How Much is Privacy Worth Around the World and Across Platforms?

March 2020

Abstract

Using carefully designed discrete choice surveys, w

1. Introduction

The prevalence and value of data in virtually all sectors has grown tremendously, with some even declaring it the world's most valuable resource (Economist, 2017). However, along with this growth in volume and value has come increased importance in getting policy right—balancing privacy preferences with benefits that derive from the use of data. Such cost benefit analyses are currently difficult, if not impossible, due to the lack of market data that reveal how much people truly value different elements of privacy or the services they receive in exchange for use of that data. Indeed, the prevalence of nonmarket goods and services in the digital economy is a major obstacle to coherent policymaking. Nevertheless, issues ranging from high-profile data breaches (e.g., Equifax, 2017) and Facebook's Cambridge Analytica scandal to a general unease about access to personal information have made data privacy a matter of increasing concern for governments and businesses around the globe.

Despite widespread agreement on the need for some kind of data privacy oversight, agreement on what that means remains elusive. The typical comparisons involve the United States vs. Europe and the State of California. As of this writing, the U.S. government is discussing legislation and regulation beyond its current policy of imposing punishments and consent decrees after finding that a firm has violated existing laws or user agreements. By contrast, Europe has implemented a comprehensive set of data privacy regulations known as the General Data Protection Regulation (GDPR). The State of California passed a law known as the California Consumer and Privacy Act (CCPA), which is scheduled to take effect in January 2020. With the legal and regulatory landscape fragmented, it is not surprising that data practices by firms are similarly inconsistent. Several Latin American countries, including Brazil,

Americans? Do these preferences vary significantly across Latin American countries? The answers to these questions are crucial for generating coherent privacy policies that will yield the most benefits.

To measure how much consumers value different types of data privacy, we employed a battery of discrete-choice surveys—a trusted approach demonstrated to be far more reliable than open-ended surveys. This approach is especially relevant for data privacy valuation, given it quite closely mimics the types of choices individuals can make in real markets for personal data (e.g., Datacoup.com). We constructed four different survey structures, centered respectively on the respondent's wireless carrier, financial institution, smartphone, and Facebook account. Across the four survey structures, we measure values for a range of data privacy types, including personal information on: finances, biometrics, location, networks, communications, and web browsing. We administered each of these four different surveys across six different countries: the United States, Mexico, Brazil, Colombia, Argentina, and Germany.

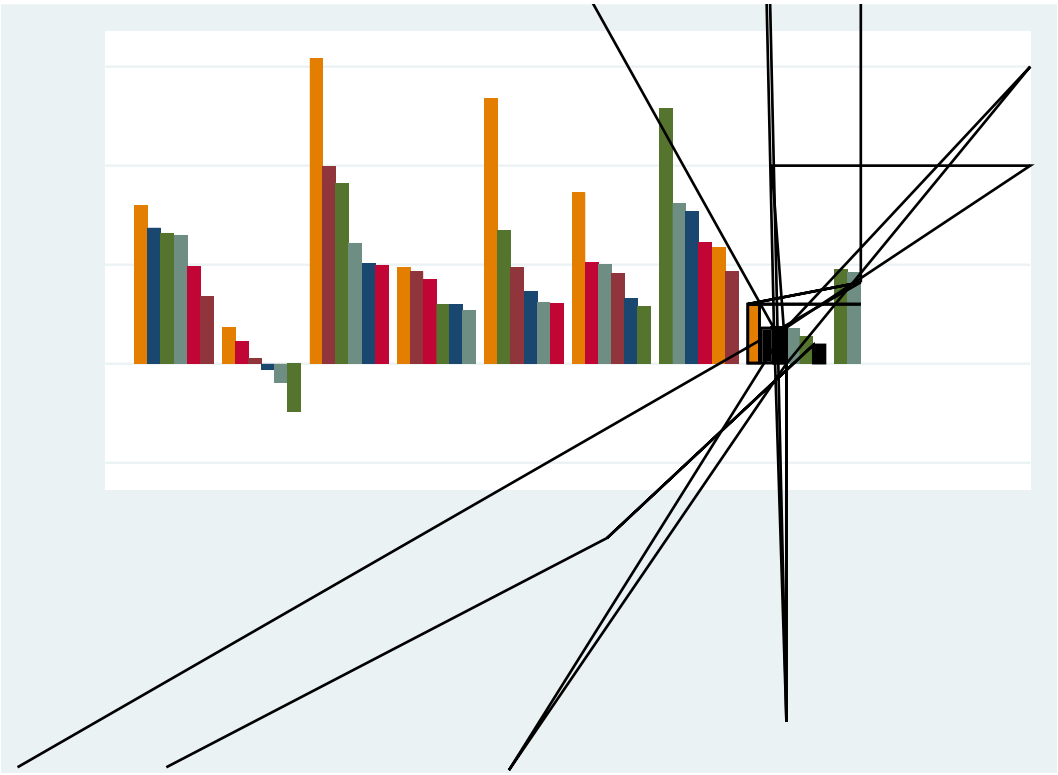
On average across countries and platforms, people placed the highest value on keeping financial data, biometric (fingerprint) information, and texts private, as shown in Figure 1. Specifically, to allow a platform to share this information with third parties, expressed in USD based on purchasing power parity (PPP) conversions, the platform would have to pay users $8.44/month to share a bank balance, $7.56/month to share fingerprint information, $6.05/month to read an individual's texts, and $5.80/month to share information on cash withdrawals. By contrast, people had to be paid only $1.82/month to share their location and essentially nothing to be sent ads via SMS.[2]

