



The Relationships Between Expected Impact and Expected Return

Companion piece to "Toward the Efficient Impact Frontier"
Stanford Social Innovation Review, Winter 2017



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What are the relationships between financial return and different types of impact? How can investors create the greatest possible impact for any given level of financial return? In “Toward the Efficient Impact Frontier,” Root Capital introduced an analytical framework for exploring these issues. This note provides detailed results of our analysis on the relationships between the expected impacts and expected return of our loans. It also provides greater detail on our dataset and methodology for calculating the expected return of individual loans.

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Topline Findings

In Root Capital's case, going where the need is greatest costs more. In this regard, there is a tradeoff between impact and financial return. At the enterprise level, we define need as the degree to which our loan meets a financial need that would otherwise go unmet (i.e., investment-level impact or additionality). At the farmer level, we define need as the level of poverty of the farmers reached by that enterprise. Among our loans, higher levels of additionality and poverty are associated with a higher cost-per-loan (i.e., subsidy required) of \$5-\$12k, holding other observable factors constant.

In other regards, achieving higher impact doesn't mean accepting a lower financial return. For Root Capital, loans to enterprises with stronger social and environmental performance – as distinguished from enterprise and farmer need – tend to have higher expected returns. For many indicators of social and environmental performance, this effect is mediated by enterprise and loan size. That is, larger enterprises are the ones with the resources to invest in social and environmental performance, and are also the ones to seek larger loan sizes that are more profitable to Root Capital.

Intriguingly, loans to enterprises engaged in certain positive social and environmental practices (e.g., offering agricultural training and fertilizers to farmers, and afforestation and reforestation activities) are associated with greater expected returns to Root Capital, even after holding enterprise size, loan size, and other potentially confounding variables constant. Note that this particular result is based on a small sample size, which we will test using larger datasets as they become available in the coming years.

We do not make any claims about whether these findings are generalizable. Rather, we hope to illustrate how data can answer commonly asked questions about whether there are tradeoffs between expected returns and specific types of expected impact.



Appendix 1: Average expected return (i.e., subsidy required) per loan, by component of the expected impact rating

The table below shows that that for Root Capital, additionality and poverty outreach are associated with lower expected returns and greater subsidy required, while scale and many indicators of social and environmental performance are associated with greater expected returns.

The way to read the table is, “the average expected return of a high-additionality loan is -\$24.6k, as compared to -\$17.1k and -\$12.7k for medium- and low-additionality loans, respectively.”

Many indicators in the expected impact rating are binary. For these we have divided the “Average expected return” column into two, and put the average expected return of loans *with* each impact criterion in the left-hand column, and the average expected return of loans *without* that impact criterion in the right-hand column. The way to read these rows is, for instance, “the average expected return of loans to enterprises operating in climate change hotspots is -\$10.7k, as compared to -\$24.7k for loans to enterprises that are not operating in climate change hotspots.” Positive numbers indicate that the average loan with the given characteristic is profitable to Root Capital and does not require subsidy.

Expected Impact Rating Theme	Sub-theme	Indicator (n/260 loans unless otherwise noted)	Average expected return (left: with impact; right: without)		P-value	
Additionality		High (41)	-\$24.6k ¹		0.08	
		Medium (107)	-\$17.1k			
		Low (112)	-\$12.7k			
Social & Environmental Vulnerability	Poverty	High (99)	-\$20.1k ²		0.26	
		Medium (81)	-\$13.1k			
		Low (80)	-\$15.2k			
	Environmental Vulnerability	Climate Change Hotspot (154)	-\$10.7k	-\$24.7k	0.01	
		Biodiversity Hotspot (222)	-\$13.0k	-\$36.5k	0.00	
		Soil Degradation Hotspot (130)	-\$11.5k	-\$21.3k	0.01	
		Water Conservation Hotspot (12)	NA ³	-\$14.7k	NA	
Social & Environmental Performance	Social ⁴	Price Premiums (33/97)	-\$3.3k	-\$8.3k	0.22	
		Wages above min. wage(90/166)	-\$10.8k	-\$12.3k	0.67	
		Agronomic extension (75/166)	-\$9.5k	-\$13.3k	0.30	
		Internal Credit (36/149)	-\$2.1k	-\$15.2k	0.01	
		Public Goods (63/166)	-\$6.6k	-\$14.6k	0.03	
		Income Diversification (7/165)	\$0.4k	-\$12.0k	0.17	
		Gender Inclusion (92)	-\$21.3k	-\$13.7k	0.05	
		Food Security & Nutrition (4) ⁵	-\$21.4k	-\$16.3k	0.73	
	Environmental	Eco-Certification (177)	-\$11.4k	-\$27.1k	0.00	
		Diversified agroforestry (28)	-\$3.4k	-\$18.0k	0.01	
		Wild-harvested tree crops (7)	-\$27.6k	-\$16.1k	0.31	
		Af/reforestation (26)	\$7.1k	-\$19.0k	0.00	
		Low-emissions technology (9)	-\$19.0k	-\$16.3k	0.79	
		3 rd -party mitigation / adaptation project (11)	\$4.9k	-\$17.3k	0.01	
		Scale (# of people reached)	>1500 (57)	-\$12.2k		0.48
			500 – 1500 (74)	-\$17.9k		
<500 (129)	-\$17.3k					

¹ The difference between high- and low-additionality loans is statistically significant (p-value 0.07).

