

The Effects of Telecommunications Technologies on Agricultural Profits and Child Labor: Evidence from Isolated Rural Villages in Peru

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Research Questions

- Can access to information technologies increase profits of agricultural households?
- How does potential increased profits affect the demand for child labor?
- Why do we care? There is evidence that access to telecommunication technologies can reduce price dispersion and trader's profits through the reduction in information asymmetries across markets. However, no evidence on the effects that the increased profits may have on children's time allocation in rural areas, where most of children work.

Motivation

- Economic effects of telecommunication technologies (TCs) have been mainly studied using the introduction of cell phones (Jensen, 2007; Aker, 2008) and internet kiosks (Goyal, 2007) as exogenous shocks.
- These studies have focused on market performance looking at price dispersion, consumer prices, trader prices and profits.
- Findings suggest reductions in price dispersion and increases in trader's profits.

Motivation

- Not surprisingly, cell phones have been catalogued as “the single most transformative tool for development” (Sachs, The Economist Sept. 2009)
- However, cell phone coverage is technically unfeasible in many rural areas situated in adverse geographical zones.
- Moreover, cell phone rollover in the majority of countries is privately managed. Making sometimes unprofitable to cover poor isolated areas.

Motivation

- Therefore, the effects of introducing TCs in this kind of areas have not been studied.
- In addition, none of the existing studies have documented how improved profits may have been translated into children's time allocation. →
- Income and substitution effects due to increased profits will offset in the demand for child labor and no clear prediction can be made. →
- Child labor is related to low future earnings and the perseverance of an inter-generational poverty trap.

The Paper's Contribution

- I assess the effects of introducing TCs in isolated rural villages that were not covered by any kind of communication facilities before and where cell coverage was unfeasible.
- On average, these villages were situated 60 km. (37.3 miles) away from the nearest phone before the intervention.
- I isolate the effects of the intervention by exploiting its timing (which I show was as good as random).
- I look not only at improved profits of benefited farmers but also at how this positive shock affected children's time allocation.

Preview of Results

- The introduction of TCs caused the value received per kg. of agricultural production to increase by 14.8 percent. In addition, annual agricultural costs were reduced by 22.6 percent.
- The likelihood of child market work dropped by 13.6 pp. (31.6% wrt. baseline).
- The likelihood of child agricultural work dropped by 9.1 pp. (25.54% wrt. baseline) but entirely concentrated among boys.
- Findings consistent with a dominant income effect in the demand for child labor and with a preference for males in HK investments.

Outline of the Talk

1. A simple model
2. The intervention
3. The data
4. Econometric approach
5. Results
6. Conclusions

A Simple Model

- Assume farmers with Bernoulli utility function defined over output and input prices:

$$u(P_o, P_i) = v(P_o) - g(P_i)$$

- where $v' > 0, v'' \leq 0, g' > 0$
- Also assume a marginal constant cost of searching price information in an additional market of C
- Now assume that the farmer has already searched for prices in N markets being O the best offered price for his output and I the best price found for his input.

A Simple Model

- Therefore, the expected marginal utility of the N+1 search is given by:

$$B(O, I) = \int_o^{\bar{P}_o} \int_{\underline{P}_i}^I [v(P_o) - g(P_i)] - [v(O) - g(I)] dG(P_i) dF(P_o) - C$$

- Optimality implies that the farmer will set his reservation prices for outputs (R) and maximum prices paid for inputs (M) by equating the expected marginal benefit of the N+1 search to zero:

$$B(R, M) = \int_R^{\bar{P}_o} \int_{\underline{P}_i}^M [v(P_o) - g(P_i)] - [v(R) - g(M)] dG(P_i) dF(P_o) - C = 0$$

A Simple Model

- Therefore, using the implicit function theorem and Leibnitz rule we get:

$$\frac{\partial R}{\partial C} = - \frac{\frac{\partial B(R, M)}{\partial C}}{\frac{\partial B(R, M)}{\partial R}} = \frac{1}{-G(M)v'(R)[1-F(R)] - F'(R)[g(M) - E(g(P_i) | P_i \leq M)]} < 0$$

$$\frac{\partial M}{\partial C} = - \frac{\frac{\partial B(R, M)}{\partial C}}{\frac{\partial B(R, M)}{\partial M}} = \frac{1}{G'(M)[E(v(P_o) | P_o \geq R) - v(R)] + [1-F(R)]g'(M)G(M)} > 0$$

A Simple Model

- Now assume that farmers decide on their children's time allocation by maximizing:

$$U[C_c, HK(S)]$$

- Subject to:

$$T = S + F$$

$$C_c \leq Y + F * P_c(C)$$

- where $P_c(C) = R(C) - M(C)$ is the per-unit profit of child labor.
- We have already shown that:

$$\frac{\partial P_c(C)}{\partial C} < 0$$

A Simple Model

- Therefore, the Slutsky equation implies:

$$\underbrace{\frac{\partial F(P_c(C), Y, T)}{\partial C}}_{\text{TotalEffect}} = \underbrace{\frac{\partial \tilde{F}(P_c(C), \bar{U}, T)}{\partial C}}_{\text{SubstitutionEffect} < 0} + \underbrace{\frac{\partial F(P_c(C), Y, T)}{\partial Y}}_{< 0} \underbrace{\tilde{F}(P_c(C), \bar{U}, T)}_{\geq 0} \underbrace{\frac{\partial P_c(C)}{\partial C}}_{< 0}$$

$\underbrace{\hspace{15em}}_{\text{IncomeEffect} \geq 0}$

- The substitution effect suggests that a reduction in search costs (C) due to TCs introduction should increase the demand for child labor.
- While the income effect suggests the opposite.
- Which effect dominates is ultimately an empirical question.

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The Intervention

- The Peruvian Fund for Investments in Telecommunications (FITEC) between 1999 and 2004 provided at least one public (satellite) payphone to 6,509 rural villages without any kind of TCs.
- Targeted villages were defined before the intervention rollout with a three phase process.
- First, FITEC defined the target universe of villages according to the following criteria:
 - Population between 200 and 3,000 inhabitants.
 - No access to TCs.
 - Not included in any future coverage plan of private telecommunications companies.

The Intervention

- Second, FITEC formed cells of 5km. radius using the targeted universe and selected a cell center that should comply with at least one of the following:
 - District capitals without TCs and that were not included in future expansion plans of private operators were automatically selected as cell centers.
 - Have a health center.
 - Situated in the intersection of access roads.
 - Have a high school.
 - Have the higher population within the cell.
- Third, field visits were conducted to assess technical viability for phones installation.









TELEFONO



MiFono

calendario 2004



The Intervention

- After village selection, the country was divided in seven zones: north border, north, middle north, middle east, south, middle south, and north tropical forest.
- Each zone was auctioned to private operators bidding for the lowest subsidy in order to get a 30-year concession.

The Intervention

- The north border project was executed in 213 villages during 1999 as planned.
- The other projects were planned to be all executed during 2001 and the first quarter of 2002. However, several contractual difficulties with private operators and delays in importing the equipment meant that the projects were not finished until 2004.
- I argue that these events provided random variation in coverage timing that I exploit to identify causal impacts.

The Intervention

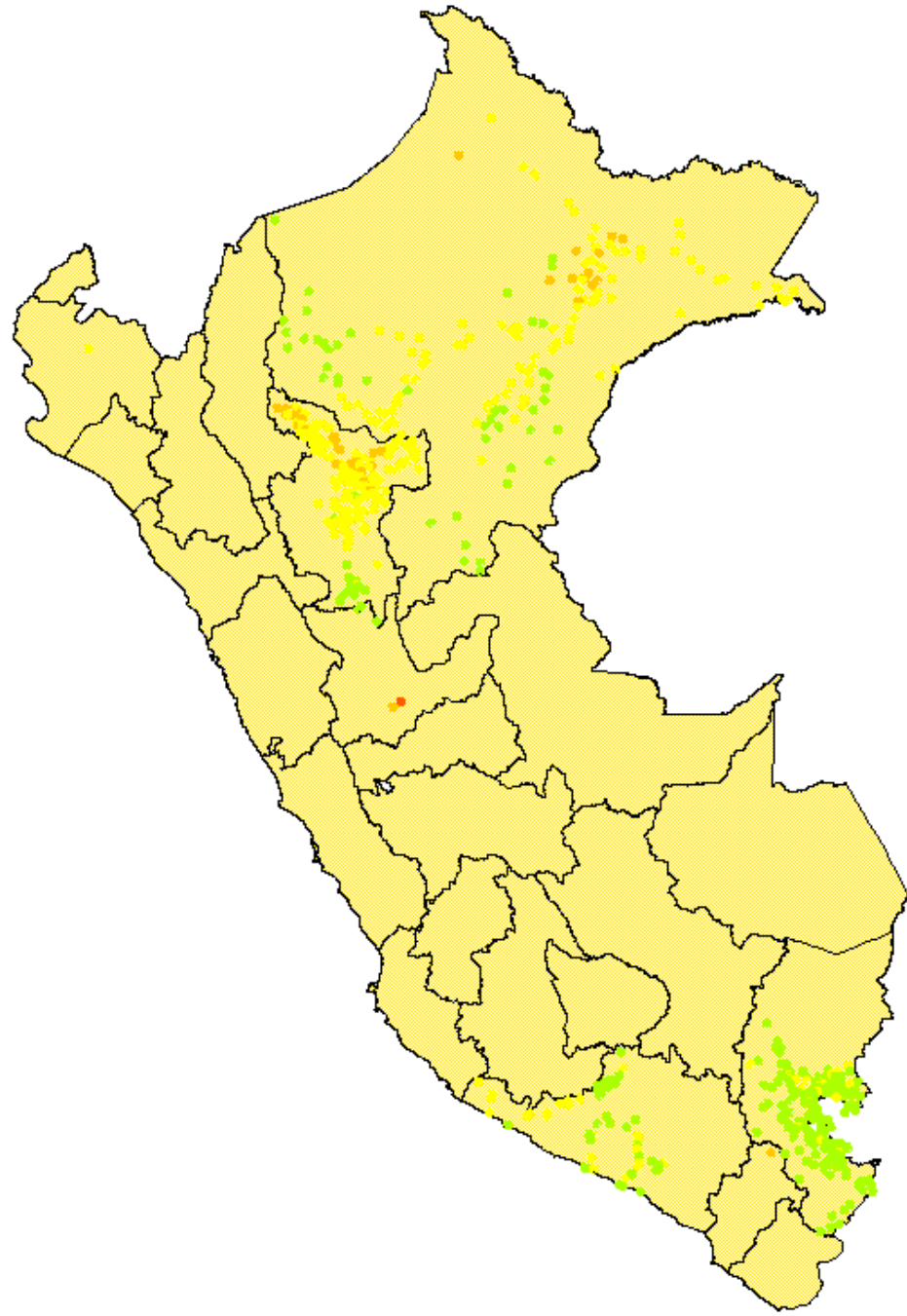
- The yearly timing of the intervention was as follows:

