department of the Treasury Office of Economic Policy, Council of Economic Advisors, and

occupational licensing has been associated with regulatory through-channels including increased costs for consumers, mobility restrictions, and lower wages for excluded workers.[29] One study estimated this burden as comprising an annual cost to consumers of $203 billion and 2.8 million fewer jobs.[30]

Trust mechanisms, where functioning successfully, may represent a cheaper and more effective way to ensure the quality and safety of services in certain marketplaces. However, there seem to be other relevant factors that determine whether this form of self-regulation is appropriate in a given marketplace, namely—

- **Does the trust mechanism collect and receive sufficient information about operators?** In order for the trust mechanism to replace the safety and quality assurance function of occupational licensing, sufficient feedback and information about past performance of operators is necessary. This suggests that regular contact with others is a bare minimum in order for trust mechanisms to operate effectively.

- **Does a platform effectively aggregate and display information about operators to allow consumers to make informed decisions about operators on the platform?** In order for the quality and safety of users on platforms to be assured, users should have some confidence that the platform is effectively and honestly collecting, aggregating and displaying information about operators on the platform.

- **What are the consequences of a failure to filter out substandard operators on a platform?** We may be less inclined to allow self-regulation by platforms in the case where operators have significant responsibilities for the health and safety of others, or where the consequences of error may be widespread or disastrous. As an example, we might be less inclined to rely on customer reviews when choosing a brain surgeon, where the consequences of failure could be fatal, as compared to a florist, where the consequences of failure may be more limited.

On the basis of this, we have sought to identify which currently licensed industries have the highest likelihood of having trust mechanisms effectively ensuring quality and safety in the future. The result is a 'regulatory substitution index', which also helps us estimate the dollar value of the regulatory burden that may be reduced in this context.

We attain a quantitative estimate of the regulatory burden online mechanisms' trust mechanisms may alleviate by utilizing recent data, existing research on the burden of licensing, and the findings of our primary research. To our knowledge, no existing exercise to quantify the potential for trust mechanisms to substitute for regulations exists. This means that the approach adopted in this report should be interpreted as a proof-of-concept calculation that lays the foundation for further work.

Our estimation methodology comprises four broad steps. **First, we build a new occupation-level dataset of job characteristics, regulatory burden, and the presence of trust mechanisms.** We do this by combining data from three sources:

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the Department of Labor. "Occupational Licensing: A Framework for Policymakers," July 2015, p. 17.

[29] Ibid.

[30] Kleiner, Morris M., Alan B. Krueger, and Alexandre Mas. "A Proposal to Encourage States to Rationalize Occupational Licensing Practices." *Paper submitted to the Brookings Institution, Washington, DC, April* (2011), p. 3.

- Time and fee burden estimates associated with 102 occupations compiled in late 2017 by the Institute of Justice in the second edition of their 'License to Work' report;[31]
- Job characteristics from the US Government's Occupational Information Network (**O*NET**) database;[32] and
- Hand-coded data on whether an occupation possesses an online platform.

Our rationale for using and combining data from the O*NET database and second License to Work report is that they are among the most comprehensive, recent, and high quality data relating to occupations and licensing burdens in the United States. O*NET comprises granular and regularly updated activity-level survey data for over 1,000 occupations developed under the sponsorship of the U.S. Department of Labor/Employment and Training Administration.[33] License to Work remains the only nation-wide study on the burdens of occupational licensing in the United States and is widely cited by academics and policymakers. For example, the FTC's former Acting Chair, Maureen K Olhausen, has even noted that "I have called for meaningful occupational licensing reform, often citing the Institute for Justice's original May 2012 License to Work report to back up my arguments."[34]

To illustrate the nature of these data, descriptive statistics for two frequently licensed occupations – taxis drivers and school bus drivers – are shown below in **Table 2**.

Second, we assess and rank the 'substitution potential' for each occupation on the basis of six dimensions from our data, summarized below at Table 3. The choice of these dimensions and their comparison benchmarks reflect our primary research findings (including stakeholder interviews) and the data in the previous step (as also noted in **Table 3**).

The creation of these variables allows for a category-by-category comparison of how amenable to substitution by trust mechanisms the licensed occupations in our dataset are. The best and worst professions in each category are available in **Appendix B** of this report.

However, we go further than this, and tentatively attempt an aggregation of these variables. That is, **the third step in our methodology is to combine these six dimensions into a "regulatory substitution index" with values for each occupation** that that range from 1.00 (most substitutable) to 0 (least substitutable). The full details of how we construct this index is described in **Appendix C** (which includes links to our data and STATA programs for replication).

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[31] Carpenter II, D.M., and Lisa Knepper. "License to Work: A National Study of Burdens from Occupational Licensing (2nd Edition)" *Institute for Justice Report*, November 2017.

[32] "O*NET Resource Center – Overview." O*NET Resource Center, https://www.onetcenter.org/overview.html. (Accessed 16 March 2018).

[33] "O*NET Resource Center – Overview." O*NET Resource Center, https://www.onetcenter.org/overview.html. (Accessed 16 March 2018).

[34] Ohlhausen, Maureen K. "Foreword – Institute for Justice," November 2017, http://ij.org/report/license-work-2/report/foreword/. (Accessed 20 March 2018).

Table 2: Selected data for taxi and school bus drivers

Variable	Taxi drivers 	School bus drivers 
No. of states licensed (2017)	16	51
Average fees ($) (2017)	$47	$112
Average calendar days lost to training (2017)	148	300
Mean exams	0	6
O*Net Job Zone (2016)	Job Zone One: Little or No Preparation Needed	Job Zone Two: Some Preparation Needed
Number employed (2016)	305,000	508,000
Performs or Works Directly with the Public (2016)	Yes	No
Responsible for others' health and safety (2016)	35% responded "Very high responsibility."	40% responded "Very high responsibility."
Consequence of error (2016)	Not reported	56% responded "Extremely serious."
Online platform exists?	Yes	No

*Source: License to Work v2. (2017), O*NET (2016), authors' primary research; image source: Getty Images.*

Table 3: Variables that are relevant to trust mechanisms potentially substituting for occupational licensing within a given occupation

Dimension/variable	Description and range	Interpretation
1. The occupation involves **working directly with the public** (a survey question O*NET)	Two categories (“**Yes”** or **“No”**)	Licensed occupations that **work directly with the public** (the variable = “**Yes**”) are more likely to be substitutable for trust mechanisms.
2. The occupation’s **consequence of error** (a survey question with a numerical response in O*NET)	Five categories ranging from “**Not serious at all**” to “**Extremely serious**” and proportional responses, including a weighted score out of five where 5 equals the highest possible consequence of error.	Licensed occupations with **less serious consequences of error** are more likely to be substitutable for trust mechanisms.
3. The occupation’s **responsibility for the health and safety of others** (a survey question with a numerical response in O*NET)	Five categories ranging from “**No responsibility**” to “**Extremely high responsibility**” and proportional responses, including a weighted score out of five where 5 equals the highest level of responsibility.	Licensed occupations with **less responsibility for others’ health and safety** are more likely to be substitutable for trust mechanisms.
4. The level of the occupation’s **contact with others** (a survey question with a numerical response in O*NET)	Five categories ranging from “**No contact with others**” to “**Constant contact with others**” and proportional responses, including a weighted score out of five where 5 equals the highest possible level of contact with others.	Licensed occupations with **more frequent contact with others** are more likely to be substitutable for trust mechanisms. This is because it could be difficult to collect feedback data for a mechanism if other human beings are not present for the whole time the occupation’s activity occurs.
5. The **presence of an online platform** where the occupation is offered on or supplied through (a hand-coded variable)	Two categories (“**Yes”** or “**No”**) with the name of the platform (e.g. “**Uber”**)	Licensed occupations with online platforms (the variable = “**Yes**”) are more likely to be substitutable for trust mechanisms.
6. Whether the online platform in category 5 is an **on-demand platform** (a hand-coded variable)	Two categories (“**Yes”** or “**No**) Example of “**Yes”**: Uber Example of “**No**”: Yelp	Licensed occupations with on-demand platforms (the variable = “**Yes**”) are more likely to be substitutable for trust mechanisms. This variable comes from a discussion we had with Professor Morris Kleiner, who noted that occupations with on-demand platforms (those with a labor spot market) may possess characteristics attractive for trust mechanisms to substitute for licensing, including the ability to collect information rapidly and regularly.

One notable feature of our index is that there are two conditions that we consider to be minimum qualifying standards for an occupation to be realistically able to substitute for an online platform's trust mechanism. These are:

1. The occupation involves **working directly with the public** (the rationale for this is the same as that noted in **Table 3**); and

2. The occupation **cannot have both:**
    a. An **"Extremely high"** or "**Very high"** responsibility for the safety of others; and
    b. An "**Extremely high**" or "**Very high**" consequence of error.

    This excludes the possibility of serious and significant consequences to users, as discussed in the brain surgeon example above.

Occupations that fail to satisfy these criteria have an index value set to 0.

A summary of our index for each occupation with non-zero index values is in **Figure 6**. The top ten occupations according to our index are shown below in **Table 4**.

Finally, the potential reduction in regulatory burden is computed on a dollar scale using our dataset using the formula

$$\text{Burden} = \sum_{i \in \text{Occupations}} \sum_{s \in \text{States}} \left(\begin{matrix} (\#\text{ of workers employed})_{s,i} \\ \times\ (\text{average fees})_{s,i} \end{matrix} \right).$$

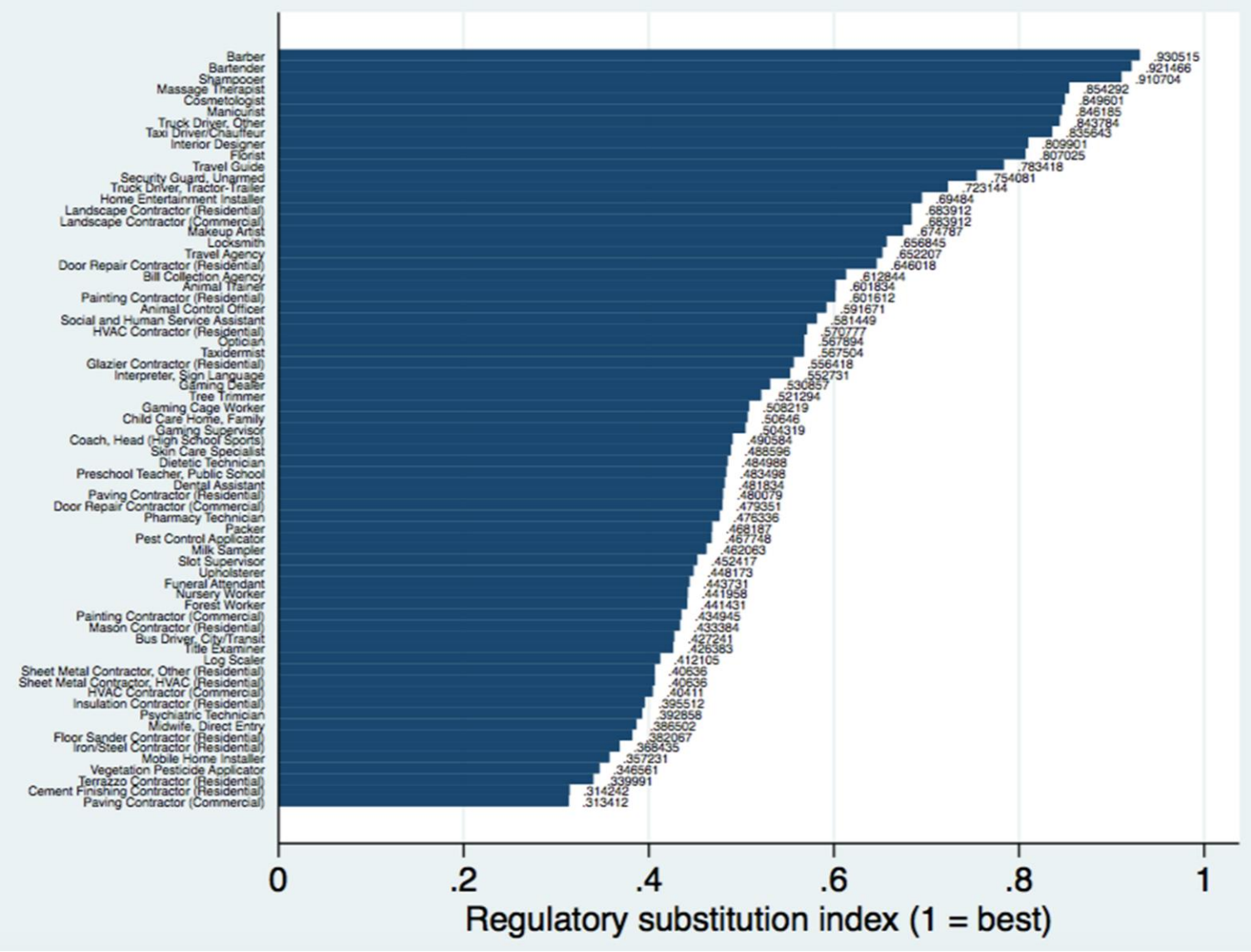
In words, our burden metric is the sum of the total licensing fees of workers across all occupations and all states, which can be interpreted as a lower bound on the point-in-time estimate of the economy-wide lifetime burden of licensing fees. This figure is an underestimate of the lifetime burden, as many licenses are not one-off and require renewal.

Table 4: The ten occupations with the highest "regulatory substitution index"

Occupation	Regulatory substitution index value (100 = perfect substitute)	Online platform exists? (with example)
1. Barber	93.05	Yes (Shortcut)
2. Bartender	92.15	Yes (Saucey)
3. Shampooer	91.07	Yes (GlamSquad)
4. Massage Therapist	85.43	Yes (StyleBee)
5. Cosmetologist	84.96	Yes (Vensette)
6. Manicurist	84.61	Yes (GlamSquad)
7. Truck Driver, Other	84.38	Yes (Uber Freight)
8. Taxi Driver/Chauffer	83.56	Yes (Uber)
9. Interior Designer	80.99	Yes (Homepolish)
10. Florist	80.70	Yes (BloomNation)

*See **Appendix C** for the full list.

Figure 6: Summary of substitution index values for occupations with non-zero index values



Data for average licensing fees for a given occupation-state[35] pair come from License to Work, and data on the number of workers employed in an a given occupation-state pair come from The US Bureau of Labor Statistics' Occupational Employment Statistics.[36] For a given set of occupations, the number arising from this formula can be interpreted as the maximum saving in total fees that could arise from workers not having to register for a license as a result of being able to use an online platform (and its trust mechanism instead) instead.