² The difference between high-poverty loans and all others is nearly statistically significant (p-value 0.11).

³ Estimate was unrealistically large due to small sample and inclusion in that sample an unusually high-risk loan.

⁴ The first six of these indicators are what we collectively term 'livelihoods practices.' Our data on livelihoods practices is less complete than our data on the rest of the components of the expected return rating, because we began collecting the data in this form partway through 2015. Therefore, these averages are for only those loans for which we have complete livelihoods data. The sample size in parentheses should be read: (# of loans that have this type of expected impact / # of loans for which we have complete data on this type of expected impact).

⁵ Enterprises that sell food into local markets to improve food security, as opposed to cash crops for export.

Appendix 2: Multivariate regression of expected impact rating components on expected return

Appendix 1 showed that certain components of our expected impact rating are associated with particularly high or low expected returns. Are these impact characteristics actually causing loan profitability to be higher or lower? Or do other factors such as enterprise size or loan size—our ‘control variables’—drive both higher expected impact and higher expected return, making it seem as if there is a direct relationship between the two when in fact there is not?

The data below demonstrates that in most cases, the apparent relationship between expected impact and expected return goes away once variables like enterprise size and loan size are accounted for. In other words, most of these impact variables are not causing expected return to be higher or lower.

By contrast, the additionality of the loan and the poverty level of the farmers continue to be associated with lower expected returns even when other variables are held constant. This does not prove that these types of expected impact cause lower expected returns, but it does eliminate several alternative explanations.

Tables 1 and 2 below show the results of a multivariate regression in which expected return is the dependent variable, and the components of the expected impact rating (Table 1) and control variables (Table 2) are the independent variables. The regression has an r-squared of 0.61, meaning that the variables in Tables 1 and 2 collectively explain 61% of the variation in expected return in this sample of 259 loans.

Table 2 shows that many control variables – including loan size and tenor, and enterprise size, sector, and strength of management – have effects on expected return that are significant in both statistical and practical terms. Once these variables are controlled for, the relationship between expected return and environmental vulnerability and social and environmental performance seems to disappear. For example, enterprise eco-certification (e.g., Fair Trade, organic) in Appendix 2 appears to be associated with lower cost-per-loan, but this finding disappears in Table 1 below when other variables are held constant. This might be because larger enterprises are more likely both to obtain certification and to take larger loans, which are more profitable to Root Capital.

Finally, Table 1 below shows that there are two indicators of expected enterprise impact – provision of extension services to farmers and enterprise afforestation or reforestation activities – that are associated with greater expected return even when all control variables are held constant. This is an intriguing finding that we will test with larger datasets in the coming years.

Table 1: Relationships of Expected Impact Rating Components with Expected Return

Expected Impact Rating Component	<u>This type of loan...</u>	<u>...is associated with this effect on expected return</u>	<u>...versus a baseline of this type of loan</u>	<u>P-value⁶</u>
Additionality	High Additionality (i.e., enterprise could not obtain loan anywhere else)	-\$4,209	Low Additionality (i.e., enterprise could obtain similar loan on similar terms from commercial lender)	0.21
	Medium Additionality (i.e., enterprise could not obtain loan from commercial lender)	-\$5,731		0.10
Social Vulnerability	High Poverty (i.e., enterprise serving farmers <\$2.50 / person / day)	-\$11,172	Low Poverty (i.e., to enterprise serving farmers living on >\$4 / day / person)	0.26
	Medium Poverty (i.e., enterprise serving farmers \$2.50 -\$4 / person / day)	-\$7,851		0.42
Environmental Vulnerability	Climate Change Hotspot	-\$3,582	No environmental vulnerability	0.38
	Biodiversity Hotspot	\$1,983		0.74
	Soil Hotspot	\$1,250		0.68
	Water Hotspot	-\$24,094		0.07
Social Performance <i>(preliminary based on small sample⁷)</i>	Price premiums	-\$3,309	No practice or practice did not meet threshold	0.34
	Wage premiums	-\$3,618		0.39
	Agronomic extension services	\$6,635		0.01
	Internal credit	\$5,680		0.16
	Public goods	\$966		0.76
	Income diversification	\$2,937		0.62
	Gender inclusion	\$3,633		0.39
Environmental Performance	Eco-certification	-\$141	No practice or practice did not meet threshold	0.97
	Diversified agroforestry	\$3,936		0.24
	Wild-harvested tree crops	-\$5,996		0.36
	Af/reforestation	\$13,557		0.01

⁶ Interpretation: Assuming that there is no relationship between this variable and expected return, the p-value represents the probability that we are showing a relationship of this magnitude due to random sampling error.

⁷ Based on a preliminary regression with only the 89 loans in the sample for which we have granular data on livelihoods. Food security excluded as only three loans in the sample met this criterion.