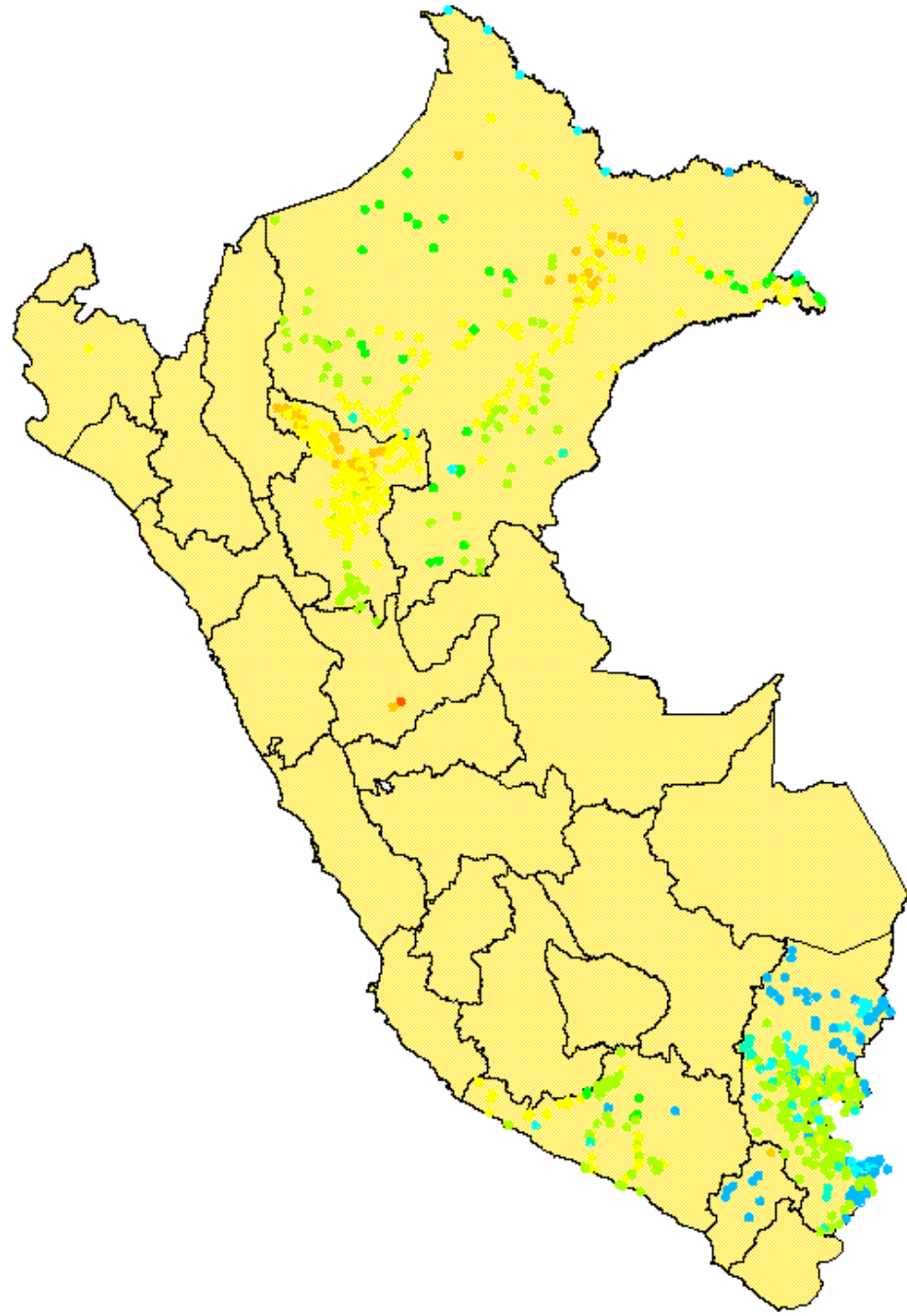
Timing of FITEL intervention

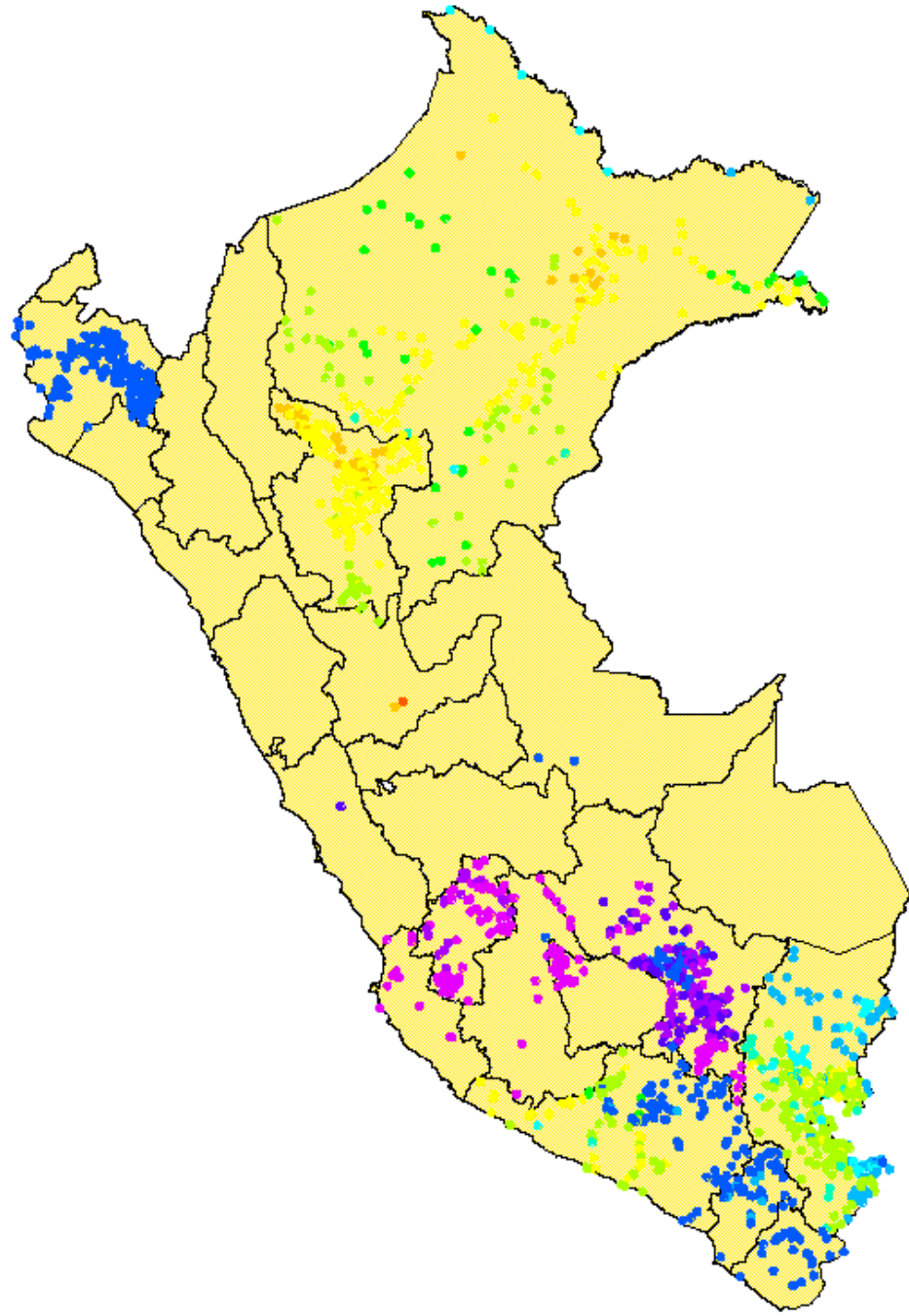
Year of Treatment	Number of Treated Villages	Percent	Cummulative
1999	213	3.27	3.27
2001	1,184	18.19	21.46
2002	2,666	40.96	62.42
2003	2,368	36.38	98.80
2004	78	1.20	100.00
Total	6,509		

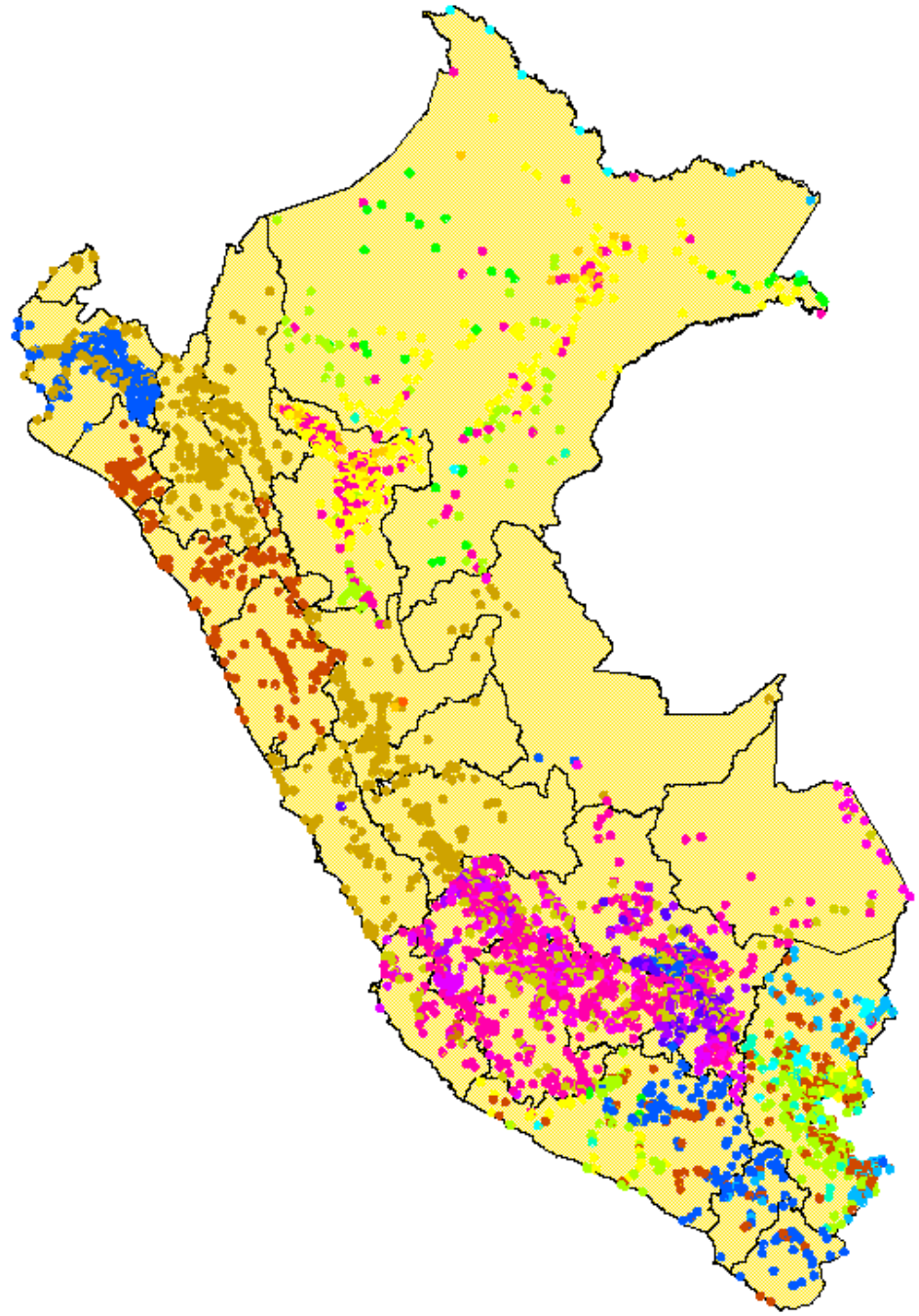
- In the analysis, I exclude the north border project because it was endogenously treated first due to its importance as border with Ecuador.

