The Role of APIs in the Economy

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Introduction

- We construct a novel data set combining API proxy statistics with firm financial outcomes
- Firms adopting API strategies are concentrated in Retail
- We find that firms that adopt APIs are significantly more profitable in years after adoption
- We find weaker suggestion that the intensity of API use correlates with net income
- In future work we seek to establish causality and the contribution of APIs to changes in the nature of the firm and macroeconomic trends like SBTC

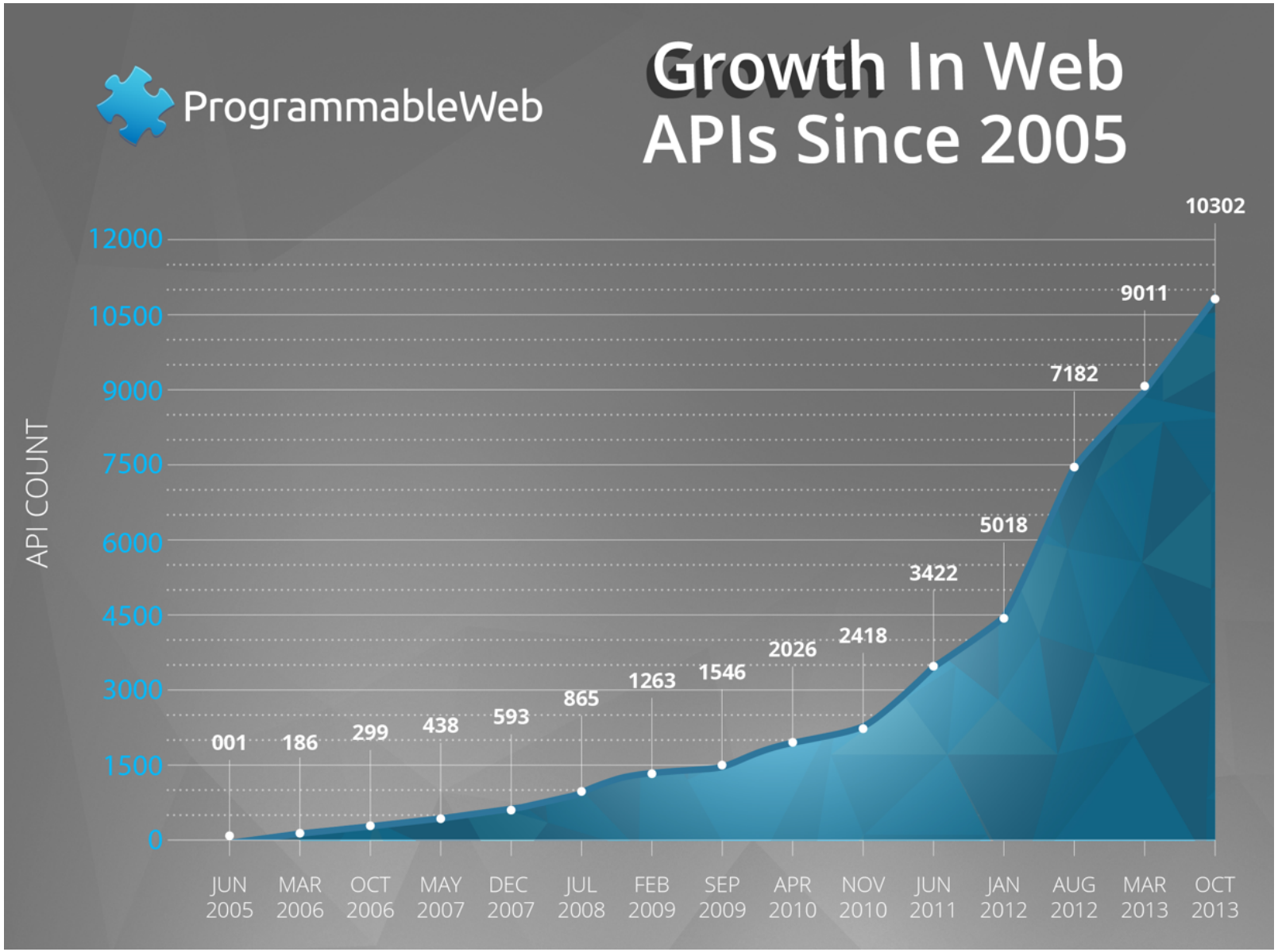
Context

- Application programming interface
- Ease access to data, internal and external
- Increase programmer productivity, information security, lower maintenance costs, modularity/re-usability