Table 2: Relationships of Control Variables with Expected Return

	<i>This</i> type of loan...	...is associated with <i>this</i> effect on expected return	...versus a baseline of <i>this</i> type of loan	P-value
Control Variables	Term Loan	\$6,428	Line of Credit	0.34
	Long-Term Loan	-\$11,053	Short-Term	0.04
	General Working Capital	-\$5,761	Trade Credit	0.12
	Pre-Harvest	-\$21,868		0.34
	Cocoa	-\$6,594	Coffee	0.09
	Fresh Fruits & Vegetables	-\$13,216		0.54
	Non-Crop Agriculture (e.g., fisheries, livestock)	-\$27,378		0.00
	Low-Perishable Crops (e.g., nuts, grains, oils, honey, dried fruits)	-\$21,702		0.00
	Incremental \$100,000 in approved loan size	\$1,617	-	0.00
	Stronger Management (i.e., incremental point in strength of management index in risk scoring system)	\$5,823	-	0.00
	Post-conflict & post-disaster countries (i.e., Haiti, DRC, Liberia)	\$4,374	Not these countries	0.43
	Enterprise revenue <\$500k	\$8,921	Enterprises with revenues > \$10M in the year preceding the loan	0.09
	Enterprise revenue \$500k - \$1M	\$8,849		0.15
	Enterprise revenue \$1M - \$2M	\$7,800		0.12
	Enterprise revenue \$2M - \$5M	\$11,967		0.02
	Local value chains	\$8,855	Export value chain	0.17
	New clients	-\$2,411	Renewal clients	0.43

Appendix 3: Methodology: Description of dataset and expected return calculations

All analysis in this document and in the “*Toward the Efficient Impact Frontier*” article is based on a dataset of 259 Root Capital loans active at some point in 2015. This dataset includes loans that were issued in previous years and repaid sometime during 2015, as well as loans that were issued in 2015 and either repaid or still outstanding as of the time of publication (November 2016).

These loans represent the subset (~60%) of active loans in 2015 for which we have complete, granular data on both expected financial performance and expected impact. Loans are excluded if we have incomplete financial data – for instance, if they mature in 2017 or after (because we have not forecasted revenues at the loan level that far out), or if they are issued in a currency other than USD (because our risk forecasting model did not include currency risk premiums at the time of publication). Capital expenditure loans are also excluded because our models for predicting risk and operational expense are tailored for working capital loans. Hence, it is not a representative subset, but nor is it cherry-picked.

All analysis here and in the article is based on expected returns calculated at the time each loan was approved, not actual returns after each loan was repaid or written off.⁸ This is because our analysis is intended to inform *ex ante* decisions about capital allocation and loan approval.

To calculate the expected financial return of each loan to Root Capital (i.e., the net profit generated or subsidy required) we estimate expected loan revenue and then subtract out all expected costs, including the *ex-ante* risk premium. Specifically, the dataset includes the following for each loan:

Revenue:

- Expected total interest and fee revenue. To project loan revenues, we first estimate what proportion of the approved loan amount the borrower is likely to withdraw, and for how many months that amount is outstanding, to arrive at an average outstanding balance for the loan. We then apply the interest rate and fees to this average outstanding balance to arrive at expected loan revenue.

Costs:

- Expected operational cost-per-loan, including both fixed and variable costs.
 - Variable costs include expenses incurred in the process of originating, servicing, and dispensing loans. These costs are materially influenced by the number of loans and by the characteristics of the borrowers.
 - Fixed costs include ongoing development, management, and improvement of credit services and systems. These costs are not materially influenced by an additional loan being made.
- *Ex ante* risk estimates from our predictive risk model, based on analysis of the performance of 1200 Root Capital loans from 1999 – 2014.

⁸ The sole exception is the description in the article of the expected return of our loan to Furaha. Our *ex-ante* revenue estimation model predicted that Furaha would draw down only \$40,000 of their approved \$80,000 loan, but this would violate our minimum loan size of \$50,000—a nuance that we had not yet corrected in our revenue estimation model. In fact, Furaha drew down \$75,000. Therefore for the purposes of the article, we based Furaha’s expected revenues, risk premium, and cost of debt on the actual loan balance of \$75k. This resulted in Furaha’s expected return shifting from the -\$26,585 that the model predicted to -\$23,525, a change of \$3,060. We shifted Furaha’s position the chart titled “Expected Return and Expected Impact” accordingly.



- Cost of debt per loan at a flat interest rate of either 1.0% or 2.5% of the average outstanding balance. For most loans we pay an interest rate of 2.5% to our investors. However, we have raised a separate pool of capital at an interest rate of 1.0% from investors that seek to support our work with the smallest and earliest-stage businesses. Specifically, our cost of capital is 1.0% for loans of less than \$150,000; loans to enterprises with revenues of less than \$300,000; and loans to enterprises that receive above a threshold score in our risk rating model.⁹

⁹ In the article, for simplicity, we represented all three example loans as incurring a cost of debt of 2.5%. In reality, the loan to Furaha qualified for the pool of capital on which we pay 1.0%.