



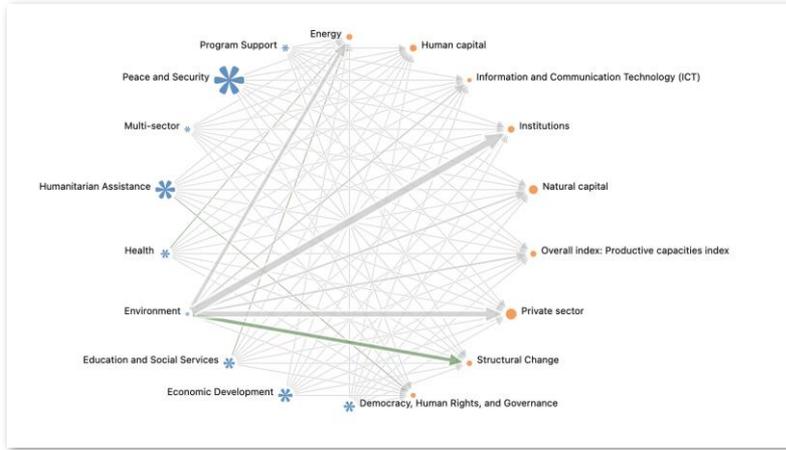
Seton Hall University
National Security Fellowship (NSF)

***Examining the Relationship between
US Foreign Aid Spending and UN
Defined Productivity Indices for
Pakistan***

*Student and Industry Led
Proof of Concept Results for:*

US Department of State

Seton Hall NSF: Assignment and Problem Statement



Pictured Above

A network visualizing relationships between United States foreign aid expenditure categories for Pakistan and increases or decreases in United Nations Productive Capacity Indices (PCI) over 18 years.



PROBLEM STATEMENT

Given data about 18 years of financial foreign aid spending in different categories provided to Pakistan, and productivity indices for the same time period, could we establish a relationship between the annual and total expenditures and the increase or decrease in PCI ratings?



OUTCOME

Our class and industry found very few statistically significant relationships between US Foreign Aid expenditure types expenditure types and UN PCI index movements. ***Of the few significant relationships observed, the spending has extremely limited positive impact on PCIs.***

◆ Seton Hall NSF: Variables

Independent Variables: United States Foreign Aid Spending

Country: Pakistan

Source: US Department of State, USAID

Date Range: 18 Years, 2001 - 2018

Spending Categories include:

- Democracy, Human Rights, and Governance
- Economic Development
- Education and Social Services
- Environment
- Health
- Humanitarian Assistance
- Peace and Security
- Program Support
- Multi-Sector

Total Expended 2001 - 2018: \$15.7 Billion

Dependent Variables: United Nations Productive Capacities Index

Country: Pakistan

Source: United Nations

Date Range: 18 Years, 2001 - 2018

Productive Capacity Indices Include:

- Energy
- Human Capital
- Information and Communication Technology
- Institutions
- Natural Capital
- Private Sector
- Structural Change
- Transport
- Overall Index: PCI

Seton Hall NSF: Linear Regression Basics



Summary of Results:

- Of 81 possible combinations between categorical spending and PCIs, **only 4 combinations have a statistically significant relationship.**

Basics of Linear Regression Applied to this Study

RQ1: Is there a positive or negative relationship between US Foreign Aid expenditures for Pakistan and the UN's Pakistan PCI Indices?

H0 (Null Hypothesis): There is no statistically significant relationship between expenditures and **changes in** PCI indices over the last 18 years of available data.

Goal: Reject the null hypothesis stated above.

Linear Regression

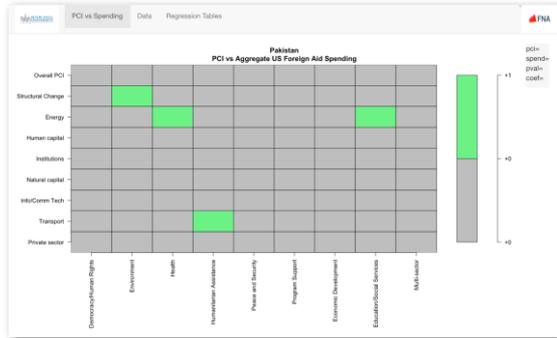
Independent variables ("X" Variables) are used to predict for an outcome expressed as a continuous variable(s) ("Y" Variables)

- P value = statistical significance;
 - must be <0.05 ; meaning that there's less than a 5% chance that the outcomes are random
- R-squared = variance explained by the regression relationship between X and Y
- Betas = results. E.g. for every change in X (\$1M USD Spent) there is a specific change in Y (PCI Index)

Controlling for Changes in Pakistan GDP from 2001-2018

- Meaning, the natural impact of GDP on the PCI indices has been excluded from the effects that the foreign aid spending has on the PCI changes

Seton Hall NSF: Results Explained and Visualized



Above: H0 Rejected (green squares)

There is a statistically significant & positive relationship between:

- Environment spending and Structural Change PCI
- Health Spending and Energy PCI
- Humanitarian Assistance Spending and Transport PCI
- Education and Social Services Spending and Energy PCI

