Is Kiva Creating Efficient Impact Through Microlending?

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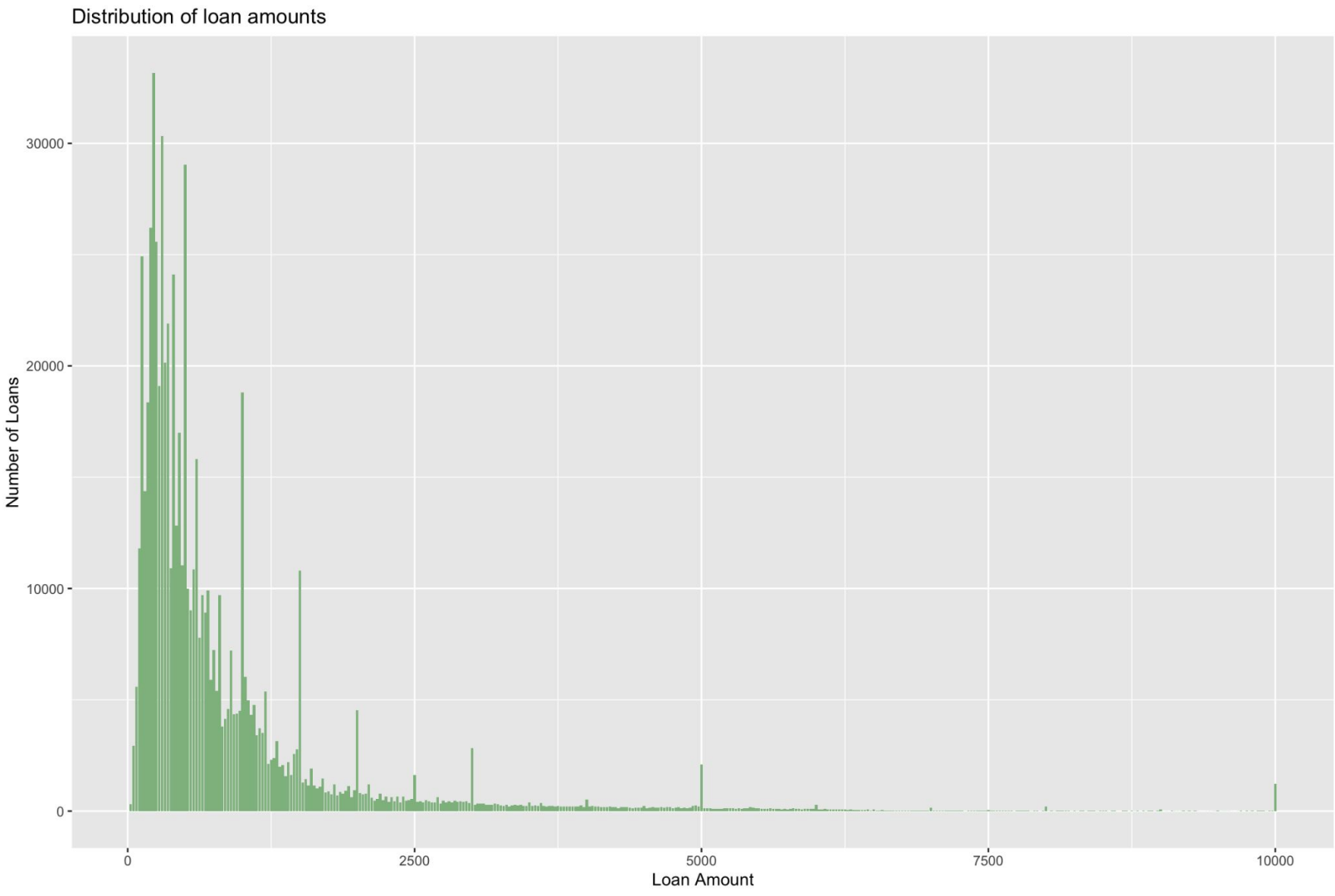
Roadmap

