

Aid or Investment: Which Really Helps?

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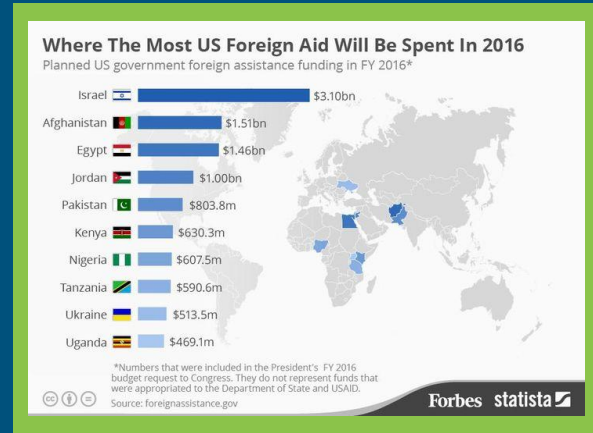
What type of foreign funds best helps improve the economies of developing countries?

Two Types of External Finance

- ❑ Foreign Aid
- ❑ Foreign Investment

Foreign Aid: What is it?

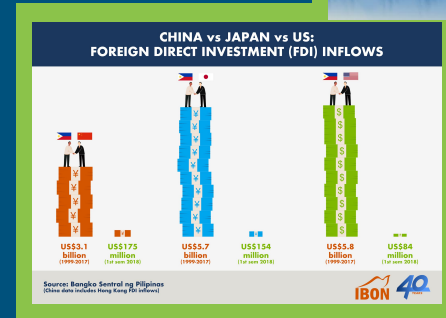
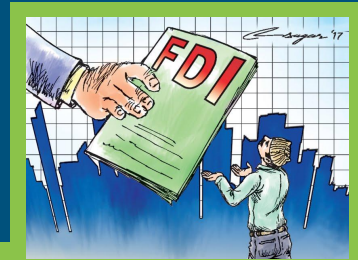
- Resources to developing countries
- **Official Development Assistance (ODA)**- government aid to promote economic development and welfare among developing countries



Foreign Investment: What is it?



- long run ownership stakes in foreign companies and assets
- **Foreign Direct Investment (FDI)**- Entity in one country controlling ownership of a business in another country



Trade Balance

- **Trade Balance**- difference in value of exports and value of imports
- Positive vs. Negative Trade Balance



GDP

Gross Domestic Product (GDP)- Total value of a country's produced goods and provided services in 1 year

↳ % Δ in GDP after 5 years

- Goal: effect of ODA and FDI on GDP growth



Our Regression Model: Variables

Explanatory Variables

- Log Aid in 2010 (in millions USD)
- Log Foreign Investment in 2010 (as a % of GDP)
- Trade Balance 2010 (in millions USD)

Response Variable

- GDP Growth in 5 year period (percent change in GDP from 2010 to 2015)