We calculate the potential reduction regulatory burden for three sets of occupations:

1. **Occupations that already have on-demand online platforms at the time of writing**. We consider this to be a 'lower-end' estimate of the maximum 'short-run' reduction in burden arising from the trust mechanisms that exist today. This number can be thought of as answering the question, "What would be savings be for workers if all taxi drivers, and other occupations in similar circumstances, avoided licensing fees by switching to Uber (and other similar platforms) today?"

2. **Occupations that have non-zero values in our regulatory substitution index.** We interpret this as our 'higher-end' estimate of the maximum 'long-run' reduction in regulatory burden that would arise if all of the occupations that could potentially substitute licensing for trust mechanisms did so.

3. **Occupations in top 50% of index scores for those occupations that have non-zero values in our regulatory substitution index**. This estimate is a "medium-run" estimate between the first two categories.

The results of these calculations are shown below at **Table 5**.

Table 5: Burden calculations for our three scenarios

Occupation set/scenario	Maximum potential reduction in regulatory burden ($)
(Short-run/Low) Occupations that already have on-demand online platforms at the time of writing	$794m
(Medium-run/Medium) Occupations in top 50% of index scores for those occupations that have non-zero values in our regulatory substitution index	$1.26bn
(Long-run/High) Occupations that have non-zero values in our regulatory substitution index	$1.94bn

[35] We thank a staff member from the FTC's Bureau of Economics who kindly offered comments on an earlier version of this chapter and helpfully pointed out that state-level data was available and would result in less bias than an earlier national-level calculation we attempted.

[36] U.S. Bureau of Labor Statistics. "Occupational Employment Statistics – May 2016 National Occupational Employment and Wage Estimates United States." Data download on XLS file from https://www.bls.gov/oes/current/oes_nat.htm#00-0000. (Accessed 24 March 2018).

On just the basis of reduced fees, the potential reduction in regulatory burden from online platforms' trust mechanisms is large and in excess of a billion dollars in two of three scenarios. Although this is noticeably smaller than the $200bn back-of-the-envelope calculation in Kleiner, Kruger, and Mass, [37] our estimate should be interpreted in light of the following facts:

- **Our calculations do not take into account the opportunity cost of days lost**. Doing so markedly increases the burden estimate. The data allow for a rough back-of-the-envelope calculation of this because the License to Work data includes a 'days lost' variable for each occupation. Assuming that half of the lost days have an opportunity cost of the 2017 median daily wage ($123) results in an aggregate burden for our 'short-run' calculation of around $61bn ((0.992m hours*0.5 of these*123 dollars in fees on average)).

- **Our estimate fails to take into account other benefits associated with trust mechanisms.** These include market growth and the superior targeting of government spending and are discussed below.

- **Not all occupations may have licensing replaced by trust mechanisms**, as reflected in the occupations that have their index values set to zero.

Further details (including the underlying data) are available at **Appendix E**.

[37] Kleiner, Morris M., Alan B. Krueger, and Alexandre Mas. "Occupational Licensing Practices," p. 3.

Market size and economic welfare

The core purpose of trust mechanisms, if effectively designed and implemented, is that they allow businesses to overcome the trust problem of online exchange and enable transactions to occur over the platform. A key question is whether these transactions grow the overall market, both in terms of transaction volume and value, and how this impacts consumer and producer surplus.

In terms of market volume, there are two possibilities:

1. **Substitution of transactions:** Transactions on online platforms enabled by trust mechanisms displace transactions that would have occurred offline in businesses using traditional business models.

2. **Addition of transactions***:* Exchange on online platforms enabled by trust mechanisms is so convenient, inexpensive or otherwise preferred over traditional business activity that there is overall growth in the market, brought about by new market participants or increased volume of activity by existing market participants.

For any given platform or industry, it is likely that both explanations will hold true to some extent. Thus, what determines whether online platforms enabled by trust mechanisms contribute to market growth is which of these two effects dominate in a given industry subject to disruption by online platforms.

There are several reasons to believe that the additionality effect may dominate in many industries, leading to an increase in overall quantity of transactions, including

- Online platforms tend to reduce search costs for consumers and therefore increase the likelihood that the marginal benefit of a purchase exceeds the marginal cost and thus increasing demand,[38] and

- Online platforms seems to lower the cost of bringing an asset to market,[39] increasing the supply in an industry and lead to an increase in total transactions.

Given that online platforms are likely to increase demand, the overall impact on prices, consumer surplus and producer surplus depends on the relative impacts. In terms of prices, there is some evidence, based on studies of ecommerce websites, that online platforms tend to reduce the price of goods and services compared to offline markets.[40] This would also suggest that the overall impact on consumer surplus was positive (with the impact on producer surplus ambiguous). However, recent research suggests that the impact of platforms on prices varies substantially between sectors, retailers and geographic markets, with 72% of goods in a recent sample having the same price online as in brick-and-mortar retailers.[41]

Despite mixed evidence of the impact of online platforms on prices, there have been several studies to suggest that the overall impact of platform entry into markets is an enhancement of welfare. One study found that peer-to-peer markets for durable goods, enabled by trust mechanisms, increase consumer surplus by 0.8% to 6.6%.[42] In the accommodation market, recent research on the ten largest US cities by penetration of Airbnb found that the entry of the platform increased total welfare by $352 million (around $70 per night booked on the platform).[43] The entry of Uber and Lyft in New York was found to have a welfare gain of 72 cents per dollar spent on the platform.[44] This welfare gain seems to be concentrated among consumers, with each dollar spent on Uber found to have generated $1.60 in consumer surplus in the four major US cities in 2015.[45]

Overall, early evidence suggests that trust mechanisms enable the growth of online platforms, which has had substantial positive welfare implications on many of the industries disrupted. However, these welfare implications appear to vary by industry, and thus we must be careful in applying these results more broadly to new industries being impacted by platform entry.

Superior targeting of government spending

Aside from regulating trust mechanism use in markets, government may also wish to make active use of trust mechanisms to improve public policy. There have been several applications of government using the

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[38] Goldmanis, Maris, Ali Hortaçsu, Chad Syverson, and Önsel Emre. "E-commerce and the Market Structure of Retail Industries." *The Economic Journal* 120, no. 545 (2010): 651-682.
[39] Horton, John J., and Richard J. Zeckhauser. *Owning, Using and Renting: Some Simple Economics of the" Sharing Economy"*. No. w22029. National Bureau of Economic Research, 2016.
[40] Lieber, Ethan, and Chad Syverson. "Online versus offline competition." *The Oxford handbook of the digital economy*(2012): 189.
[41] Cavallo, Alberto. "Are online and offline prices similar? evidence from large multi-channel retailers." *American Economic Review* 107, no. 1 (2017): 283-303.
[42] Fraiberger, Samuel P., and Arun Sundararajan. "Peer-to-peer rental markets in the sharing economy." Forthcoming. (2015).
[43] Farronato, Chiara, and Andrey Fradkin. *The welfare effects of peer entry in the accommodation market: The case of airbnb*. No. w24361. National Bureau of Economic Research, 2018.
[44] Lam, Chungsang Tom, and Meng Liu. "Demand and Consumer Surplus in the On-demand Economy: The Case of Ride Sharing." Working paper. (2017).
[45] Cohen, Peter et al. *Using big data to estimate consumer surplus: The case of uber*. No. w22627. National Bureau of Economic Research, 2016.

informational content from trust mechanisms (particularly reviews and ratings) to better target government activities.

Ratings and textual content from Yelp has been shown to have strong predictive power on the hygiene inspection outcomes for restaurants.[46] A learning model using Yelp data was found to predict severe hygiene offenders with 82% accuracy, suggesting that inspection activity and public disclosure policy may be improved by mining public opinions from informational content collected in the trust mechanisms of online platforms.

Similarly, the Behavioural Insights Team in the United Kingdom has used data collected in the trust mechanism employed by a medical bookings platform for the National Health Services (NHS Choices) to identify with 95% accuracy doctor's surgeries that would fail random health inspections.[47] Yelp data have also been used with some success to predict changes in local economic activity, like business openings and closures, without incurring the cost of traditional data collection and surveying.[48] However, shortcomings of this approach have also been identified, with the data from online platforms found to be most informational in denser, wealthier and more educated areas.[49]

New creative applications of data collected via trust mechanisms are likely to be found, offering governments more ways to target spending in the future. This could either serve to create savings for taxpayers or improve the quality of existing government programs.

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[46] Kang, Jun Seok, Polina Kuznetsova, Michael Luca, and Yejin Choi. "Where not to eat? Improving public policy by predicting hygiene inspections using online reviews." In *Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing*, pp. 1443-1448. 2013.

[47] The Behavioural Insights Team. "Using Data Science in Policy," 14 December, 2017, report available at: behaviouralinsights.co.uk/publications/using-data-science-in-policy/.

[48] Glaeser, Edward L., Hyunjin Kim, and Michael Luca. *Nowcasting the Local Economy: Using Yelp Data to Measure Economic Activity*. No. w24010. National Bureau of Economic Research, 2017.

[49] Ibid.

The harms of trust mechanisms

The rising prominence of trust mechanisms in online commerce has also brought about harms to consumers and businesses in some markets. In the **Background** section above, we discussed some specific, high-profile examples of problems that trust mechanisms have caused in the last twelve months. In this section, we will discuss methodically the different forms of harm that trust mechanisms may bring about and what challenges these harms present to regulators.

Strategic manipulability

As the name suggests, the goal of trust mechanisms is to improve trust in online marketplaces. This suggests that the integrity of the data collected and displayed through trust mechanisms may be of high concern to effective market functioning. The strategic incentives of various market participants may pose a threat to the integrity of trust mechanisms.

There are three key groups that may have an incentive to manipulate trust mechanisms: sellers of online goods and services; buyers of goods and services; and platforms themselves. We consider each in turn.

1. **Sellers of goods and services in online platforms**
   Vendors in online platforms would like to present a more positive image of themselves than other users might provide (for example, higher ratings or more glowing reviews). A 2009 study of reviews on Amazon, iTunes and Vanno (a now defunct company reputation website) found that between 20% and 47% of reviews on the platforms showed evidence of manipulation, with this proportion varying both by platform and by product on a platform.[50] A recent study suggests that Amazon's fake review problem has only worsened in recent months, despite the platform taking steps to ban vendors from incentivizing reviews on the site.[51] However, there is evidence to suggest that the incidence of vendor manipulation of trust mechanisms seems to be worse on platforms that allow anyone to submit data (as opposed to those that allow only customers to review).[52] On Yelp, firms with a weak reputation or facing high levels of competition have been found to be more likely to commit review fraud.[53] Firms have been known to resort to extreme measures in some cases, with small businesses like the one illustrated in **Figure 7** allegedly operating as rankings manipulation services.[54] The mattress firm Casper resorted to legal action against an online review platform in 2017 due to what it perceived to be unfair rankings and

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[50] Kornish, Laura J. "Are user reviews systematically manipulated? Evidence from the helpfulness ratings." *Leeds School of Business Working Paper* (2009).
[51] Woolacott, Emma. "Amazon's Fake Review Problem Is Now Worse Than Ever, Study Suggests." *Forbes*, 9 September, 2017, https://www.forbes.com/sites/emmawoollacott/2017/09/09/exclusive-amazons-fake-review-problem-is-now-worse-than-ever/#429dfc497c0f. (Accessed 14 February 2018).
[52] Mayzlin, Dina, Yaniv Dover, and Judith Chevalier. "Promotional reviews: An empirical investigation of online review manipulation." *American Economic Review* 104, no. 8 (2014): 2421-55.
[53] Luca, Michael, and Georgios Zervas. "Fake it till you make it: Reputation, competition, and Yelp review fraud." *Management Science* 62, no. 12 (2016): 3412-3427.
[54] Tweedie, Steven. "This disturbing image of a Chinese worker with close to 100 iPhones reveals how App Store rankings can be manipulated." *Business Insider,* 11 February, 2015, http://www.businessinsider.com/photo-shows-how-fake-app-store-rankings-are-made-2015-2 (Accessed 25 March 2018).

Figure 7: Image of an alleged app store ranking manipulation service

Image Source: Weibo

ultimately paid for its acquisition.[55] One hotel has threatened to fine guests who post negative reviews of their stay online.[56] Where identified, vendor manipulation may lead to countervailing responses by users and corrective action by platforms.

2. **Buyers of goods and services on platforms**
   In online platforms where the reputation of buyers is a concern, buyers may have an incentive to misreport information in a trust mechanism. One cause is the opportunity for retaliatory feedback, estimated to comprise around 1.2% of mutual feedback data on eBay in 2013.[57] However, this may underestimate the degree that retaliation affects the integrity of trust mechanism, with a laboratory experiment on Airbnb suggesting the *threat* of retaliatory feedback is a significant driver of upward bias in reviews.[58] Because social interaction often occurs as a side-product to the main transaction on online platforms, socially-induced reciprocity may also affect the information provided to trust mechanisms. Together, the threat of retaliatory feedback and socially-induced reciprocity effects are estimated to upwardly bias around 15% of reviews on Airbnb.

3. **The platform itself**
   Online platforms may also face incentives to manipulate their own trust mechanisms. Yelp has been accused of giving preferential treatment in their algorithm to businesses who advertise with them, including hiding unflattering reviews and altering star ratings. Although an empirical study of Yelp reviews found no evidence to suggest advertisers were treated differently to non-advertisers on the platform,[59] these

[55] McKay, Tom. “Mattress Startup Casper Sued a Mattress Review Site, Then Paid for Its Acquisition.” *Gizmodo*, 24 September, 2017, https://gizmodo.com/mattress-startup-casper-sued-a-mattress-review-site-th-1818703265. (Accessed14 February 2018.)

[56] Alter, Charlotte. 2014. ‘”Historic’ inn charges $500 per negative online review.” *Time*, 4 August, 2014, http://time.com/3079343/union-street-guest-house-negative-review/ (Accessed 14 February 2018).

[57] Bolton, Gary, Ben Greiner, and Axel Ockenfels. "Engineering trust: reciprocity in the production of reputation information." *Management science* 59, no. 2 (2013): 265-285.

[58] Fradkin, Andrey. "Search, matching, and the role of digital marketplace design in enabling trade: Evidence from airbnb." Working paper. (2017).