1. Background
2. Exploratory Data Analysis
3. Modeling
4. Reflection

1. Background

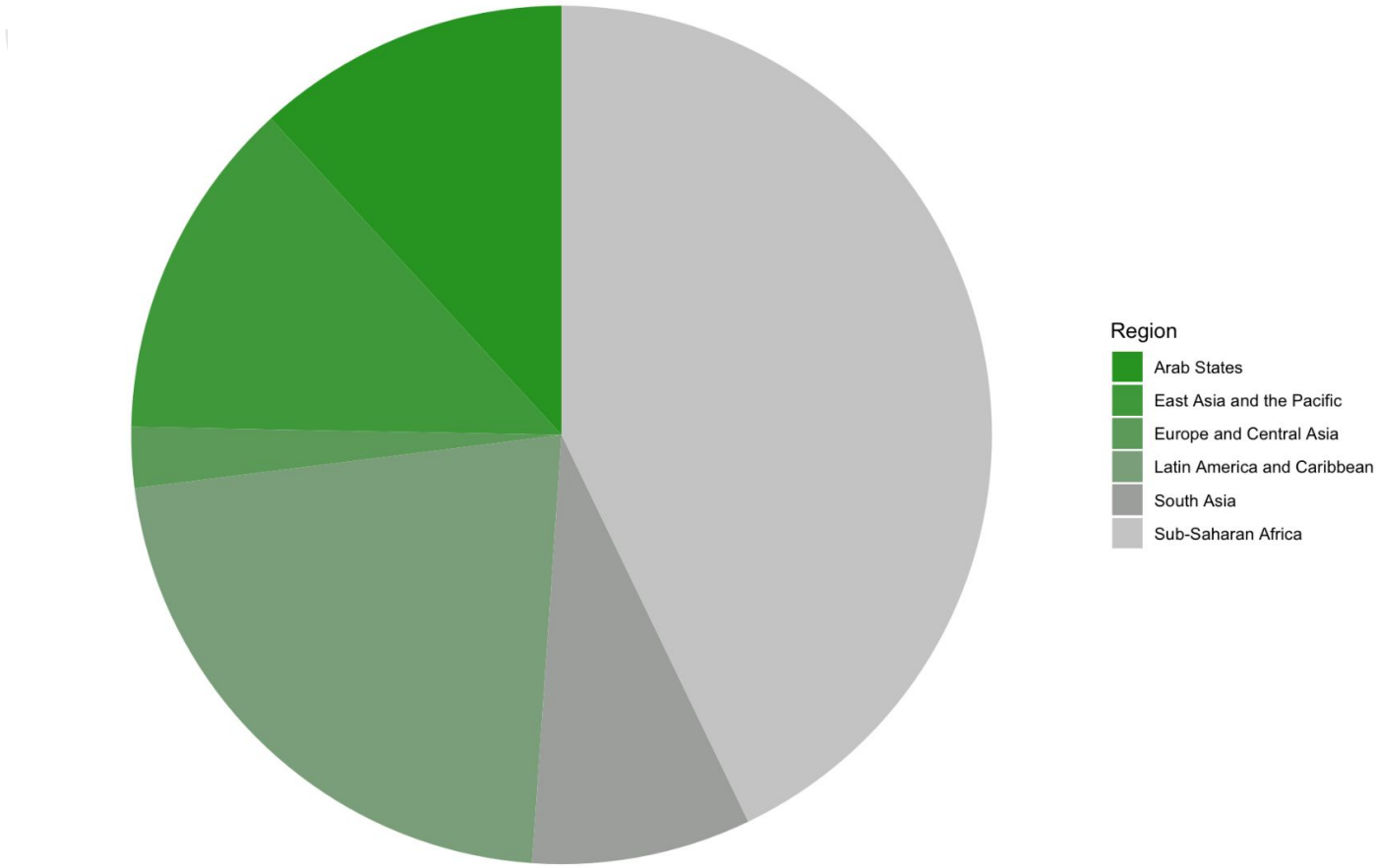
About Kiva

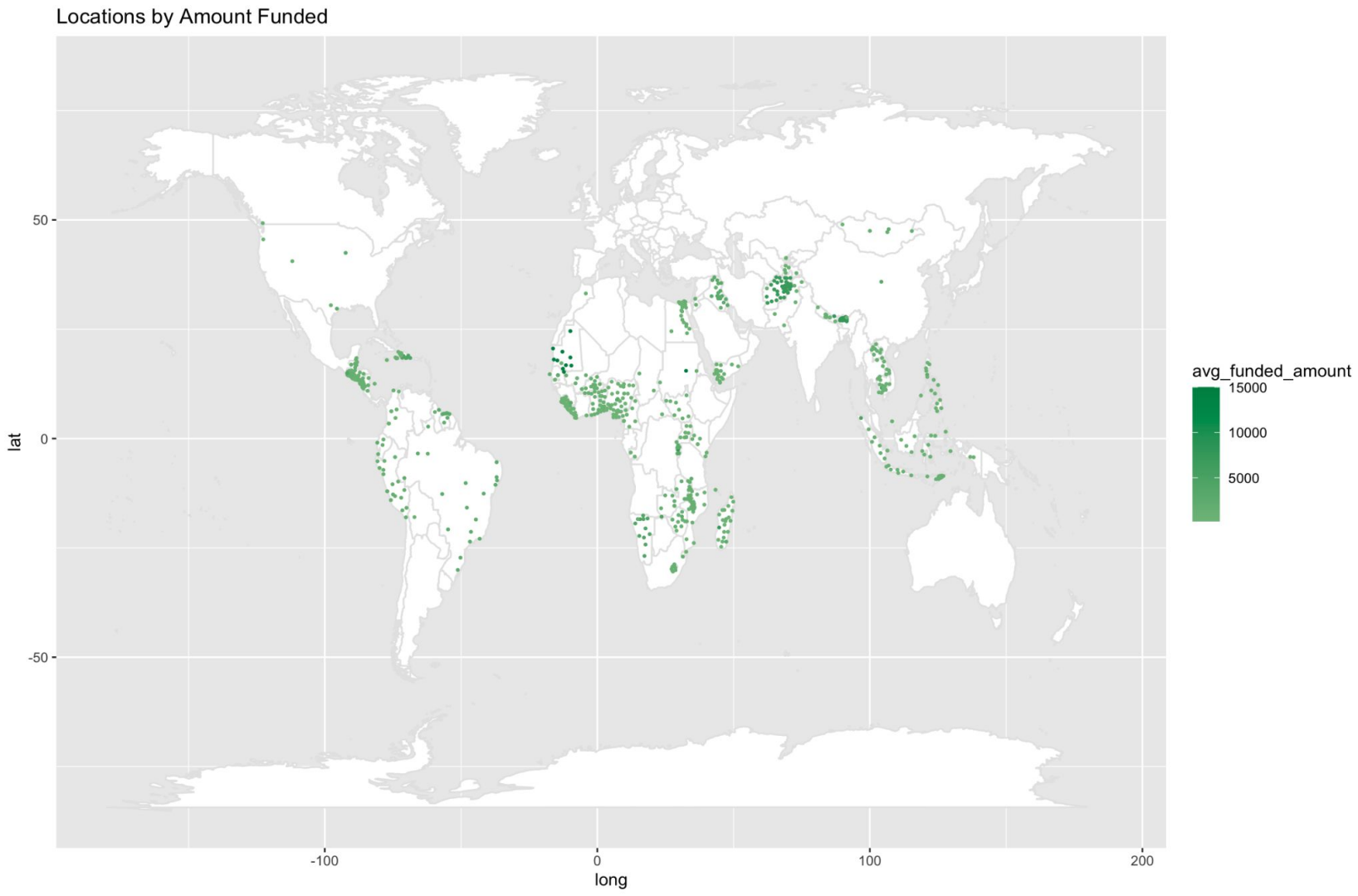
- Kiva.org is a **crowdfunding platform** to provide **financial services** to families and businesses **worldwide**
- Kiva lenders have given over **$1 billion** in loans to over **2 million people**
- Understanding borrowers -> efficient impact!