Transformations

- Natural logs
- Remove extreme outliers

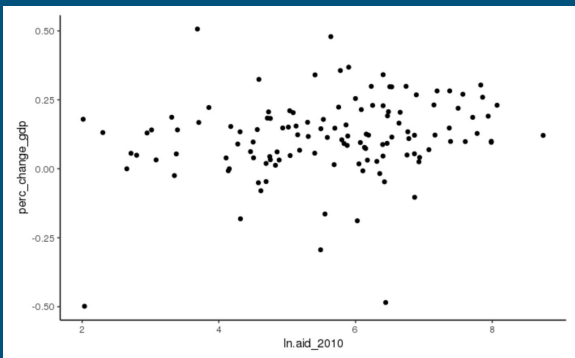
Model Assumptions

- Linearity Assumption

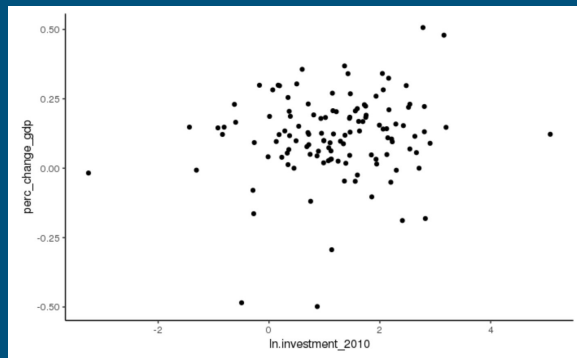
 - Straight Enough Condition

- Independence Assumption

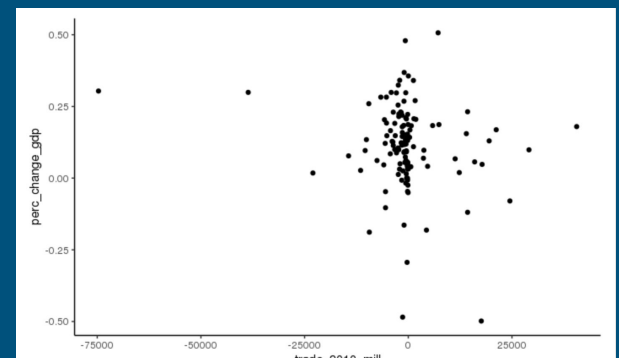
Log Aid Scatterplot



Log FDI Scatterplot

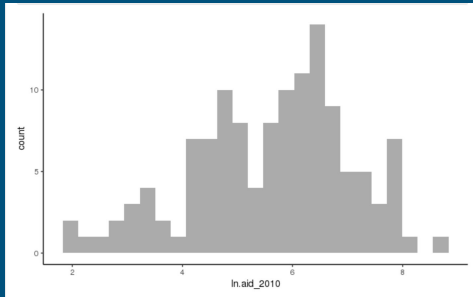


Trade Balance Scatterplot

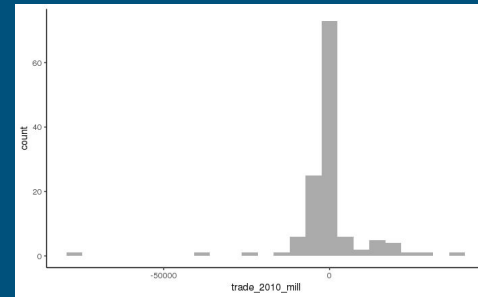


Model Assumptions: Normal Population

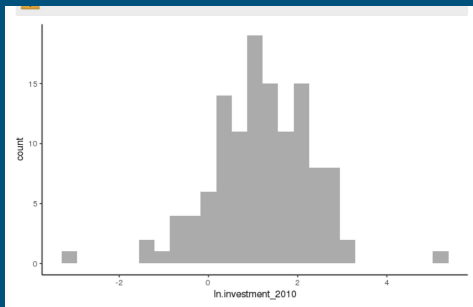
Log(investment)



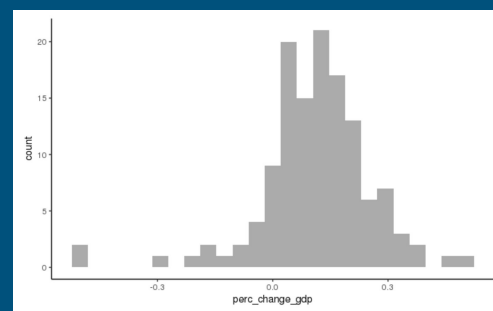
Trade Balance



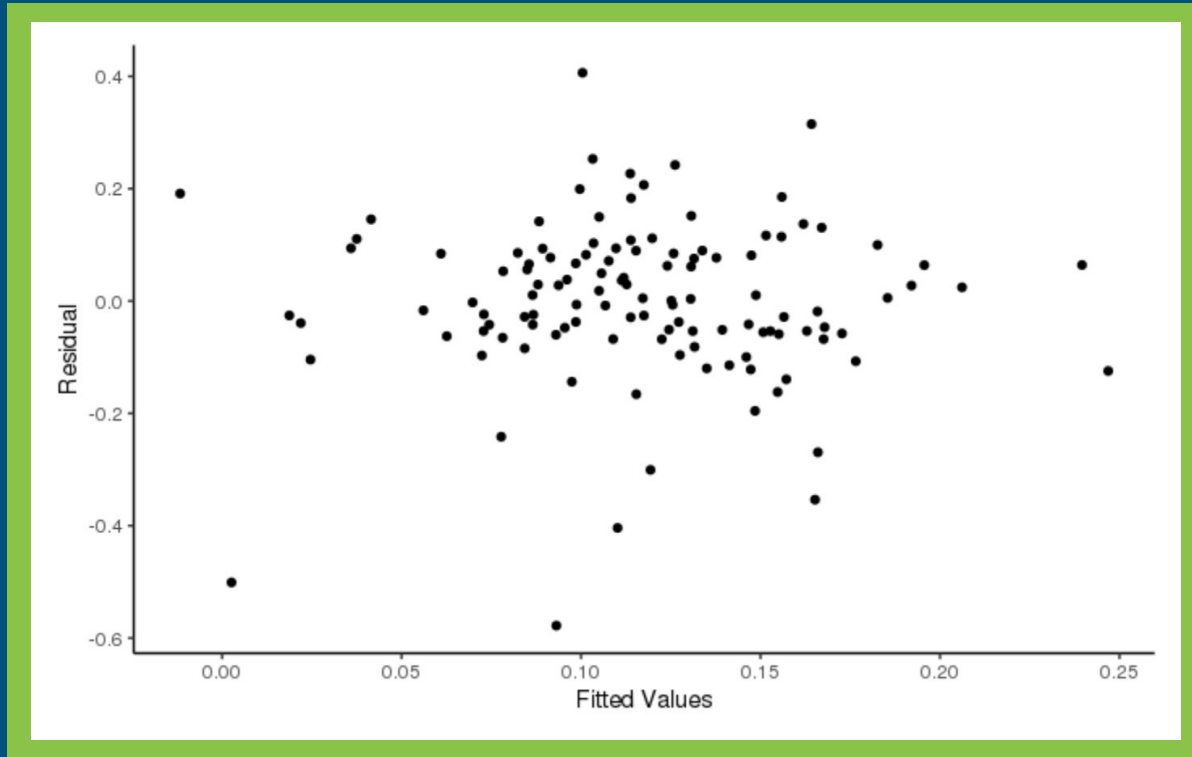
Log(aid)