[59] Luca, Michael. "Reviews, reputation, and revenue: The case of Yelp. com." (Working Paper) (2016).

accusations do demonstrate the theoretical possibility of an incentive for platforms to bias trust mechanisms in certain circumstances. Competition between platforms may also generate a similar incentive – for example, if Platform A seeks to claim that their average service level is better than Platform B's then Platform A may seek to inflate their overall ratings artificially. Because there is usually substantial proprietary data underlying trust mechanisms, it will be difficult to tell in many circumstances whether any such tactics are being employed by firms. On the other hand, competition between firms for users may mediate this effect.

These three sources of strategic manipulation in trust mechanisms are likely to lead to diminution of informed choice and may therefore pose a threat to consumer welfare. However, there are several mitigating arguments to consider, including:

- The possibility that consumers are aware of possible strategic biases and factor these into their purchasing decisions;
- Reversion to the mean – where a large amount of information is collected about participants, individual instances of manipulation are less likely to impact aggregate reviews; and
- Market forces which may offset the effect of strategic manipulation – for instance, unhappy buyers tricked by positive reviews may feel a greater responsibility to leave negative reviews in response.[60]

Despite these arguments, ensuring that an accurate information is provided to users at the point of sale is likely to be in the public interest. Around half of Americans who read online reviews say they "generally give an accurate picture of the true quality of the product" and some 82% of Americans check online reviews before purchasing a product for the first time.[61] Supporting informed choice by consumers may require government intervention to lower the risk and incidence of strategic manipulation.

Discriminatory behavior

Discrimination is a concern in all marketplaces, and there is good reason to worry that new technologies, like trust mechanisms, open up new modes for discriminatory behavior. In a recent study on Airbnb, guests with names perceived to be African-American were found to be 16% less likely

to be accepted by vendors than guests with names perceived to be characteristically white.[62] On Uber, the cancellation rate for drivers with names perceived to be African-American has been found to be around twice as high as the cancellation rate for perceived white-sounding names.[63]

[60] Some evidence for this effect in online forums has been presented in Dellarocas, Chrysanthos. "Strategic manipulation of internet opinion forums: Implications for consumers and firms." *Management science* 52, no. 10 (2006): 1577-1593.

[61] Smith, Aaron and Monica Anderson. "Online Shopping and E-Commerce." *Pew Research Center*, 19 December, 2016, http://www.pewinternet.org/2016/12/19/online-shopping-and-e-commerce/. (Accessed 20 February 2018).

[62] Edelman, Benjamin, Michael Luca, and Dan Svirsky. "Racial discrimination in the sharing economy: Evidence from a field experiment." *American Economic Journal: Applied Economics*9, no. 2 (2017): 1-22.

[63] Ge, Yanbo, Christopher R. Knittel, Don MacKenzie, and Stephen Zoepf. *Racial and gender discrimination in transportation network companies*. No. w22776. National Bureau of Economic Research, 2016.

Figure 8: Protest against alleged discriminatory behavior on Uber

Image Source: United for Equal Access NY

While these discriminatory outcomes are concerning, it is not immediately clear that trust mechanisms are the cause of them. For instance, on Uber, which uses a matching algorithm which is blind to gender, male drivers have been found to earn 7% more than female drivers, but this gap is driven by differential levels of experience, preferences over when/where to work and preferences for driving speed.[64] Additionally, discriminatory behavior has existed in marketplaces well before online platforms.

However, there are several reasons to believe that trust mechanisms may open up a new and concerning medium of discrimination:

- **There is evidence of discrimination in ratings on some online platforms**. On the casual labor site TaskRabbit, women have been shown to receive 10% fewer reviews than men.[65] On Fiverr, black workers are found to receive 32% fewer reviews than white workers and have an average star rating 9% lower. Combined with evidence that ratings and review numbers both contribute to higher earnings on platforms where users initiate matchings,[66] this would suggest worse outcomes for women and black workers on these platforms.

- Where trust mechanisms are used by platforms to determine qualifications, bans or matches for their users, **nondiscriminatory practices within companies may become discriminatory**.[67] For example, Rosenblat et al. write

  "Uber's rating system may, thus, present a facially neutral route for discrimination to "creep in" to employment decisions.

  Through a rating system, consumers can

[64] Cook, Cody, Rebecca Diamond, Jonathan Hall, John List, and Paul Oyer. *The Gender Earnings Gap in the Gig Economy: Evidence from over a Million Rideshare Drivers*. No. 00634. The Field Experiments Website, 2018.
[65] Hannák, Anikó, Claudia Wagner, David Garcia, Alan Mislove, Markus Strohmaier, and Christo Wilson. "Bias in Online Freelance Marketplaces: Evidence from TaskRabbit and Fiverr." In *CSCW*, pp. 1914-1933. 2017.
[66] See, for example, Luca, Michael. "Reviews, reputation, and revenue: The case of Yelp. com." (Working Paper) (2016).
[67] Rosenblat, Alex, Karen EC Levy, Solon Barocas, and Tim Hwang. "Discriminating Tastes: Uber's Customer Ratings as Vehicles for Workplace Discrimination." *Policy & Internet* 9, no. 3 (2017): 256-279.

directly assert their preferences and biases in ways that companies would be prohibited from doing directly. In effect, companies may perpetuate bias without being liable for it, as the grounds for firing or "deactivating" a particular driver may be derived from a large corpus of systemically biased consumer ratings."

Platforms themselves may not be legally liable for discriminatory outcomes in this case, which may lower the incentive to debias their platforms.

A number of platforms have moved to remove or lower discriminatory behavior by redesigning elements of their trust mechanism. For instance, Airbnb has changed the way that reviews and information are presented in an attempt to lower discrimination on their platform.[68] Still, regulators should be aware of the potential for trust mechanisms to bring about new forms of discriminatory behavior in markets.

Imperfections in trust mechanisms

Several other imperfections in trust mechanisms has been identified. Some of the main ones include:

- **Selection bias –** contribution to optional trust mechanisms may be thought of as a public good problem,[69] and therefore may be subject to freeriding. This is particularly the case for optional trust mechanisms which are burdensome for contributors. The result may be that only very motivated users, and in particular those with very good or very bad experiences, may contribute to the trust mechanism, leading to a bias towards extremes. On the other hand, contributions to trust mechanisms which are exclusive to market participants are also likely to be generally biased toward positive experiences because the types of people who contribute have demonstrated themselves as people inclined to purchase that kind of good or service. This often leads to a J-shaped distribution of data, and has been found to negatively impact product demand, firm profit and consumer surplus in such industries[70].

- **Cold start –** in many trust mechanisms, the online platform has no information to display about new users, which may put them at a disadvantage compared to established users on the platform. There is significant evidence that users depend both on informational content and the number of reviews when making ecommerce transactions.[71] For example, on Airbnb, there is a significant positive association between the number of months of membership on the platform and the price charged by vendors.[72] However, goods and

[68] McGee, Chantel. "How Airbnb's redesign aims to combat discrimination on the service." *CNBC*, 8 April, 2017, https://www.cnbc.com/2017/04/07/airbnb-experimenting-with-site-design-to-fight-discrimination.html.(Accessed 14 February 2018.)
[69]Resnick, Paul, and Richard Zeckhauser. "Trust among strangers in Internet transactions: Empirical analysis of eBay's reputation system." In *The Economics of the Internet and E-commerce*, pp. 127-157. Emerald Group Publishing Limited, 2002.
[70] Hu, Nan, Paul A. Pavlou, and Jie Zhang. "On self-selection biases in online product reviews." *MIS Quarterly* 41, no. 2 (2017): 449-471.
[71] Flanagin, Andrew J., Miriam J. Metzger, Rebekah Pure, Alex Markov, and Ethan Hartsell. "Mitigating risk in ecommerce transactions: perceptions of information credibility and the role of user-generated ratings in product quality and purchase intention." *Electronic Commerce Research* 14, no. 1 (2014): 1-23.
[72] Teubner, Timm, Florian Hawlitschek, and David Dann. "PRICE DETERMINANTS ON AIRBNB: HOW REPUTATION PAYS OFF IN THE SHARING

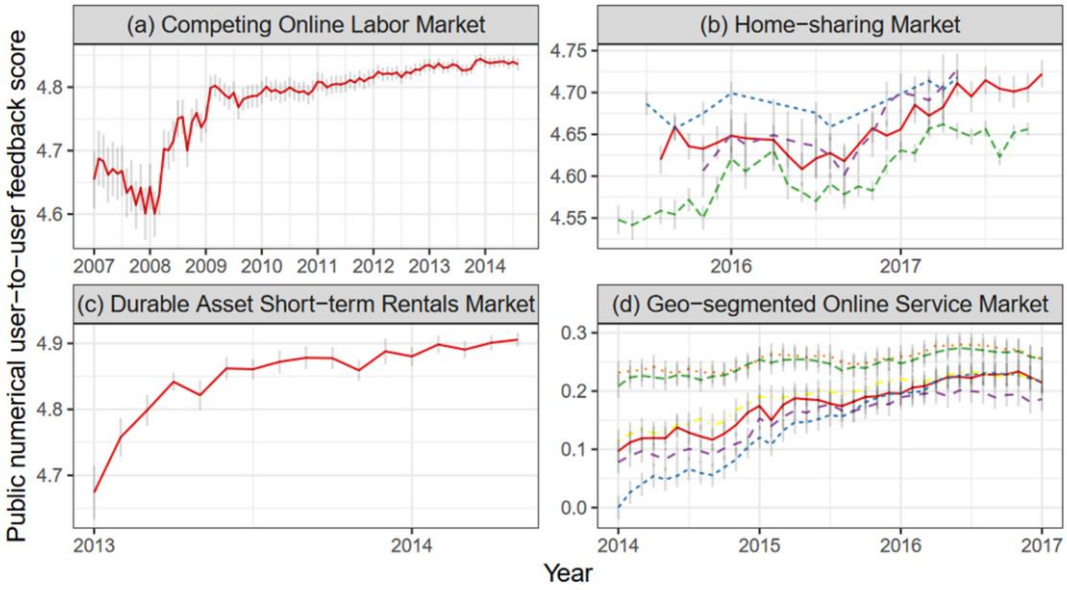
services with little data are found to have a weaker relationship between rating and other more objective measures of quality.[73]

- **Final period problem –** concern for future reputation is less likely to be a motivator for users who intend to leave a platform in the near future. As a result, we may expect to see a decline in service quality prior to platform exit. For example, sellers leaving eBay have 25% more negative reviews in final week of trading than their long-term averages.[74]

- **Reputation inflation –** over time, user responses to trust mechanisms may change for a variety of reasons. There is evidence that the average rating on star rating platforms increases over time, an effect referred to as 'reputation inflation'.[75] **Figure 9** illustrates this effect on a number of online platforms. The result may be that that informativeness of the reputation mechanism as a whole diminishes over time. This may be due to pressure on users to leave above average feedback out of fear of retaliation.

These imperfections vary in magnitude depending on the type of trust mechanism used which makes the design choices of online platforms particularly consequential for user welfare

Figure 9: Reputation inflation in platform markets



Source: Filippas, Apostolos, John Horton, and Joseph M. Golden. Reputation in the Long-Run. No. 6750. CESifo Working Paper, 2017.

ECONOMY." *Journal of Self-Governance & Management Economics* 5, no. 4 (2017).

[73] De Langhe, Bart, Philip M. Fernbach, and Donald R. Lichtenstein. "Navigating by the stars: Investigating the actual and perceived validity of online user ratings." *Journal of Consumer Research* 42, no. 6 (2015): 817-833.

[74] Cabral, Luis, and Ali Hortacsu. "The dynamics of seller reputation: Evidence from eBay." *The Journal of Industrial Economics* 58, no. 1 (2010): 54-78.

[75] Filippas, Apostolos, John Horton, and Joseph M. Golden. *Reputation in the Long-Run*. No. 6750. CESifo Working Paper, 2017.

Assessing the costs and benefits of trust mechanisms

As we have demonstrated, the benefits associated with trust mechanisms enabling new business models may be substantial. Consumers, businesses and governments are all likely to enjoy increased economic activity and better quality goods and services enabled by new technology. Despite this, there are new harms to consumer welfare and competition that are made possible by trust mechanisms, and the costs of these may also be substantial.

In many cases, it is in the platform's interest to minimize the potential for harm caused by their trust mechanisms. Market forces may incentivize businesses to act against discriminatory behavior, for example, or to minimize some of the biases and imperfections that may exist in their trust mechanisms. In these cases, the argument for regulatory action is weaker – collaboration with online platforms may be the major role for government regulators.

However, there are some cases where market forces alone may be insufficient to force action to reduce harms. Incentives for some platforms to manipulate their trust mechanisms for strategic or competitive gains seem particularly concerning. Instances where platforms benefit from reducing informed choice to consumers may also present a case for intervention.

We believe the overarching goal for regulators should be to minimize the potential costs associated with trust mechanisms, while maximizing the upside. In the following chapter, we discuss steps regulators can take to achieve this.

Recommendations

Key takeaways

Consumer-facing recommendations:
1. Regulators should investigate the development of an online database of information about the characteristics and function of trust mechanisms employed by platforms.
2. Regulators should require businesses to make public information about the characteristics and function of trust mechanisms employed on their platform.

Business-facing recommendations:
3. Regulators issue guidelines via its Business Center to businesses concerning how to minimize potential harms caused by trust mechanisms in online platforms.

Recommendations for government relationships:
4. (In respect to occupational licensing) Regulators write to state and local authorities about appropriate ways to minimize regulatory burden in the face of trust mechanisms.
5.(In respect to better targeting government policy) Regulators should investigate areas where consumer protection activities could be better targeted using data from trust mechanisms.

The broad implications of our findings for our report's recommendations

Two stylized facts emerged from our analysis that are consequential for all of the recommendations that follow. These are:

1. **There is (probably) no such thing as a single "perfect" or "optimal" trust mechanism that applies to a given industry or an online platform within it**. Rather, as shown by our classification schema and field research, a wide variety of mechanisms exist within and across industries. These each have their strengths and weaknesses in solving the trust problems a particular online platform faces. This implies that specific mechanism design rules or mandates may be extremely difficult, if not impossible, to compose.
2. **Although all trust mechanisms have imperfections, it is not always clear that a market failure exists in regards to correcting them.** In many cases, platforms' incentives are well-aligned to address these. For example, to incentivize honest and combat retaliatory reviews, Airbnb amended its trust mechanism to include a 'double-blind' review policy in July 2014,[76] and many platforms have in-house teams and procedures for removing fake reviews.[77] A number of existing laws, such as the Consumer Review Fairness Act passed in 2016, also address these issues. Similarly, other imperfections such as 'reputation inflation'[78] are recently documented phenomenon. Regulatory interventions in some areas may thus run the risk of being

[76] "Building trust with a new review system." *Airbnb Blog,* 10 July, 2014, https://blog.atairbnb.com/building-trust-new-review-system/. (Accessed 16 December, 2017).