Distribution of loan amounts
30000
20000
10000
0
Number of Loans
0
2500
5000
7500
10000
Loan Amount

2. Question:
Are Kiva loans going to the right people?

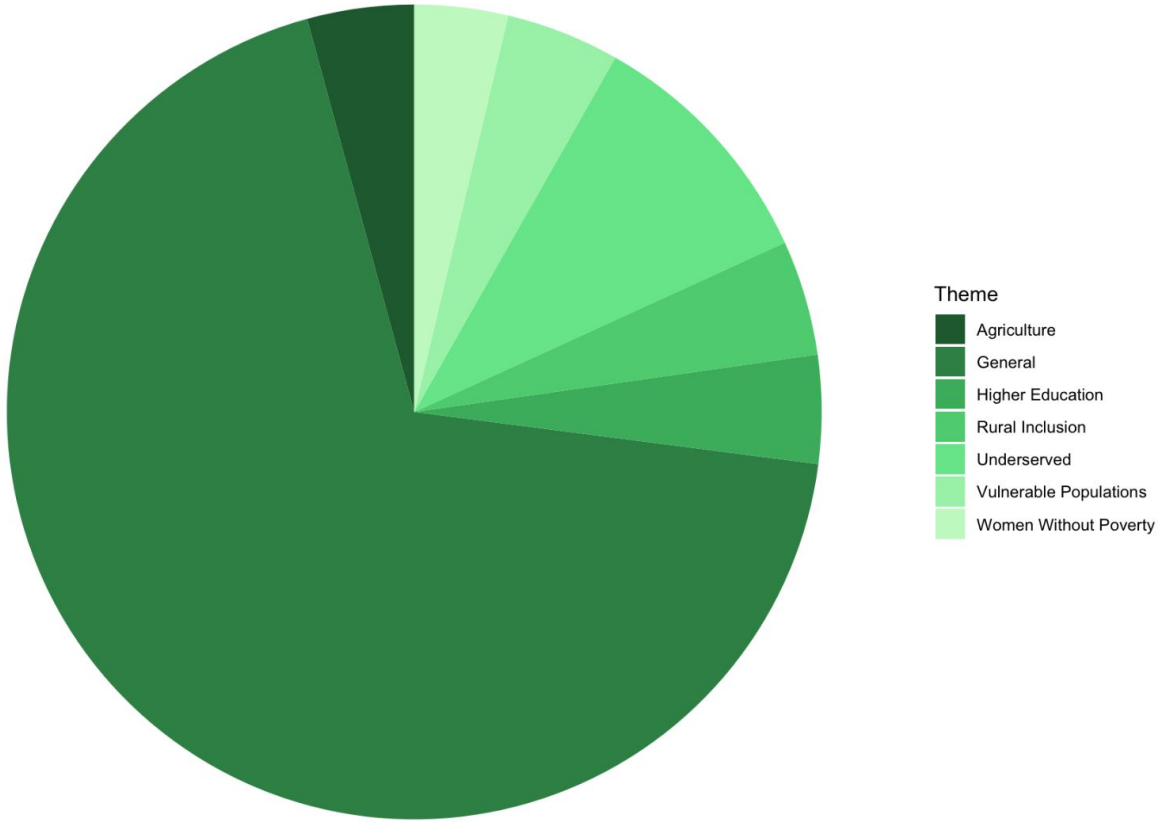
Split by World Regions

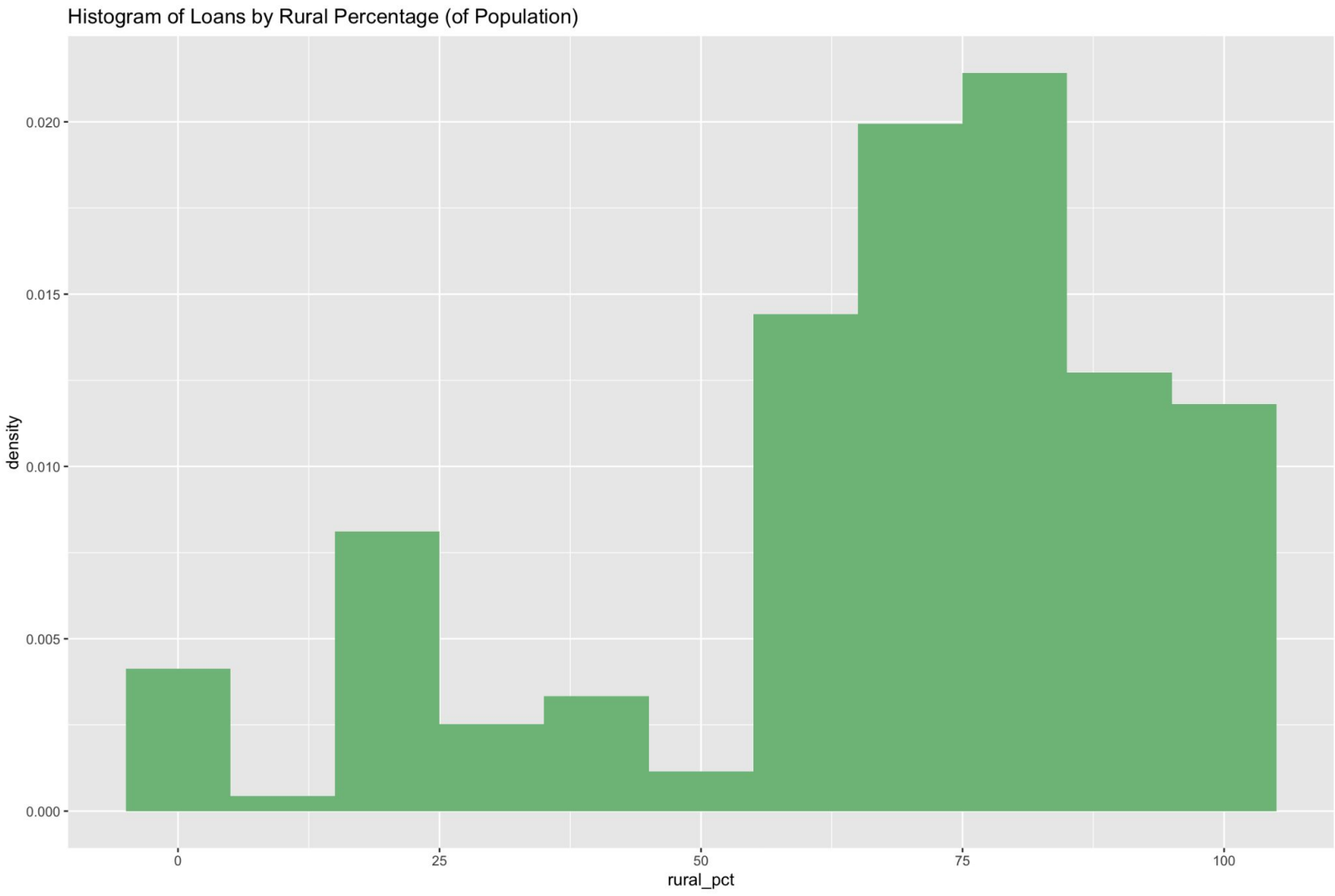


