

Spatial Patterns of Growth and Poverty Changes in Peru (1993-2005)



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OVERVIEW

- Research Question: What explains the existence of different trajectories of growth, poverty and inequality in rural territories? Is there is something beyond individual and geographic attributes.
- Methodological Approach: Accounting for while controlling for individual, household characteristics, access to infrastructure and geography and location specific variables
- Main Findings: The residual as a “measure of our ignorance”
- Research Agenda: Understanding the relationship between institutional change / growth / poverty and distributional changes / natural resource sustainability in two rural territories

Motivation

■ WDR-2009 World Bank Report

- Income gaps (or inequities) can be fully explained by personal attributes and their location
- Income gaps are determined by observable and measurable attributes. What we cannot measure it either does not exist or is irrelevant for main conclusions
- Institutions are just “Context”, they do not affect in any substantive way the way how personal attributes and location affect wellbeing
- Conclusion: policy should be geography-neutral and should help establish the base so that urbanization occurs “naturally”

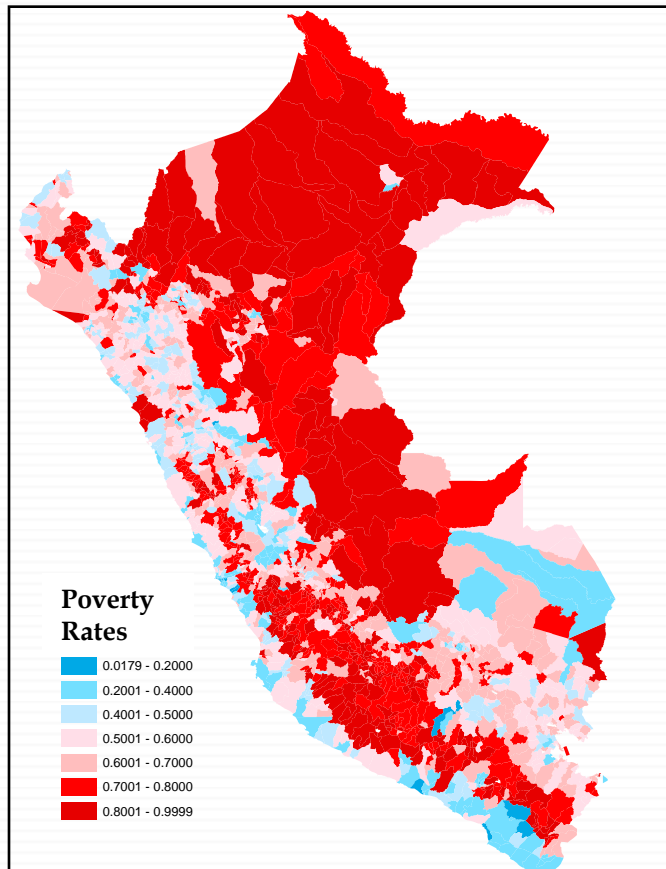
■ And what if the theory is wrong?

