

**To:** Mr. Mark Cuban, Head of Strategy, Janzen Consulting Group

**From:** Prince Enyiorji (AU ID: 5572508) and Wasif Zawad Talukder (AU ID: 5515787)

**Date:** 15 October 2023

**RE:** Relationship between investment size and company fundamentals of startups

How much revenue should you have if you are looking to raise funds for your startup? How much funding should you expect if you have sales or if you are still at the idea stage? Jason Cohen, Founder of WP Engine, provides a high-level rule-of-thumb for the 2023 scenario, “A seed round nets you \$1 million to \$2 million if you have an idea, a working product, \$50,000-plus per month in revenue, and strong growth numbers. That’s all before Series A.”<sup>1</sup> If a seed-stage company can raise a million dollars and it is not unknown for startup investments to be in the hundred thousand or even fifty thousand, what is the expected funding for a US startup without sales? What other factors do investors rely on while making funding decisions? To find a logical framework for founders to create an investment-ready pitch, we hypothesize that there is some relationship between investment size and revenue generated, employee size, local economy and type of funding i.e., Debt, equity, credit guarantee etc. **From our findings, we can conclude that with the exception of no. of full-time employees, all other variables identified have statistically and substantively significant relationship with investment size.**

To investigate this hypothesis, we used the dataset from The State Small Business Credit Initiative (SSBCI), a federal government program that allocates funds to SMEs following the economic peculiarities of states where these small businesses are located using employee size, annual revenue, and income distribution across regions within states as loan/investment benchmarks. The SSBCI Transactions data set comprehensively documents all transactions conducted within the SSBCI program, spanning from its inception in 2011 through December 31, 2016. This dataset encompasses both quantitative variables, such as revenue (The borrower’s/investee’s annual revenues for the most recent fiscal year as of the reporting yearend), loan/investment amount (the principal amount of the loan or investment supported with SSBCI funds), and full-time employee size (The borrower’s/investee’s Full Time Equivalent employees, rounded to the nearest whole number, at the time of loan or investment closing). Also. it includes qualitative variables like Low and Middle Income type (indicates census tracts that fall in the “Low and Moderate Income” categorizations, based on the 2010 Census Bureau's 5-year American Community Survey) and program type (grouped into capital access programs, collateral support programs, loan guarantee programs, loan participation programs, or venture capital programs).<sup>2</sup> To minimize the effect of outliers on our regression model, we did an outlier analysis and replaced any outlier values in investment amount and

---

<sup>1</sup> [LinkedIn](#)

<sup>2</sup> [SSBCI-Data-Definitions.pdf \(treasury.gov\)](#)

revenue with the mean sample value of that variable. We recoded the LMI type and the program type categorical data into a dummy variable.

A Multiple OLS Regression analysis was performed to better understand the relationship between these variables and loan/investment amount, and no assumptions were violated. The regression model, with non-LMI region and venture capital programs as reference group, is:

$$\text{Investment Amount} = \beta_0 + \beta_1(\text{Revenue Amount}) + \beta_2(\text{No. of Full-time Employees}) + \beta_3(\text{is LMI region}) + \beta_4(\text{Loan Guarantee}) + \beta_5(\text{Loan Participation}) + \beta_6(\text{CAP}) + \beta_7(\text{Collateral Support})$$

CAP has garnered the highest number of subscriptions, with participation from over 58% of businesses in

	<i>Frequency</i>	<i>Relative Frequency</i>
<b><i>Program Type</i></b>		
Venture Capital	1623	7%
Loan Guarantee	2779	13%
Loan Participation	2065	9%
CAP	13965	64%
Collateral Support	1530	7%
Total Observations	21962	100%
<b><i>LMI Type</i></b>		
Non-LMI	12539	57%
LMI	9423	43%
Total Observations	21962	100%

non-LMI areas and a substantial 70% in LMI regions. However, Collateral Support has the least participation of 8.29% and 5.21% in Non-LMI and LMI regions respectively. Non-LMI located businesses have the largest number of revenue and full-time employees both at 61% and 63% respectively.

	<i>Loan Investment (\$)</i>	<i>Revenue (\$)</i>	<i>Full Employees</i>
Mean	46,570.84	218,242.81	10.53
Median	31,500.00	170,000.00	3.00
SD	56,273.25	243,075.10	31.47
Skewness	2.26	1.77	10.15
Minimum	500.00	0.00	0.00
Maximum	295,000.00	1,146,683.00	695.00
Count	21,962.00	21,962.00	21,962.00

CAP made the largest loan/investment across businesses, disbursing \$387million from 2011 to 2016 which accounts for 38% of total funding while Venture Capital funding accounts for the least

loan/investments (11%). Also, CAP has made the largest investments in both LMI and non LMI regions accounting for over 14% and 23% respectively while Venture Capital investments remain the least in LMI (3.84%) and non-LMI (7.31%). This corroborates the large deviation from the mean and further buttress that the loan/investment data is skewed to the right.

With a 99% confidence level, the model's p-value (page 3) attains statistical significance. Therefore, we can confidently reject the null hypothesis, indicating that the sample data effectively represents the population and can be used to generalize for population parameter. However, the model is substantively insignificant, indicating a large effect size at 28.5%. The predictive power of the model is below the 80% threshold, with independent variables explaining 22% of the dependent variable. Also, all independent

variables are moderately correlated. VIF score Revenue (1.018), Full time Employee (1.063), Program Type (1.088) and LMI (1.022).