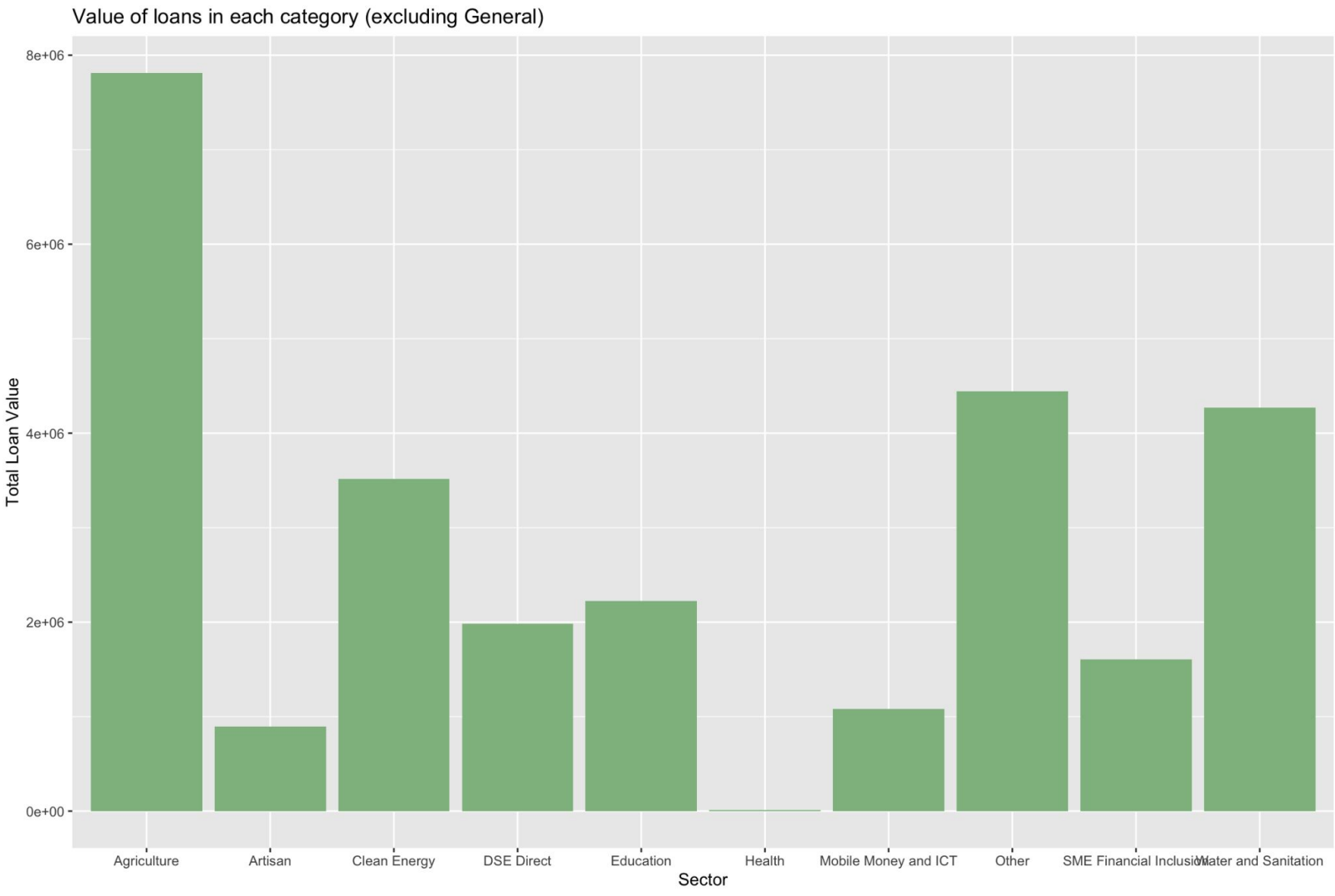

Locations by Amount Funded
50
0
-50
lat
-100
0
100
200
long
avg_funded_amount
15000
10000
5000