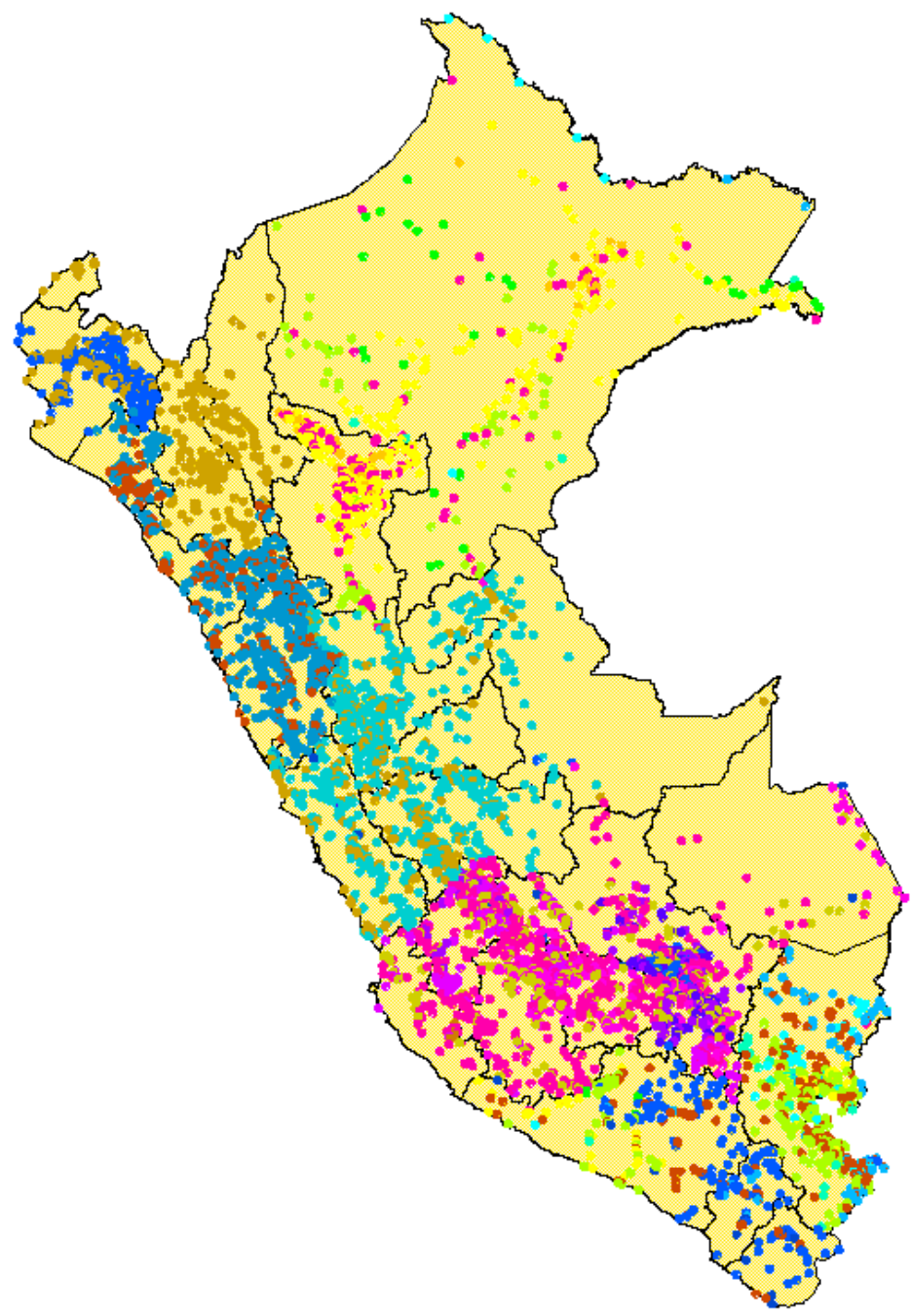


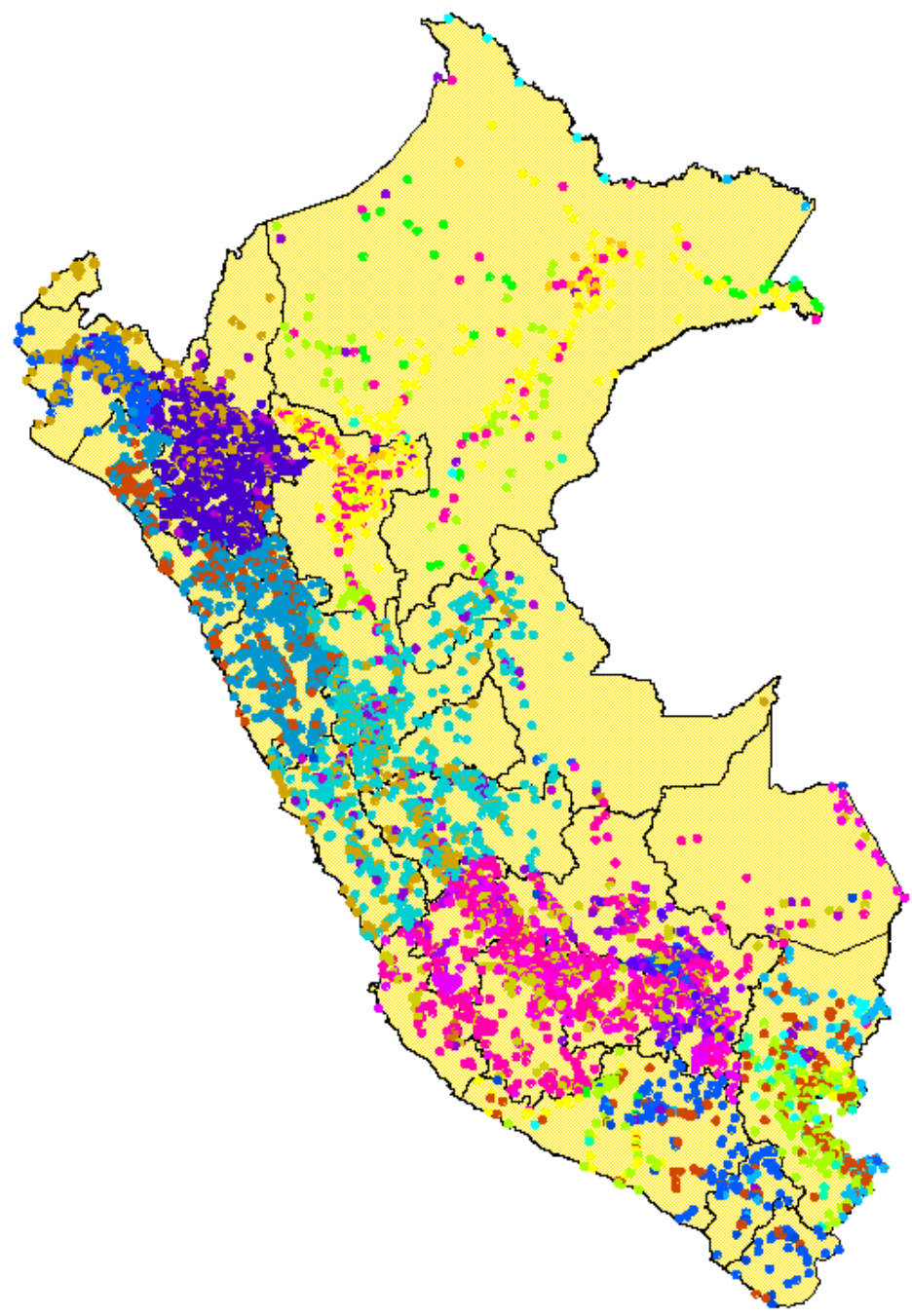


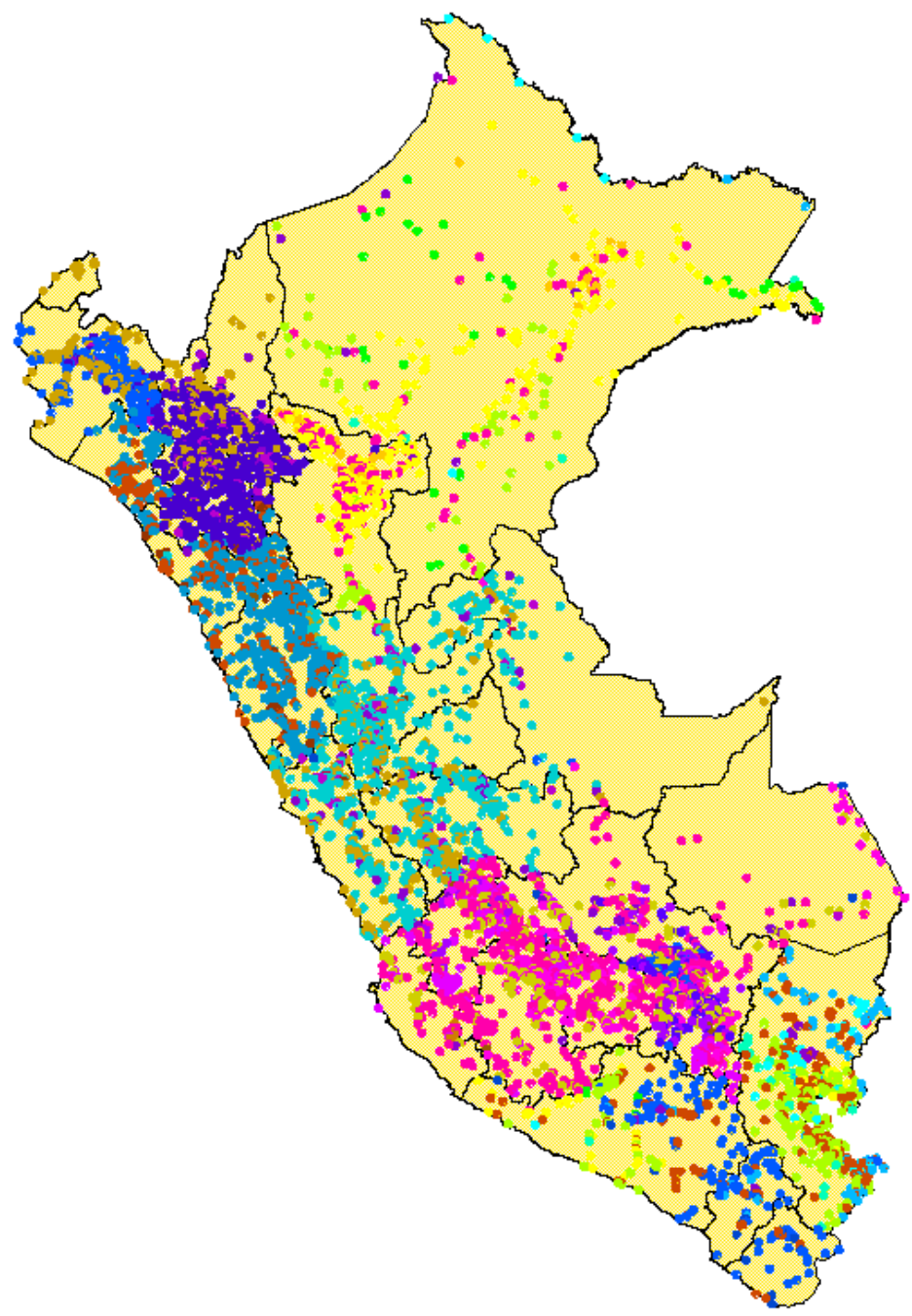


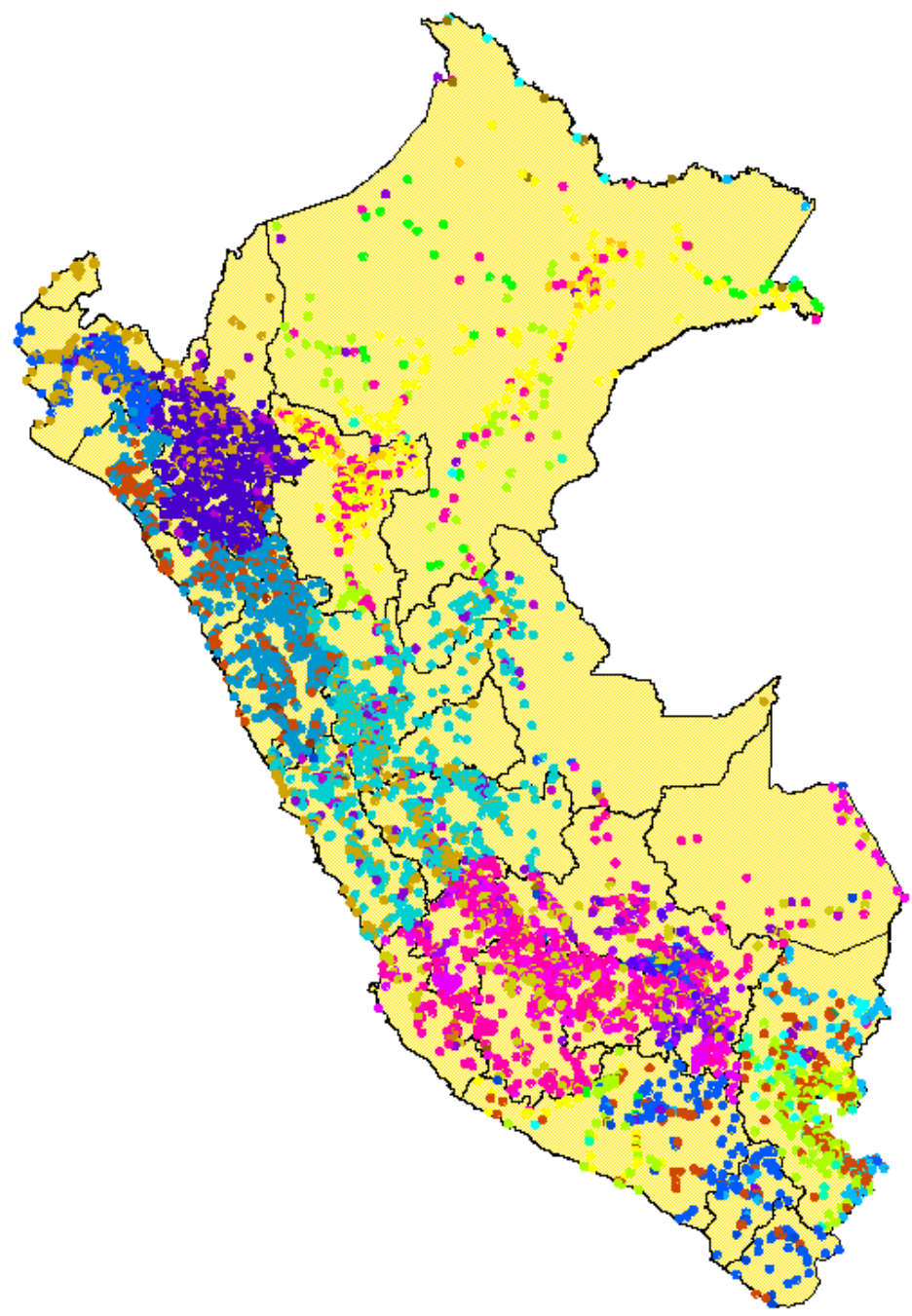


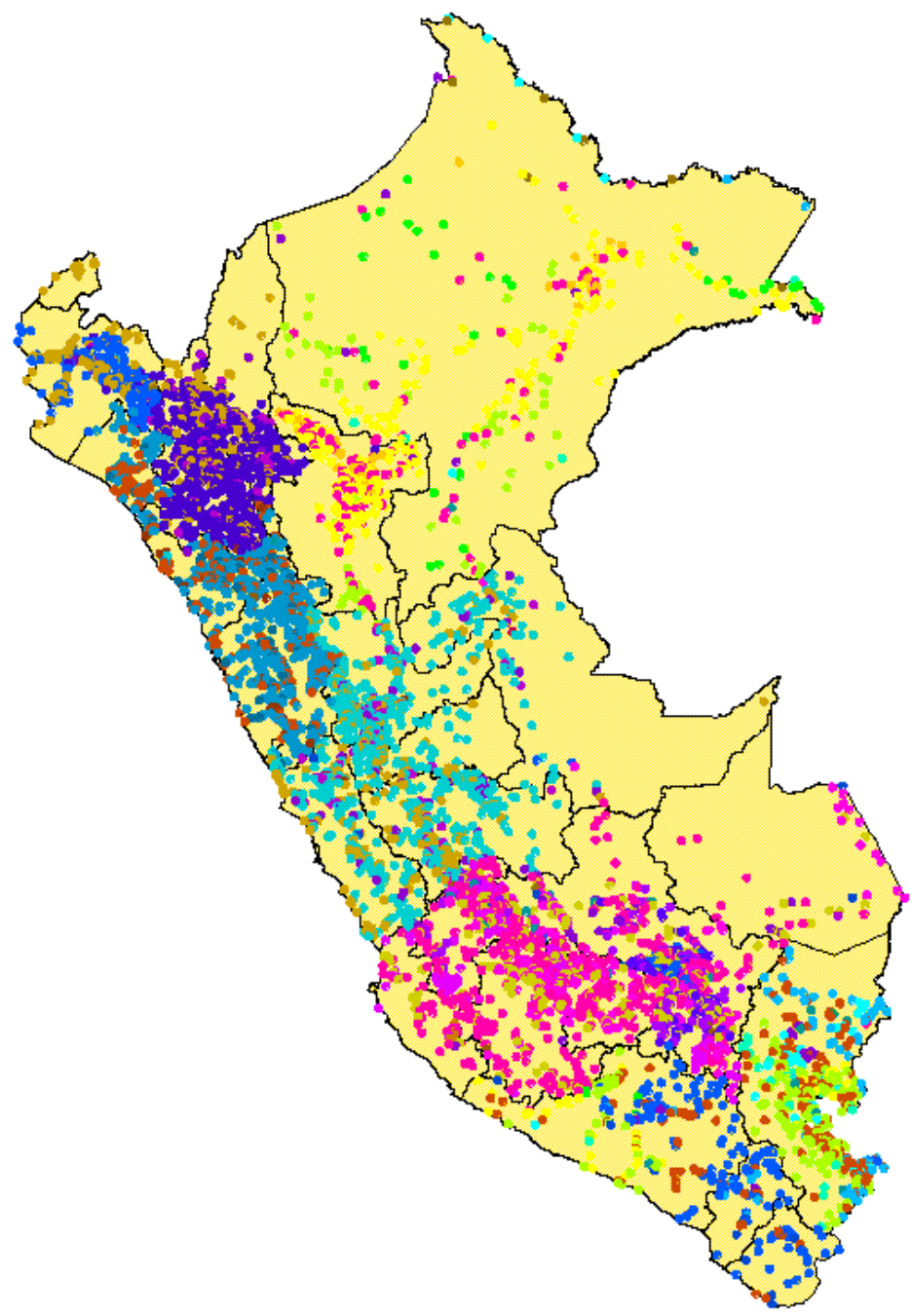


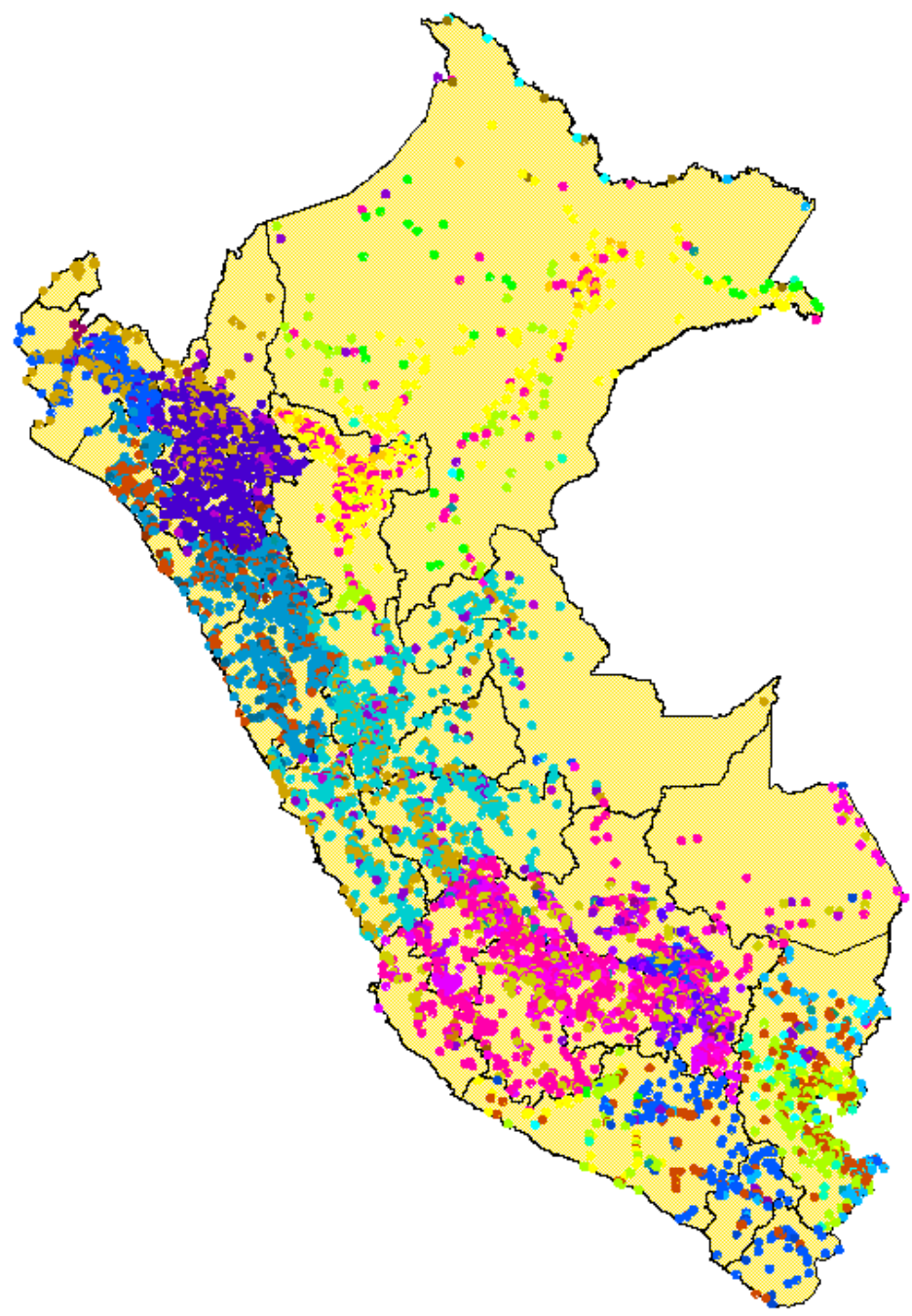


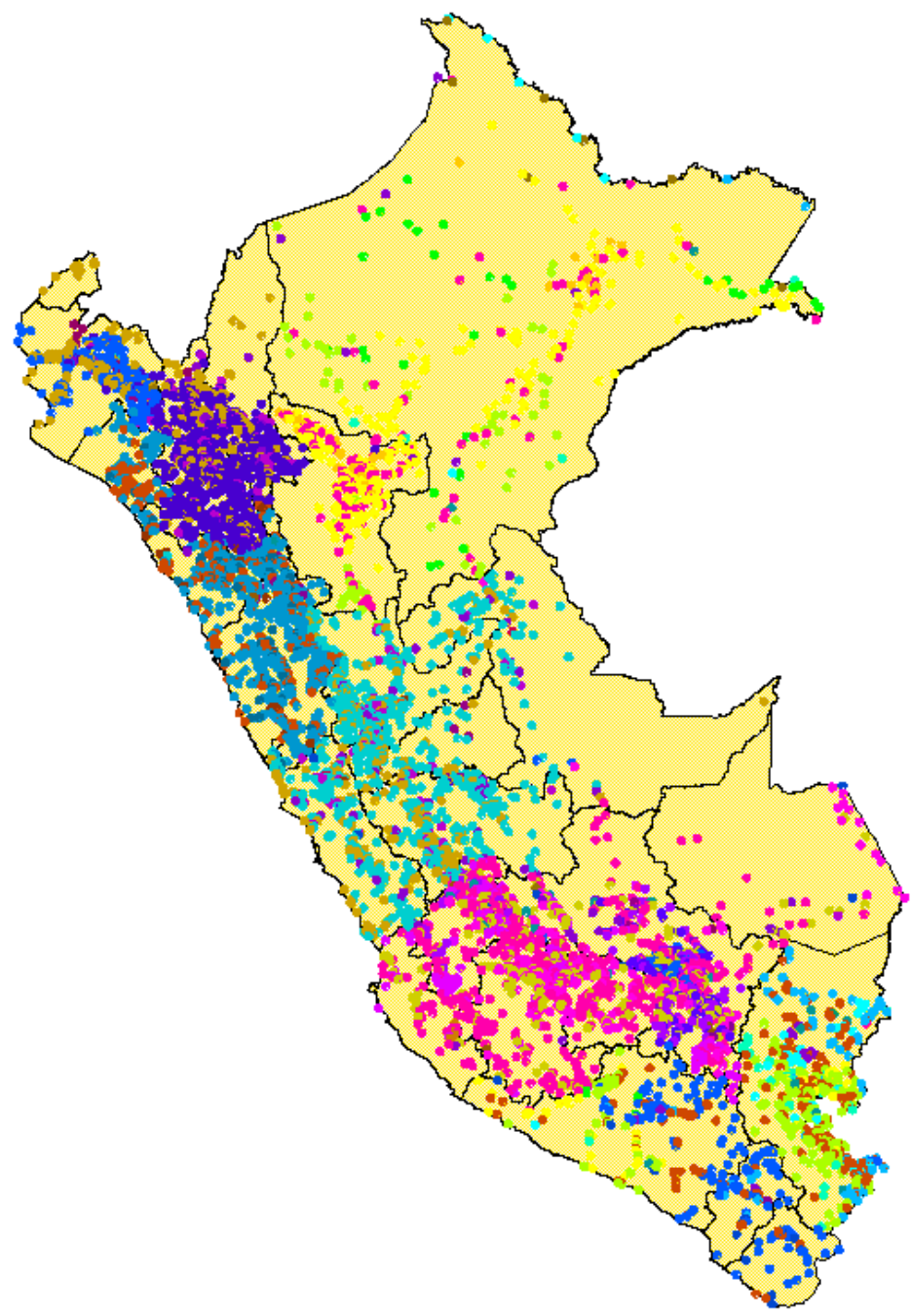












Outline of the Talk

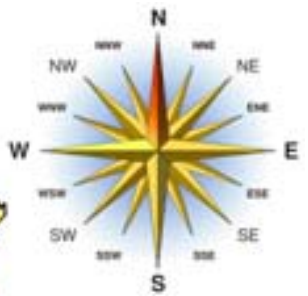
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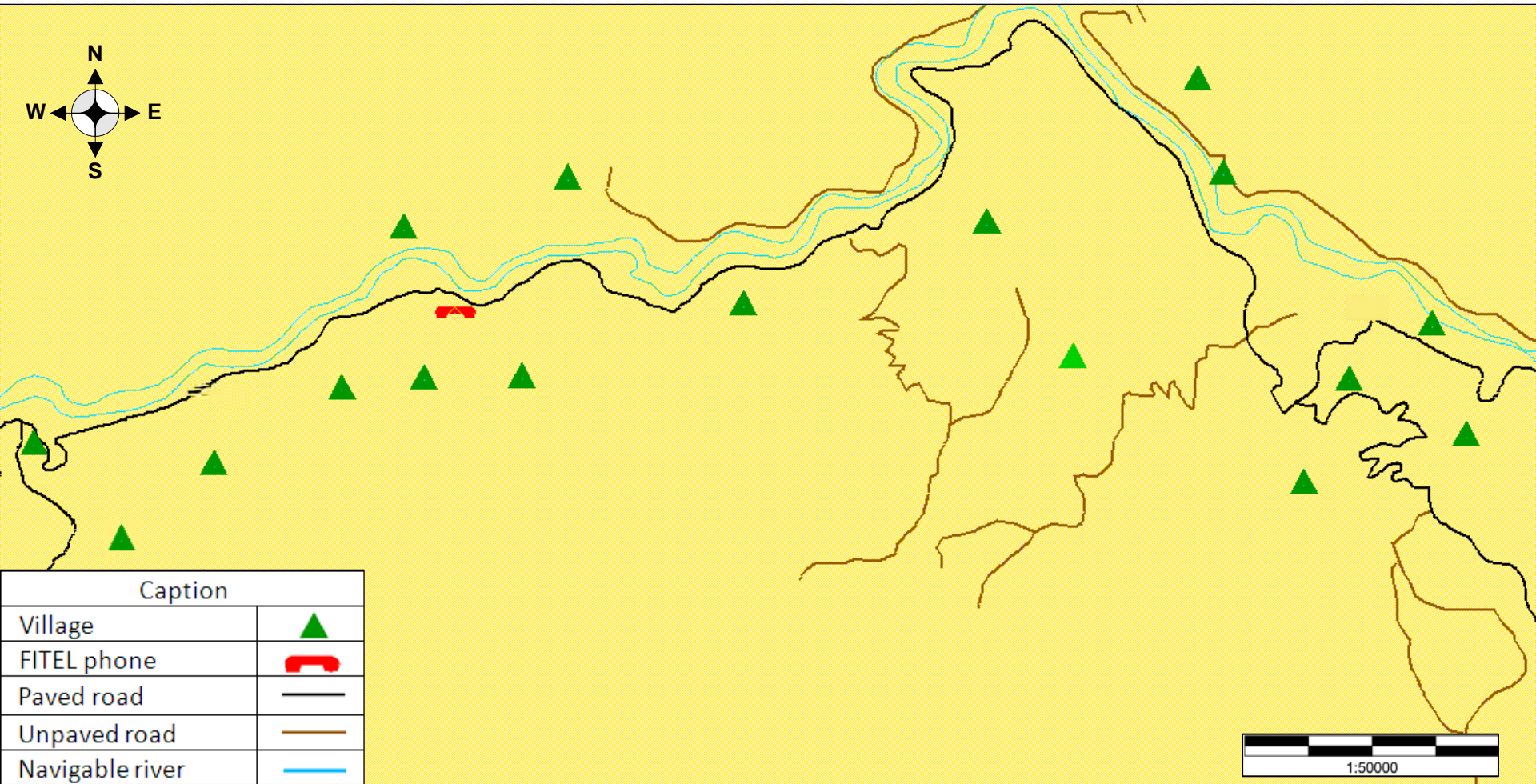
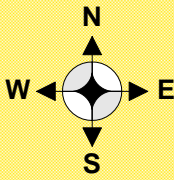