[77] See **Appendix A** for several examples of these.

[78] Horton, John, and Joseph Golden. "Reputation inflation: Evidence from an online labor market." *Working Paper, NYU* (2015).

premature or inferior to what platforms may produce on their own.

Nevertheless, we believe there are a number of valuable areas where regulators can and should act to facilitate and encourage the healthy development and use of trust mechanisms in line with its mission. These are discussed below.

Guidance for regulating trust mechanisms

We evaluated policy options related to trust mechanisms using several criteria which are relevant for consideration by business regulators:

1. *Likelihood to reduce potential for harm to consumers on platforms* – we seek regulatory interventions that show real promise of improving consumer outcomes on platforms;

2. *Ability to allow for and promote platform competition* – we seek policies that do not constrict competition between platforms and do not entrench unfair competitive advantages;

3. *Level of burden for platform* – we seek to minimize red tape and ensure that the benefits of any policy proposals outweigh the burden imposed on businesses; and

4. *Support for economic growth and success of platform markets* – we seek policies that support the economic benefits of trust mechanisms.

We have also taken into account the three elements of Moore's strategic triangle – the authorizing environment, operational capacity, and the creation of value.[79] This suggests a fifth criteria:

5. *Political and operational feasibility* – we seek policy changes that are implementable – both in the political context of regulators and taking into account their operational capabilities.

We have developed our policy proposals in response to the challenges identified in the previous sections, and have informed them on the basis of discussions with businesses and policy-makers, and other field research. Our recommendations fall into three categories: those geared towards consumer welfare, businesses and government. These, are summarized and discussed below.

Consumer-facing recommendations

We see one of the key challenges facing consumers as the lack of information that consumers have access to regarding the characteristics and function of trust mechanisms in online platforms. As discussed above, one of the key causes of this is a lack of transparency on the part of online platforms, and this may be an area in which the strategic interests of platform businesses and consumer welfare are aligned. Greater awareness and transparency would help address the potential harms which may not be in the platform's own interest to address. Our first recommendations address this problem.

Addressing a lack of transparency – options considered:

1. No change;
2. *Regulators to develop and make available for public consumption a*

[79] Moore, Mark Harrison. *Creating public value: Strategic management in government*. Harvard University Press, 1995.

database of information about trust mechanisms employed by platforms;

3. *Regulators to require businesses to publicize information about the trust mechanisms employed on their platforms, including their characteristics and function.*

We believe that the no change option is insufficient to reduce the potential of harm to consumers. With trust mechanisms playing an increasingly influential role in the economy, a continued lack of transparency regarding the trust mechanisms enabling these transactions may lead to irreversibly negative consequences for the evolution of online marketplaces. We also note that a continued lack of transparency may also hinder competition of platforms on the basis of trust mechanisms. We thus do not recommend the no change option.

Recommendation 1

We do recommend that regulators investigate the development of an online database of information about the characteristics and function of trust mechanisms employed by platforms. We believe that consumers would benefit from data on the characteristics of trust mechanisms on platforms, including an assessment of the potential to be manipulated and information about complaints regarding the platform's trust mechanism. This would allow consumers to make more informed choices in online marketplaces. We also believe that regulators are well-placed to provide this data in an objective and fair way between platforms. **Appendix C** contains an example of what data would be displayed as part of this database.

Recommendation 2

We do recommend that regulators require businesses to make public information about the characteristics and function of trust mechanisms employed on their platform. Even under a model where regulators publicize data, there would still need to be a requirement for transparency, as some aspects (particularly regarding the ownership and use of trust mechanism data) are not currently available from many platforms. We believe that the minimum requirement for publication should be the information included in the example database entry in **Appendix C**.

Business-facing recommendations

As discussed above, there are a number of potential harms of trust mechanisms which businesses may already be motivated to address. However, there may be a lack of information in some businesses, particularly startups, as to the best way to address these problems (or of the hidden costs and unintended consequences of leaving them unaddressed). It is in the interests of both consumers and businesses to improve the function of trust mechanisms, and we believe that regulators may effectively play an informational and advocacy role in this process.

Improving trust mechanisms employed by businesses – options considered:

1. No change.
2. Development of ISO standard(s) for trust mechanisms.
3. *Regulators to issue guidance to businesses concerning how to minimize potential harms, including how to combat fake reviews and prevent discrimination.*

We do not recommend the no change option as there may be a lack of information in some platforms as to how to protect their platforms from problems like fake reviews and discriminatory behavior. In addition, providing advice on these topics places the responsibility of action squarely on the platform to improve their trust mechanisms.

We also do not recommend the development of an ISO standard for trust mechanisms. This is a current proposal of the European Commission with a committee at the International Organization for Standardization currently investigating standard principles and requirements for the collection, moderation and publication of online reviews, to be codified in ISO/FDIS 20488.[80] We believe that an ISO standard would not be sufficiently flexible to cater the different kinds of trust mechanisms in the market, as described in **Chapter 2** above. In particular, since trust mechanisms may act as a medium for competition in some industries, the requirement for a standardized trust mechanism may inhibit competition in those markets. An ISO standard is also likely to be overly burdensome for many platforms given the heterogeneity of trust problems that they may seek to solve, which may apply even within an industry (as discussed in **Chapter 2** and shown in our field research).

Recommendation 3

We recommend that regulators issue guidelines to businesses concerning how to minimize potential harms caused by trust mechanisms in online platforms. Guidelines could be developed on a number of topics, including how to maximize informativeness, prevent reputation inflation, and discriminatory behavior. Five principles based upon our mechanism classification scheme in **Chapter 2** and the associated platform profiles (**Appendix A**) that could be included in such guidelines are:

- **Know what your [the platform's] design goals are.**
- **There are many ways to generate trust.**
- **Different parties may have different incentives.**
- **It's not always a good idea to copy other companies.**
- **Let people speak honestly about your products and their experience with your company.**

Recommendations for government relationships

Some government practices may benefit from change in the face of trust mechanisms. As highlighted above, the economy stands to benefit from a substantial decrease in regulatory burden due to a lowered need for occupational licensing in some industries.

Occupational licensing – options considered

1. No action.
2. *Regulators to write to state and local authorities about areas in which occupational licensing laws could be weakened in response to the emergence of trust mechanisms.*

Given the substantial economic benefits that decreased regulatory burden of occupational licensing may provide, we do not recommend regulators take no action with respect to occupational licensing.

Recommendation 4

We do recommend that regulators write to state and local authorities about appropriate ways to minimize regulatory burden in the face of trust mechanisms. Because state and local authorities often have jurisdiction for most forms of occupational licensing, there are limited ways regulators can unilaterally change the regulatory burden in affected industries. However, regulators could be a powerful voice for change in some states and heighten the

[80] International Organization for Standardization. "ISO/FDIS 20488: Online consumer reviews -- Principles and requirements for their collection, moderation and publication." Available at: iso.org/standard/68193.html. (Accessed 15 February 2018.)

prominence of this issue in the minds of voters. The political forces protecting occupational licensing in some industries are significant, but the economic impact is so substantial that reform efforts are warranted.

Targeting government policy – options considered

1. No action.
2. *Investigate areas where regulators' activities could be better targeted using data from trust mechanisms.*

There are few downsides to experimentation with better targeted government activities, and so we do not recommend the no action option here.

Recommendation 5

We do recommend that the regulators should investigate areas where their activities could be better targeted using data from trust mechanisms. For example, data from online company review sites could be used to inform surveillance activities targeted at identifying scammers.

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Appendix A.1 – Online retail platform profiles

		Amazon (Marketplace)	eBay	Etsy	Jet.com	eBid
	Description	Fixed-price marketplace where 3rd-party sellers sell to all Amazon customers	One of the world's first online auction and fixed-price marketplaces	Marketplace focused on handmade and vintage goods like art and jewellery	E-commerce site with a focus on consumer discounts; has a retail partnership program	Online auction site founded in 1998 and operating in 23 countries
Participants	**Sides**	One-sided: buyers rate goods and sellers	Two-sided: buyers and sellers	One-sided: buyers rate sellers	One-sided: buyers rate sellers	Two-sided: buyers and sellers
	Access	Only transacting customers	Any registered eBay member may leave feedback	Only transacting customers	Any registered Jet.com member may leave feedback	Only transacting customers
	Obligation	Optional	Optional	Optional	Optional	Optional
Content	**Format**	Star ratings, comments, tags for some products (e.g. fit for clothing), "helpful" tags	Seller ratings, product star ratings, badges, return and refund guarantees	Star ratings, comments, and photos	Star ratings and comments	Net review score, comments, activity time, address verification
	Scale	Five stars	Product stars: out of five Sellers: integer score with categories; various badges	Five stars	Five stars	Net score of positive (+1), neutral (+0), and negative (-1)
	Subcategories	Product-dependent (e.g. "comfort" for headphones)	Yes (4): description, communication, shipping time, shipping charges	N/A	N/A	N/A
	Frequency	Once per transaction (within 90 days of order for products and sellers)	Reviews can be left at any time	Once per transaction (within 100 days of the estimated delivery date)	Once per transaction	Once per transaction

Function	**Visibility**	Ratings and reviews are visible to the public	All seller and product ratings are public; ratings of buyers are not	Ratings and reviews are visible to the public	Ratings and reviews are visible to the public	Ratings and reviews are visible to the public
	Anonymity	Reviewers can change their “public name”	Detailed seller ratings (subcategories) anonymous; others not	Not anonymous	Not anonymous	Not anonymous
	Weighting	Unweighted, but seller-feedback shows average of last 12 months	Sellers unweighted; buyer-given feedback distribution for last 12 months	Unweighted	Unweighted	Overall average and five most recent reviews shown
	Influence	Affects search ranking, customer recommendations, may lead to user removals	Affects search rankings, sellers ratings, refunds, member suspensions	Affects search rankings, featured products and sellers; other uses unclear	Affects search filter options; other uses of the information is unclear	Affects search rankings; other uses unclear
	Filtering	Sellers may respond; reviews can be flagged	Sellers may respond, reviews can be flagged	Sellers may respond to <=3 stars; platform may remove	Reviews are accompanied by “verified buyer” status	Hosts may respond; address verification tags

Continued:

		Craigslist	Facebook Marketplace	Groupon	Shopify	Magento (API)
	Description	Classifieds advertisement website founded in 1995 with annual revenue ~700m USD	Classifieds advertisement section of Facebook for inter-user exchanges	Site with deals becoming available if a minimum number of people sign up	Platform for online stores and POS with >600k firms and >55bn USD annual revenue	Open-source e-commerce platform/content management system
Participants	Sides	Two-sided: buyers and sellers	Two-sided: buyers and sellers	One-sided: buyers rate sellers	One-sided: buyers rate products	One-sided: buyers rate products
	Access	Anyone	Potentially transacting parties	Only redeeming customers	Registered online store users	Depends on online store creator/operator
	Obligation	Optional	Optional	Optional	Optional	Optional
Content	Format	Photos, location, contact details for buyers, “prohibited” goods flag	Photos, location, seller profile, private messages between buyers and sellers	Star ratings and written comments; reviewer tags (e.g. “Top Reviewer”)	Star ratings and written comments	Star ratings and written comments (but can vary by store)
	Scale	N/A	N/A	Five stars	Five stars	Five stars
	Subcategories	N/A	N/A	N/A	N/A	Determined by online store operator
	Frequency	Varies	Varies	Once per transaction	Once per transaction	Once per transaction
Function	Visibility	All elements visible to public except private messages	All elements visible to other Facebook users except private messages	Visible to the public	Visible to public upon approval of online store operator	Visible to public upon approval of online store operator
	Anonymity	User identities anonymous	Non-anonymous	Non-anonymous	Non-anonymous	Depends on online store creator/operator

	Weighting	N/A	N/A	Unweighted	Unweighted	Unweighted
	Influence	N/A	N/A	Affects search rankings, featured deals	Influence determined by online store operator and users who see reviews	Influence determined by online store operator and users who see reviews
	Filtering	Craigslist offers a ‘prohibited’ goods/service flag	User interactions linked to Facebook user profiles	Formal dispute process where both parties notified	Online store operator may remove (or flag) comments	Online store operator may remove comments

Core trust problem facing online retail platforms

Ex-ante identification of seller and product/service quality prior to a financial transaction.

Industry level findings: stylized facts and selected examples

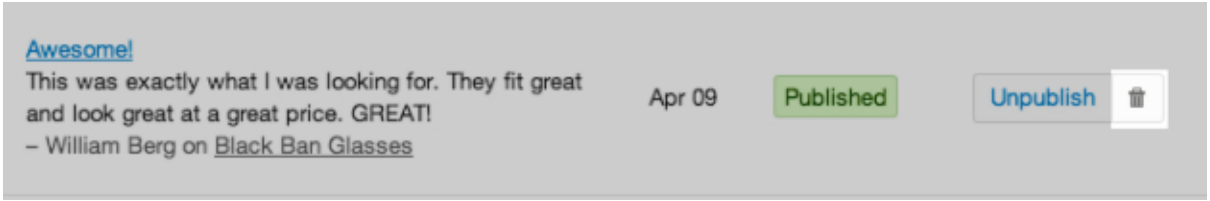
1. Star ratings (out of five) + buyer comments are among most common form of mechanism in this industry. In fact, it is generally difficult to find online retail platforms that lack this mechanism (particularly when conditioning on there being some kind of feedback mechanism). Some examples are given below.

Platform	Star rating appearance
Amazon	
eBay	
Etsy	

Intra-industry differences usually focus on reported distributional and sub-group information (e.g. other products reviewed by reviewers) and seller ratings in addition to product ratings (such as eBay's feedback scores).