Split by loan themes/use

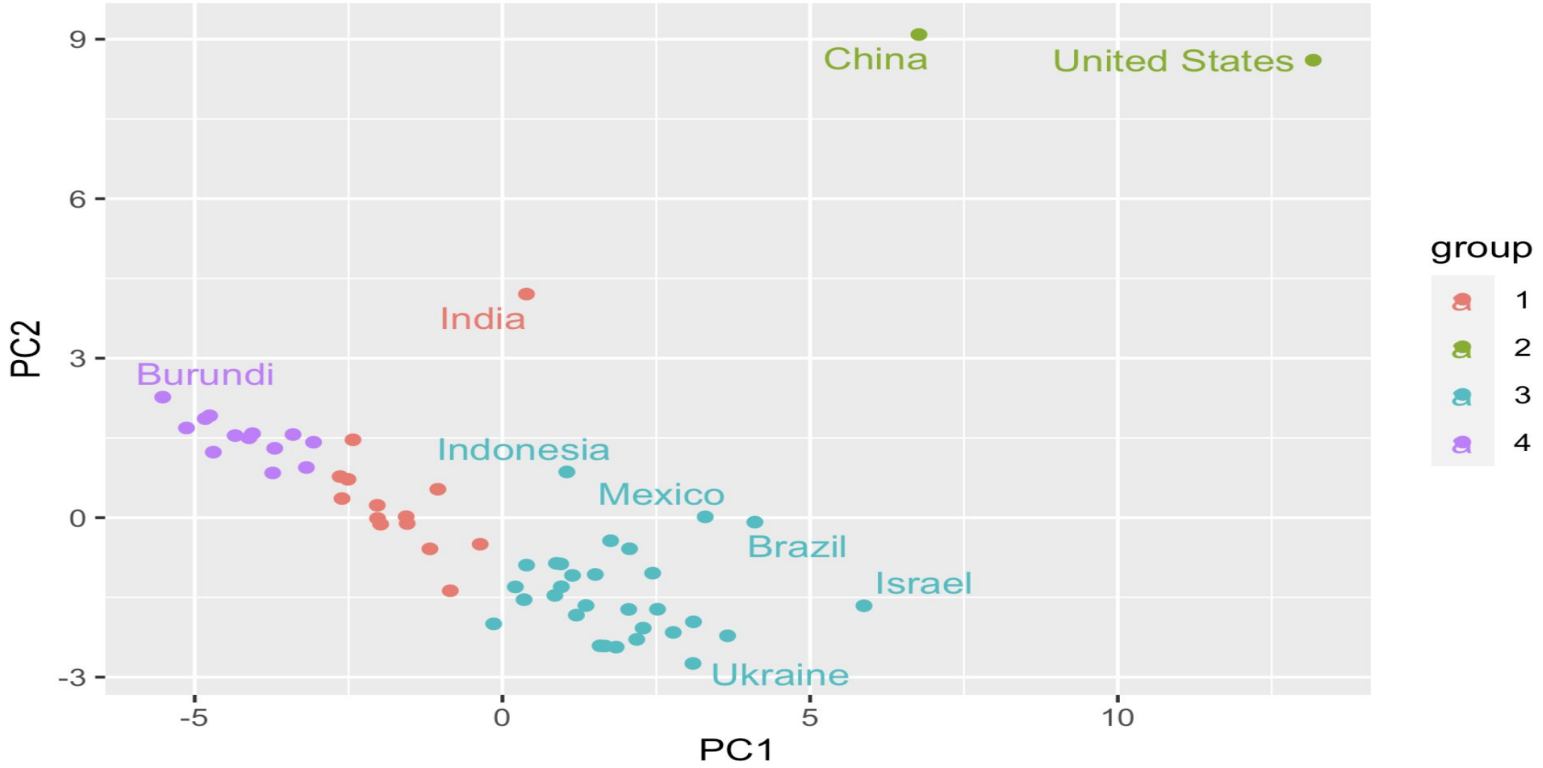
By funded amount




Histogram of Loans by Rural Percentage (of Population)
density
0.020
0.015
0.010
0.005
0.000
0
25
50
75
100
rural_pct


Value of loans in each category (excluding General)
Total Loan Value
8e+06
6e+06
4e+06
2e+06
0e+00
Agriculture
Artisan
Clean Energy
DSE Direct
Education
Health
Mobile Money and ICT
Other
SME Financial Inclusion
Water and Sanitation
Sector

Countries in Clusters



3. Modeling

PCA of countries

	PC1	PC2
Gender Development Index	0.166688226	-0.145916714
Gender Inequality Index	-0.227073230	0.039553867
Surface area (km2)	0.174863760	0.293883539
GDP: Gross domestic product (million current US$)	0.184602585	0.325778349
GDP per capita (current US$)	0.229265321	0.103820214
Economy: Agriculture (% of GVA)	-0.212634855	0.129497425
Economy: Services and other activity (% of GVA)	0.186413549	-0.113249067
Employment: Agriculture (% of employed)	-0.244061844	0.161796826
Employment: Industry (% of employed)	0.197625642	-0.111820212
Employment: Services (% of employed)	0.236989454	-0.163934443
International trade: Exports (million US$)	0.170886205	0.326595604
International trade: Imports (million US$)	0.188966683	0.326309055
Urban population (% of total population)	0.223369794	-0.146681717
Urban population growth rate (average annual %)	-0.202560232	0.161842819
Fertility rate, total (live births per woman)	-0.234686136	0.118183647
Infant mortality rate (per 1000 live births	-0.248494779	0.150576219
Mobile-cellular subscriptions (per 100 inhabitants).1	0.243147640	-0.105159494
CO2 emission estimates (million tons/tons per capita)	0.171201352	0.339947366
Energy production, primary (Petajoules)	0.245545037	0.103223732
Pop. using improved sanitation facilities (urban/rural, %)	-0.201983093	-0.076493274