[2] These are estimates of willingness-to-accept (WTA).

Figure 1: Average Payment Consumers Would Demand for Permission to Share Data Across Countries and Platforms

These averages mask significant differences across countries. In general, people in Germany valued privacy more than people in the U.S. and Latin America. Figure 2 contains the averages by country. This figure shows what many believe to be true, which is that Germans tend to value their privacy more than others. However, this summary finding is not true across the board and is largely driven by Germans' strong preferences for financial privacy. For example, for fingerprint information – which people on average across countries value the second-highest in the list of data types we study – German's value is well below that of several other countries. Another noteworthy result is not 1 0 0 1 184.94 225.65 Tm0itref9ore

Figure 2: Average Payment Consumers Would Demand for Permission to Share Data to Share Data Across Countries by Feature



We are also able to examine how values may differ across platform. In principle, if a user is giving an organization the right to share their data, then these values should not differ across platform since presumably each platform could share with the same third parties. In reality, though, people may have different levels of trust in different platforms or believe that data sharing practices differ. We do, in fact, see some differences across platforms for the same piece of data. The surveys did not ask about the same types of information for each platform, so our ability to compare across platforms is thus constrained. Figure 3 shows the available comparisons by platform and country. The figure shows that in all six countries, people must be paid more by their wireless carrier than other platforms to be sent ads, share contact information, and share location data. While people are more willing to share contact information with Facebook than with their wireless provider across countries, the amount Facebook would have to pay users for the right to share contact

information varies significantly across countries. Germany again shows its strong taste for privacy,

comparability in the magnitude and relative rankings in WTA for privacy across countries, with some exceptions (e.g., network information in Mexico and fingerprint information in Colombia). Additional analysis indicates that within-country variation in values is largely similar for each of the six countries, with Germans often exhibiting more homogeneous preferences compared to the others.

Figure 4: Summary of Results

We also find consistent differences by sex in privacy valuations. Across platforms, data types, and countries, women value privacy more than men

Figure 5: Average Payment Consumers Would Demand for Permission to Share Data by Sex, Age, and Income

These results are largely robust to a randomly controlled treatment in the form of a leading statement about the value of data collection by these entities. Preferences for privacy are generally unaffected by such a prompt, suggesting that their values of online privacy are reasonably stable and not easily influenced.

Our findings have several implications. The striking consistencies in relative rankings of the value of online privacy across our six countries suggests that both public and private policies should offer similar *relative* privacy protections if facing similar costs for protection. However, differences in how much people value privacy of different data types across countries suggests that people in some places may prefer weaker rules while people in other places might prefer stronger rules. How much people value some data types does not vary much across countries,

however. In particular, people value the privacy of their contact information and texts fairly similarly across countries.

The generally similar within-country variation in values has interesting implications for both firms and governments. For firms, this suggests that, to the extent that tiered privacy protections may be economically sensible for one country, it is likely economically sensible for all in our group. With respect to government policies, these results suggest that, when viewed in economic terms, the distribution of support for various protections is likely similar across countries. The notable exception in both cases is Germany, which appears to have more homogeneous preferences regarding online data privacy.