Context

- We work with API management firms
- Some have specific strategy in mind, others simply 'go digital' and put info out there
- Clearly APIs necessary for platform/ecosystem approach
- Lots of API success stories

Web API Growth (Source: ProgrammableWeb.com)



Data

- Currently we have data corresponding to roughly 10 percent of the API management industry
- We are working towards:
- Collecting another about 40 percent of industry
- Integrating OSIRIS
- Finding employment by job title data
- Firm survey

Sample Firms Using API Management

Main Characteristics of Firms that Adopted APIs	2013	2014	2015
Main Sectors			
Retail (NAICS 44-45)	67.6%	72.10%	70.20%
Management (NAICS 55-56)	17.4%	20.20%	19.10%
Information & Financial (NAICS 51-52)	7.0%	5.30%	4.60%
Average Others	0.4%	0.70%	0.63%
Region (Publicly Traded in USA only)			
USA	83.4%	80.0%	79.3%
EUROPE	10.1%	9.2%	10.2%
AMERICAS	4.4%	8.1%	7.7%
ASIA	2.0%	2.3%	2.0%
Proximity to Provider (Euclidean L2)	31.1	30.98	27.3
USA (firms based in USA)	31.1	30.98	27.3
EUROPE (firms based in EU)	22.7	21	20.4
Size			
Employees	674.22	1180.8	943.2
Margin after Operational Expenditures	11.80%	14.80%	18.60%

API data - Quarterly

API Usage Statistics

Year	Variable	Firms	Mean	Std. Dev.	Min	Max
2013	Number of APIs	22	5.00	5.67	1	25
	Developers	22	80.26	148.06	1	492
	Calls	22	2.87	12.20	2	57.40
	Data	22	126000.00	522000.00	0	2340000.00
	Data per Call	22	43971.37	42786.89	2	40766.55
2014	Number of APIs	33	15.52	18.86	1	70
	Developers	33	329.27	888.33		4777
	Calls	33	1.20	2.55	2	10.80
	Data	33	26700.00	104000.00	0	571000.00
	Data per Call	33	22304.14	40776.61	2	52870.37
2015	Number of APIs	40	32.05	59.37	1	331
	Developers	40	365.05	598.69	1	3171
	Calls	40	3.23	11.10	1	66.60
	Data	40	35700.00	111000.00	0	546000.00
	Data per Call	40	11043.89	10000.00	2	8198.20

Financial Characteristics of API Adopting Firms

Year	Variable	Firms	Mean	Std. Dev.	Min	Max
2010	Net Income	38	1434.68	3542.75	-224.16	19085.00
	Capital Investment	37	1297.06	4193.54	2.24	20302.00
	Leverage	37	1.47	6.37	-15.19	34.56
	Market Value	32	24118.85	41372.40	306.15	173667.73
	R&D % Income	23	5.69	8.41	0.00	26.70
	Operating Profits	37	3525.54	8430.69	13.75	38952.00
2011	Net Income	40	1050.25	1617.17	-83.02	8572.00
	Capital Investment	40	1269.24	4018.84	2.18	20272.00
	Leverage	38	0.84	4.72	-20.71	13.71
	Market Value	32	26364.90	43786.66	244.47	179217.72
	R&D % Income	25	5.57	7.97	0.00	25.42
	Operating Profits	40	3355.12	7166.68	-1.15	34686.00
2012	Net Income	41	1161.66	1906.26	-195.87	9019.00
	Capital Investment	40	1349.40	3968.17	2.50	19728.00
	Leverage	40	0.28	5.46	-30.52	10.83
	Market Value	33	27901.75	45647.53	297.86	188148.83
	R&D % Income	24	7.03	9.43	0.00	31.17
	Operating Profits	40	3289.89	6937.90	-10.76	31140.00
2013	Net Income	22	1919.89	3766.79	-536.87	18249.00
	Capital Investment	22	1905.17	4774.90	5.08	21228.00
	Leverage	22	2.20	3.05	0.12	16.97
	Market Value	22	31331.18	45231.01	516.41	183757.27
	R&D % Income	17	5.10	7.52	0.00	25.95
	Operating Profits	22	5478.64	12113.35	8.41	49374.00
2014	Net Income	33	1464.19	1754.84	-72.37	6224.00
	Capital Investment	33	2255.65	4975.84	17.21	21433.00
	Leverage	33	2.65	4.32	0.16	17.57
	Market Value	33	36009.49	46906.25	449.08	174228.41
	R&D % Income	33	5.14	9.03	0.00	26.87
	Operating Profits	33	4800.88	7379.46	31.60	31689.00
2015	Net Income	40	2297.67	3840.38	-43.21	13345.00
	Capital Investment	40	2210.31	5639.84	21.96	20015.00
	Leverage	40	3.73	8.28	0.20	31.16
	Market Value	40	42373.17	65740.92	771.83	211447.39
	R&D % Income	40	6.50	11.15	0.00	28.87
	Operating Profits	40	6487.03	12952.94	23.06	47845.00