The Data

- FITEL: gps location of each phone and installation date.
- Instituto CUANTO: Peruvian living standards measurement surveys for 1997 and 2000 coded at the village level.
- Peruvian Statistics Bureau: national households surveys 2001-2007, gps location of rural villages nationwide, access to archives in order to code surveys at the village level.
- Peruvian Ministry of Transports: shape files of all communication network in Peru (highways, roads, paths, navigable rivers).
- NASA: shape files of land gradient in a 90m. cell precision.

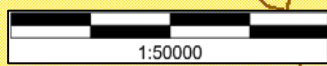
The Data

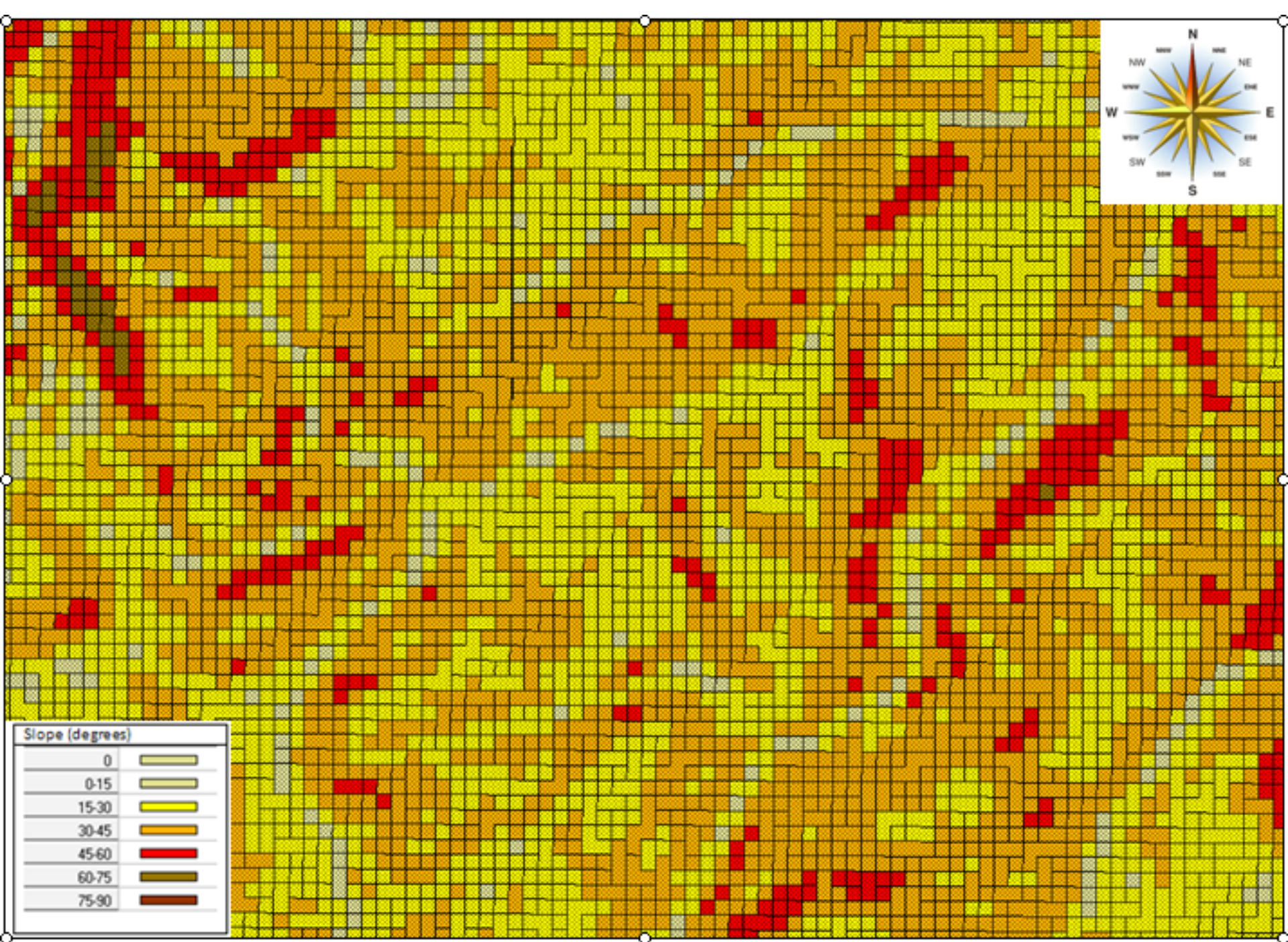
- I calculate travel time between each surveyed village and the nearest FITELE phone using *SMALLWORLD* software.
- The algorithm first calculates real traveled distance by dividing each 90m. cell linear distance by the cosin of the cell gradient.

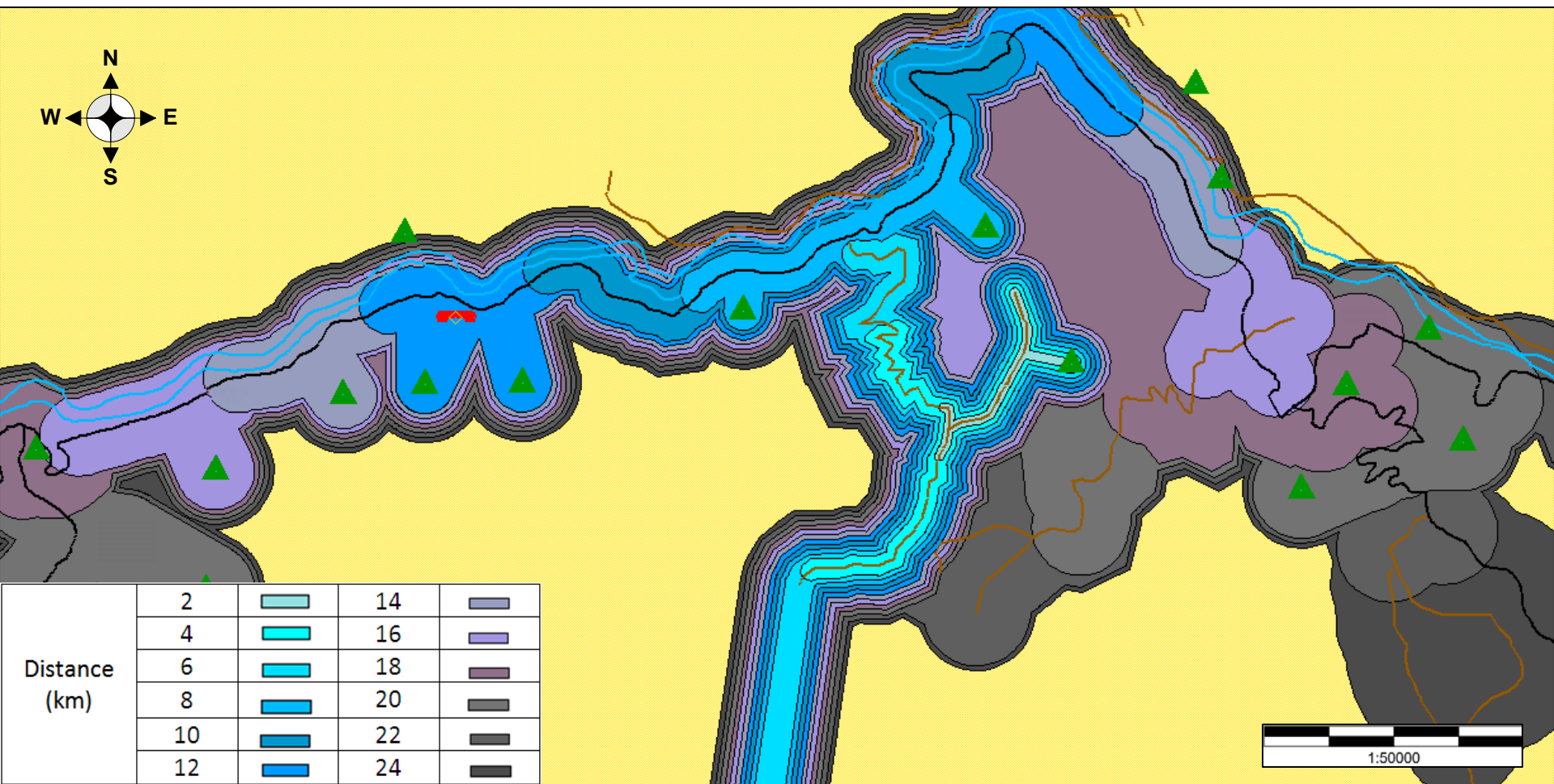
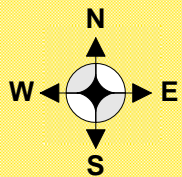