The Final Model

```
Residuals:
      Min        1Q    Median        3Q       Max
-12561813  -4153681   -681723   3368092  25482096

Coefficients:
                                                                  Estimate Std. Error t value Pr(>|t|)
(Intercept)                                                     -7.365e+09  2.312e+09  -3.185 0.002568 **
`GDP per capita (current US$)`                                  -1.723e+03  4.756e+02  -3.623 0.000713 ***
`Economy: Agriculture (% of GVA)`                                4.128e+05  1.375e+05   3.001 0.004292 **
`Employment: Agriculture (% of employed)`                        7.355e+07  2.311e+07   3.183 0.002588 **
`Employment: Industry (% of employed)`                           7.355e+07  2.314e+07   3.179 0.002618 **
`Employment: Services (% of employed)`                           7.384e+07  2.311e+07   3.195 0.002499 **
`International trade: Imports (million US$)`                     5.365e+01  1.568e+01   3.422 0.001298 **
`Mobile-cellular subscriptions (per 100 inhabitants).1`          2.502e+05  8.885e+04   2.816 0.007079 **
`Individuals using the Internet (per 100 inhabitants)`           7.071e+03  2.900e+03   2.439 0.018577 *
`CO2 emission estimates (million tons/tons per capita)`         -8.438e+02  2.598e+02  -3.248 0.002151 **
`Energy production, primary (Petajoules)`                       -1.674e+05  5.777e+04  -2.898 0.005691 **
`Pop. using improved sanitation facilities (urban/rural, %)`    -5.503e+05  1.357e+05  -4.057 0.000186 ***
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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8048000 on 47 degrees of freedom
Multiple R-squared:  0.4842,  Adjusted R-squared:  0.3635
F-statistic: 4.011 on 11 and 47 DF,  p-value: 0.0003801
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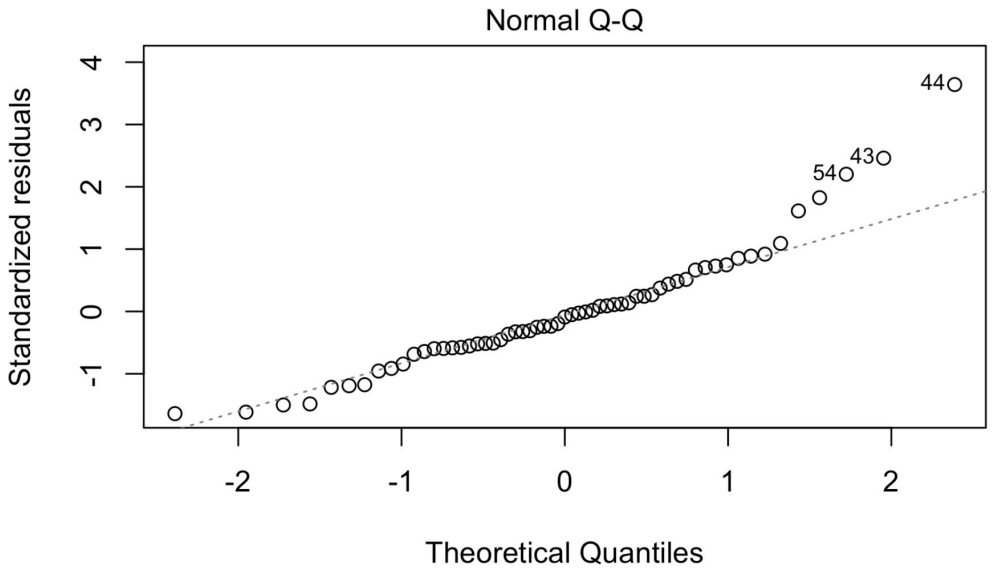
Country Distribution in Funding



country <chr>	loan_amount <dbl>
Philippines	55301250
Kenya	32520075
Peru	30493725
Paraguay	29514025
Cambodia	19841325
Uganda	15209525
Ecuador	14946950
Tajikistan	14941875
Colombia	13906275
El Salvador	13663125

4. Reflection

Addressing Outliers

Similar funding, deployed differently

- Uganda - energy & environment
- Ecuador – “vulnerable populations”, food
- Tajikistan/Colombia – small business equipment
- Cambodia – higher education

Further Exploration

- Lack of granularity - MFIs, local conflicts
- Multicollinearity in the data - CO2 emissions, MPI

Next Steps

- NLP on Kiva loan “stories”, borrower backgrounds
- Non-linear model - classification methods, deep learning
- Investigate Kiva search algorithm