The Short-Term Effects of GDPR on Technology Venture Investment

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GDPR Mandates

• Data subjects’ rights
  – granular informed opt-in consent, freely given
  – right to access copy of self PII data
  – right to know data breach
  – right to be forgotten
  – right of own PII data portability

• Privacy by design:
  – data management, auditing, classification, risk identification and mitigation

• Train or hire qualified staff (Data protection officer)
  – if has 250+ employees or is heavy in data use

• Violators may face severe penalties
  – can be ~$23m or 4% of annual revenue
GDPR Timeline

• 4/14/16: Adopted by European Parliament, set to take effect on 5/25/18

• 1/25/18, SafeDK: More than half of mobile applications are not GDPR ready

• 5/9/18, 5/23/18: Apple removes apps that share location data w/o consent, updates privacy terms

• 5/10/18: Facebook: “Businesses may want to implement code that creates a banner and requires affirmative consent… Each company is responsible for ensuring their own compliance”

• 5/24/18: Shopify updates app permissions for merchants/developers

• 5/24/18: Google releases consent SDK for developers

• 5/25/18: GDPR takes effect
Motivation

- GDPR enforcement by each member state of EU, with large heterogeneity in expectation
- Bloomberg: “500 biggest corporations are on track to spend a total of $7.8 billion to comply”
- Young ventures are more susceptible to increases in compliance costs (Campbell et al., 2015; Krasteva et al., 2015)
- Compliance costs were realized as new policies were rolled out
  - Reliance on larger platforms’ policies (compliance, liability, compatibility)

- Who is better to assess those costs than investors?
Motivation

- Pew Surveys:
  - 91% feel that they have lost control of their PII data
  - 61% want to do more to protect their data privacy
  - 66% believe the current law is not sufficient to protect consumer privacy

- FTC (2014, 2016):
  - Data brokers, risk of inaccurate data

- Bureau of Justice Statistics (2014):
  - 7% of 16+ year olds Americans are victims of identity theft

- Appthority (2018):
  - 95% of the top 200 iOS and Android apps engages in 1+ risk behavior

- CCPA (6/28/18), Bill of Senator Wyden (11/1/2018)
Literature Review

• Acquisti et al. (2016 JEL): Economics of Privacy
• Empirical work:
  – Miller and Tucker (2009, 2011): Medical privacy regulations reduced the adoption of electronic medical records
  – Kim and Wagman (2015): opt-in for data trade leads to higher mortgage rate, lower underwriting standards, and potential downstream foreclosures.
  – Goldberg et al. (2018): For EU firms, recorded pageviews fall by 7.5%, conversions fall 12.5%, ad tracking fall 6.2% after the rollout of GDPR
• Theoretical work:
  – Campbell et al. (2015): privacy regulation imposts cost on all firms, especially for small and new firms, and for goods not mediated by price
  – Krasteva et al. (2015): as compliance cost increases for small firms, more innovations will be carried out by established firms.
Data

- Venture deals in EU & US taking place in July 2017 through September 2018 from Crunchbase

- Firm information (name, location, category, founding date, financing dates, employee range)

- Deal information (size & date of deal, funding stage such as Seed/Series A/etc, participating investors)
Summary Statistics

(a) Average # of deals per week
- EU: 81
- US: 178

(b) Median $MM raised per deal
- EU: 1.42
- US: 3.02

(c) Average firm age (excluding 9+ y.o.)
- EU: 2.94
- US: 3.05

(d) Average # of investors per deal
- EU: 2.15
- US: 3.07

Graphs showing comparisons between EU and US:
- EU: 48.56% New firms (0-3 years), 15.37% Young firms (3-6 years), 9.72% Established firms (6-9 years), 35.31% Mature firms (9+ years)
- US: 44.77% New firms (0-3 years), 18.63% Young firms (3-6 years), 10.74% Established firms (6-9 years), 35.31% Mature firms (9+ years)
Summary by Venture Age

(b) Total # of deals

(a) Average $MM raised per deal

(c) Median $MM raised per deal
Funding Stage (Firm Age, Average $ Raised)

Larger circles: higher # of deals
Summary by Location
Average # of deals per category (5 categories)
# Deals Per Week, EU & US:

![Graph showing deals per week in EU and US with GDPR effect](image)
# Deals/Week/State/CrudeCategory, EU & US:

![Graph showing deals per week per state per crude category for EU and US.](image)