Caption	
Village	
FITEL phone	
Paved road	
Unpaved road	
Navigable river	



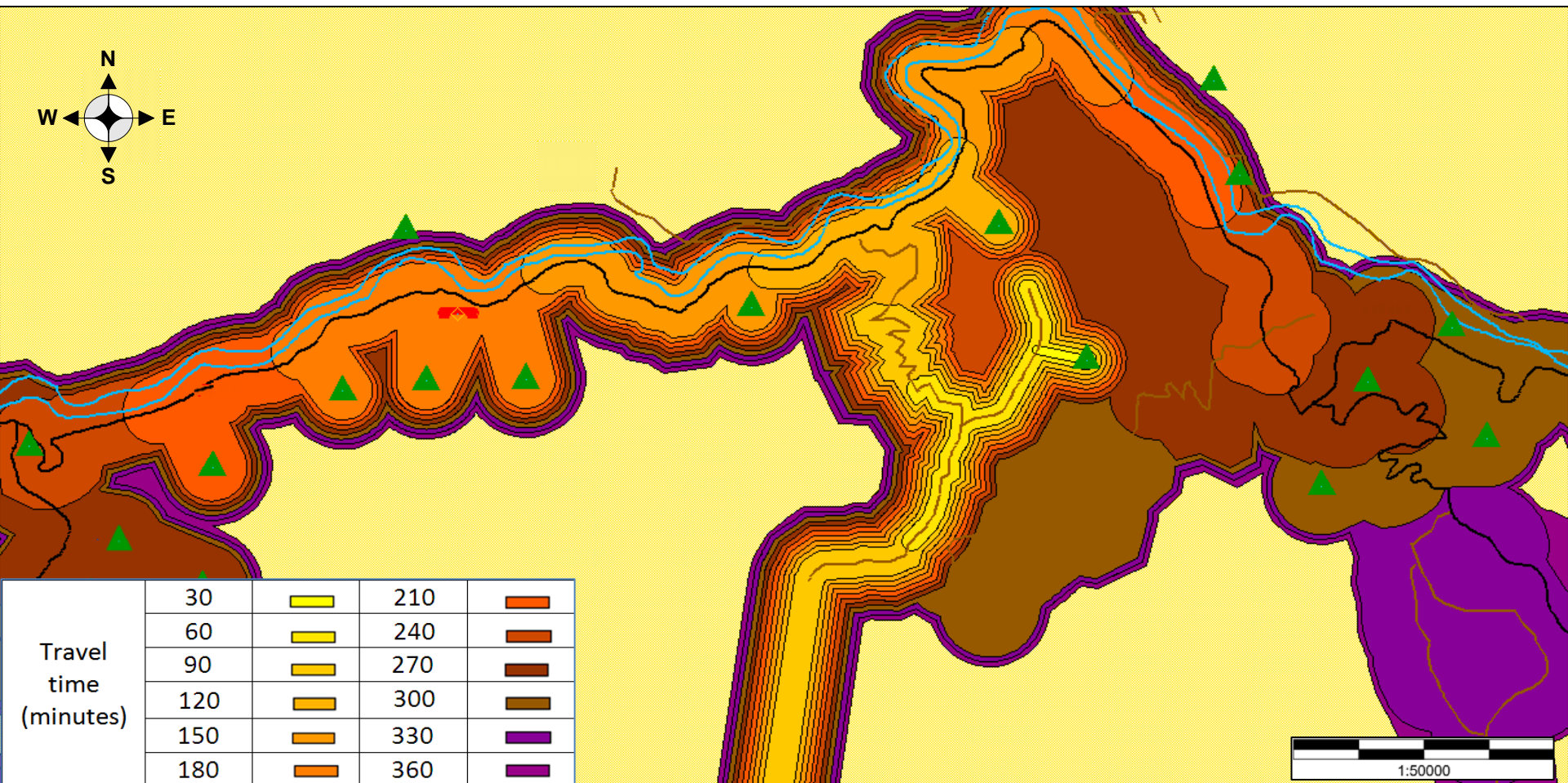




1:50000

The Data

- Then, the algorithm calculates travel time taking into account the type of roads available and the geographical difficulty:



The Data

- I take surveyed villages within a 30min. radius of the nearest phone as treated villages for my analysis (mean=6min).
- This leaves me with 15,242 household-year observations and 19,409 child(6-13 years old)-year observations. Distributed in 772 village-year observations with at least one observation before and one observation after treatment.

The Data

Households sample size by survey year and treatment timing

Survey year	Treated early	Treated late	Total sample
(1)	(2)	(3)	(4)
1997	161	93	254
2000	224	107	331
2001	1,132	767	1,899
2002	1,409	666	2,075
2003	1,127	572	1,699
2004	615	393	1,008
2005	1,604	916	2,520
2006	1,610	862	2,472
2007	2,047	937	2,984
Total	9,929	5,313	15,242

The sample refers to households reporting both agricultural production and costs. Treated early refers to households in villages that received a phone between 2001 and 2002. Treated late refers to households in villages that received a phone between 2003 and 2004.

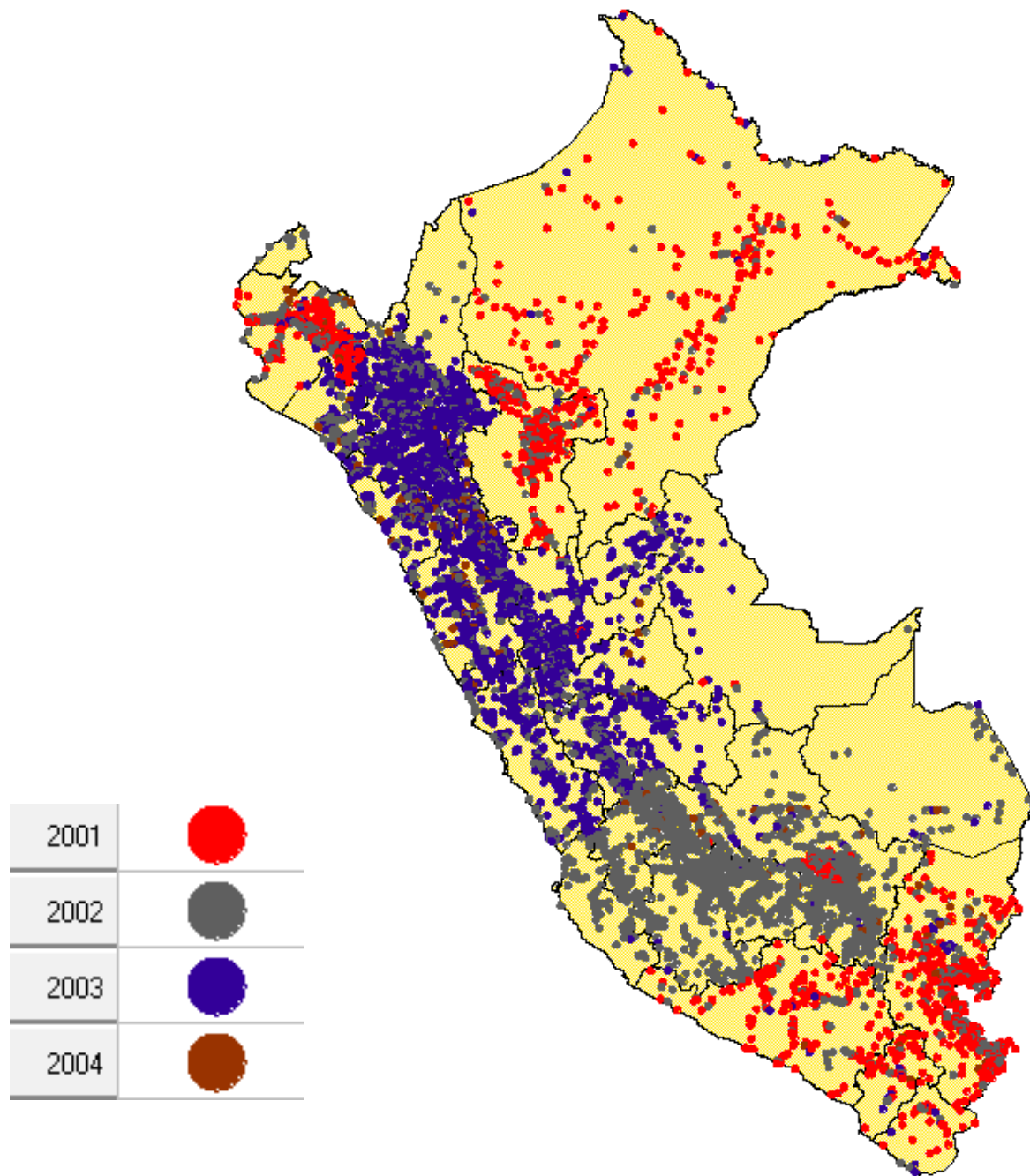
The Data





Childs sample size by survey year and treatment timing

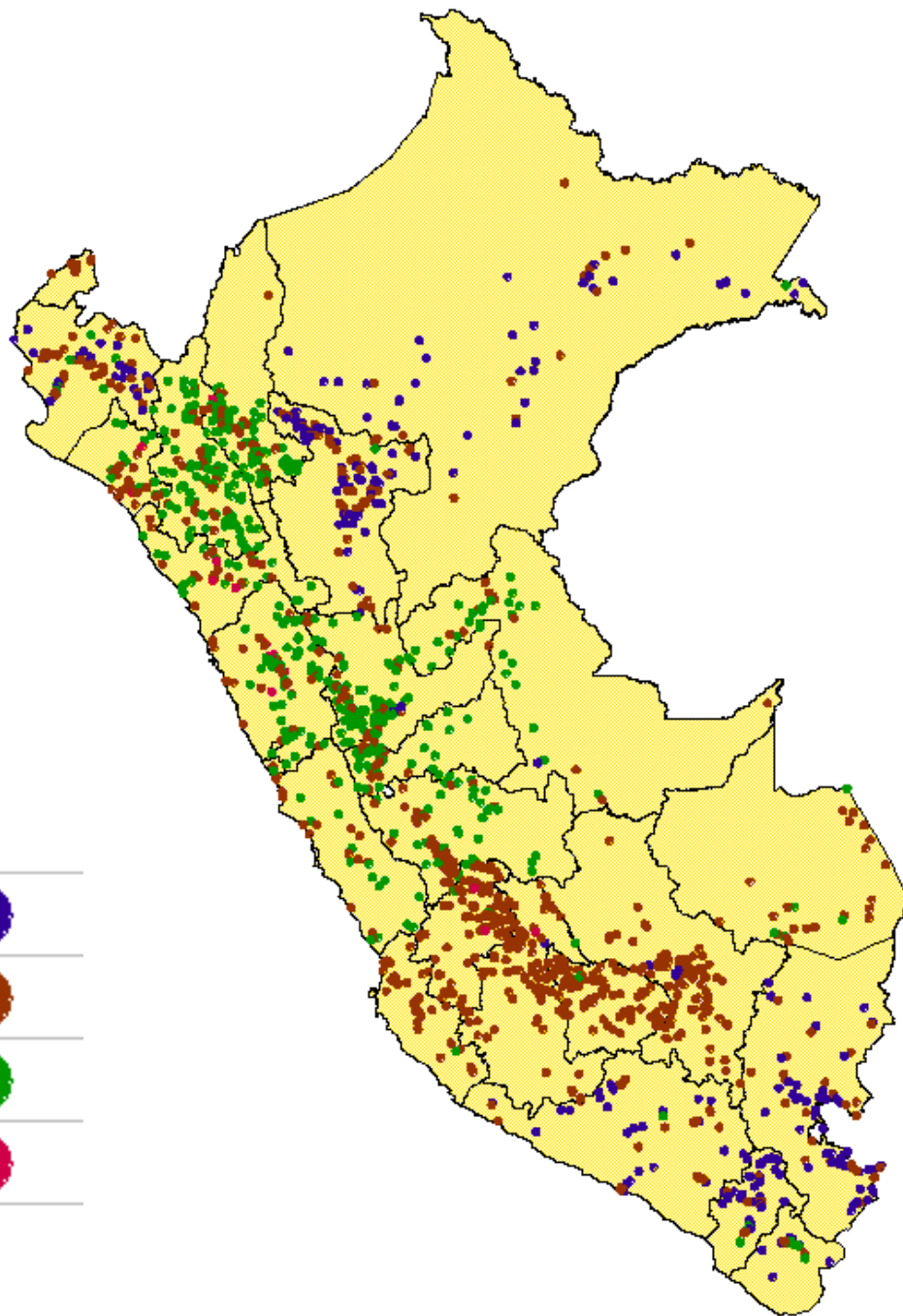
Survey year	Treated early	Treated late	Total sample
(1)	(2)	(3)	(4)
1997	353	157	510
2000	423	205	628
2001	1,605	1,001	2,606
2002	1,923	903	2,826
2003	1,433	729	2,162
2004	872	469	1,341
2005	2,061	1,161	3,222
2006	1,858	979	2,837
2007	2,122	1,155	3,277
Total	12,650	6,759	19,409

The sample refers to childs between 6 and 13 years old.

