The One-Year Impact of the General Data Protection Regulation (GDPR) on European Ventures

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ABSTRACT

Data is a key input in technological innovation and in the matching processes between firms and customers, from advertising, security, and e-commerce, to transportation, healthcare, and banking. This report summarizes economic analyses of the consequences of GDPR for investment in new technology ventures in the European Union (EU). The analyses distinguish between the impacts on foreign and non-foreign investment, between younger and more established ventures, and between more and less data-reliant ventures. The results, utilizing global venture data, indicate that GDPR's effects on investment in EU ventures are broadly negative, and particularly so for foreign investments, younger ventures, and data-reliant firms. The findings demonstrate a post-GDPR average reduction of 26.10% in the overall number of monthly EU deals and a 33.80% reduction in the average dollar amount raised per deal.

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1. INTRODUCTION

The General Data Protection Regulation, a landmark EU privacy law that restricts how firms can use personal data, was enacted in April, 2016, becoming enforceable two years later on May 25, 2018. The regulation aims to protect data by 'design and default,' with both specific as well as heuristic requirements that firms handle data according to a set of principles. The law mandates a higher degree of privacy, data management, and control, requires legitimate interest or informed opt-in consent for data collection, and assigns substantial liability risks and penalties for data flow and data processing violations. GDPR is particularly likely to influence technology firms, which tend to incorporate data into their value propositions through product design, personalized services, customer engagement, and monetization.

For the youngest of those firms and their investors, GDPR introduces significant uncertainties. First, the regulation creates uncertainty with respect to which data-driven products are compliant, and whether products or processes need to be changed, since compliance itself is a function of heuristics that have yet to be technically specified or fully tested in courts. For instance, ventures and investors may be unclear about whether legitimate interest (versus informed consent) is an adequate path to compliance.[1] Second, ventures may rely on the compliance strategies of larger platforms, but many of these platforms announced how they intended to pursue compliance only on or around GDPR's implementation date,[2] and some are still revising their policies to meet compliance adequacy.[3] The choices of the larger platforms may also be critical for smaller businesses because they influence those firms' data-related liabilities under the regulation.[4] As a consequence, GDPR also leads to uncertainty with respect to the actual cost of compliance. The regulation is thus associated with uncertainties about the extent to which ventures are able to comply, and how much it would cost them to do so, with indications that the costs are significant.[5] For investors, it follows that GDPR introduces new costs and dimensions of uncertainty and due diligence.

In this report, we first present the overall effect of GDPR on technology venture investment in the EU, using worldwide data from the beginning of 2014 to the middle of 2019, i.e., data that goes back more than four years before and a year after GDPR's enforceability took effect. We extend the analysis to examine multiple dimensions of the effects of GDPR. The results are largely in line with our previous report that comprised only four months of EU and US post-GDPR data.[6] Then, we present a new analysis about the impact of GDPR on foreign vs. non-foreign venture investments. We show that GDPR has had a negative effect on EU venture investment and the effects are magnified for foreign investors.

More specifically, when comparing foreign-led venture investment deals to purely domestic deals, our findings suggest a 22.20% reduction in the average number of monthly EU foreign deals and a 41.89% reduction in their per-deal dollar amount after the rollout of GDPR. In comparison, the reductions are 12.1% and 28.08% in the number and per-deal amounts of purely domestic EU deals.[7] Ventures that rely on data more and the youngest (0-6 year old) ventures incurred much of the negative effects, with reductions of 26.29% and 23.36%, respectively, in the number of deals after the rollout of GDPR.

2. DATA

The analyses utilize two primary sources of data—Thomson Reuter's VentureXpert (VX) and CrunchBase (CB). Data from VX and CB on worldwide venture-related funding activities is collected from January 2014 to June 2019, including financing round parameters such as venture information (name, location, operating category, founding date, and financing dates) and funding information (the size of a funding round, the date a round was announced, the type of financing such as Seed, Series A, and Series B, the type of investors, their locations, preferred industries, and experience, and the number of investors per funding round).

More specifically, for each venture financing round, we track the location (country, state, city, and zipcode) of lead investors (i.e., those investors who have the highest amounts at stake in financing rounds and conduct much of the due diligence), the industry in which each investor prefers to invest (e.g., 'software', 'AI', 'analytic', 'internet', 'service', 'diversified', etc), each investor's experience (i.e., the difference between the financing round year and the year that the investor began investing), the investor's size (i.e., the amount of capital under management), and other measures of investment experience (the number of prior investments, and the number of investments made in a particular industry as well as across all industries before the financing round year).

Each funding round observed is a 'deal' event, and deals are tallied monthly in each US state, EU member state, and other world countries. A deal is said to be foreign if the venture and its (lead) investor are from a different 'union' (i.e., one in EU and one in the US, China or elsewhere). A deal is said to be of the same union if the venture and its lead investor belong to different member states within the same union (e.g., a venture in France has a German lead investor, and a venture in New York has a lead investor from California). A deal is said to be domestic if the venture and its lead investor are from the same state (e.g., from the same US state or EU member state).