2. The Value of Privacy

The empirical analysis in the paper measures the value of online privacy across different types of privacy, countries, and people within countries. In this section, we provide context for our empirics by discussing various existing methods for measuring the value of privacy, and determinants of such value.

2.1. Measuring the Value of Privacy

Measuring the value of data privacy can be challenging for myriad reasons. For starters, "privacy" in the abstract does not have a specific meaning. This problem is reminiscent of challenges in valuing the environment, such as the value of having clean oceans or clean air. A solution is to quantify data privacy in general, such as the value of avoiding a major data breach. However, valuing something of

A range of prior studies have attempted to measure individuals' monetary valuations for particular types of privacy, many in the form of experiments where participants faced actual or hypothetical privacy and financial trade-offs. The majority of these studies focused on individuals' willingness-to-accept (WTA) payment in exchange for disclosing otherwise private information, as we do below, while a few examine willingness to pay (WTP)

2.2. Determinants of the Value of Privacy

As noted above, prior work suggests context and personal traits are important determinants of the value of privacy. A particularly relevant component of personal traits includes cultural values, defined as a set of strongly held beliefs that guide attitudes and behavior and that tend to endure even when other differences between countries are eroded by changes in economics, politics, technology, and other external pressures (Hofstede 1980, Long & Quek 2002). Milberg et al. (2000) used a formative index to assess how four of Hofstede's (1980, 1991) cultural values indices – Power Distance Index (PDI), Individualism (IND), Masculinity (MAS), and Uncertainty Avoidance Index (UAI) – influence information privacy concerns. They found that concerns about information privacy were positively associated with PDI, IND, and MAS, and negatively associated with UAI. Hence, this prior work points to differences in general sentiment across countries but leaves open the question of whether and how such differences materialize for specific types of (online) privacy.

3. Survey Design

The surveys we construct measure individuals' WTA to give up various forms of privacy, rather than their WTP to retain privacy. The choice to measure WTA rather than WTP is largely driven by the fact that several proposals (and existing marketplaces, such as DataCoup) involve firms paying consumers for their data rather than consumers paying firms to keep their data private.[3] For this reason, we believe WTA is arguably the more appropriate measure relative to WTP.

[3] A substantial literature finds that WTA estimates tend to be higher than WTP estimates, suggesting that our estimates may be considered an upper bound. (See Chapman, et al. 2019 for a comprehensive discussion).

will inquire in the third part of the survey. The cognitive buildup is in the Appendix, and was carefully vetted by several focus groups.

Based on interactions with focus groups, we recognized many respondents may not be aware of how much data they are sharing currently. For example, some showed an initial aversion to sharing their voiceprint, until they were made aware that home devices like the Amazon Echo (via Alexa) and Google (via Assistant) may collect this information. We included examples in areas where lack of awareness of data sharing seemed particularly relevant.

The final part of the survey consists of repeated choice experiments. Here, we mimic the real market choice situation while exogenously varying our variables of interest – particularly, prices, exposure to ads, and the types of data the user shares. In the discrete choice experiments (DCEs), individuals make a series of choices over hypothetical alternatives, defined by a set of attributes. Since our primary goal is to estimate the WTA to give up specific elements of privacy,

individuals for access to their digital data, so a privacy market already exists. We also note that the specific types of privacy we consider were generally motivated by existing policies, such as GDPR and CCPA.

Each respondent is presented with ten different choice questions, a common volume for such surveys at this level of complexity. In addition, to mitigate any endogeneity concern, we explicitly state that any omitted feature should be assumed to be identical across all alternatives. In other words, any omitted attributes are controlled for, i.e., held fixed, when making the comparison. If the survey involves a product or service already owned by the respondent, we specifically instruct them to treat all unmentioned features as being identical to the product or service they currently have.

Finally, for each of the four surveys, we randomize across two versions. The first is as described above. The second includes a statement at the top of the feature descriptions page, which highlights the potential benefits of third-party data access, particularly with regard to targeting advertising. In our analysis, we examine whether the presence of such a statement materially

to capture the main effects.[6] Our relative D efficiency is 72.5%, 82.4%, 82.6%, and 72.4%, for the finance, smartphone, carrier, and Facebook surveys, respectively. The chosen design generates 150 choice questions for the smartphone and carrier surveys and 50 choice questions for the financial and Facebook surveys. The latter two have fewer features, and so require fewer variants. We grouped the choice questions into sets of ten (which we call versions), with four alternatives for the smartphone and carrier surveys and three alternatives for the financial and Facebook surveys. We randomly vary the alternatives for each choice, and randomly distribute the versions across respondents.