Treated early refers to childs in villages that received a phone between 2001 and 2002. Treated late refers to childs in villages that received a phone between 2003 and 2004.



2001	
2002	
2003	
2004	



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Econometric Approach

- I exploit the intervention timing by estimating the following regression model:

$$O_{ijt} = \alpha_j + \phi_t + \beta_1 * Post_{jt} + X'_{ijt}\gamma + \varepsilon_{ijt}$$

- where O_{ijt} is the outcome of interest for household/child i , in village j in month*year t . $Post$ is an indicator which takes a value of 1 if village j had a phone in month*year t while 0 otherwise. Village and month*year fixed effects. Extra controls defined latter and estimated standard errors clustered at the village level.
- Identification assumption: random timing

Econometric Approach

Baseline differences for agricultural households

Survey year:	1997	2000	2001
	Late - Early (1)	Late - Early (2)	Late - T2002 (3)
<i>Household head characteristics</i>			
Age	-1.668 (1.963)	-2.015 (2.653)	-0.275 (1.047)
High education (1=secondary+)	0.058 (0.062)	-0.062 (0.054)	-0.075* (0.030)
Home ownership	-0.051 (0.073)	-0.031 (0.043)	0.009 (0.026)
<i>Agricultural outcomes (in natural logs)</i>			
Annual production (value)	0.011 (0.293)	-0.113 (0.281)	0.117 (0.141)
Annual production (kgs.)	-0.103 (0.310)	-0.007 (0.256)	0.079 (0.185)
Value per kg. sold	0.175 (0.237)	-0.203 (0.126)	0.027 (0.105)
Annual costs	0.068 (0.353)	-0.162 (0.337)	0.013 (0.172)
Productivity 1: production (value)/costs	-0.020 (0.267)	0.157 (0.265)	0.091 (0.130)
Productivity 2: production (kgs.)/costs	-0.142 (0.263)	0.258 (0.271)	0.049 (0.139)
Production sold/total production (kgs.)	-0.049 (0.075)	-0.060 (0.075)	0.088 (0.053)
Production consumed/total production (kgs.)	0.237 (0.192)	0.348 (0.204)	-0.269 (0.198)
Observations	323	410	1759

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. Late refers to villages treated during 2003 or 2004. Early refers to villages treated during 2001 or 2002. T2002 refers to villages treated during 2002.

* Statistically significant at 5% level.

Econometric Approach

Baseline differences for childs between 6 and 13 years old

Survey year:	1997	2000	2001
	<u>Late - Early</u>	<u>Late - Early</u>	<u>Late - T2002</u>
	(1)	(2)	(3)
<i>Child characteristics</i>			
Age	0.060 (0.182)	-0.180 (0.181)	-0.033 (0.116)
Gender (1=male)	-0.081 (0.053)	-0.074 (0.043)	-0.029 (0.027)
<i>Child outcomes</i>			
Market work	-0.056 (0.103)	-0.054 (0.072)	-0.045 (0.058)
Agricultural work	-0.045 (0.104)	-0.056 (0.072)	-0.037 (0.059)
Wage work	-0.011 (0.006)	-0.006 (0.007)	-0.008 (0.022)
School - enrollment	0.031 (0.019)	-0.020 (0.020)	-0.043* (0.014)
School - main activity	0.056 (0.103)	0.054 (0.072)	0.045 (0.058)
Observations	510	628	2314

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. Late refers to villages treated during 2003 or 2004. Early refers to villages treated during 2001 or 2002. T2002 refers to villages treated during 2002.

* Statistically significant at 5% level.

Differential Trends: Value per Kilogram



Differential Trends: Annual Agricultural Costs



Differential Trends: Child Labor - Market Work



Differential Trends: Child Labor - Agricultural Work



— Treated Early — Treated Late

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Results

Total annual agricultural production (in kgs.)

Dependent Variable:	Natural log of annual production			
	(1)	(2)	(3)	(4)
<i>Post</i>	-0.032 (0.101)	-0.037 (0.101)	-0.036 (0.101)	-0.042 (0.100)
Household characteristics	No	Yes	Yes	Yes
House ownership status	No	No	Yes	Yes
Differential trends by natural region	No	No	No	Yes
Observations	15743	15742	15742	15742
R-squared	0.47	0.50	0.50	0.50

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month and village fixed effects. Household characteristics include household size, as well as sex, age and education level of the household head. Ownership status is an indicator for house formal property. The natural regions are coast, highlands and jungle. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Aker (2008) finds no effects in the quantity (kg.) sold by grain traders in Niger after cell phone introduction.

Results

Value per kg. sold

Dependent Variable:	Natural log of per kg. sell value			
	(1)	(2)	(3)	(4)
<i>Post</i>	0.157*	0.155*	0.158*	0.148*
	(0.086)	(0.085)	(0.086)	(0.087)
Household characteristics	No	Yes	Yes	Yes
House ownership status	No	No	Yes	Yes
Differential trends by natural region	No	No	No	Yes
Observations	11495	11495	11495	11495
R-squared	0.36	0.36	0.36	0.37

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month and village fixed effects. Household characteristics include household size, as well as sex, age and education level of the household head. Ownership status is an indicator for house formal property. The natural regions are coast, highlands and jungle. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Aker (2008) reports an increase of 6.78% in prices received by grain traders in Niger after cell phones introduction.

Results

Annual agricultural costs

Dependent Variable:	Natural log of annual costs			
	(1)	(2)	(3)	(4)
<i>Post</i>	-0.223** (0.108)	-0.226** (0.107)	-0.224** (0.107)	-0.215** (0.106)
Household characteristics	No	Yes	Yes	Yes
House ownership status	No	No	Yes	Yes
Differential trends by natural region	No	No	No	Yes
Observations	15340	15339	15339	15339
R-squared	0.42	0.45	0.45	0.45

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month and village fixed effects. Household characteristics include household size, as well as sex, age and education level of the household head. Ownership status is an indicator for house formal property. The natural regions are coast, highlands and jungle. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Jensen (2007) reports an increase of 72 Rs. in fishermen costs after cell phones introduction in Kerala-India. However, he does not separate production costs from communication costs.

Results

Estimated effects: agricultural production, costs and productivity (HHs reporting both production and costs)

Dependent Variable (in natural logs):	Production in kgs.	Sell value per kg.	Agricultural costs	Productivity value/costs	Productivity kgs./costs
	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	-0.066 (0.097)	0.148* (0.087)	-0.226** (0.106)	0.181** (0.089)	0.223* (0.118)
Observations	15242	11495	15242	15242	15242
R-squared	0.50	0.36	0.45	0.40	0.44

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month fixed effects, village fixed effects, household characteristics (household size, as well as sex, age and education level of the household head), ownership status (indicator for house formal property), and differential trends by natural regions (coast, highlands and jungle). * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Jensen (2007) reports a 9% increase in fishermen average profits. Aker (2008) reports a 29% increase in grain traders profits.

Results

Child labor: market work

Dependent Variable:	Work indicator (childs between 6 and 13 years old)				
	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	-0.146*** (0.041)	-0.142*** (0.041)	-0.140*** (0.041)	-0.140*** (0.041)	-0.136*** (0.041)
Child characteristics	No	Yes	Yes	Yes	Yes
Household head characteristics	No	No	Yes	Yes	Yes
House ownership status	No	No	No	Yes	Yes
Differential trends by natural region	No	No	No	No	Yes
Observations	19409	19409	19391	19391	19391
R-squared	0.36	0.40	0.40	0.40	0.40

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month and village fixed effects. Market work includes wage employment, self-employment, agriculture, helping in a family business, domestic work in an external household, among others. Child characteristics include sex and age. Household head characteristics include age and education level. Ownership status is an indicator for house formal property. The natural regions are coast, highlands and jungle. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Dammert (2008) reports a 12.3 pp. increase in child market work in coca-growing regions after a successful coca eradication program during the late 1990's in Peru.

My estimates imply that, for each phone installed, 15.8 children shifted from market work towards school as their main activity.

Results

Child labor: agricultural work

Dependent Variable:	Work indicator (childs between 6 and 13 years old)				
	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	-0.098** (0.041)	-0.096** (0.040)	-0.095** (0.040)	-0.094** (0.040)	-0.091** (0.040)
Child characteristics	No	Yes	Yes	Yes	Yes
Household head characteristics	No	No	Yes	Yes	Yes
House ownership status	No	No	No	Yes	Yes
Differential trends by natural region	No	No	No	No	Yes
Observations	19409	19409	19391	19391	19391
R-squared	0.37	0.40	0.41	0.41	0.41

Estimated standard errors clustered at the village level in parentheses. Weighted regressions using the inverse of sampling probability to reflect survey design. All regressions include month and village fixed effects. Child characteristics include sex and age. Household head characteristics include age and education level. Ownership status is an indicator for house formal property. The natural regions are coast, highlands and jungle. * denotes significance at the 10% level; ** denotes significance at the 5% level; *** denotes significance at the 1% level.

Dammert (2008) reports a 13.7 pp. increase in child agricultural work in coca-growing regions after a successful coca eradication program during the later 1990's in Peru.

Results

Child labor by gender

Dependent Variable:	Market work			Agricultural work			Wage work		
	All (1)	Boys (2)	Girls (3)	All (4)	Boys (5)	Girls (6)	All (7)	Boys (8)	Girls (9)
<i>Post</i>	-0.136*** (0.041)	-0.144*** (0.048)	-0.125*** (0.048)	-0.091** (0.040)	-0.108** (0.047)	-0.072 (0.045)	-0.022* (0.012)	-0.005 (0.013)	-0.036** (0.018)
Observations	19391	9721	9670	19391	9721	9670	19391	9721	9670
R-squared	0.40	0.46	0.44	0.41	0.46	0.44	0.17	0.25	0.26

Child labor by parental education

Dependent Variable:	Market work		Agricultural work		Wage work	
	Low educ. (1)	High educ. (2)	Low educ. (3)	High educ. (4)	Low educ. (5)	High educ. (6)
<i>Post</i>	-0.133*** (0.047)	-0.140** (0.063)	-0.109** (0.046)	-0.031 (0.064)	-0.003 (0.013)	-0.058* (0.031)
Observations	13196	6195	13196	6195	13196	6195
R-squared	0.43	0.52	0.44	0.52	0.23	0.30

Results

Child labor: market work sensitivity analysis

Dependent Variable:	Work indicator (childs between 6 and 13 years old)					
	Excluding coast	%Poor<median	%Poor>median	Low population density<median	High population density>median	Without migrants
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Post</i>	-0.153*** (0.046)	-0.133*** (0.051)	-0.135** (0.065)	-0.043 (0.054)	-0.161*** (0.062)	-0.176*** (0.052)
Observations	17193	9317	10074	9274	10117	13254
R-squared	0.40	0.40	0.42	0.44	0.40	0.43

Child labor: agricultural work sensitivity analysis

Dependent Variable:	Work indicator (childs between 6 and 13 years old)					
	Excluding coast	%Poor<median	%Poor>median	Low population density<median	High population density>median	Without migrants
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Post</i>	-0.118*** (0.046)	-0.061 (0.049)	-0.120* (0.063)	-0.003 (0.051)	-0.122** (0.062)	-0.119** (0.053)
Observations	17193	9317	10074	9274	10117	13254
R-squared	0.40	0.41	0.42	0.43	0.40	0.43

Robustness

Falsification test: pretending that treatment started one year before the real date

Dependent Variable (in natural logs):	Production in kgs.	Sell value per kg.	Agricultural costs	Productivity value/costs	Productivity kgs./costs
	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	0.109 (0.144)	-0.024 (0.115)	0.031 (0.144)	0.023 (0.136)	0.075 (0.165)
Observations	15242	11495	15242	15242	15242
R-squared	0.50	0.37	0.45	0.40	0.44

Dependent Variable:	Market work	Agricultural work	Wage work
	(1)	(2)	(3)
<i>Post</i>	0.010 (0.071)	0.027 (0.066)	0.006 (0.029)
Observations	19391	19391	19391
R-squared	0.40	0.41	0.17

Robustness

Estimated effects: agricultural production, costs and productivity (dropping years 1997 and 2000)

Dependent Variable (in natural logs):	Production in kgs.	Sell value per kg.	Agricultural costs	Productivity value/costs	Productivity kgs./costs
	(1)	(2)	(3)	(4)	(5)
<i>Post</i>	-0.077 (0.097)	0.121+ (0.083)	-0.221** (0.106)	0.179** (0.089)	0.220* (0.118)
Observations	14657	11013	14657	14657	14657
R-squared	0.51	0.39	0.43	0.40	0.46