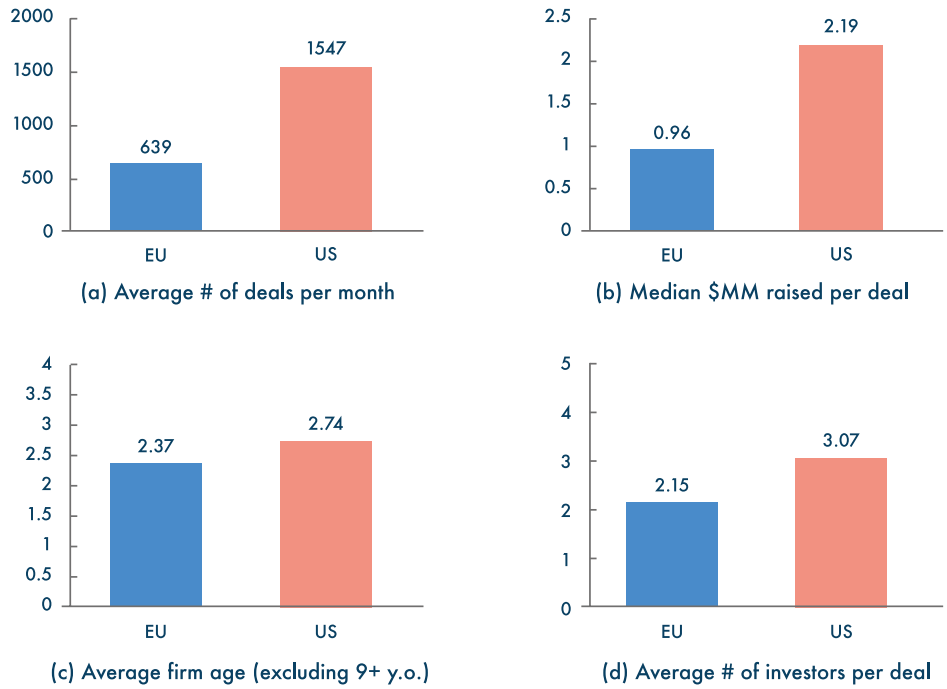

Figure 1: Summary statistics, venture deals

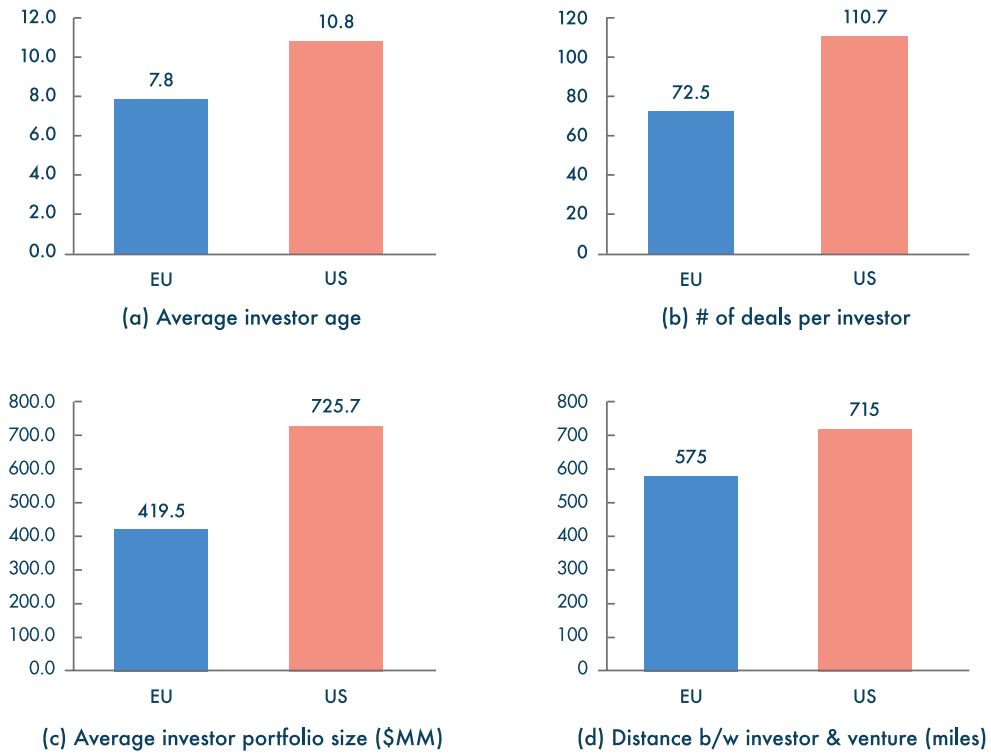

Figure 2: Summary statistics, investors

A venture's time variant age is calculated based on its founding date. We consider two different age categories: young ventures/firms (0-6 years old), and mature firms (6+ years old). Firms may consequently switch between age categories in our sample. We further collect local macroeconomic controls such as unemployment rate, CPI, interest rate, and GDP for each US state and EU country in which a venture is located.

Figures 1-4 (along with Table 1 in the Appendix) summarize aspects of the data, focusing on EU and US ventures. Figure 1(a) indicates that the average number of deals per month in the US is more than twice that in the EU, with a similar pattern for the median amount raised per deal in Figure 1(b). Per Figure 1(c), given similar average ages for US and EU ventures, Figure 1(d) suggests that US venture deals involve a higher number of investors on average relative to EU deals. Figure 2 summarizes investor information. Figure 2(a) shows investors' average number of years of operation. Figure 2(b) indicates that US investors participate in more deals than EU investors. Figure 2(c) gives the average sizes of investors' portfolios, which is higher in the US than in the EU. Figure 2(d) shows that the distance between investors and ventures is somewhat higher for US investors.

Figure 3 depicts the distribution of deals financed by the different investor types (i.e., foreign, same-union, and domestic). The US has similar proportion of same-union and domestic deals. The EU, in contrast, has a larger proportion of deals led by domestic investors.

A comparison of deals by the different investor types is presented in Figure 4, indicating that ventures financed by foreign investors tend to have higher dollar amounts, and that the average size of domestic deals tends to be smaller. More than 70% of both US and EU deals are by same-union and domestic investors.

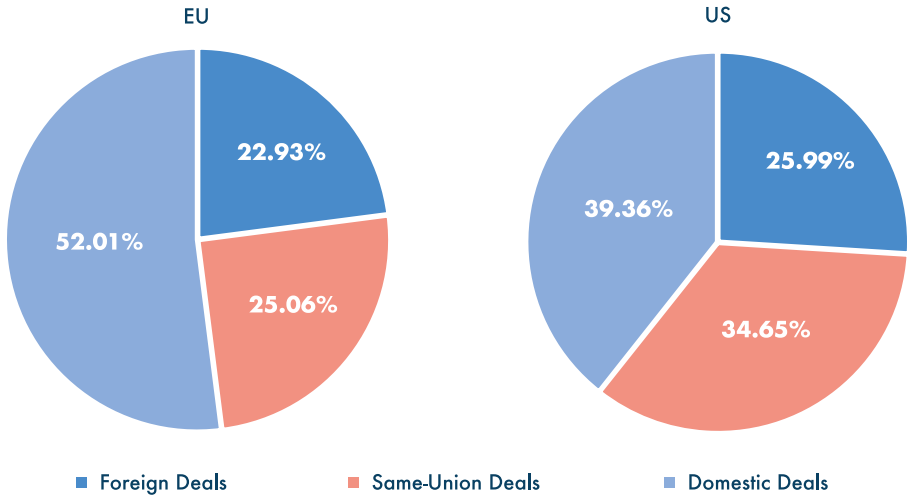

Figure 3: Venture deals by venture-investor geographic relationships in the EU and US