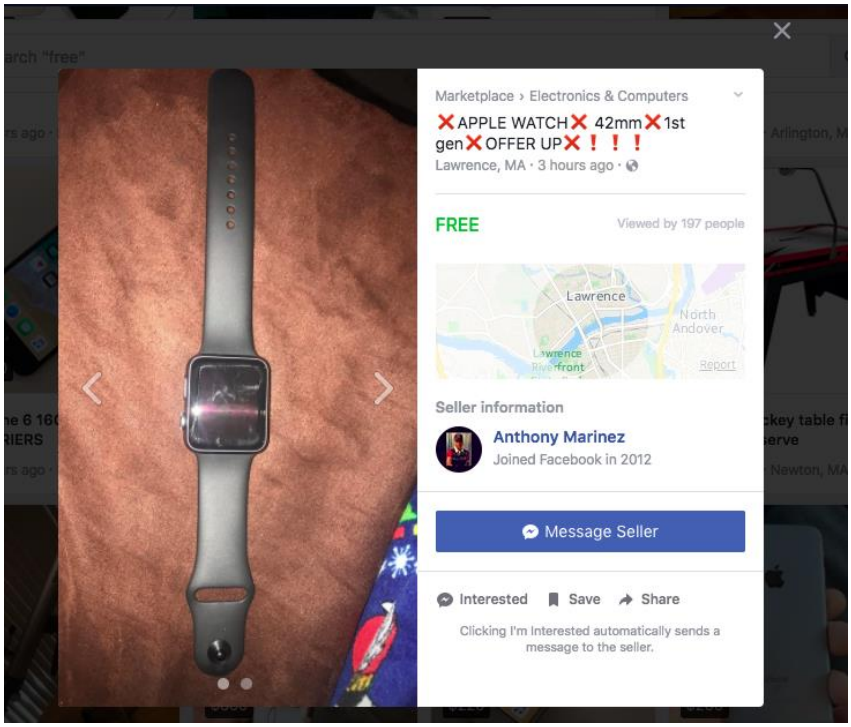
2. Transparency of inputs to the trust mechanism is generally high across the industry. For many platforms, aggregate scores are able to be reconstructed from individual ratings and reviews, which are all publicly available. Platforms' use of review information – e.g. in regard to seller sanctions – is also often publicized.

However, this is not always the case. Consider for example the Shopify API, which is used by over 600,000 businesses worldwide. Its API allows platform managers (usually product sellers) to unilaterally censor and delete feedback without reason:



3. Market participants are usually not compelled to input information, but many platform-initiated mechanisms exist to encourage these. A common form of these is a reminder email to leave a rating for a purchase (see example below). Encouragement may also come directly from a seller on some platforms.

4. Platforms with less-rich trust mechanisms are associated with a higher frequency of lower quality and lower-priced items. As discussed earlier in this report, this may be a consequence of competitive positioning. An example of this is Facebook Marketplace (an illustrative listing is below) which has no ratings or review system, and includes a user option to “Only show free listings”.



Appendix A.2 – Short-term accommodation platform profiles

		Airbnb	VRBO	Homeaway	Flipkey	Couchsurfing.com
	Description	Largest short-term rental marketplace with >4m shared and full-space listings	Airbnb competitor with focus on vacation rentals and large sq. ft. full-space listings	Vacation rental marketplace owned by VRBO's parent company, Expedia	Vacation rental marketplace with >300k listings worldwide; subsidiary of TripAdvisor	Shared lodging platform with >15m members; no host charges allowed
Participants	**Sides**	Two-sided: guests and hosts	Two-sided	Two-sided	One-sided (travelers only)	Two-sided: all community members regardless of type on the site
	Access	Only transacting parties	Only transacting parties	Transacting parties for ratings, any registered member for the guestbook	Anyone may write a review	Transacting parties for surf/host refs, registered for other references
	Obligation	Optional, but incentivized via email on check-out day	Optional, but incentivized via email three days post-stay	Optional, but incentivized via email three days post-stay	Optional, but incentivized via post-stay emails	Optional, but incentivized via post-stay emails
Content	**Format**	Comments by guests and hosts (with word limit), star ratings, user verification, list photos, and host badges	Comments by guests and hosts (with word limit), star ratings, user verification, list photos, and host badges	Reviews by guests and hosts, star ratings, user verification, photos, badges, and "guestbook comments"	Star ratings, written reviews, review count, photos, amenities lists, "payment protection" status	Two types of references (surf/host and personal), +/- feedback tags, verification systems
	Scale	Five stars, various badges and tags (e.g. 'Superhost,' 'Highly Rated,' 'Rare Find')	Five stars, various badges (e.g. 'Premier Partner,' 'Popular,' 'Excellent')	Five stars, various badges and tags (e.g. 'Superhost,' 'Popular,' 'Excellent')	Five stars (aggregate and individual)	Four reference categories (e.g. Don't Recommend), other discrete tags
	Subcategories	Yes (for guests): accuracy, location, communication, check in, cleanliness, value	Yes (for hosts): cleanliness, communication, and adherence to house rules	Yes (for hosts): cleanliness, communication, and adherence to house rules	No	Yes: 17 categories split by +/- reference, e.g. "punctual," "unfriendly"

	Frequency	Once after transaction (within 14 days of checkout)	Once after transaction (within one year of checkout)	Once after transaction (within one year of checkout)	Usually one review per transaction (but more possible)	Surf/host refs: once after trans. (within 14 days) Other refs: at any time
Function	**Visibility**	Public + private host; double-blind period; traveler review (by host) private	Public + private host; 14-day double-blind period; traveler review (by host) private	Public + private host; 14-day double-blind period; traveler review (by host) private	Reviews are public after approval by platform	Surf/host positive refs ad tags visible, negative refs only seen by the platform
	Anonymity	Not anonymous	Not anonymous	Not anonymous	Anonymous	Tags anonymous; refs not
	Weighting	Unweighted (but aggregate host scores only visible after >3 reviews)	Unweighted (but aggregate host scores only visible after >3 reviews)	Unweighted (but aggregate host scores only visible after >3 reviews)	Unweighted (simple average star rating shown)	Unweighted (total proportion of positive references shown)
	Influence	Affects placement in search, host badges, may lead to access being revoked	Affects placement in search, tags, host comparison dashboard, access decisions	Affects placement in search, tags, host comparison dashboard, access decisions	Affects placement in search, eligibility for featuring and awards, warning labels	Affects search rankings, ability to send messages, support, favourites, more
	Filtering	Hosts may respond to comments; reviews can be left for partial stays; content flagging and dispute system	Hosts may respond to comments; reviews can be flagged for removal if they violate content guidelines	Hosts may respond to comments; reviews can be flagged for removal if they violate content guidelines	Reviewers may delete; fraud-detection system operated by platform; suspect reviews may be flagged by anyone	Users may respond to references; formal dispute forms available for violating guidelines

Core trust problem facing short-term accommodation platforms

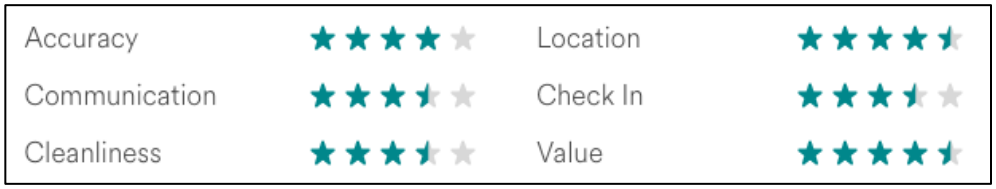
Identifying quality and ensuring personal and property safety for travelers and hosts.

Industry level findings: stylized facts and selected examples

1. "Double-blind" review processes are commonly used to mitigate retaliatory reviews. Most platforms we examined hide travelers' and hosts' feedback from each other until both have submitted feedback on the other or a preset time window for providing feedback (usually 14 days) elapses. This aims to incentivize honesty by preventing retaliation. As Airbnb noted when introducing the system:[81]

> *Both hosts and guests may worry that if they leave an honest review that includes praise and criticism, they might receive an unfairly critical review in response. To address this concern, reviews will be revealed to hosts and guests simultaneously. Starting today, hosts and their guests will only see reviews they receive from a completed trip after both participants have completed their assessment of the experience.*

2. Rating subcategories and qualitative tags are frequently used and allow multiple quality dimensions of a user to be communicated. For example, VRBO has ratings of travelers along "cleanliness," "communication," and "adherence to house rules." There is heterogeneity of subcategories and tags across platforms, and the named dimensions could potentially involve trade-offs in some cases that users may weight differently (e.g. "value" vs. "cleanliness" as shown below).



3. There does not seem to be a norm for the side of the market the trust mechanism draws information, the anonymity of responses, and access to the platform. Some platforms draw feedback from both travelers and hosts (e.g. Airbnb), whereas others only elicit responses from travelers (e.g. Flipkey). Even among platforms with two-sided mechanisms, the nature and volume of information is not the same across all of them. For example, VRBO and Homeaway feature sub-category ratings for travelers only; Airbnb's sub-categories apply to hosts only. In regards to anonymity and access, Flipkey allows for anonymous reviews from anyone who visits the site, and Couchsurfing.com only makes public feedback positive. This lack of "convergence" stands in contrast to several other industries we examine.

4. Platforms appear to place a high level of importance on identity verification mechanisms. Identity verification usually occurs through the provision of personal information from government IDs, credit cards, social media profiles, email addresses, often in combination with each other. This are often an explicit requirement to use the platform, and can also serve as a gateway to other features (as in the case of Couchsurfing.com below).

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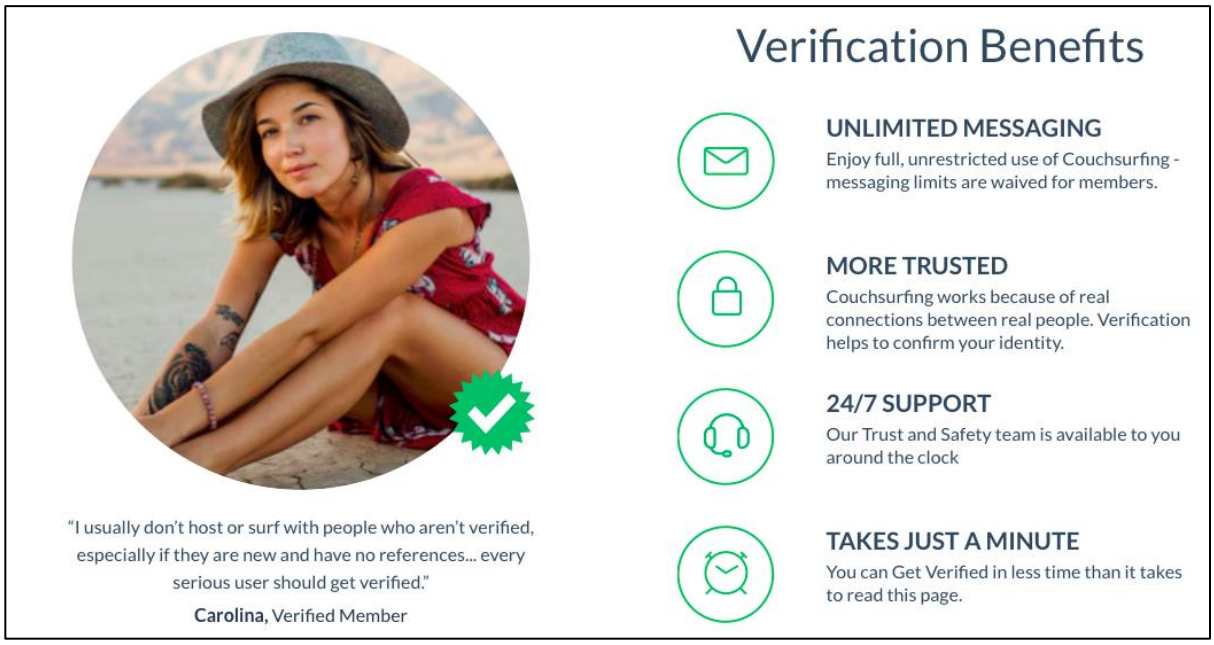
[81] Airbnb, "Building Trust with a New Review System."



Platform functionality benefits of identity verification on Couchsurfing.com

Appendix A.3 – Ridesharing platform profiles

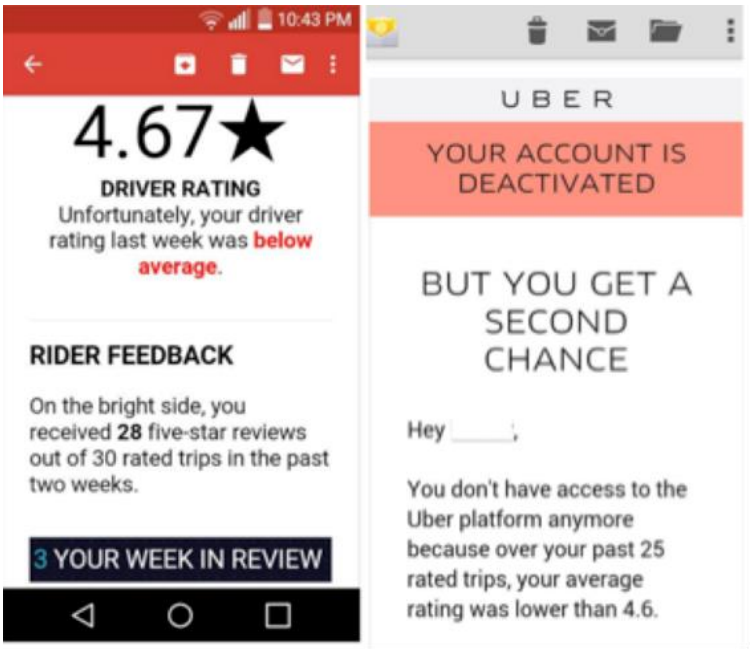
		Uber	Lyft	Juno	Via
	Description	Largest ride-sharing company in US	Uber's major competitor	NYC ridesharing app, merged with former competitor Gett	NYC, Chicago and DC-based app focused on pooled transportation
Participants	**Sides**	Two-sided	Two-sided	One-sided: passengers rate drivers	One-sided: passengers rate drivers
	Access	Only transacting parties	Only transacting parties	Only transacting parties	Only transacting parties
	Obligation	Optional (was mandatory)	Optional	Optional	Optional
Content	**Format**	Star rating, optional comments, tags	Star rating, optional comments	Star ratings	Star rating, optional comments
	Scale	Five stars	Five stars	Five stars	Five stars
	Subcategories	No, although tags may 'modify' ratings	Yes, including cleanliness, safety, navigation, friendliness	No	No
	Frequency	After each ride	After each ride	After each ride	After each ride with a new driver
Function	**Visibility**	Users see own profile and those they are matched with	Users see own profile and those they are matched with	Users see own profile and those they are matched with	Not seen by users
	Anonymity	Yes	Yes	Yes	Yes
	Weighting	Only most recent 500 ratings	Only most recent 100 ratings	*Unknown*	*Unknown*
	Influence	Drivers banned below certain level, users may cancel after match but before pickup, some benefits for highly rated drivers	Drivers banned below certain level, users may cancel after match but before pickup, some benefits for highly rated drivers	Platform uses ratings to qualify drivers	Platform uses feedback to qualify drivers and ensure ongoing driver quality
	Filtering	"Ratings protection" – consistent low raters discarded as are low ratings with certain banned reasons (e.g. GPS route)	Strict policy against review removal / filtering	*Unknown*	*Unknown*

Core trust problem facing ridesharing platforms

Ensuring the safety of passengers and drivers, and the quality of experience for passengers.