Preliminary Data Analysis

- Three Current Approaches to Ascertaining Impact on Net Income
- Firm FEs
- Nearest Neighbor
- General Difference in Difference

Table 4: Linear Regression of Log Net Income, with Firm Fixed Effects

	(1)	(2)	(3)	(4)
Data	6.669^{+}	7.455^{+}	8.102^{+}	6.646^{+}
	(1.98)	(1.93)	(2.43)	(2.27)
Capital Expenditures (log)		-0.146	-0.409	0.0215
		(-0.55)	(-1.48)	(0.06)
Employees			0.00866	-0.00582
			(1.67)	(-0.59)
Leverage Ratio				0.254
				(1.65)
Constant	6.421^{**}	7.310^{**}	7.454^{**}	7.251^{*}
	(186.82)	(4.51)	(5.35)	(5.76)
Observations	720	720	720	680
R^2	0.394	0.429	0.663	0.823

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 5: Linear Regression of Log Net Income, with Firm Fixed Effects

	(1)	(2)	(3)	(4)
Calls	6.448^{+}	7.430^{+}	8.125^{+}	6.695^{+}
	(1.95)	(1.94)	(2.48)	(2.36)
Capital Expenditures (log)		-0.170	-0.439	-0.00482
		(-0.63)	(-1.58)	(-0.01)
Employees			0.00877	-0.00571
			(1.71)	(-0.60)
Leverage Ratio				0.254
				(1.69)
Constant	6.607**	7.677**	7.920**	7.544*
	(205.71)	(4.51)	(5.45)	(5.75)
Observations	800	800	800	760
R^2	0.387	0.432	0.672	0.832

t statistics in parentheses

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 6: Linear Regression of Log Net Income, with Firm Fixed Effects

	(1)	(2)	(3)	(4)
Developers	-0.0385^{+}	-0.0448^{+}	-0.0563*	-0.0467^{+}
	(-1.91)	(-1.91)	(-3.39)	(-2.89)
Capital Expenditures (log)		-0.175	-0.547^{+}	-0.182
		(-0.64)	(-2.33)	(-0.55)
Employees			0.0111^{+}	-0.000597
			(2.59)	(-0.07)
Leverage Ratio				0.197
				(1.44)
Constant	6.797**	7.933**	8.489**	8.133**
	(76.46)	(4.47)	(6.91)	(6.60)
Observations	800	800	800	760
R^2	0.377	0.424	0.785	0.873