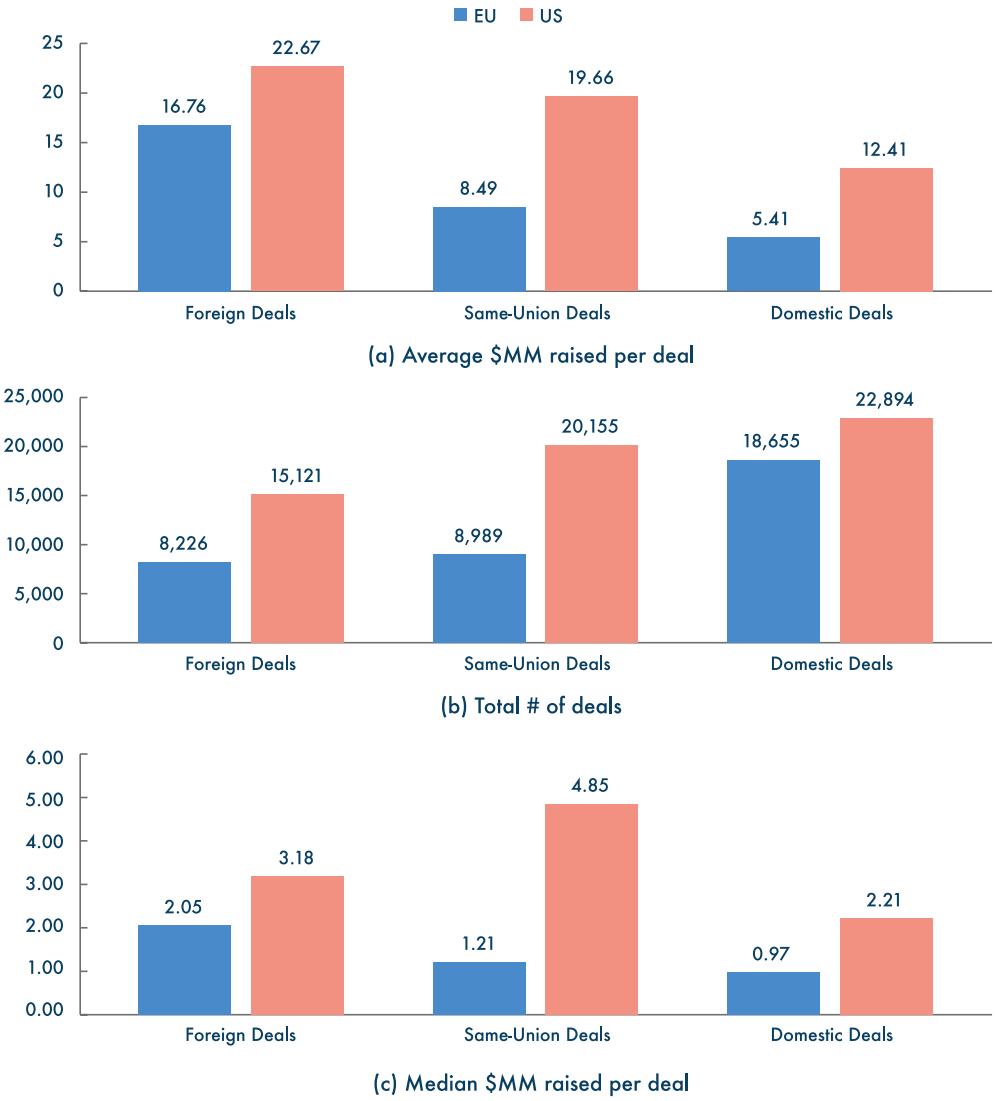

Figure 4: Summary statistics of investments by investor-venture geography, EU and US

3. EMPIRICAL APPROACH

We aim to examine the effects of GDPR on investment in technology ventures. We do so by contrasting venture activity in the EU with the rest of the world, and specifically with the US, before and after both the enactment and the rollout of GDPR. While GDPR was enacted in April 2016, its enforceability began to take hold in May 2018, with mandatory implementation by EU member states and mandatory compliance by firms that service EU citizens. We anticipate that as GDPR's enforceability came into place, entrepreneurs and investors realized the compliance, uncertainty and implementation costs, as well as the ex-post implications of GDPR. This is particularly evident in the days and weeks immediately before GDPR's effective date, as major platforms, including Google, Facebook, Amazon, Apple, and Shopify, on which a vast number of technology ventures rely, began to reveal the ways in which they were tightening their developer-side services with new data sharing, data portability, and data liability rules. Our sample suggests significant consequences to GDPR's rollout, with investor dollars differentially lessening and fewer venture deals being executed in the EU relative to the rest of the world following the rollout of GDPR.

Figure 5 depicts trend lines of the total funding amounts raised and the number of deals per month per member state from January 2014 to April 2019 in the US, the EU, and the rest of the world (RoW). Figures 5(a) and 5(b) suggest that no divergence took place between the EU and the rest of the world after the enactment of GDPR, but some sustained divergence took place around the time that GDPR was rolled out. The trends also track each other closely otherwise, and particularly so up until May 2018.

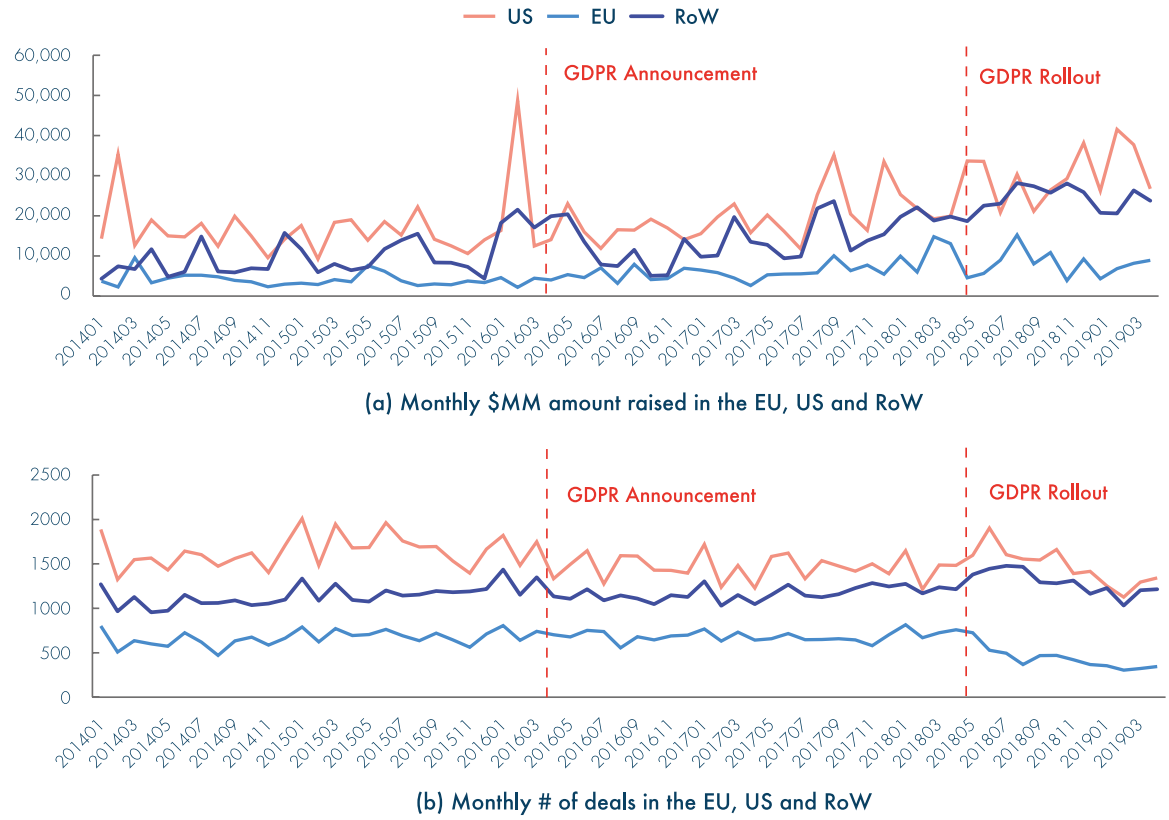

Figure 5: Monthly trends for total funding raised and number of deals

We add macroeconomic variables and time and state/country fixed effects to control for unrelated variations. Our treatment group comprises EU ventures (adding in European Economic Area (EEA) countries does not change the results) and our control group comprises ventures in the rest of the world. Our empirical approach utilizes a difference-in-differences methodology (DID). The analyses are carried out at two levels. At the aggregate, each observation is defined at the month-state level and the dependent variable is the number of deals secured in each month-state. As previously indicated, as a measure of the geographic zones to which ventures and investors belong, we further categorize deals into three types—foreign, same-union, and domestic deals. At the deal level, the dependent variable is either the dollar amount raised per deal or the geographic venture-to-investor distance. We use appropriate regressions (Poisson for number of deals, Ordinary Least Squares for $ amount), for which the specifications are given by:

$$y_{st} = \alpha_s + \alpha_t + \delta X_{st} + \beta_1 EU_s \times GDPR\_Enact_t + \beta_2 EU_s \times GDPR\_Rollout_t + \varepsilon_{st}, \quad (1)$$

where s denotes state, t indexes month, EU_s is a dummy that equals 1 for EU states and 0 otherwise, $GDPR\_Enact_t$ is a dummy variable which equals 1 if the time t is on or after April 2016 but before May 2018 and 0 otherwise, and $GDPR\_Rollout_t$ is a dummy variable which equals 1 if the time t is after May 2018 and 0 otherwise. The dependent variable of interest is Y_{st}, which is either the number of financing deals in each month-state, or the dollar amount per deal. State and country-specific macroeconomic controls (monthly unemployment rate, CPI, interest rate, and quarterly GDP) are denoted by X_{st}, and ε_{st} is an error term. This methodology controls for fixed differences between EU and non-EU ventures via state and country fixed effects, and month dummies control for aggregate fluctuations.

The coefficients β_1 and β_2 capture the effects of GDPR's enactment and rollout, respectively.

4. EFFECTS OF GDPR ON VENTURES

We compare the average total monthly number of deals per state and the average dollar amount raised per deal, before and after April 2016 and May 2018, using US and RoW ventures as control groups. We identify a significant negative effect of GDPR's rollout against EU ventures but limited effects from the enactment of GDPR. The proceeding figures illustrate how the 2018 rollout of GDPR affected the average number of deals and the amount raised per deal for EU ventures.[8]

Figure 6 depicts the effect of the rollout of GDPR on the average monthly number of financing deals per state by EU ventures. The light blue bars represent the average total monthly number of venture financing deals that would have prevailed in the EU if GDPR were not rolled out, whereas the blue bars give the average number of deals that we observe post GDPR, suggesting a considerable negative effect. The results suggest a 26.1% decrease in the number of EU ventures deals after the rollout of GDPR (a statistical representation is provided in Column 1 of Table 2 in the Appendix). Our analysis reveals that much of the decrease is driven by younger ventures and by ventures that are more reliant on data.

Compounding the negative effect of GDPR on the number of EU venture deals is a reduction in the dollar amount raised per deal. This is illustrated by Figure 7, where the light blue bars depict the average dollar amounts in millions of dollars per deal by EU ventures if GDPR were not rolled out, whereas the blue bars give the averages that we observe. The results suggest a decrease of 33.8% in the average dollar amount raised per EU deal after the rollout of GDPR. These effects are magnified for younger ventures and for more data-reliant ventures, with respective decreases of 37.85% and 46.1%.

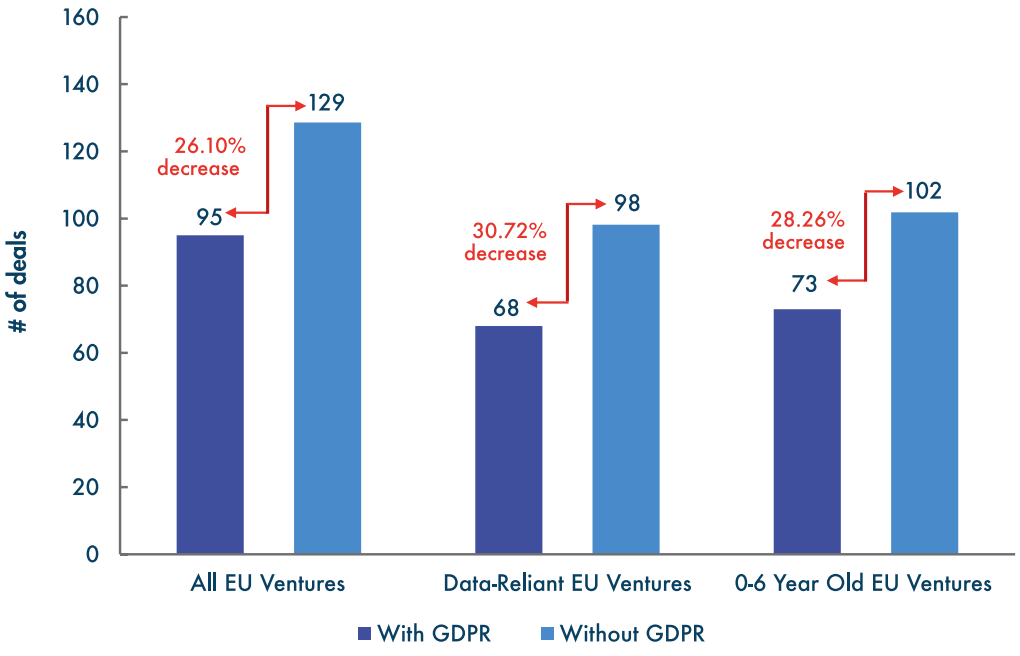

Figure 6: Effect of GDPR on the number of month-state deals by EU technology ventures

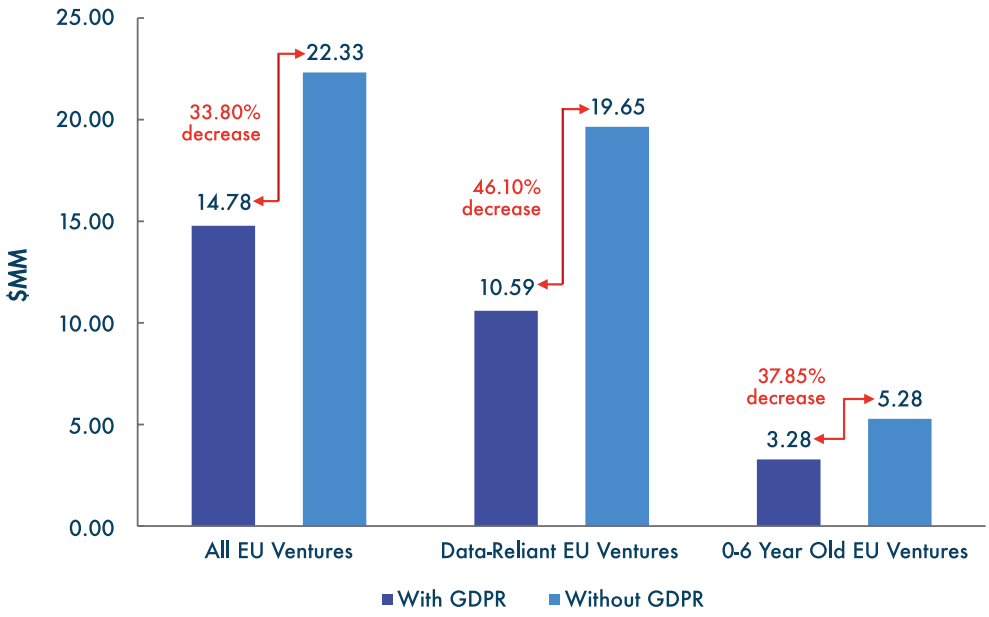

Figure 7: Effect of GDPR on the $ amount raised per deal in EU technology ventures

EFFECTS OF GDPR ON INVESTORS

Next, our analyses assess the differential effects of GDPR's enforceability on foreign vs. non-foreign (same-union and domestic) investments and identify a significantly larger negative effect on EU venture deals that are led by foreign investors. The proceeding figures illustrate these effects.