Industry level findings: stylized facts and selected examples

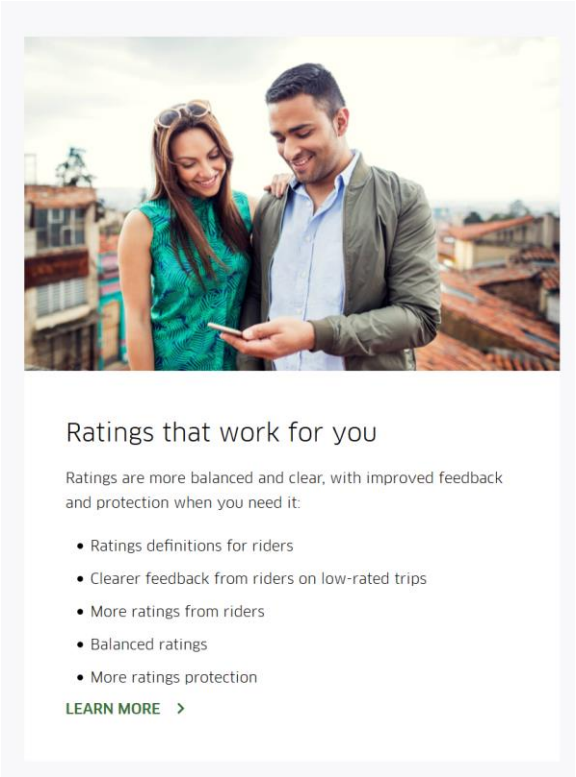
1. Trust mechanisms operate as the 'qualifying requirement' for ridesharing drivers. Ridesharing platforms tend to require drivers to maintain a certain minimum rating in order to continue to operate on the platform. This allows platforms to filter out those drivers who may be endangering passengers or offering a low quality service.



Example Uber driver deactivation message

2. Changes to trust mechanism are hotly contested among drivers and passengers, indicating perceived importance by both parties. A number of very active forums exist where drivers and passengers on ridesharing platforms debate changes and proposals to change ridesharing ratings systems. An example is the ratings sub-forum on uberpeople.net which attracts around 100 posts and comments per week. Uber is aware of the need to maintain confidence and satisfaction with their rating system, as evidenced by the major announcements included in their '180 Days of Change' campaign which included ratings changes geared towards improving driver satisfaction.

November: Improvements to your pickups and ratings experience



180 Days of Change campaign changes to ratings system

3. Profiles are not public, but are made available to transacting parties.
Ridesharing platforms tend to limit the ratings data made available publicly about their drivers and passengers. Because, in general, users are not able to choose their own matches on these platforms (geographical location is more important), making ratings data available only after matching seems to be sufficient for most ridesharing platforms to enable transactions to occur.

Appendix A.4 – Online freelance labor platform profiles

		Upwork	Freelancer.com	Fiverr	Toptal	Crew.co
	Description	Global freelance labor website with $1bn in annual billings	Global freelance labor website based on freelancers bidding for work	Claims to be 'world's largest online marketplace for freelance services'	Vetted high-end freelance labor marketplace	Claims to offer 'top 3% of freelancers' in the world
Participants	**Sides**	Two-sided: freelancers and clients	Two-sided	Two-sided	Platform acts as a filter and no feedback is taken All prospective freelancers are required to take tests and provide portfolios to Toptal	Two-sided
	Access	Only contracting parties	Only contracting parties	Only contracting parties		Only contracting parties
	Obligation	Optional, but incentivized	Optional, but incentivized	Optional, but incentivized		Optional
Content	**Format**	Written feedback on clients, star ratings and comments on freelancers; results on tests offered by Upwork	Star ratings, written feedback, skill tests offered by freelancer.com	Star ratings, written feedback, private feedback on clients, "Pro" badge	Platform assesses applicants for freelance roles and determines suitability, which is guaranteed to clients All freelancers must complete tests in order to become eligible for jobs A portfolio of previous work is displayed to prospective clients	Score, written feedback
	Scale	5 stars, 0-100 job success score; test pass badges	5 stars, test pass badges	Five stars		Score out of 10
	Subcategories	No	Yes for freelancers: quality, communication, expertise, professionalism, hire again?	Yes for freelancers: Communication, service, buy again or recommend		No
	Frequency	Once at end of transaction	Once per transaction	Once per transaction		Once at end of transaction
Function	**Visibility**	Freelancer feedback aggregated into public 'job success score' out of 100. Client reviews private to Upwork	Freelancer reviews public, client reviews private to freelancer.com	Public	Reviews are not used to filter. A private algorithm is used to assess suitability of freelancers for client jobs	Not public, visible only to crew.co

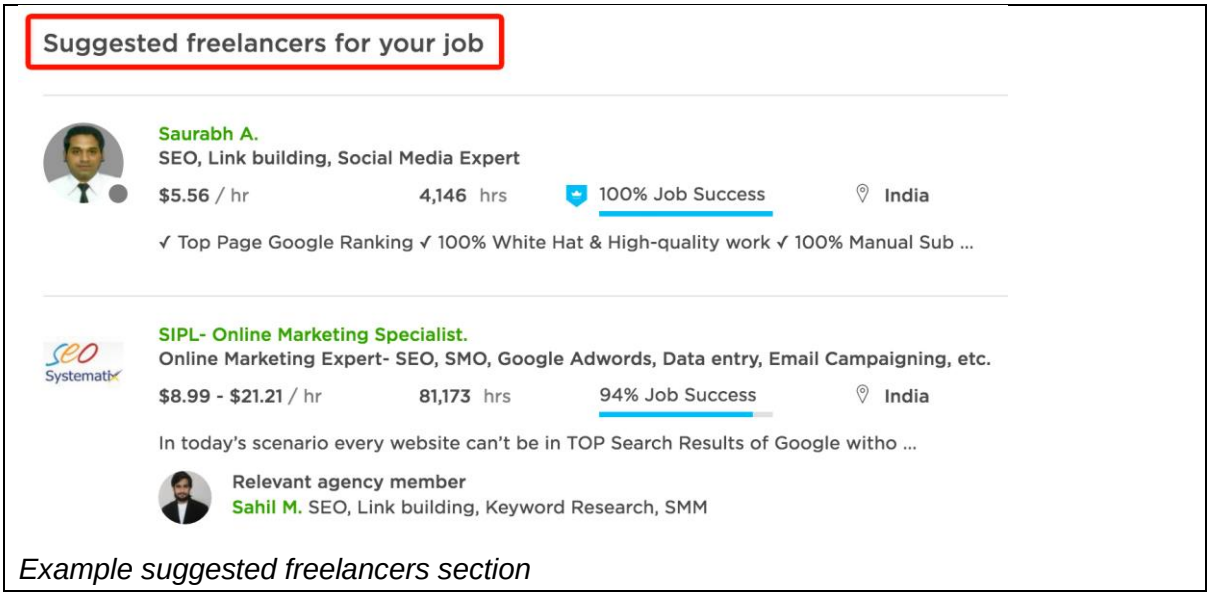
	Anonymity	Not anonymous, some contract details are visible	Not anonymous, some contract details are visible	Not anonymous		No
	Weighting	Weighted by recency (best of 6,12 and 24 months)	Aggregated into reputation score based on recency, number of reviews, size of projects and quality of reviewer	None		Unknown
	Influence	Affects placement in search rankings, top performer badges	Used in ranking algorithm in searches, top performer badges	Used to create ‘level’ of freelancer, affecting ranking algorithm		If rating falls below a certain level, access can be revoked
	Filtering	Dispute resolution system, top performers may remove one review	Not possible to remove negative ratings	Sellers may invite users to edit reviews of each other		None

Core trust problem facing platforms

Ensuring freelancers have the capabilities to complete job in the time and of the quality expected by client.

Industry level findings: stylized facts and selected examples

1. In marketplace freelance platforms, ratings have a two-fold impact on freelancers. Ratings affect both the positioning in search algorithm (controlled by the platform) and the likelihood clients will hire the freelance if presented in search results (controlled by the client). In thick marketplaces, this double impact of ratings seems to strengthen the incentive for freelancers to earn good reviews. For example, Upwork not only promotes highly rated freelancers higher in their search algorithm, they also offer a separate 'suggested freelancers' section for clients on their homepage and a 'suggested freelancers' email for clients after they have posted a job.



Example suggested freelancers section

2. Where the platform is more closely involved in each individual transaction, ratings seem to play a smaller role. Where search is not the primary method of matching on a platform, platforms seem to absorb a greater proportion of the risk associated with bad transactions. For example, on Toptal, portfolio work rather than previous feedback is provided to prospective clients on the platform and any feedback after a transaction is only used by the platform to determine the suitability of freelancers for future projects. These kinds of platforms may be seen as closer to a traditional agency model in the services industry, rather than the marketplace model that has come to characterize many parts of the sharing economy.

3. Non-anonymized feedback seems to be expected by clients on freelance platforms. Because clients tend to have specialized requests for freelancers on these platforms, more information about the types of jobs completed by freelancers previously is likely to help clients identify whether a given freelancer has the skills necessary to complete the specialized task at hand. Non-anonymized feedback, which includes details about contracts previously completed, and portfolios of work are likely to help clients overcome the trust problem inherent in this market.

Appendix A.5 – Online advertising platform profiles

		Facebook Advertising	Google Adwords	Bing Ads	Snap Inc	Outbrain
	Description	Targeted and pay-per-click advertising on world's largest social network	Pay-per-click and search advertising on world's largest search engine	Search advertising by Microsoft	Youth-targeted video and integrated advertising on messaging platform	Online advertiser specializing in presenting sponsored website links
Participants	**Sides**	Two-sided: advertiser and ad viewer	Two-sided: advertiser and ad viewer	Two-sided: advertiser and ad viewer	One-sided: to advertiser	One-sided: to advertiser
	Access	Only parties who have created or viewed an ad	Only parties who have created or viewed an ad	Only parties who have created or viewed an ad	Only parties who have created or viewed an ad	Only parties who have created or viewed an ad
	Obligation	Impressions data collected automatically, ad viewer feedback optional	Click data collected automatically, ad viewer feedback optional	Click data collected automatically, ad viewer feedback optional	Viewership data collected automatically	Click data collected automatically
Content	**Format**	For advertiser: report on impressions, engagement broken down by demographic For ad viewer: "report ad" feature, like, share, comment	For advertiser: report on number of clicks, click-through-rate, conversion rate For ad viewer: report ad feature	For advertiser: report on number of clicks, click-through-rate, conversion rate, relative success rates of ad by website For ad viewer: report ad feature	Report on number of impressions, swipe ups, click through and time spent watching videos	Report on number of clicks, click-through-rate, conversion rate
	Scale	Advertiser: Number of impressions, engagement Viewer; categories of complaint, like / not	Advertiser: number and rate, $/click Viewer: written complaints	Advertiser: number and rate, $/click Viewer: written complaints	Number, rate, seconds	Number, rate, seconds
	Subcategories	Demographic breakdown, detailed data	Very limited geographic information, broken down by key word	Very limited geographic information, broken down by key word	Demographic reporting (age, location, gender)	Geographic reporting
	Frequency	Updated continuously throughout advertising campaigns	Updated continuously throughout advertising campaign	Updated continuously throughout advertising campaign	Updated continuously throughout advertising campaign	Updated continuously throughout advertising campaign
Fun ctio	**Visibility**	Private	Private	Private	Private	Private

	Anonymity	Viewer interactions are anonymous by default, unless viewers choose to engage publicly with ad using social tools.	Anonymous	Anonymous	Anonymous	Anonymous
	Weighting	None.	None	None	None	None
	Influence	Placement in Newsfeed algorithm, cost of advertising	Placement in search, cost of advertising	Placement in search, cost of advertising	Cost and placement	Ad placement and cost
	Filtering	Unknown – it is not clear whether Facebook excludes certain types of engagement from advertising manager	Unknown – it seems unlikely clicks are excluded, Google response to complaints unknown.	Unknown – it seems unlikely clicks are excluded, Google response to complaints unknown.	Unknown	Unknown

Core trust problem facing online advertising platforms

Ensuring advertisements are presented to appropriate audiences which will drive engagement and revenue for advertisers

Industry level findings: stylized facts and selected examples

1. Advertisers expect more granular and detailed data on the effectiveness of their advertising in order to enable trust in a platform. Compared to other industries profiled in this document, the trust mechanisms on online advertising platforms are substantially more sophisticated than star ratings and similar mechanisms. This may reflect the fact that the revenue-generating side of the market for advertising is businesses rather than consumers, who may have more resources to analyze feedback than many consumers. Trust in online advertising platforms seems to require demographic information and detailed click-through data to be provided as a minimum.

2. Anonymity is a common feature of trust mechanisms on online advertising platforms. Platforms rarely provide information about the identity of users who have engaged with advertising to advertisers. Indeed, attempts to access identifying data may constitute a breach of advertiser's terms and conditions, as in the recent case of Cambridge Analytica and Facebook.[82] In many cases, advertisers would be willing to pay for further information about viewers of their advertisements which may help improve targeting and marketing efforts. However, protecting certain aspects of the identity of users seems necessary to maintain thickness of the advertising market, to ensure that the user base from which platforms derive revenue remains large. This tradeoff is reflected in the trust mechanisms of online advertising platforms, which will display various levels of demographic data to advertisers, but are unlikely to provide individualized and identifiable data.

3. Despite efforts by advertising platforms, trust on online platforms seems to be significantly influenced by instances of strategic manipulation. One common problem on online advertising platforms that diminishes perceptions of trust by advertisers is instances of strategic manipulation by other vendors on online platforms. A recent report on by the Association of National Advertisers found that ad bots inflate monetized audiences on online platforms by between 5 and 50%, at a cost of around $6.3 billion per annum to advertisers.[83] This has led some advertisers to decrease advertising spending on online platforms, with the World Federation of Advertisers (whose members include some of the largest advertisers including McDonalds's, Visa and Unilever) warning members

"Until the industry can prove that it has the capability to effectively deal with ad fraud, advertisers should use caution in relation to increasing their digital media investment, to limit their exposure to fraud."[84]

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[82] Rosenberg, M., Nicholas Confessore, and Carole Cadwalladr. "How Trump Consultants Exploited the Facebook Data of Millions." *The New York Times,* 17 March, 2018, https://www.nytimes.com/2018/03/17/us/politics/cambridge-analytica-trump-campaign.html. (Accessed 17 March 2018).