- **US**
- **EU**

**GDPR takes effect**

*Note: The image contains a graph with data points and a note indicating where GDPR takes effect.*
Total $ Raised Per Week/State/CrudeCategory

GDPR takes effect
Average Weekly $ Raised for Healthcare and Finance, EU & US

The graph shows the average weekly $ raised for healthcare and finance in the EU and US from 2017 to 2019. The data is represented by a line graph with two lines: one for the US (solid blue) and one for the EU (dashed red). The GDPR takes effect at the end of the data period.
Average Weekly $ Raised for all other categories, EU & US

GDPR takes effect
Average Weekly $ Raised Per Deal, EU & US

![Graph showing average weekly $ raised per deal in the EU and US over time, with a notable increase around GDPR take effect.]
Empirical Methodology

• Difference-in-difference framework
  – EU ventures after May 25 2018 as treatment, US ventures as control group

• Tobit for $ amount (0 censored), Poisson for # of deals (count data)

• Macroeconomic controls (unemployment, CPI, interest rate, GDP, exchange rate)

• Time (week) and state (US) /country (EU) fixed effects

• Log linear at deal level, control for investor type, firm age, funding stage, category

\[ y_{jkt} = \alpha_t + \alpha_k + \delta X_{jkt} + \beta GDPR_{kt} + \varepsilon_{jkt} \]
GDPR Effect on $MM Raised Per Week Per Member State Per Crude Category (Average EU)

<table>
<thead>
<tr>
<th>Category</th>
<th>With GDPR</th>
<th>Without GDPR</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>All EU Ventures</td>
<td>26.56</td>
<td>23.18</td>
<td>$3.38m</td>
</tr>
<tr>
<td>0-3 Year Old EU Ventures</td>
<td>15.31</td>
<td>14.41</td>
<td>$0.90m</td>
</tr>
</tbody>
</table>

$MM
GDPR Effect (Average EU)

Combined findings indicate negative effects in both the **extensive** margin (# of deals) and **intensive** margin ($ per deal).
## Results by Crude Categories

<table>
<thead>
<tr>
<th>Category or Age Group</th>
<th>Aggregate $mm per week per state change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare &amp; Financial</td>
<td>-5.22m ($30.1m avg)</td>
</tr>
<tr>
<td>All Other Categories</td>
<td>Not significant</td>
</tr>
<tr>
<td>0-3 Year-Old Firms</td>
<td>-0.9m ($14.82m avg)</td>
</tr>
</tbody>
</table>
Robustness

- Dropped the month of May, tried other start weeks
- Top-coded observations to reduce influence of outliers
- Used unsupervised industry categorization
- Used other specifications including OLS
Back-of-the-Envelope Job Calculation

• Calculate $ amount raised per employee range annually for each 0-3 year old firm, then average bounds across 0-3 year old firms

• Find reduction in total $ amount invested per week

• Calculate their overall $ amount reduction due to GDPR in Jun-Sep 2018, extrapolate to a calendar year using Jun-Sep 2017 relationship to 2017

• Divide amount by lower and upper bounds of $ per employee to obtain bounds on employee losses

• Find ratio of losses to the total employee range in the sample
Average $ Raised Per EU Tech Employee

Data provides ranges of employees per firm (1-10, 11-50, 51-100, etc)
Rough Bound Estimates of Annual EU Tech Jobs Lost

- Range estimate of potential job losses: 3,604 to 29,819

- Could be indicative of wait-and-see approach, only observe short term
- Preliminary, back-of-the-envelope calculation
- 4.09-11.20% of overall 0-3 year old venture tech jobs in the EU in our sample

0-3 Year Old EU Ventures

Range estimate of potential job losses
Preliminary Conclusions

• In the short run, GDPR has a pronounced negative effect on new EU venture financing, both on # of deals and amount per deal. More study is needed:
  • Post-GDPR sample is relatively short
  • Some investment dollars may be flowing to the US, could overstate results
  • Did not examine non-EU countries that serve EU, could understate results
  • Investors may fear rising costs / business obstacles / uncertainty – we can’t distinguish
  • Small part of the bigger investment/venture picture (Crunchbase is not a complete universe)

• Ventures in the health and finance categories appear to be susceptible
  – Counterintuitive, US already has HIPPA (but at doctor’s office, consent for service)
  – Calls for further study across categories when more data is available (e.g., with GDPR, service must be provided without consent, different penalties)

• Potential for technology and related job losses