Figure 8 presents the effects of GDPR's enforceability on the different investor types, depicting a 22.20% decrease in the monthly number of deals per state led by foreign investors after GDPR compared to decreases of 15.80% and 12.1% for same-union and domestic investors, respectively. These effects are accentuated for ventures that are more data reliant,

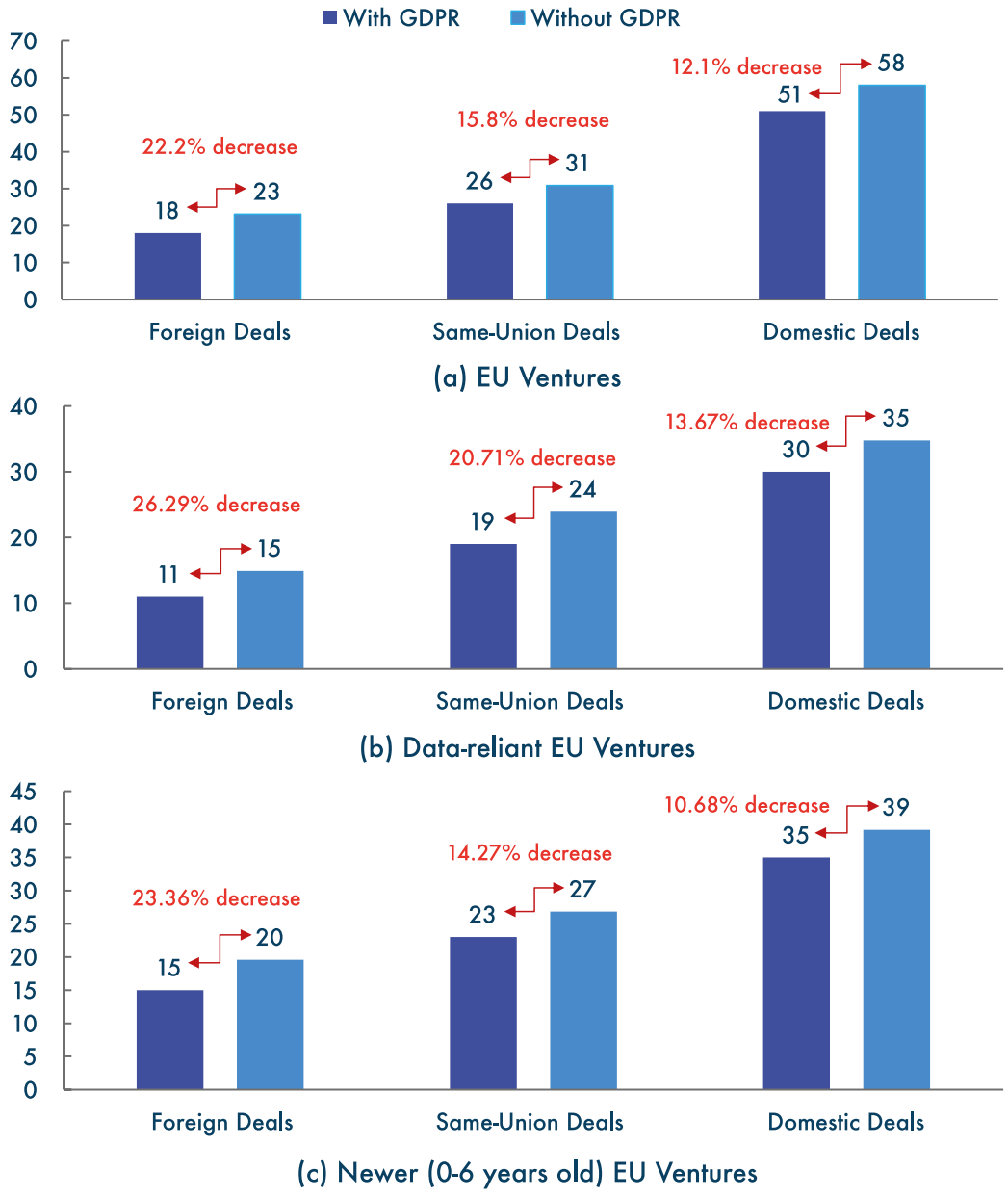

Figure 8: Effects of GDPR on the number of month-state by different investor types

with a decrease in the average number of deals of 26.29% for foreign investors compared to decreases of 20.71% and 13.67% for same-union and domestic investors. Similar findings are obtained for younger ventures. The number-of-deals analysis represents a salient extensive margin effect, suggesting a substantially greater percentage of foreign funding rounds may fail to materialize after the rollout of GDPR, though all three deal type, foreign, same-union, and domestic, decrease following GDPR's rollout. Said another way, GDPR's overall impact on the EU venture scene could have been worse had it not been for its prevalence of domestic and same-union deals.

The impact of GDPR on the intensive margin (i.e., dollar amount raised in deals that actually go through) also varies across the different investor types. As depicted in Figure 9, the results suggest a decrease of 41.89% in the average dollar amount raised per foreign-led deal compared to decreases of 35.77% and 28.02% for same-union and domestic deals, respectively.

One may also suspect differential effects on foreigners who invest in EU ventures depending on whether they are based in the US or elsewhere in the world. In the next analysis, financing deals are grouped as follows: deals financed by EU-based investors, by US-based investors, and by RoW-based investors. This makes it possible to compare the effects of GDPR on US investors, EU investors, and investors in the rest of the world. Figure 10 depicts the negative effects of GDPR's rollout on investment in EU ventures for those three groups of investors when using US ventures as the control group. The results suggest decreases of 10.68%, 21.48% and 18.04% from EU, US, and RoW investors, respectively, in the number of deals per month-state. This analysis enables an assessment of the shift in investments by RoW investors after GDPR, where the negative effect suggests a withdrawal of funding by these investors from EU ventures relative to US ventures.