4. Data

For the financial survey, respondents were allowed to proceed even if they did not have a checking account.[9]

Appendix tables A1-A6 contain demographic distributions for each country, broken down by the four survey types.

respect to and obtain the estimated utility parameters for each attribute, clustering our errors on individuals.

The calculation of WTA for attributes relies on . In our case, the attributes include the personal data whose values we intend to estimate and the services the person would receive in

6. Results and Discussion

Tables A7-A10 contain our parameter estimates for all four surveys across all six countries. Tables 2a-2d then contain our valuation estimates, which we calculated as described in Section 5[10].

[Tables 2a-2d about here]

To facilitate comparisons, we convert each estimate into U.S. dollars using purchasing power parity (PPP) conversion rates provided by the International Monetary Fund for October 2019. Although not a perfect means of comparison, it provides a clearer sense of relative valuations across countries.

We find that people, on average required payments of about $9/month from their banks to for the right to share their balance and about $7.50/month from their smartphone manufacturer to share their fingerprint information. At the other end of the spectrum, people placed very low value on avoiding ads and required payments of $1.82/month for their location data. Interestingly,

differences in Latin American ads vs. Germany and the U.S. or differences in preferences for ads between Latin Americans compared to Germans and Americans.

We also see variation across countries for each type of data and platform. Table 4 shows privacy values disaggregated across country, data type, and platform.

[Table 4 about here]

For wireless carriers, we find a strikingly similar rank ordering of preferences across countries, with highest value for information on contacts, followed by browsing history, location, and ads. The range of values, however, is large and differs by country. Wireless providers in Germany would have to pay users $2.30/month for the right to send them ads by text while wireless providers in the U.S. would have to pay $1.63/month. In both countries, people would have to be paid four times by their wireless provider to allow the provider to share their contact information. While Germans generally

respondents place the lowest value on both types of banking information ($4.99 & $3.03), with the Latin American countries all somewhere in between, e.g., $3.30 for cash withdrawals in Mexico and $9.96 for balance in Brazil. The value people place on avoiding ads was much lower across all countries—over $2/month for Germany, about $0.75/month for the U.S., and

In absolute terms, we see all countries exhibiting notable value for financial privacy, with Germany having an especially high value. After accou

countries, with Germans often exhibiting notably more homogeneous preferences compared to the others.

[Tables 5a-5d about here]

Tables 6a-6d present differences in values for each type of online privacy between the survey that highlights the potential benefits of third-party data access and the one that doesn't. Here, we generally see little difference between the two survey versions. While a few coefficients indicate some statistical significance, there is not a clear pattern. Further, Holm adjusted p-values and joint tests of significance indicate failure to reject the differences as zero. Hence, it appears that preferences for privacy are generally unaffected by prompts indicating potential benefits from sharing online personal information.

[Tables 6a-6d about here]

Because of our unique focus on specific platforms and types of data across countries, few other results exist to compare against our own. One exception is Savage and Waldman (2013), discussed earlier, who focus on WTP for privacy in smartphone apps, as opposed to our WTA approach. Among other types of data, they investigated how much people were WTP to keep their location hidden from smartphone apps. They found that people were WTP $1.19 to keep location hidden. While we do not ask about smartphone apps explicitly, we explore how much people are WTA to allow their smartphone to share their location. We estimate a WTA of $1.20 in the U.S. for smartphones, remarkably close to their $1.19, providing some element of external validity.

Other comparisons are less clean, as we focus on other platforms while Savage and Waldman focus on apps. They estimate WTP $4.05 to conceal contact information from apps while

we estimate WTA $5.11 averaged across Facebook and wireless carrier (the two platforms on

The largely similar within-country variation in values that we find has interesting implications for both firms and governments. For firms, this finding suggests that, to the extent tiered privacy protections may be economically sensible for one country, it is likely economically sensible for all in our group. With respect to government policies, these results suggest that, when viewed in economic terms, the distribution of support for various protections is likely similar across countries. The notable exception in both cases is Germany, which appears to have more homogeneous preferences regarding online data privacy.