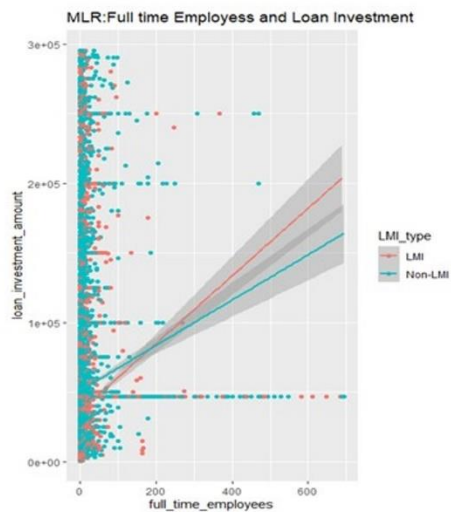
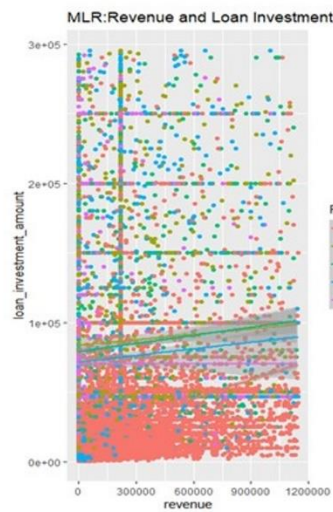
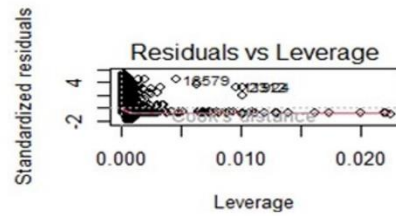
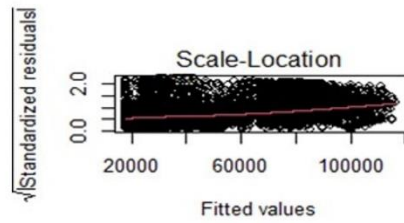
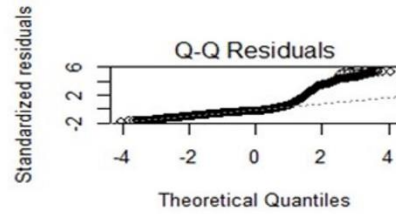
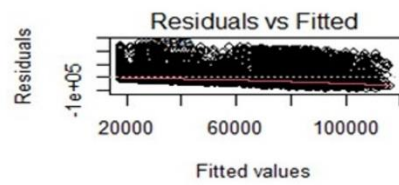
$$\text{Loan/investment} = 67297.57 + 0.03(\text{Revenue}) + 8.871(\text{No. of Full-time Employees}) - 6821.91(\text{LMI region}) + 10858.30(\text{Loan Guarantee}) + 2076.40(\text{Loan Participation}) - 42732.69(\text{CAP}) + 13657.90(\text{Collateral Support}) + \varepsilon$$

Dependent variable:	
Loan Investment	
revenue	0.031*** (0.001)
Full time Employee	8.871 (10.972)
program_type Collateral Support	56,390.590*** (1,350.903)
program_type Loan Guarantee	53,591.000*** (1,051.513)
program_type Loan Participation	44,809.100*** (1,194.100)
program_type Venture Capital	42,732.690*** (1,308.130)
LMI	-6,821.908*** (684.269)
Constant	24,564.870*** (616.630)
Observations	21,962
R2	0.222
Adjusted R2	0.222
Residual Std. Error	49,636.920 (df = 21954)
F Statistic	895.973*** (df = 7; 21954)
Note: *p<0.1; **p<0.05; ***p<0.01	

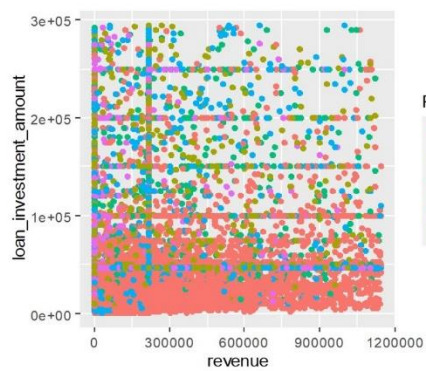
Interpreting the relationships, we observe -all other things been equal- that; for each additional dollar in Revenue corresponds to an average increase of 0.03\$ in Loan/investment ( $p < 0.01$ ), for each additional labor employed corresponds to an average increase of 8.871 dollar in Loan/investment ( $p > 0.01$ ). Additionally, LMI regions have a \$6,821.91 Loan/investment decline compared to Non-LMI regions ( $p < 0.01$ ). Loan Guarantee programs have a \$53,591 Loan/investment increase compared to CAP ( $p < 0.01$ ). Loan Participation programs have a \$44,809.10 Loan/investment increase compared to CAP ( $p < 0.01$ ). Venture Capital programs have a \$42,732.69 Loan/investment increase compared to CAP ( $p < 0.01$ ). Collateral Support programs have a \$56,390.59 Loan/investment increase compared to CAP ( $p < 0.01$ ). Limitations of this model include a low adjusted  $R^2$ , which means some of the most important factors that describe the variability of investment sizes were not included in the model.

To conclude, we hope that this research helps build a better logical framework for startup founders and investors to determine investment size for businesses

that are industry standard based on precedence, and that this information will help founders identify the best offers and investors make competitive ones.



### Program Types Given SMEs Annual Revenue



### Loan Investment in SMEs with Full Employees Across Region