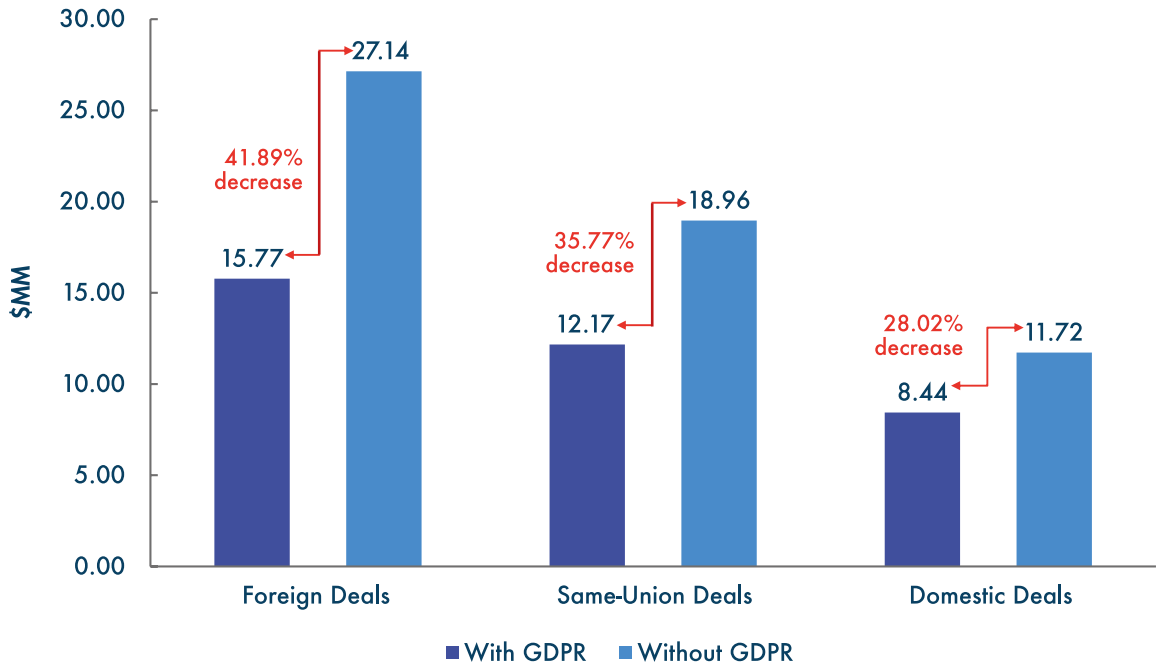

Figure 9: Effect of GDPR on the $ amount raised per deal for different investor types

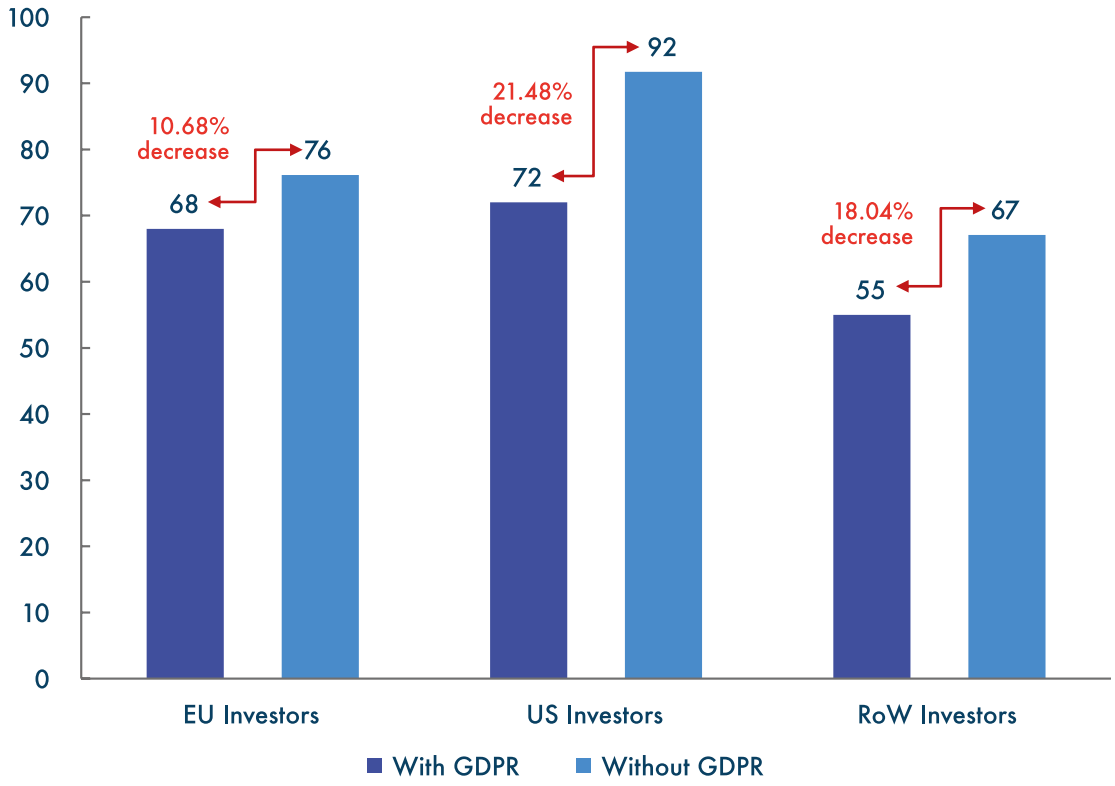

Figure 10: Effect of GDPR on the monthly number of deals for different investor groups

CONCLUSION

Using five and a half years of investment data from the global venture market, we reported analyses of the effects of GDPR on the financing of new technology ventures in the EU. The findings suggest that GDPR has been associated with pronounced negative effects on EU venture investment and the effects are larger for ventures that are more data reliant, younger, and/or benefit from foreign investment. The negative effects manifest in the number of deals and in the amount invested per deal. We caution that given the extent of our data, which comprises a year after the enforceability of GDPR took effect, it is impossible to rule out that our estimates may be reflective of a shorter-term reaction such as a wait-and-see attitude by investors and entrepreneurs, rather than a permanent long-term consequence of GDPR. The long-term impact of GDPR on the EU technology venture scene will be clearer in the coming years, as other countries and regions grapple with their own data regulations. At the same time, our findings suggest that countries that are reliant on foreign investment in new technology businesses stand to lose more from implementing a regulation such as GDPR.

REFERENCES

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APPENDIX: TABLES

Table 1a: Summary Statistics – Aggregate Level

	EU					US				
	Mean	Median	75-percentile	95-percentile	N	Mean	Median	75-percentile	95-percentile	N
Panel A: Whole Sample										
# of countries/states	-	-	-	-	24	-	-	-	-	51
# of months	-	-	-	-	64	-	-	-	-	64
# of categories	-	-	-	-	4	-	-	-	-	4
$ MM amount raised	58.70	0.57	14.97	280.39	6,144	98.94	1.30	22.58	405.98	13,056
# of deals	6.62	2	7	30	6,144	7.58	2	6	26	13,056
# of foreign deals	1.49	1	3	12	1,584	1.82	1	4	15	3,366
# of same union deals	1.83	1	2	10	1,584	2.91	1	3	13	3,366
# of domestic deals	3.20	2	4	18	1,584	3.39	2	5	19	3,366
# of different industry deals	3.68	1	9	15	1,584	4.47	1	7	18	3,366
Unemployment	8.63%	7.11%	10.15%	20.67%	1,584	4.68%	4.64%	5.60%	6.93%	3,366
GDP (in trillion *10)	17.18	6.15	13.71	71.75	1,584	37.19	21.57	47.15	149.55	3,366
CPI	108.45	108.22	110.35	113.85	1,584	111.15	110.18	113.48	115.84	3,366
Interest	-0.15%	-0.29%	0	0.29	1,584	0.73%	0.32%	1.24%	2.37%	3,366
Panel B: Sub-group by data intense										
More data-related:										
# of foreign deals	4.71	1	4	19	1,584	8.06	3	9	38	3,366
# of same union deals	5.84	1	6	21	1,584	7.55	3	8	31	3,366
# of domestic deals	8.91	3	12	42	1,584	12.34	7	16	59	3,366
Less data-related:										
# of foreign deals	1.96	1	2	5	1,584	3.18	1	3	5	3,366
# of same union deals	2.36	1	3	5	1,584	3.32	1	4	7	3,366
# of domestic deals	4.11	1	3	7	1,584	5.43	2	6	11	3,366
Panel C: Sub-group by firm age										
New & Young firm (0-6 year):										
# of foreign deals	5.17	2	9	27	1,584	7.93	3	15	33	3,366
# of same union deals	6.58	3	14	39	1,584	7.43	3	13	27	3,366
# of domestic deals	10.69	6	21	64	1,584	12.14	8	29	72	3,366
Mature firm (6+ year):										
# of foreign deals	2.18	0	1	7	1,584	3.38	1	2	9	3,366
# of same union deals	2.84	1	2	8	1,584	3.31	1	2	8	3,366
# of domestic deals	4.64	1	4	13	1,584	5.18	2	4	15	3,366