Methodological Approach

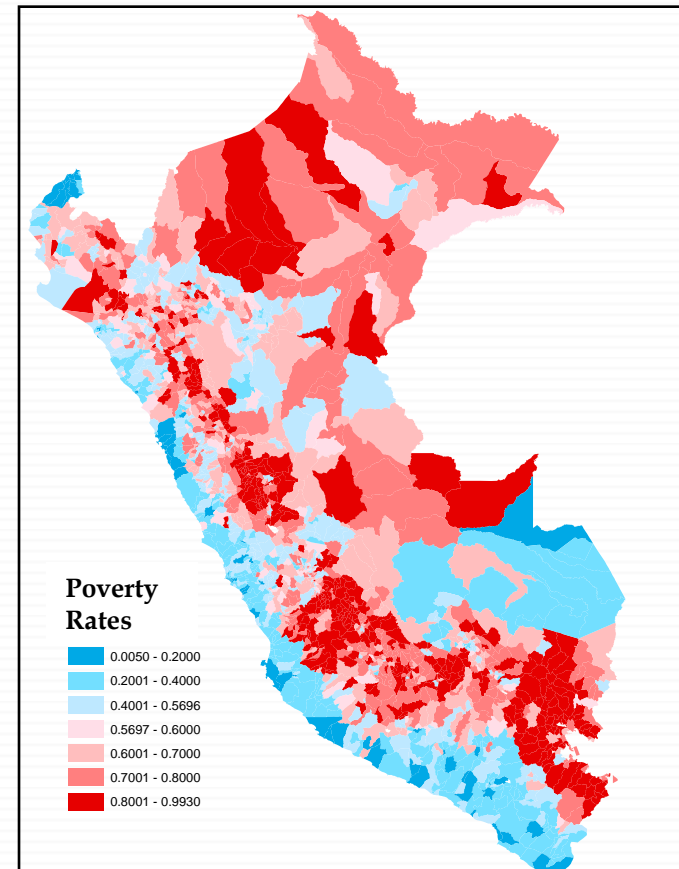
- We combine detailed individual level population Census data Household Surveys, Agriculture Census and Administrative data to construct estimates of per-capita expenditure, poverty, and inequality indicators, at a level of spatial disaggregation that is typically not possible through household survey data.
- We describe the empirical regularities that are common to districts and provinces that have similar trajectories (i.e.. WWW).
- We modeled the relationship between these wellbeing indicators (and their evolution between two consecutive censuses 1993-2005) ignoring systematically the role of institutions... but doing our best to control for a large array of other “observable” factors
- We try to make obvious that if we recognize that there is something missing that varies between territories and goes beyond physical attributes or individual or household characteristics, or access to public infrastructure, we cannot account in a consistent way the spatial distribution of wellbeing.