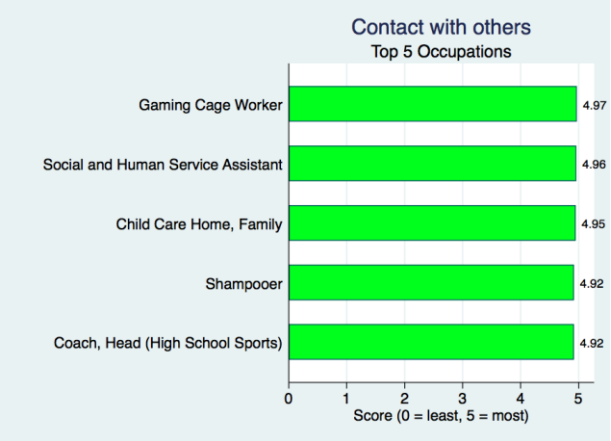
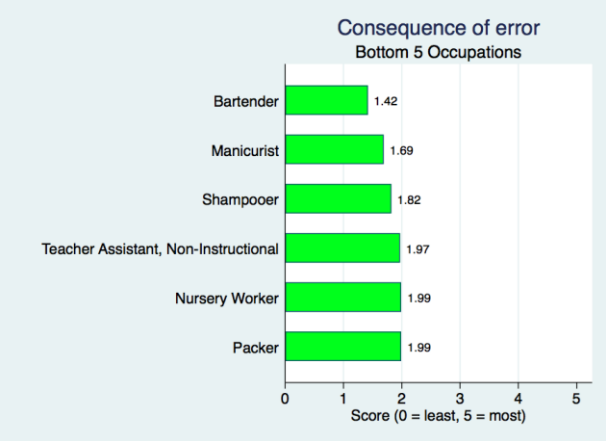
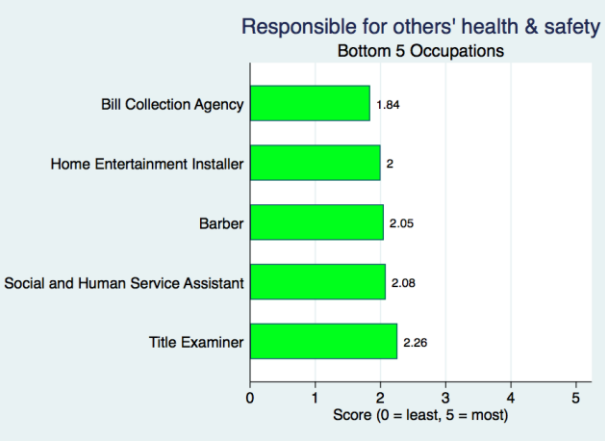
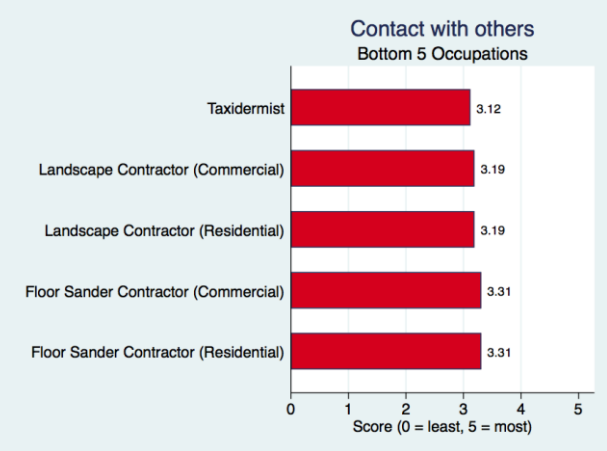
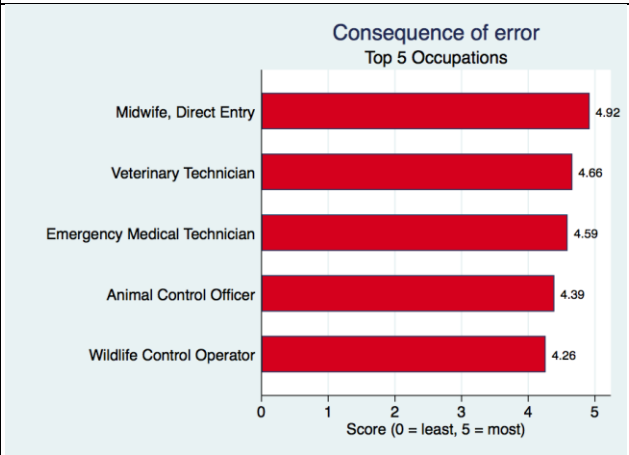
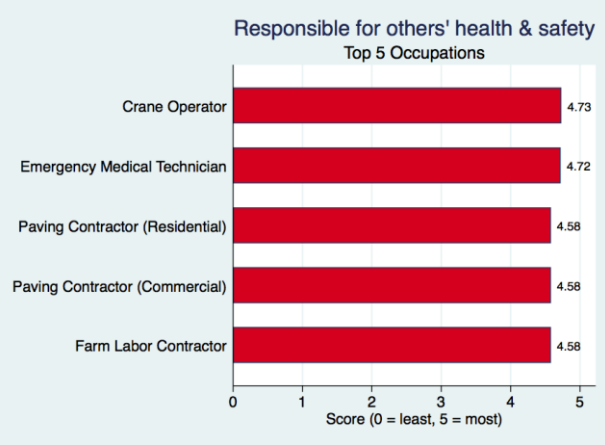
[83] White Ops/Association of National Advertisers. "The Bot Baseline 2016-17: Fraud in Digital Advertising," https://www.ana.net/content/show/id/botfraud-2017. (Accessed 16 March, 2018).

[84] Kotila, M., Ruben C. Rumin, and Shailin Dhar. "Compendium of ad fraud knowledge for media investors." *WFA and The Advertising Fraud Council Report,* 2017, https://www.wfanet.org/app/uploads/2017/04/WFA_Compendium_Of_Ad_Fraud_Knowledge.pdf. (Accessed 16 March, 2018).

In response, the Media Rating Council developed a third-party accreditation system for measurement of the effectiveness of ads, which is now used by Facebook, Twitter, Google and others. [85]

[85] Bahlavan, Pahlavan. “Building trust and increasing transparency with MRC-accredited measurement.” *Google Agency Blog,* 21 February, 2017, https://agency.googleblog.com/2017/02/building-trust-and-increasing.html. (Accessed 16 March, 2018).

Appendix B – Top and bottom professions on O*Net variables

Contact with others	Consequence of error	Responsibility for others' health and safety
		
		

Appendix C – Benefits estimation methodology and the full regulatory substitution index

This section provides further notes on the regulatory burden reduction estimates in **Chapter 3**.

Replication: dataset construction and associated STATA files

Data sources

The variables in our main dataset come from three sources:

1. Data from **License to Work, Second Edition** can be found at the following URL: http://ij.org/report/license-work-2/ltw2-data/
2. Data from **O*NET** can be found at the following URL: https://www.onetonline.org/
3. The remaining data about platform presence were hand-collected and are available in the Stata file "l2w_onet_data_0318.dta."

Additionally, for the burden calculation, we use state-level occupation employment data from the US Bureau of Labor Statistics' National Occupational Employment and Wage Estimates for May 2016 (the most recent period at the time of writing). These data are contained within the Stata file "burden.dta" and are available in raw form at https://www.bls.gov/oes/current/oes_nat.htm#00-0000.

Occupations were manually matched between O*NET and License to Work, Second Edition by occupation name. The variables "occname_l2w," "occname_onet," and "id_onet" track these matches for reproducibility. The only occupation where an O*NET match was not found was for an "Auctioneer," so this was dropped from the dataset when preparing the regulatory substitution index.

STATA files

- The file "l2w_onet_data_0318.dta" is the starting dataset which includes selected variables from the previous section.
- The file "occlicensev2.do" conducts all of the calculations and charts in **Chapter 3** of the report
- The file "burden_calc.do" calculates the reduction in regulatory burden from the report. It should be run after "occlicensev2.do."
- The remaining .dta files are each input and intermediate output data for "occlicensev2.do."

The regulatory substitution index

Objective

The intent of the regulatory substitution index is to provide a parsimonious snapshot of the potential for online platforms' trust mechanisms to substitute for occupational licensing in a given industry.

The index takes values between 0-1, with 1.00 being an "ideal" occupation for trust mechanisms to substitute for. It represents a simple average of nine components that are also scaled to take scores between 0-1.00 (with the same interpretation).

Methodology

The construction of the index uses a "distance-to-frontier" approach used, for example, by the World Bank's Doing Business Rankings.[86] The calculation begins by defining a "best" and "worst" value of each dimension present within the dataset. These were shown in **Table 2** of **Chapter 3**, which is reproduced below.

Topic/dimension	Best value (w example)	Worst value
1. Performs or Works Directly with the Public	Yes (Florist)	No (Animal Breeder)
2. Contact with others (category)	Constant contact (Shampooer)	Occasional contact (Taxidermist)
3. Contact with others (frequency)	98% (Gaming Cage Worker)	24% (Paving Contractor)
4. Responsible for others' health and safety (category)	No Responsibility (Plant Nursery Worker)	Very High Responsibility (School Bus Driver)
5. Responsible for others' health and safety (frequency)	22% (Plant Nursery Worker)	80% (Emergency Medical Technician)
6. Consequence of error (frequency)	Not Serious at All (Funeral Attendant)	Extremely Serious (Emergency Medical Technician)
7. Consequence of error (proportion)	23% (Funeral Attendant)	94% (Midwife, Direct Entry)
8. Online platform exists	Yes (Taxi Drivers)	No (Milk Sampler)
9. Online platform is an on-demand platform	Yes (Taxi Drivers)	No (Door Repair Contractors)

The score (denote this x) for each of the nine categories for each occupation is then normalized to a common unit via the following linear transformation:

$$Rescaled\ score = \frac{(worst - x)}{(worst - best)}$$

Finally, the individual scores are aggregated by simple averaging to produce the rankings of occupations in **Chapter 3**. The relevant code for the creation of the index and its component scores is at lines 61-75 of "occlicense.do."

The full regulatory substitution index (including components)

These are generated by running "occlicense.do" with index values being contained in the variable "reg_sub_index and are shown below.

[86] See "Distance to Frontier – Doing Business." *The World Bank Group*, 2017, http://www.doingbusiness.org/data/distance-to-frontier. (Accessed 25 February 2018).

Occupation name	Index score	Works direct w the public?	Contact (category)	Resp. for health/safety (category)	Consequence of error (category)	Contact (score)	Resp (score)	Error (score)	Platfo rm?	Platform name	On demand ?
Barber	0.9305 148	1	Constant contact	Some responsibility for others	Some consequence of error	4.83	2.05	2.36	1	Shortcut	1
Bartender	0.9214 658	1	Constant contact	Moderate responsibility for others	Little consequence of error	4.7	2.78	1.42	1	Saucey	1
Shampooer	0.9107 04	1	Constant contact	Moderate responsibility for others	Some consequence of error	4.92	2.98	1.82	1	GlamSquad	1
Massage Therapist	0.8542 917	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.41	2.6	2.5	1	StyleBee	1
Cosmetologist	0.8496 007	1	Constant contact	Very high responsibility for others	Some consequence of error	4.82	3.52	2.26	1	Vensette	1
Manicurist	0.8461 846	1	Constant contact	Very high responsibility for others	Some consequence of error	4.5	3.55	1.69	1	GlamSquad	1
Truck Driver, Other	0.8437 837	1	Constant contact	Some responsibility for others	Moderate consequence of error	4.67	2.47	3.37	1	Uber Freight	1
Taxi Driver/Chauffeur	0.8356 429	1	Contact most of the time	Moderate responsibility for others	Some consequence of error	4.49	3.23	2.28	1	Uber	1
Interior Designer	0.8099 01	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.48	3.38	2.62	1	Homepolish	1
Florist	0.8070 254	1	Constant contact	Very high responsibility for others	Some consequence of error	4.53	3.83	2.23	1	BloomNation	1
Travel Guide	0.7834 177	1	Constant contact	Moderate responsibility for others	Very high consequence of error	4.51	2.92	3.79	1	Dopios	1
Security Guard, Unarmed	0.7540 812	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.44	3.79	3.22	1	Bannerman	1
Truck Driver, Tractor-Trailer	0.7231 444	1	Contact most of the time	Moderate responsibility for others	Very high consequence of error	3.93	2.96	3.91	1	Uber Freight	1
Home Entertainment Installer	0.6948 397	1	Contact most of the time	Some responsibility for others	Moderate consequence of error	4.18	2	2.64	1	Yelp	0
Landscape Contractor (Commercial)	0.6839 122	1	Contact about half the time	Moderate responsibility for others	Moderate consequence of error	3.19	3.31	2.91	1	Plowz & Mowz	1
Landscape Contractor (Residential)	0.6839 122	1	Contact about half the time	Moderate responsibility for others	Moderate consequence of error	3.19	3.31	2.91	1	Plowz & Mowz	1
Makeup Artist	0.6747 867	0	Constant contact	Moderate responsibility for others	Some consequence of error	4.68	3.36	2.36	1	Vensette	1
Locksmith	0.6568 448	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.39	2.83	2.83	1	Yelp	0
Travel Agency	0.6522 074	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.45	2.55	3.38	1	TripAdvisor	0
Door Repair Contractor (Residential)	0.6460 181	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.38	2.87	2.99	1	Yelp	0
Bill Collection Agency	0.6128 443	1	Constant contact	Some responsibility for others	Some consequence of error	4.88	1.84	2.38	0		
Animal Trainer	0.6018 339	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.23	3.6	2.75	1	Yelp	0
Painting Contractor (Residential)	0.6016 12	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.34	3.85	2.66	1	Yelp	0
Animal Control Officer	0.5916 71	1	Constant contact	Moderate responsibility for others	Very high consequence of error	4.76	3.25	4.39	1	Yelp	0