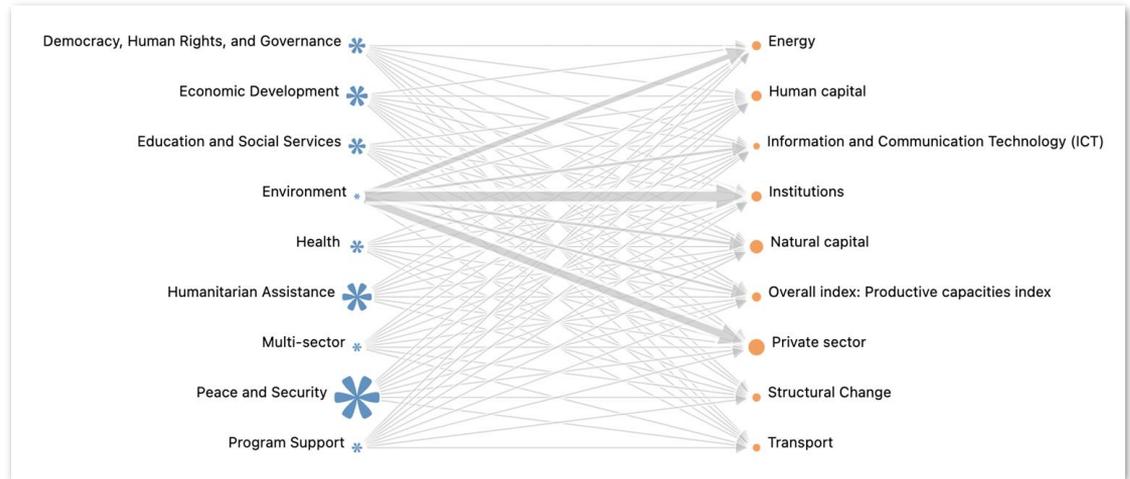
However, the impact of the spending on the PCI indices is minimal

Summary of Results: Of 81 possible combinations between categorical spending and PCIs, only 4 combinations have a statistically significant relationships.

Below: H0 Supported:

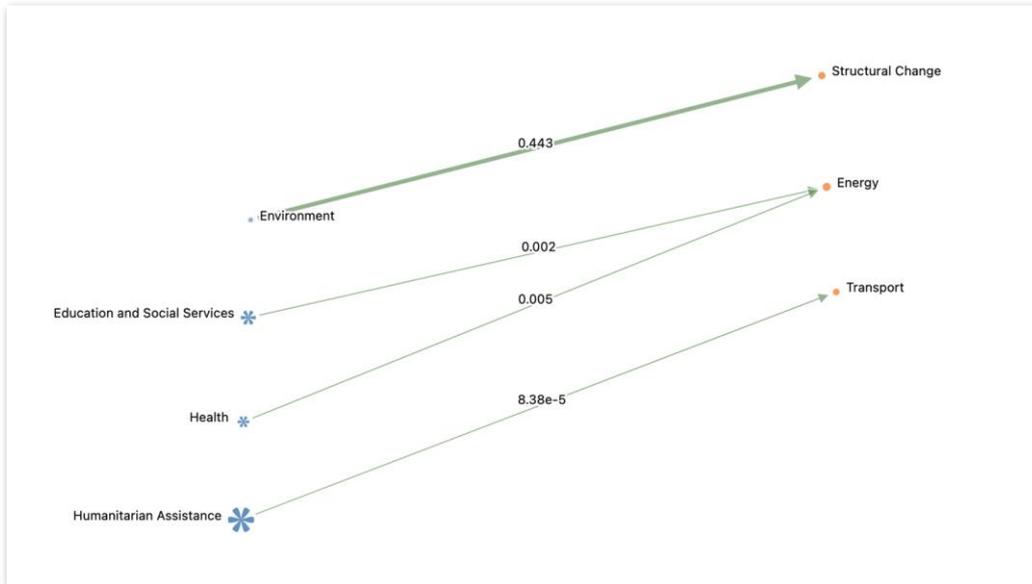
There is no statistically significant relationship between US Foreign Aid spending and the changes in PCI indices whatsoever seen in the following relationships.

- Blue Icons = Spending Categories | Orange Icons = PCI Indices
- Gray Links = No Statistical Significance (p-value > 0.05)
- Icon Size = Amount of Spend / average PCI | Link Size = beta



Seton Hall NSF: Results Explained and Visualized

4 of 81 (5%) possible spending to PCI relationships are statistically significant. Of them, a combined \$4M in USD spending would increase four different categories by far less than a full index point in each area and less than half an index point total for all four PCIs combined. Three of the four expenditure to PCI relationships while significant, have relatively zero impact based on the Beta's reported when controlling for Pakistan's GDP. Additionally, in most cases the R-squared values for these relationships also suggests that in addition to the impact being extremely limited, although positive, these models only explain approximately 29-46% of the variation (read as: impact) observed



Left: Statistically significant relationships between spending and UN PCIs

- Green Link = statistically significant relationship
- Green Link Width & Label = Results / Betas

Results:

- Environment Spending positively impacts Structural Change PCI by 0.4 points for every \$1M spent
- Education and Health Spending positively impacts Energy PCI by 0.002 and 0.005 points (respectively) for every \$1M USD spent
- Humanitarian Assistance spending positively impact the transport PCI by 0.00008 points for every \$1M USD spent

◆ **Seton Hall NSF:** Impacts and Next Steps

Questions based on research include:

Ideas to explore are:

- 1. What other US Dept of State data could be used to identify impact on Pakistan outcomes of interest? Does Department of State have their own dependent variables we could use to measure success / return on investment (ROI)?**
- 2. If no other variables for ROI are available, what considerations should be implemented given the lack of impact on expenditure on Pakistani productivity?**
- 3. Should we explore the same categorical relationships between additional similar or even non-similar countries to determine whether Pakistan is unique, or if there is never any great relationship between US AID Foreign Aid spending and UN PCI Indices?**



Questions? |