Main Findings: Poverty 1993 - 2005

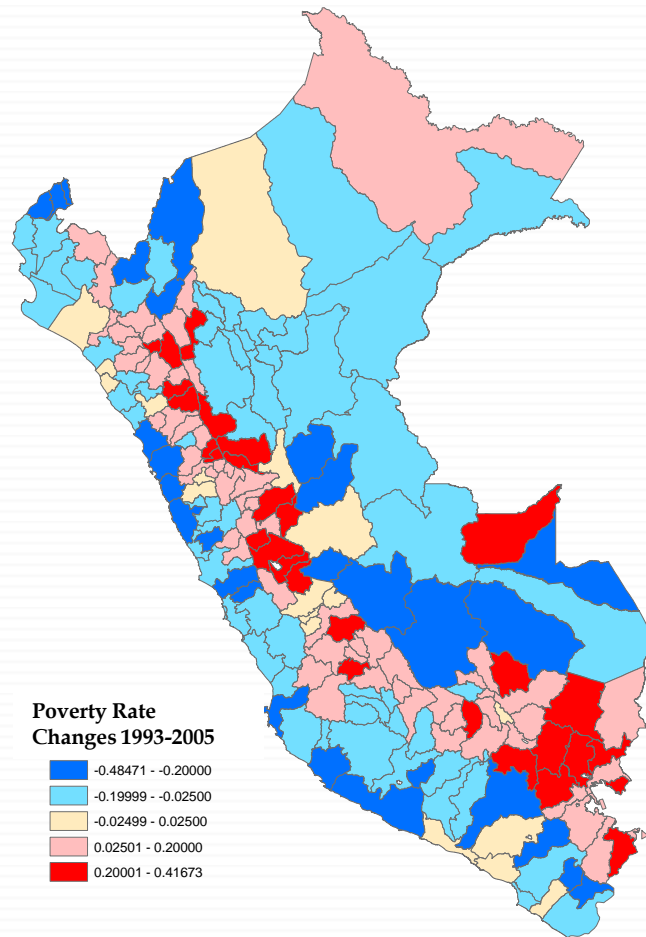
1993



2005



Cambios Provinciales Pobreza



Spatial
Correlation
Patterns are
evident

District Characteristics according to Poverty Dynamics Patterns

	Districts with poverty increase n=680	Districts with poverty reduction n=796
<u>Human capital and demographic aspects</u>		
Percentage of woman headed household	24.4%	21.7% ***
head of household has spanish mother tongue	57.6%	85.3% ***
Percentage of head of household with uncompleted primary education attained or less	12.2%	8.6% ***
Percentage of head of household with completed superior education attained	1.9%	3.3% ***
<u>Infrastructure</u>		
Index of fragmentation of agricultural plots (the more the worst) (1994)	0.911	0.827 ***
Land Asset index (at median prices) (1994)	20,816	33,153 **
Percentage of households with piped water source within the house (1993)	26%	50% ***
Percentage of households with sewerage service within the house (1993)	20%	42% ***
Percentage of households with electricity within the house (1993)	37%	61% ***
Percentage of telephone line subscribers (1993)	3%	11% ***
<u>Location and geographic characteristics</u>		
Percentage of rural population in the district	71.7%	45.0% ***
Distance to the nearest town with 100,000 inhabitants or more (hours)	8.01	4.96 ***
Altitude	2708	525 ***
Percentage of population living in Costa Region	5%	48% ***
Percentage of population living in Sierra Region	87%	11% ***
Percentage of population living in Selva Region	9%	21% **
Percentage of population living in Lima Metropolitana	0%	20% ***
Average slope	44.78	31.13 ***
Precipitation - coefficient of variation	107.5%	205.4% ***

Note: weighted by population

Note: there are 352 districts with no significant change in poverty status

¿How much of the inequality of the wellbeing distribution can be accounted by differences in asset endowments and geographic related variables?

- Wellbeing is measured as the ratio Per-Capita Expenditure/Poverty Line
- Controlling for
 - Private assets and household characteristics
 - Education, household size and composition, gender of head of household, maternal language
 - Animal stock, plot size, land fragmentation
 - Source of employment in area: agriculture, industry, services)
 - Access to private and public services
 - electricity, drinkable water, sanitation, telephone
 - Access to markets (time to nearest town 50,000-100,000 inhab.)
 - Variables related to location/Geography/Climate
 - Precipitation, temperature (average and variability), type of soil, soil depth, slope. Altitude, region (coast/highlands/jungle)

Poverty has a Spatial Dimension

Spatial Correlation
(Moran Statistics for Selected Variable)

	1993	2005	Change 1993-2005
Per-capita Expenditure	0.6095	0.7338	0.4667
Poverty	0.5327	0.7094	0.5719
Gini	0.3663	0.2167	0.4222
Head of HH Education (more than secondary)	0.6585	0.6484	0.5144
Access to electricity	0.5964	0.5658	0.3409
Access to drinkable water	0.4995	0.4631	0.3385
Altitude		0.8675	

Note: All statistics are significant at 1%

Regional Gaps can not be fully explained taking into account assets and geography

Regional Decomposition of Log Welfare Ratio – 2005

	Models				
	1	2	3	4	5
Sierra- Costa: Log Welfare Ratio	-0.425	-0.425	-0.425	-0.425	-0.425
Geography	-0.449 ***	-0.342 ***	-0.281 ***	-0.283 ***	-0.180 ***
Infrastructure		-0.103 ***	-0.107 ***	-0.112 ***	-0.046
Economic Environment			-0.058	-0.067	0.010 ***
Private Assets				0.021 ***	0.014 **
Human Capital and household Characteristics					-0.226 ***
Residual	-0.449	-0.444	-0.446	-0.442	-0.428
Selva - Costa: Log Welfare Ratio	-0.298	-0.298	-0.298	-0.298	-0.298
Geography	-0.375 ***	-0.194 ***	-0.131 ***	0.127 ***	-0.097 ***
Infrastructure		-0.174 ***	-0.174 ***	-0.172 ***	0.073
Economic Environment			-0.061 **	-0.065 *	0.014 ***
Private Assets				0.003 ***	0.002 ***
Human Capital and household Characteristics					-0.168 ***
Residual	-0.375	-0.368	-0.366	-0.361	-0.323
Number of observations	1828	1828	1828	1828	1828
Adjusted R-square	0.480	0.590	0.610	0.620	0.730
Spatial Correlation for Residuals	0.846 ***	0.789 ***	0.797 ***	0.798 ***	0.762 ***

***p<1%, **<5%, * p<10%

Spatial pattern is persistent even after controlling for private, public assets and geography

Moran Statistics for Selected Estimations – 2005

	Residual		Predicted	
Poverty 2005				
- OLS controlling for initial conditions	0.3087	***	0.7974	***
- OLS controlling for initial conditions & change in covariates	0.3052	***	0.7677	***
- Spatial Lag Model	0.0627	**	0.8488	***
- Spatial Error Model	-0.0309	*	0.7704	***
Log Per Capita Expenditure 2005	0.3328	***	0.7839	***
- OLS controlling for initial conditions				
- OLS controlling for initial conditions & change in covariates	0.3155	***	0.7750	***
- Spatial Lag Model	0.1917	***	0.8000	***
- Spatial Error Model	-0.0398	*	0.7755	***