Table 1b: Summary Statistics – Deal Level

	EU				US			
	Mean	Median	Std.dv	N	Mean	Median	Std.dv	N
Panel A: Venture Characteristics								
# of ventures	-	-	-	16,440	-	-	-	32,825
$ MM amount raised per deal	8.72	0.95	81.76	23,373	17.78	2.03	125.67	37,776
Venture age	2.85	1.83	8.78	23,373	3.29	2.09	14.87	37,776
# of investors per deal	2.15	1.96	5.17	23,373	3.07	2.85	7.11	37,776
Panel B: Investor Characteristics								
Investor age	7.8	5.1	9.78	18,862	10.8	6.4	15.77	29,362
Investor size ($M)	419.5	357.5	502.1	18,862	725.7	588.9	918.5	29,362
General experience	72.5	-	-	18,862	110.7	-	-	29,362
Distance between investor and venture (miles)	575	273	795	18,862	715	469	981	29,362
Panel C: Type of investments – Venture Side								
# of foreign deals	-	-	-	5,360	-	-	-	9,821
$ MM amount per foreign deal	16.76	2.05	114.55	5,360	22.67	3.18	146.19	9,821
Percentage of foreign deals				22.93%				25.99%
# of same union deals	-	-	-	5,857	-	-	-	13,088
$ MM amount per same union deal	8.49	0.21	82.26	5,857	19.66	4.85	131.28	13,088
Percentage of same union deals				25.06%				34.65%
# of domestic deals	-	-	-	12,155	-	-	-	14,867
$ MM amount per domestic deals	5.41	0.97	43.11	12,155	12.14	2.21	80.52	14,867
Percentage of domestic deals				52.01%				39.36%
Panel D: Type of investments – Investor Side								
# of foreign deals by EU investor	-	-	-	-	-	-	-	4,029
$ MM amount per foreign deals by EU investor	-	-	-	-	25.35	3.01	163.62	4,029
# of foreign deals by US investor	-	-	-	3,181	-	-	-	-
$ MM amount per foreign deals by US investor	21.02	4.12	121.28	3,181	-	-	-	-

Note: We do not report the summary statistics of same-union and domestic deals from investors' perspective in Panel D since these measurements duplicate the ones from ventures' perceptive in Panel C. For example, EU ventures would have same-union or domestic deals if they have EU investors, and EU investors would invest in same-union or domestic deals if they invest in EU ventures. However, foreign deals can be decomposed by EU-investors (for US ventures), US-investors (for EU ventures), and rest-of-the-world (Non-EU/US) investors (for both EU and US ventures). In Panel D, the # of foreign deals by Non-EU/US investors is sorted into EU and US ventures. In other words, the EU columns represent the # of deals invested by Non-EU/US investor in EU ventures and similarly with the US columns for US ventures.

Table 2: GDPR impact on aggregate level # of deals and $ amount per deal

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	DV: # of deals per month/state/category				ln ($ amount per deal)		
	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	OLS	OLS	OLS
GDPR_Enact	-0.043	-0.319	-0.281	-0.411	0.689***	0.514***	0.742***
	(0.202)	(0.220)	(0.200)	(0.579)	(0.146)	(0.138)	(0.169)
EU * GDPR_Enact	0.063	0.097	0.128	0.047	-0.021	0.006	-0.023
	(0.074)	(0.128)	(0.093)	(0.102)	(0.039)	(0.066)	(0.067)
GDPR_Rollout	-0.284	-0.478	-0.128	-1.478***	1.726***	0.638**	1.764***
	(0.261)	(0.335)	(0.381)	(0.131)	(0.192)	(0.270)	(0.224)
EU * GDPR_Rollout	-0.302***	-0.445**	-0.367***	-0.338***	-0.338***	-0.461***	-0.378***
	(0.108)	(0.220)	(0.124)	(0.139)	(0.065)	(0.148)	(0.118)
Marginal effect (rollout)	-26.1%	-35.92%	-30.72%	-28.26%	-	-	-
Unemployment	0.025*	0.012	0.015	0.029***	0.022***	0.040***	0.030*
	(0.013)	(0.020)	(0.026)	(0.011)	(0.001)	(0.015)	(0.017)
GDP	0.006	0.217**	0.003*	0.001	0.001	0.001**	0.002
	(0.011)	(0.094)	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)
CPI	-0.005	0.052**	0.018	0.005	0.000	0.014	-0.000
	(0.022)	(0.025)	(0.022)	(0.019)	(0.000)	(0.017)	(0.000)
Interest rate	-0.063**	-0.229***	-0.119**	-0.065*	-0.016	0.424***	-0.011
	(0.032)	(0.059)	(0.055)	(0.036)	(0.018)	(0.079)	(0.020)
Sample Group	Whole Sample	Whole Sample	Data-reliant Ventures	Newer Ventures	Whole Sample	Data-reliant Ventures	Newer Ventures
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,200	19,200	4,950	4,950	97,496	59,085	75,228
R-squared	-	-	-	-	0.497	0.484	0.479
F-test on pre-treatment (p-value)	0.109	0.124	0.107	0.134	-	-	-

*Note: The dependent variable for Columns 1, 2, 3 and 4 is the # of deals, whereas it is ln (1+# of deals) for Columns 5, 6, and 7. Columns 1 – 4 report a Poisson specification, and Columns 5 – 7 report OLS with the same settings of Columns 1, 3, and 4. Column 2 reports the results using ventures from the rest of the world (non-US and non-EU) as the control group in lieu of US ventures. GDP is scaled by 10*trillion. Standard errors are clustered by state (i.e., member state in EU and state in US). ***, **, and * indicate significance at the 1%, 5%, and 10% levels.*