Finally, t

the importance of data in the digital economy and the amount of data people share, it would seem prudent to continue this work.

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Tables

Table 1a: Attributes, Descriptions, and Levels for Carrier Survey

Attributes	**Descriptions and Levels**	**Levels**
Monthly Payment	The amount you would receive in monthly	

Table 1b: Attributes, Descriptions, and Levels for Financial Survey

Attributes	**Descriptions and Levels**	**Levels**
Monthly Payment	The amount you would receive in monthly payments from the bank.	Arg:$0, $10, $20,…,$160, $170 Bra.:$0,$1,…$8,$8.50,$9,$10,…$15,$16 Col.:$0,$750,$1500,…,$12,000,$12,750 Ger:€0,€0.25,€0.50,…,€4.00,€4.25 Mex:$0,$5,$10,…,$80,$85 U.S.:$0,$0.25,$0.50,…,$4.00,$4.25
Sends Ads	The bank is able to send ads to your smartphone via text message	No or Yes
Shares Balance	The bank can use and distribute your balance information to any company or individual that pays for it	No or Yes
Shares Frequency and Amounts of Cash Withdrawals	The bank can use and distribute information about the frequency and amounts of your cash withdrawals to any company or individual that pays for it	No or Yes

Table 1d: Attributes, Descriptions, and Levels for Facebook Survey

Attributes	**Descriptions and Levels**	**Levels**
Monthly Payment	The amount you would receive in monthly payments by a third party.	Arg:$0, $10, $20,…,$160, $170 Bra.:$0,$1,…$8,$8.50,$9,$10,…$15,$16 Col.:$0,$750,$1500,…,$12,000,$12,750 Ger:€0,€0.25,€0.50,…,€4.00,€4.25 Mex:$0,$5,$10,…,$80,$85 U.S.:$0,$0.25,$0.50,…,$4.00,$4.25
Reads Texts	Facebook can use and distribute information from your texts to any company or individual that pays for it. Note that this includes texts sent using WhatsApp and Facebook Messenger.	No or Yes

Table 2a: WTA Estimates for Carrier Survey[15]

	Argentina	**Brazil**	**Colombia**	**Germany**	**Mexico**	**U.S.**
Send Ads	15.60**	1.74	-913.07*	1.77**	2.13	1.63**
	(6.13)	(1.54)	(455.44)	(0.31)	(3.18)	(0.40)
Share location	43.91**	6.00**	3364.05**	2.70**	35.71**	2.50**
	(7.36)	(1.65)	(604.74)	(0.44)	(4.81)	(0.51)
Share contacts	129.66**	17.67**	7035.25**	7.07**	71.88**	6.66**
	(14.12)	(3.30)	(922.81)	(0.86)	(7.55)	(1.13)
Share browsing history	71.51**	9.72**	4033.31**	3.73**	25.17**	4.25**
	(9.30)	(2.24)	(744.15)	(0.50)	(3.99)	(0.76)

Table 2b: WTA Estimates for Financial Survey[16]

	Argentina	**Brazil**	**Colombia**	**Germany**	**Mexico**	**U.S.**
Send ads	-17.78*	0.01	-4571.51**	1.65**	-8.39+	0.73**
	(7.05)	(1.28)	(1106.67)	(0.43)	(4.43)	(0.25)
Share balance	121.45**	20.72**	12181.23**	11.88**	56.82**	4.99**
	(13.71)	(4.15)	(2440.85)	(1.98)	(8.80)	(0.79)
Share cash withdrawals						

Table 2c: WTA Estimates for Smartphone Survey[17]

	Argentina	Brazil	Colombia	Germany	Mexico	U.S.

Table 3: Average WTA By Feature Across Country and Platform

Read Texts	Argentina	Brazil	Colombia	Mexico	Germany	U.S.	Average
Share balance	5.08	9.96	9.09	6.10	15.43	4.99	8.44

Table 4: WTA Estimates for All Surveys in U.S. Dollars[19]

	Argentina	Brazil	Colombia	Germany	Mexico	U.S.

Table 5a: Coefficient of Variation Estimates for Carrier Survey[20]

	Argentina	Brazil	Colombia	Germany	Mexico	U.S.

Table 5c:

Table 6a:

Table 6c: Difference in WTA When Prompted for Smartphone