***p<1%, **<5%, * p<10%

Spatial Autocorrelation of Residuals when modeling Poverty Change and Growth 1993-2005

	Growth		Poverty Change	
OLS	0.3020	***	0.3354	***
Spatial Lag Model	0.1278	***	0.1149	***
Spatial Error Model	-0.0320	*	-0.0329	*

***p<1%, **<5%, * p<10%

Spatial persistence of Inequality

- Only when one acknowledges that rate of returns to assets are location-specific (so they change between territories) is that one is able to explain the spatial distribution of wellbeing and the spatial distribution of wellbeing changes in an appropriate way

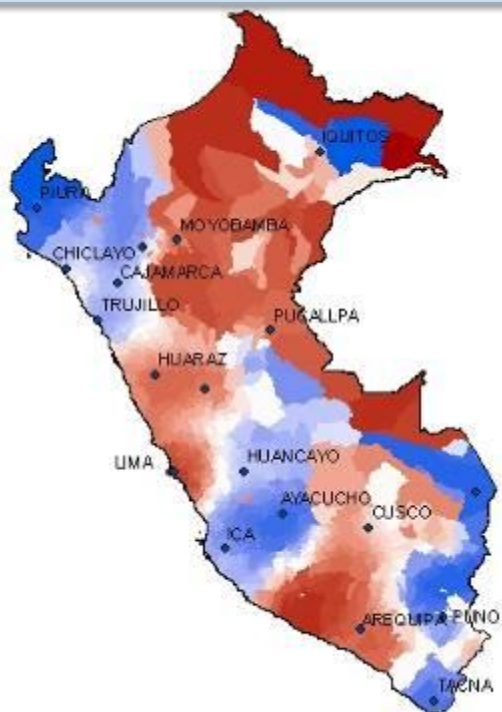
Spatial Autocorrelation of Residuals when modeling
Poverty and Per-capita Expenditure using
Geographic Weighted Regression

	Moran I
GWR Poverty 2005	0.0218 *
GWR Log per-capita Expenditure 2005	0.0149

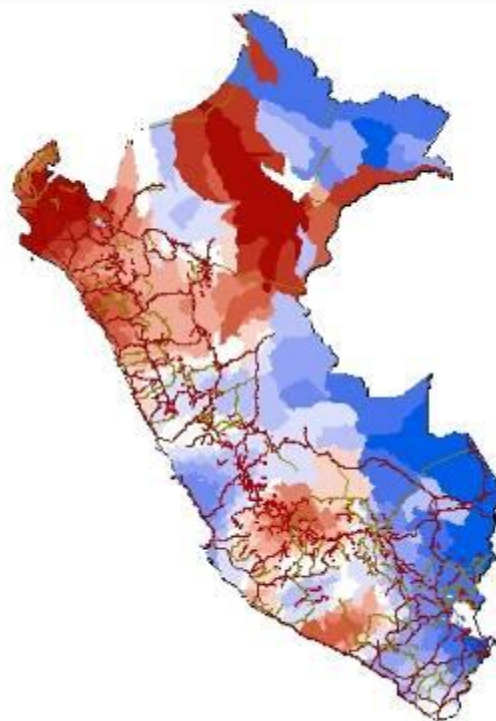
*** $p < 1\%$, ** $< 5\%$, * $p < 10\%$

When one acknowledges that rate of return to asset are location specific ...

Marginal Impact of Electricity over Per-Capita Expenditure Growth



Marginal Impact of reduction in time to markets over Per-Capita Expenditure Growth