GDP Growth



Model Assumption: Equal Variances



Multiple Linear Regression Model

$$\text{Perc_change_gdp} = -0.043980571 + 0.022924303 \cdot \ln.\text{aid_2010} + 0.0247224263 \cdot \ln.\text{investment_2010} - 0.000001226 \cdot \text{trade_2010_mill}$$

```
Call:
lm(formula = perc_change_gdp ~ ln.aid_2010 + ln.investment_2010 +
    trade_2010_mill, data = countries3)

Residuals:
    Min       1Q   Median       3Q      Max
-0.57785 -0.05805  0.00220  0.08444  0.40634

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)   -0.043980571  0.062086490   -0.708   0.4801
ln.aid_2010    0.022924303  0.010001858    2.292   0.0237 *
ln.investment_2010 0.024724263  0.011839999    2.088   0.0390 *
trade_2010_mill -0.000001226  0.000001283   -0.956   0.3410
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1437 on 116 degrees of freedom
(8 observations deleted due to missingness)
Multiple R-squared:  0.08679, Adjusted R-squared:  0.06318
F-statistic: 3.675 on 3 and 116 DF, p-value: 0.01425
```

Sample Size= 120

Log Aid r= 0.023

Log Investment r= 0.025

Trade Balance r= -0.000001

Results: Foreign Aid

P-Value	Conclusion	95% CI
0.0237	association $r = 0.023$	(0.003320661, 0.04252794)

Results: Foreign Investment

P-Value	Conclusion	95% CI
0.0390	Association $r = 0.025$	(0.001517865, 0.04793066)

Results: Trade Balance

P-Value	Conclusion	95% CI
0.3410	no association $r = -0.000001$	(0.00000374068, 0.00000128868)

Interaction Model

- P-value of 0.00639 for $\ln(\text{investment}_{2010}:\text{trade}_{2010_mill})$
- Literature shows that FDI interacts positively with trade
 - Stimulates domestic investment
- trade will magnify correlation between log FDI and GDP growth
- log FDI will magnify correlation between trade and GDP growth

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.1041648926	0.1025560198	-1.016	0.31195
$\ln(\text{aid}_{2010})$	0.0321720563	0.0167553062	1.920	0.05736 .
$\ln(\text{investment}_{2010})$	0.0526246013	0.0540448417	0.974	0.33227
trade_{2010_mill}	-0.0000111294	0.0000057536	-1.934	0.05557 .
$\ln(\text{aid}_{2010}:\ln(\text{investment}_{2010}))$	-0.0039293258	0.0090414482	-0.435	0.66469
$\ln(\text{investment}_{2010}:\text{trade}_{2010_mill})$	0.0000067086	0.0000024142	2.779	0.00639 **
$\ln(\text{aid}_{2010}:\text{trade}_{2010_mill})$	0.0000008161	0.0000007067	1.155	0.25060

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.14 on 113 degrees of freedom
(8 observations deleted due to missingness)

Multiple R-squared: 0.156, Adjusted R-squared: 0.1112

F-statistic: 3.482 on 6 and 113 DF, p-value: 0.003396

How Well did the Multiple Regression Model Work?

- Aid or investment: which really helps?
- $R^2 = 0.086$
 - interpretation
- Log aid and Log investment - 0.003 difference in association
 - Overlapping CI's - similarly contribute to changes in GDP

Future Thoughts

- This data suggests that there is an association between foreign investment and GDP and aid and GDP
- Significant interaction between Investment and Trade
- More than 10% of the population
- Trade balance not adjusted for inflation