t statistics in parentheses

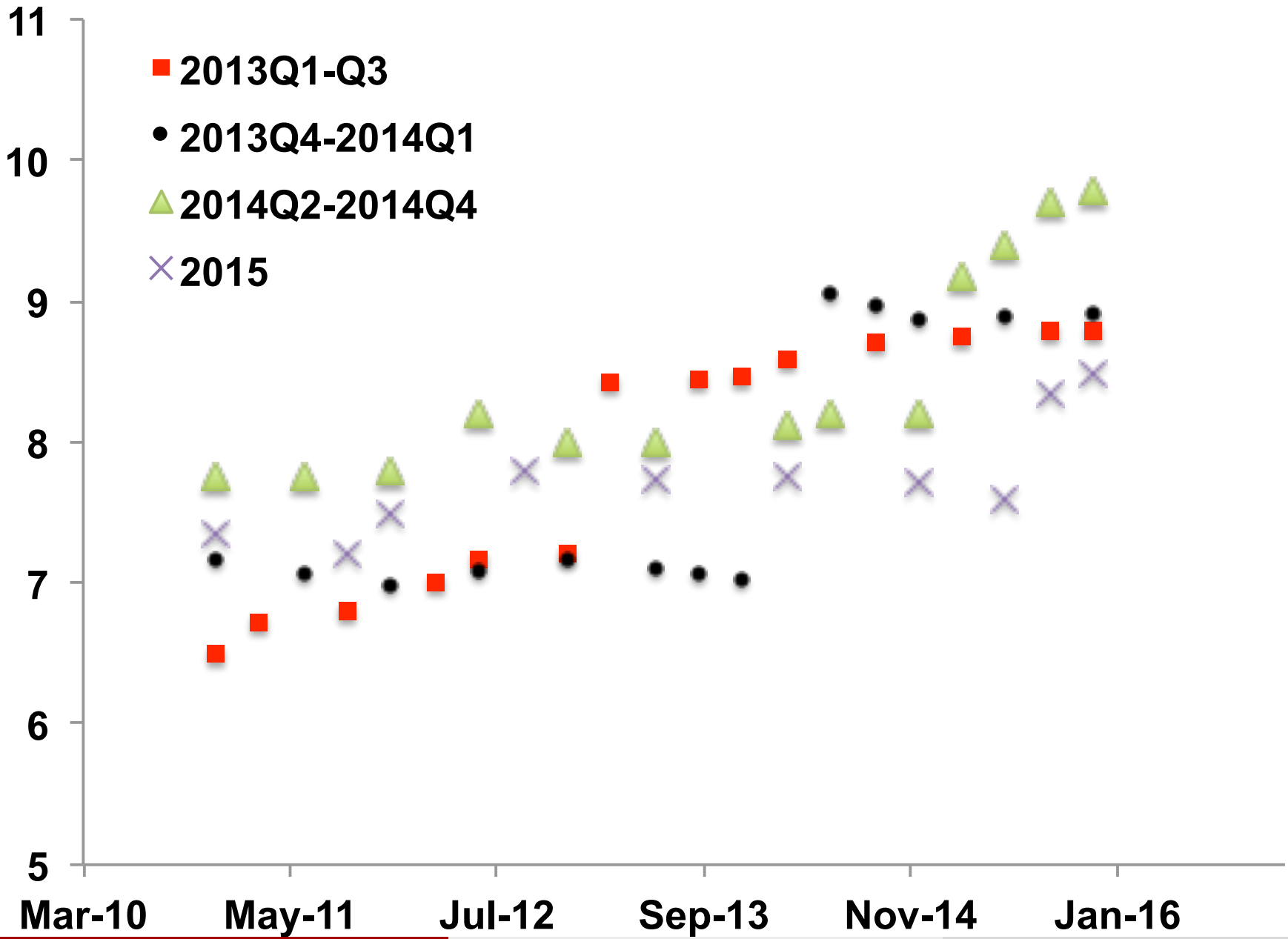
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Treatment Effect Estimation
Outcome Variable: Net Income
Treatment Variable: Adoption of API (Binary, adjusted in time)

	Regression (IPW)		Regression (IPW)		Propensity	Nearest
	Baseline	Leverage	Baseline	Leverage	Match	Neighbor
ATE	162.46 **	186.22*			267.78**	222.59**
	(12.89)	*(17.13)*			*(6.85)*	*(7.39)*
ATE (Open Platform)			52.35+	52.29*		
			(6.89)	*(7.13)*		
Capital Exp.	-0.0864	-0.0229+	-0.0484	-0.0200+		
	(6.32)	*(6.79)*	*(6.32)*	*(6.79)*		
Leverage		-0.0461+		-0.0461+		
		(7.54)		*(7.54)*		
Constant	22.49**	32.28**	17.49**	16.28**		
	(9.01)	*(19.21)*	*(11.93)*	*(23.75)*		

Std. Errors statistics in parentheses
+ p<0.10, * p<0.05, ** p<0.01

Log Net Income Grouped by Adoption Date



Future Goals

Future Directions for Research

- With time series employment data, very interesting SBTC paper. Allows us to study programmer productivity as accumulating asset.
- With more information about firm ecosystem policies, structural IO paper estimating elasticities around platform strategy
- With a better instrument (or perhaps only more data), a strong business oriented paper about consequences of API strategy adoption – Advice?