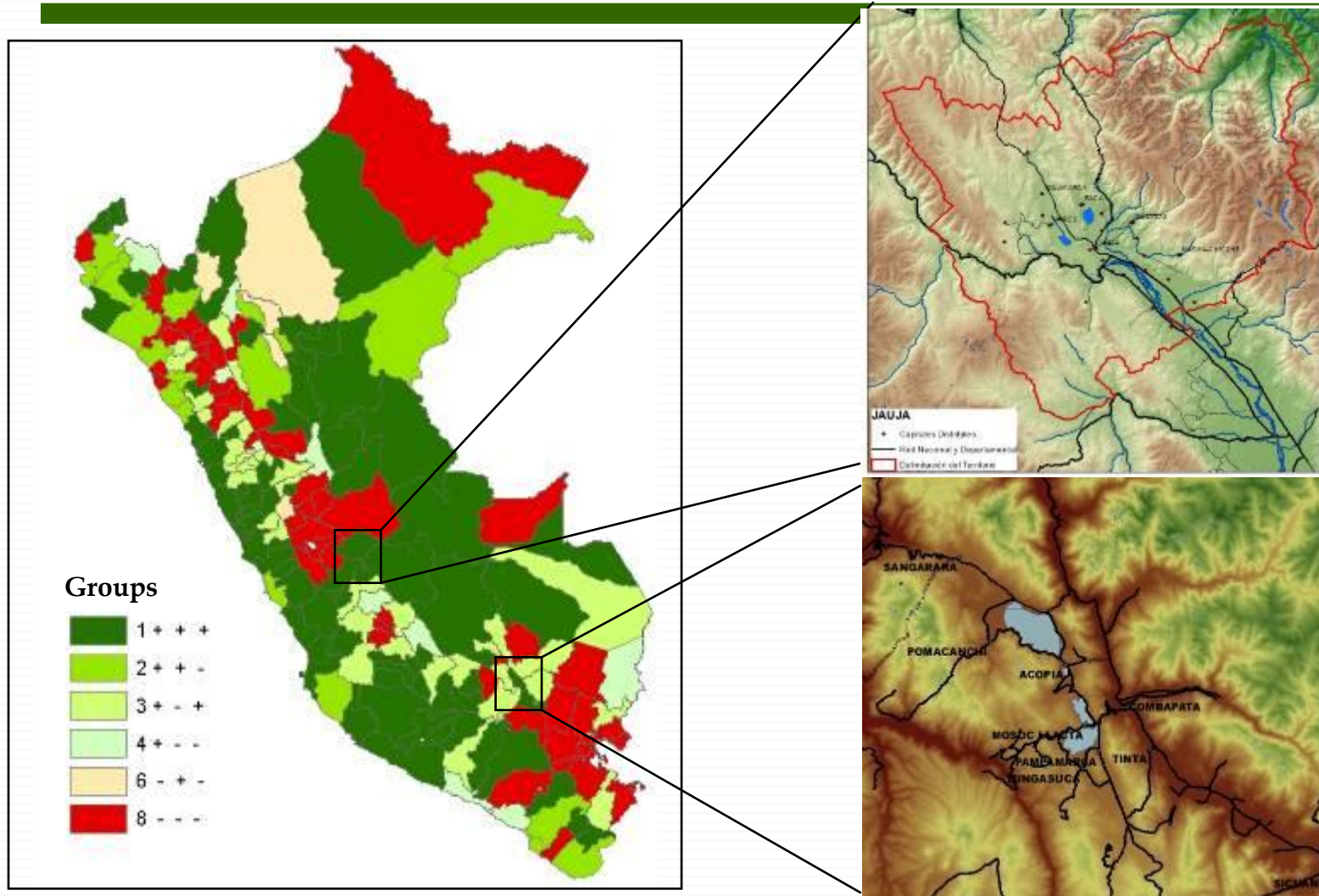
Conclusions

- Log welfare ratio gaps (or inequities) cannot be adequately explained just taking into account personal, household attributes, public assets and geography related variables
- We must acknowledge that there are “un-observed” factors that change between territories
- Two alternative hypothesis to account for the results obtained: (1) We need to take into account additional personal or location specific attributes. Alternatively, (2) we are not taking into account how economic agents interact within the territories beyond their personal attributes and their location (non-linearities).
- An important fraction of the Log welfare ratio variance (a proxy for income inequality) has a territorial base.

Conclusions

- The rate of return to assets changes across territories. This return heterogeneity is not just the expression of the ownership/access to specific assets. There are differences that cannot be fully attributed to variables related to location/geography or to the characteristics of the individuals and households living in those territories.
- Our working hypothesis is that this systematic non-observed component is associated with the institutions that exist within the territories. These institutions determine that otherwise identical territories (in term of assets and geography) will have different wellbeing trajectories
- Institutions and coalitions within the territories could be relevant to understand why some territories are able to generate a W-W-W dynamic, while other territories are not.
- To unpack this “black box” we need to explore in detail specific territorial dynamics.

To explore the role of Institutions we are doing in-depth analysis in 2 Territories



Thanks