Table 3: GDPR impact on # of deals for different investor and venture subgroups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DV: # of deals in different geographic-relationship subgroups								
	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson	Baseline Poisson
GDPR_Enact	-0.665*	-0.728***	-0.878**	-0.521***	-0.493***	-0.104	0.281	0.274**	0.479***
	(0.396)	(0.155)	(0.385)	(0.126)	(0.123)	(0.109)	(0.201)	(0.124)	(0.139)
EU * GDPR_Enact	-0.046	-0.023	0.128	0.058	0.098	0.138	0.077	0.055	0.098
	(0.201)	(0.216)	(0.211)	(0.065)	(0.077)	(0.112)	(0.057)	(0.055)	(0.081)
GDPR_Rollout	-0.792***	-0.804***	-0.680***	-1.067***	-1.033***	-0.539***	0.941**	0.478*	0.121
	(0.144)	(0.156)	(0.199)	(0.170)	(0.164)	(0.126)	(0.395)	(0.263)	(0.361)
EU * GDPR_Rollout	-0.251***	-0.172**	-0.129**	-0.305***	-0.232**	-0.147**	-0.266**	-0.154**	-0.113*
	(0.103)	(0.080)	(0.068)	(0.126)	(0.080)	(0.068)	(0.135)	(0.071)	(0.065)
Marginal effect (rollout)	-22.20%	-15.80%	-12.10%	-26.29%	-20.71%	-13.67%	-23.36%	-14.27%	-10.68%
Unemployment	0.029***	0.026	0.041	0.008	-0.009	0.009	0.022	0.015	0.011
	(0.014)	(0.053)	(0.078)	(0.012)	(0.012)	(0.015)	(0.027)	(0.026)	(0.016)
GDP	-0.131	0.053**	0.059	-0.003***	0.005	0.001	-0.002*	-0.004**	0.018
	(0.081)	(0.021)	(0.109)	(0.000)	(0.011)	(0.000)	(0.000)	(0.001)	(0.020)
CPI	0.046***	0.002	0.007	0.069***	0.028	0.026	0.028	0.018	0.017
	(0.017)	(0.031)	(0.069)	(0.017)	(0.021)	(0.019)	(0.022)	(0.022)	(0.015)
Interest rate	0.118***	0.028	0.044	-0.085***	-0.537***	-0.139**	-0.101**	-0.119**	-0.151***
	(0.034)	(0.274)	(0.204)	(0.029)	(0.105)	(0.058)	(0.050)	(0.055)	(0.046)
Sample Group	Whole Sample	Whole Sample	Whole Sample	Data-reliant Ventures	Data-reliant Ventures	Data-reliant Ventures	Newer Ventures	Newer Ventures	Newer Ventures
Subgroup	Foreign	Same Union	Domestic	Foreign	Same Union	Domestic	Foreign	Same Union	Domestic
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950
R-squared	-	-	-	-	-	-	0.505	0.551	0.620
F-test on pre-treatment (p-value)	0.125	0.133	0.129	0.118	0.121	0.113	0.191	0.185	0.166

*Note: The dependent variable is the # of deals, subgrouped further into data-reliant and newer ventures with three different investment types – foreign, same-union, and domestic. GDP is scaled by 10*trillion. Standard errors are clustered by state (i.e., member state in EU and state in US). ***, **, and * indicate significance at the 1%, 5%, and 10% level.*

Table 4: GDPR impact on $ amount per deal and # of deals as a function of investor geography

	(1)	(2)	(3)	(4)	(5)	(6)
	ln ($ amount per deal)			# of deals per month/state		
	OLS			Poisson Regression		
GDPR_Enact	0.653	0.164	1.103***	-0.043	-0.316	0.281
	(0.536)	(0.342)	(0.276)	(0.202)	(0.254)	(0.201)
EU * GDPR_Enact	-0.021	-0.017	-0.082	0.063	0.102	0.077
	(0.039)	(0.078)	(0.090)	(0.074)	(0.094)	(0.057)
GDPR_Rollout	1.536***	0.947**	2.068***	-0.284	-0.570**	0.941**
	(0.192)	(0.414)	(0.447)	(0.261)	(0.284)	(0.395)
EU * GDPR_Rollout	-0.418***	-0.357**	-0.280*	-0.113*	-0.242***	-0.199***
	(0.065)	(0.166)	(0.161)	(0.061)	(0.080)	(0.061)
Marginal effect (rollout)	-	-	-	-10.68%	-21.48%	-18.04%
Unemployment	0.011	-0.011	0.021	0.025*	0.034**	0.012
	(0.015)	(0.028)	(0.033)	(0.013)	(0.015)	(0.020)
GDP	0.002	-0.004***	0.005	-0.131	-0.295**	0.053**
	(0.004)	(0.000)	(0.008)	(0.081)	(0.133)	(0.021)
CPI	-0.016	0.101**	-0.116***	-0.005	-0.002	0.052**
	(0.018)	(0.043)	(0.034)	(0.022)	(0.020)	(0.025)
Interest rate	0.049	-0.077	0.222**	-0.063**	-0.069**	-0.229***
	(0.035)	(0.075)	(0.098)	(0.032)	(0.034)	(0.059)
Sample Group	Whole Sample	Whole Sample	Whole Sample	EU Investors	US Investors	RoW Investors
Subgroup	Foreign	Same Union	Domestic	Foreign	Same Union	Domestic
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,287	18,344	27,518	4,950	4,950	4,950
R-square	0.664	0.705	0.615	-	-	-

*Note: The dependent variable is the # of deals, subgrouped further into foreign, same-union, and domestic deals, or EU investors, US investors, and RoW investors. Deals with missing investor information are omitted since they are required by this specification. GDP is scaled by 10*trillion. Standard errors are clustered by state (i.e., member state in EU and state in US). ***, **, and * indicate significance at the 1%, 5%, and 10% levels*

ENDNOTES

[1] See, e.g., https://www.cpomagazine.com/data-protection/direct-marketing-under-the-gdpr-consent-vs-legitimate-interests/ and https://www.assetfinanceinternational.com/index.php/ legal/legal-general/legal-general/17331-gdpr-confusion-over-legitimate-interest-affects- motor-retail-marketing.

[2] Examples include a SafeDK report that more than half of mobile applications are not compliant as of January 2018 (https://www.mobilemarketer.com/news/study-55-of-apps-may-not- meet-gdpr-privacy-standards/515546/), Apple reportedly removing apps that share location data (https://www.idownloadblog.com/2018/05/09/apple-removing-apps-location-data/) and updating its privacy terms (https://techcrunch.com/2018/05/23/apple-introduces-new-privacy-portal-to- comply-with-gdpr/), Facebook announcing that "Businesses may want to implement code that creates a banner and requires affirmative consent. Each company is responsible for ensuring their own compliance" (https://developers.facebook.com/ads/blog/post/2018/05/10/compliance- protections-gdpr/), Shopify updating its app permissions for merchants and developers (https://www. shopify.com/partners/blog/gdpr-compliance), and Google releasing new consent requirements to developers (https://bit.ly/2ziUgJA).

[3] See, e.g., https://www.nytimes.com/2019/01/21/technology/google-europe-gdpr-fine.html and https://www.ft.com/content/197a6758-a148-11e9-a282-2df48f366f7d.

[4] See, e.g., https://digiday.com/media/google-publishers-gdpr-standards/.

[5] https://www.bloomberg.com/news/articles/2018-03-22/it-ll-cost-billions-for-companies-to-comply-with-europe-s-new-data-law

[6] Our previous report is available at: https://datacatalyst.org/reports/data-as-a-driver-of- economic-efficiency/.

[7] The corresponding reductions are 15.80% and 35.77% in the number and per-deal amount, respectively, of within-EU deals where the investors and ventures are from different EU countries.

[8] The results depicted utilize US ventures as the control group—results using RoW ventures as the control group are similar.