Social and Human Service Assistant	0.5814488	1	Constant contact	Some responsibility for others	Moderate consequence of error	4.96	2.08	2.9	0		
HVAC Contractor (Residential)	0.5707766	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.34	4.17	2.92	1	Yelp	0
Optician	0.567894	1	Constant contact	Moderate responsibility for others	Some consequence of error	4.81	2.7	2.15	0		
Taxidermist	0.5675037	1	Contact about half the time	Some responsibility for others	Moderate consequence of error	3.12	2.42	2.8	1	Yelp	0
Glazier Contractor (Residential)	0.5564181	1	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.39	3.82	3.74	1	Yelp	0
Interpreter, Sign Language	0.5527314	1	Constant contact	Some responsibility for others	Moderate consequence of error	4.86	2.43	2.89	0		
Gaming Dealer	0.5308572	1	Constant contact	Moderate responsibility for others	Moderate consequence of error	4.59	2.66	2.56	0		
Tree Trimmer	0.5212944	1	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.37	4.34	3.81	1	Yelp	0
Gaming Cage Worker	0.5082188	1	Constant contact	Moderate responsibility for others	Very high consequence of error	4.97	2.87	3.5	0		
Child Care Home, Family	0.5064598	1	Constant contact	Moderate responsibility for others	Moderate consequence of error	4.95	3.15	3.16	0		
Gaming Supervisor	0.5043186	1	Constant contact	Moderate responsibility for others	Moderate consequence of error	4.89	2.92	3.37	0		
Coach, Head (High School Sports)	0.4905837	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.92	3.75	2.71	0		
Skin Care Specialist	0.4885957	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.24	2.78	2.64	0		
Dietetic Technician	0.4849877	1	Constant contact	Moderate responsibility for others	Moderate consequence of error	4.68	3.34	2.87	0		
Preschool Teacher, Public School	0.4834979	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.73	3.51	2.79	0		
Dental Assistant	0.4818338	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.89	4.02	2.51	0		
Paving Contractor (Residential)	0.4800791	1	Contact most of the time	Extremely high responsibility for others	Moderate consequence of error	3.86	4.58	3.42	1	Yelp	0
Door Repair Contractor (Commercial)	0.4793514	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.38	2.87	2.99	0		
Pharmacy Technician	0.4763361	1	Constant contact	Moderate responsibility for others	Very high consequence of error	4.79	2.96	3.72	0		
Packer	0.4681875	0	Contact most of the time	Very high responsibility for others	Some consequence of error	4.15	3.53	1.99	1	Yelp	0
Pest Control Applicator	0.4677482	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.38	2.84	3.27	0		
Milk Sampler	0.4620626	1	Constant contact	Moderate responsibility for others	Moderate consequence of error	4.61	3.43	3.11	0		
Slot Supervisor	0.4524173	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.72	3.67	3.23	0		
Upholsterer	0.4481729	0	Contact most of the time	Moderate responsibility for others	Some consequence of error	3.65	2.84	2.3	1	Yelp	0
Funeral Attendant	0.4437314	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	4.33	3.36	3.05	0		
Nursery Worker	0.4419584	1	Contact most of the time	Moderate responsibility for others	Some consequence of error	3.59	3.11	1.99	0		

Forest Worker	0.4414311	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.7	4.11	2.89	0		
Painting Contractor (Commercial)	0.4349454	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.34	3.85	2.66	0		
Mason Contractor (Residential)	0.4333839	0	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.79	3.15	2.5	1	Yelp	0
Bus Driver, City/Transit	0.4272411	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.45	3.66	3.26	0		
Title Examiner	0.4263835	0	Contact most of the time	Some responsibility for others	Moderate consequence of error	3.65	2.26	3.46	1	Yelp	0
Log Scaler	0.4121049	1	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.8	3.13	2.99	0		
Sheet Metal Contractor, HVAC (Residential)	0.4063599	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.28	3.74	3.28	1	Yelp	0
Sheet Metal Contractor, Other (Residential)	0.4063599	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.28	3.74	3.28	1	Yelp	0
HVAC Contractor (Commercial)	0.40411	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.34	4.17	2.92	0		
Insulation Contractor (Residential)	0.3955123	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.72	3.59	2.63	1	Yelp	0
Psychiatric Technician	0.3928584	1	Constant contact	Very high responsibility for others	Moderate consequence of error	4.65	4.42	3.44	0		
Midwife, Direct Entry	0.3865021	1	Constant contact	Moderate responsibility for others	Extremely high consequence of error	4.76	3.48	4.92	0		
Floor Sander Contractor (Residential)	0.3820669	0	Contact about half the time	Moderate responsibility for others	Moderate consequence of error	3.31	3.29	2.5	1	Yelp	0
Iron/Steel Contractor (Residential)	0.3684348	0	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.39	4.33	3.57	1	Yelp	0
Mobile Home Installer	0.3572313	1	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.75	3.83	3.2	0		
Vegetation Pesticide Applicator	0.346561	1	Contact most of the time	Moderate responsibility for others	Very high consequence of error	3.62	3.3	3.82	0		
Terrazzo Contractor (Residential)	0.339991	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.55	3.8	3.22	1	Yelp	0
Cement Finishing Contractor (Residential)	0.3142417	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.52	4.34	3.05	1	Yelp	0
Paving Contractor (Commercial)	0.3134124	1	Contact most of the time	Extremely high responsibility for others	Moderate consequence of error	3.86	4.58	3.42	0		
Fisher, Commercial	0	0	Contact most of the time	Very high responsibility for others	Very high consequence of error	3.91	3.99	3.55	0		
Electrical Helper	0	0	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.3	3.95	3.7	0		
Athletic Trainer	0	0	Constant contact	Very high responsibility for others	Very high consequence of error	4.85	4.12	3.55	0		
Pipelayer Contractor	0	0	Constant contact	Very high responsibility for others	Moderate consequence of error	4.67	4.44	3.46	0		
Iron/Steel Contractor (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.39	4.33	3.57	0		
Weigher	0	0	Contact most of the time	Moderate responsibility for others	Very high consequence of error	4.34	2.71	3.53	0		
Sheet Metal Contractor, HVAC (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.28	3.74	3.28	0		

Conveyor Operator	0	0	Contact about half the time	Very high responsibility for others	Moderate consequence of error	3.43	4.17	3.28	0		
Carpenter/Cabinet Maker Contractor (Residential)	0	0	Contact most of the time	Very high responsibility for others	Some consequence of error	4.37	4.22	2.49	0		
Drywall Installation Contractor (Residential)	0	0	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.69	3.1	2.79	0		
Sheet Metal Contractor, Other (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.28	3.74	3.28	0		
Drywall Installation Contractor (Commercial)	0	0	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.69	3.1	2.79	0		
Floor Sander Contractor (Commercial)	0	0	Contact about half the time	Moderate responsibility for others	Moderate consequence of error	3.31	3.29	2.5	0		
Glazier Contractor (Commercial)	0	1	Contact most of the time	Very high responsibility for others	Very high consequence of error	4.39	3.82	3.74	0		
Mason Contractor (Commercial)	0	0	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.79	3.15	2.5	0		
Wildlife Control Operator	0	1	Constant contact	Very high responsibility for others	Very high consequence of error	4.67	4.23	4.26	0		
Fire Alarm Installer	0	1	Constant contact	Very high responsibility for others	Very high consequence of error	4.55	3.8	3.61	0		
Cement Finishing Contractor (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.52	4.34	3.05	0		
Veterinary Technician	0	1	Constant contact	Very high responsibility for others	Extremely high consequence of error	4.9	4.12	4.66	0		
Crane Operator	0	0	Constant contact	Extremely high responsibility for others	Very high consequence of error	4.55	4.73	3.99	0		
Farm Labor Contractor	0	0	Contact most of the time	Extremely high responsibility for others	Moderate consequence of error	4.49	4.58	2.5	0		
Animal Breeder	0	0	Contact most of the time	Moderate responsibility for others	Moderate consequence of error	3.68	3.31	2.63	0		
School Bus Driver	0	0	Contact most of the time	Moderate responsibility for others	Very high consequence of error	4.22	3.34	3.86	0		
Carpenter/Cabinet Maker Contractor (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Some consequence of error	4.37	4.22	2.49	0		
Earth Driller, Water Well	0	0	Contact most of the time	Very high responsibility for others	Very high consequence of error	3.99	3.72	3.95	0		
Still Machine Setter, Dairy Equipment	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.26	3.55	3.01	0		
Security Alarm Installer	0	1	Constant contact	Very high responsibility for others	Very high consequence of error	4.55	3.8	3.61	0		
Emergency Medical Technician	0	1	Constant contact	Extremely high responsibility for others	Extremely high consequence of error	4.59	4.72	4.59	0		
Terrazzo Contractor (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.55	3.8	3.22	0		
Teacher Assistant, Non-Instructional	0	0	Constant contact	Moderate responsibility for others	Some consequence of error	4.72	2.51	1.97	0		
Insulation Contractor (Commercial)	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	3.72	3.59	2.63	0		
Psychiatric Aide	0	0	Contact most of the time	Very high responsibility for others	Moderate consequence of error	4.37	4.45	2.98	0		

Appendix D – Example database profile

The following is an example of an entry containing information about the operation of trust mechanisms on a platform that could be provided on a business regulator's website.

Upwork

www.upwork.com

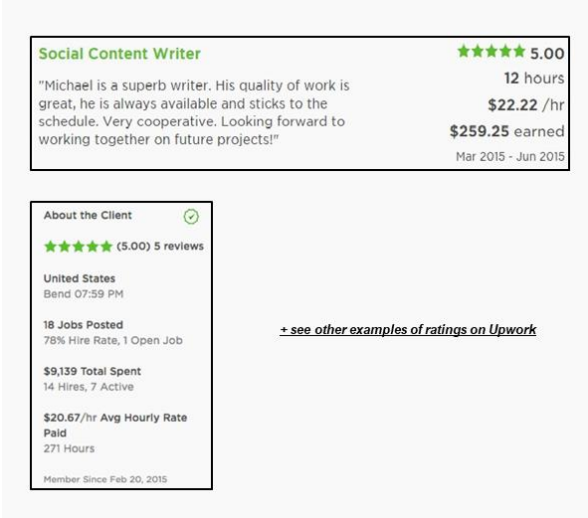
A global freelancing platform where businesses and independent professionals connect and collaborate remotely

How does Upwork enable trust on their platform?
Upwork collects reviews from freelancers and clients about their experiences with other users on the platform. Only transacting parties can review other parties. These reviews are optional, but incentivized.

What type of information does the platform collect on transactions?
Upwork's users can submit written feedback and star ratings, once per transaction. Freelancers may also take tests on skills which may be displayed on their profile.
Star ratings are scored out of 5, and aggregated into a job success score between 0 and 100.

How does Upwork use user feedback?
Feedback about freelancers is used to create a 'job success score' which affects the placement of freelancers in searches. Highly rated freelancers may be promoted in 'suggested freelancers' emails and promotions to clients. Freelancers who have completed Upwork tests also have badges showing their competencies as evaluated by Upwork.
Feedback about clients is used privately by Upwork to prevent misbehavior on their platform and may be used to remove clients from Upwork.

How is user feedback filtered or altered by Upwork?
There is a dispute resolution system where freelancers may contest reviews, which is moderated by Upwork. 'Top performers' as determined by Upwork are also able to remove one review of the platform. Only recent reviews (6, 12 or 24 months) are used to calculate average ratings and job success scores.



Things to keep in mind on Upwork:

- For freelancers, reviews may affect your placement in searches on the site and therefore your probability of being hired.
- Some reviews may have been removed by Upwork or their clients. Be aware while making hiring decisions on the platform.
- Eligibility for skill badges is assessed by Upwork and so should not be treated like independently verified qualifications.

Appendix E – Design guidelines for businesses

The style, tone, and formatting of these guidelines are based on existing informational publications by the Federal Trade Commission and other business regulators.

Building Trust on Your Online Platform: Design Tips for Reputation and Review Systems

Customer reviews, ratings, guarantees, verification, and other reputation and "trust mechanisms" are increasingly important in the digital economy. We have tips to help your company make the most of these and comply with the law.

Reputation and review systems are an important way of building trust and credibility in the digital economy. Is your company doing the best it can in this area?

When used as intended, reviews, ratings, and other tools that build trust and reputation can increase sales, consumer welfare, and allow companies to engage with their target customers in meaningful and bespoke ways. But these systems can sometimes have unintended consequences that can harm both businesses and consumers.

Here are some tips for getting the most out of them, and complying with the law.

WHAT ARE ONLINE PLATFORMS (AND ARE THEY RELEVANT TO MY COMPANY)?

Online platforms are businesses that create value by facilitating exchanges between distinct groups via the web. Today, the majority of the world's most valuable companies and well-known brands operate in this way.

But you don't have to be a billion-dollar business for the idea to be relevant to your company. If you conduct any type of e-commerce, have a listing of your business online, or interact with customers via the web in any way, then this article may be relevant for you. Consumers may also find this article helpful. But we also have a separate guide for you **here**.

WHAT ARE REPUTATION AND REVIEW SYSTEMS?

Reputation and review systems are ways to discern information about factors such as product quality, service standards, customer/business reliability, safety, and the risk of fraud.

These systems can take many forms. Examples include star ratings, written reviews, money-back guarantees, identity verification systems, and skill tests. They are important because without them, platform users may the lack the confidence to engage in online interactions. This is be a particularly important problem online because of user anonymity.

WHAT ARE SOME COMMON PROBLEMS WITH THESE SYSTEMS?

Harm to consumers and businesses can result from misleading information, which can result from:

- Deliberately manipulated reviews and ratings
- Responses from a non-representative or ideal pool of responders
- Bias against certain groups and demographics
- Inflated or not up-to-date ratings
- Insufficient ratings which can send a signal of poor quality

Many of these problems can be addressed or mitigated from considered design choices.

WHAT CAN ONLINE PLATFORMS DO TO GET THE MOST OUT OF THEIR REPUTATION AND REVIEW SYSTEMS?

In designing reputation and rating systems for your business, here are five principles to keep in mind.

- **Know what your goal is.** Reputation systems can serve different purposes. Is yours to signal quality? To allow users find specific products that suit them? To promote safety?
- **There are many ways to generate trust.** For example, numerical ratings may be complemented with tags and badges, and guarantees from your company.
- **Different parties may have different incentives.** Not all of these may be "to be honest."
- **It's not always a good idea to copy other companies.** Recent research has found that different systems can be suited to different types of companies. And even within industries, trust mechanisms can be imperfect even if they are common.

And **most importantly**:

- **Let people speak honestly about your products and their experience with your company.**

To put these principles into practice, we recommend that you keep the following questions in mind when designing reputation and rating systems:

Category	**Question**	**For example**
Participants	Who **participates**? Who has **access**? Is participation **required**?	Businesses and customers Only transacting parties Optional vs. mandatory
Content	What is the **format** and **scale** used? Are there subcategories for ratings?	Star ratings out of five Timeliness, value, location
Function	Who may **view** the content? Is information **anonymous**? Are responses **weighted**? How is information **used** by the platform? Can the **credibility** of responses be checked?	Public vs. private Anonymous vs. identifiable Recent X number of reviews Improvements to the platform Detecting anomalous reviewers