Dependent Variable:	Market work	Agricultural work	Wage work
	(1)	(2)	(3)
<i>Post</i>	-0.149*** (0.041)	-0.103** (0.040)	-0.023* (0.012)
Observations	18254	18254	18254
R-squared	0.44	0.44	0.18

Robustness

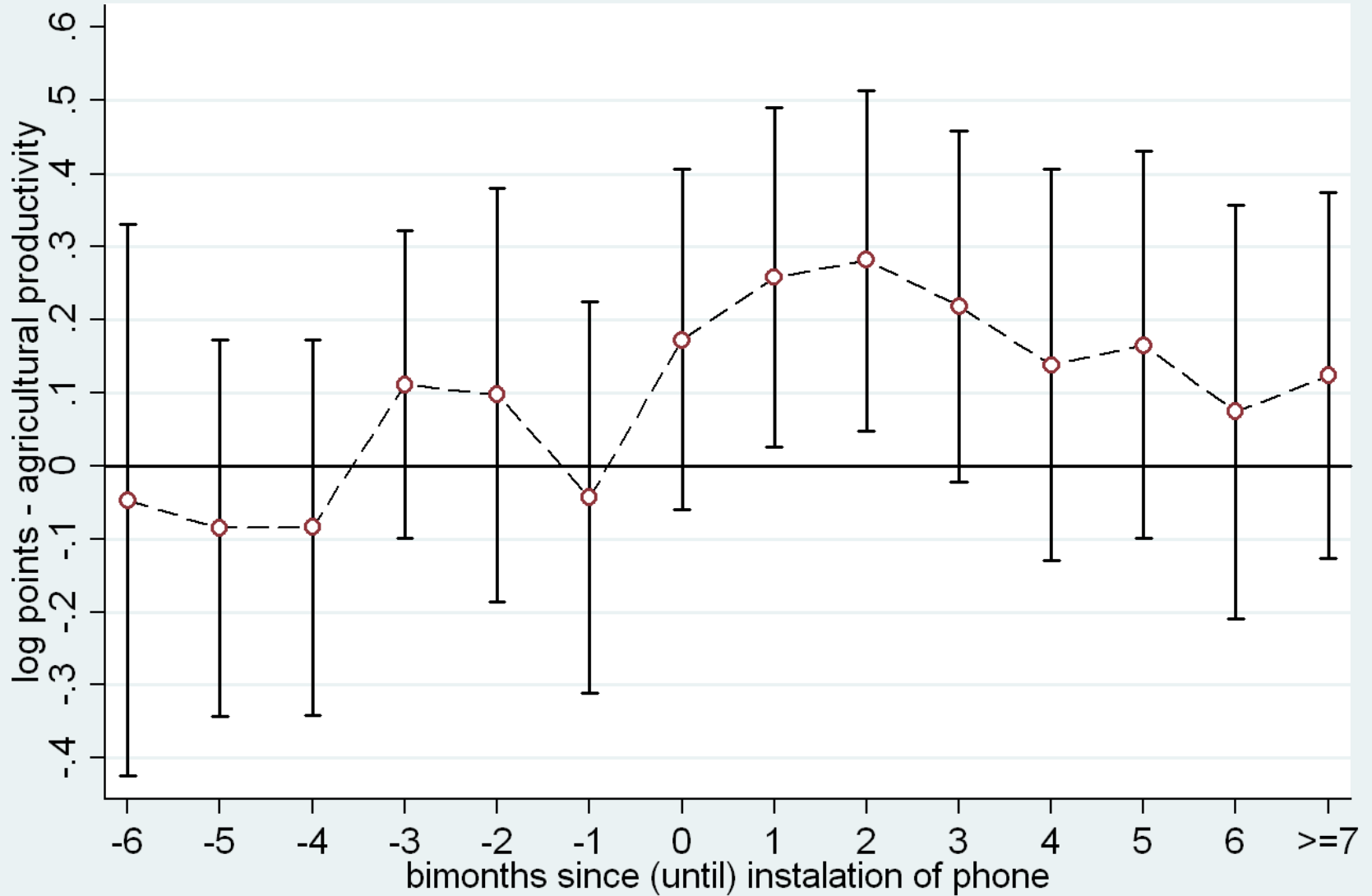
- I perform event studies regressions as follows:

$$O_{ijt} = \alpha_j + \phi_t + \sum_{p=-6}^{\geq 7} \beta_p * D_p + X'_{ijt} \gamma + \varepsilon_{ijt}$$

- where D_p is a dummy equal to one if the observation was collected p bi-months (before) after the intervention. The omitted category is more than a year before the intervention.

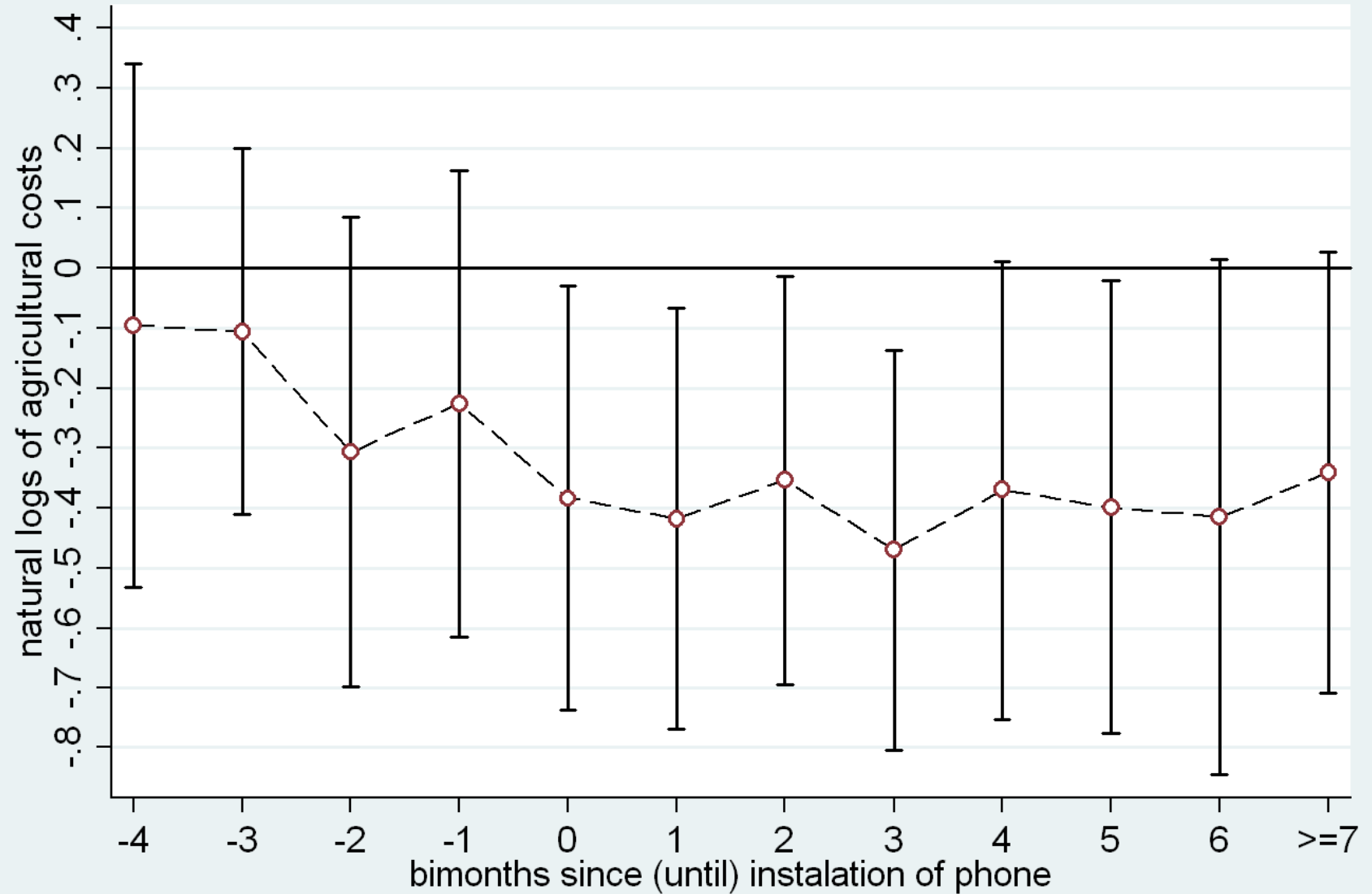
Robustness

Event Studies: Agricultural Productivity (in natural logs)



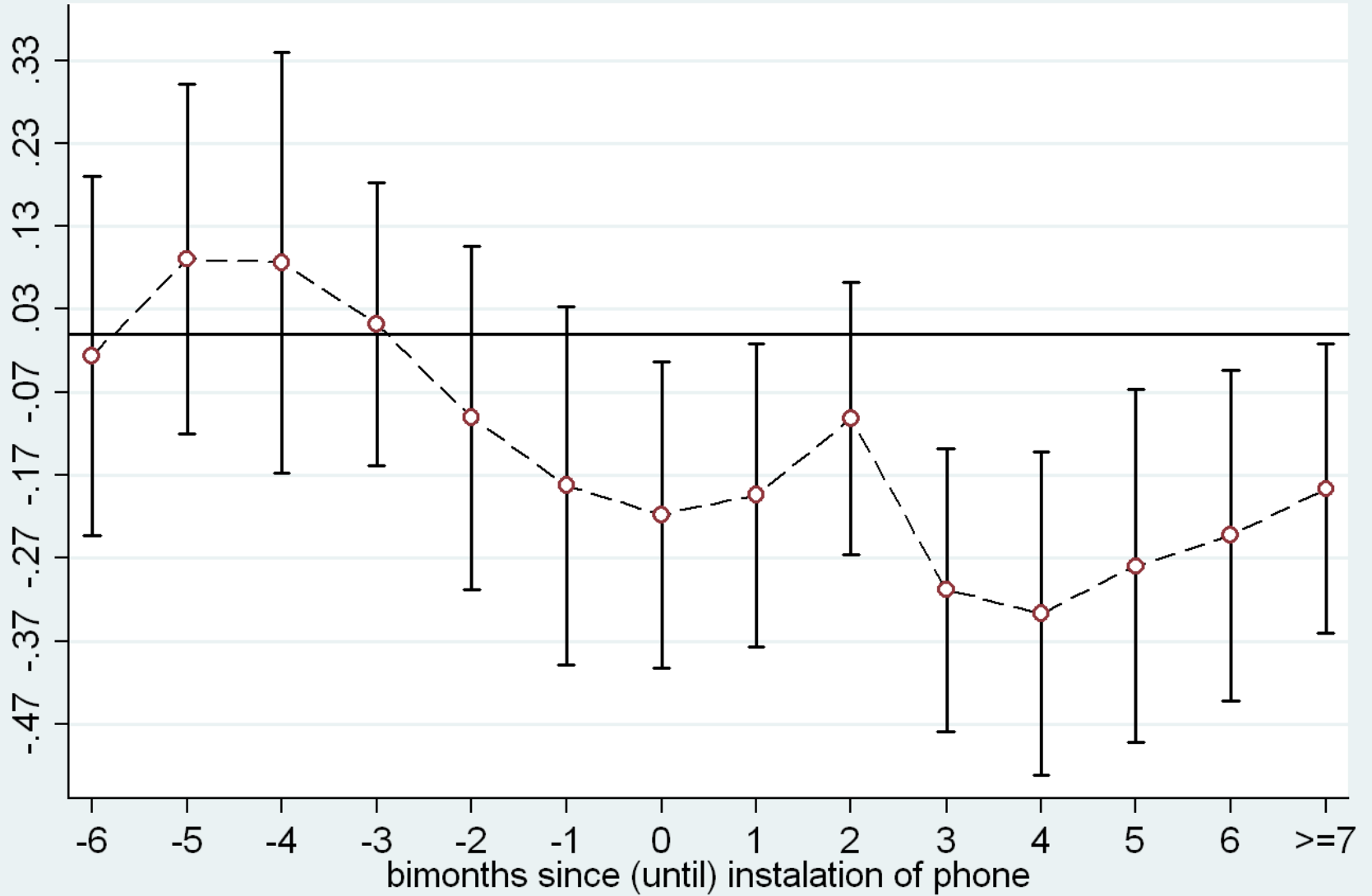
Robustness

Event Studies: Agricultural Costs (in natural logs)



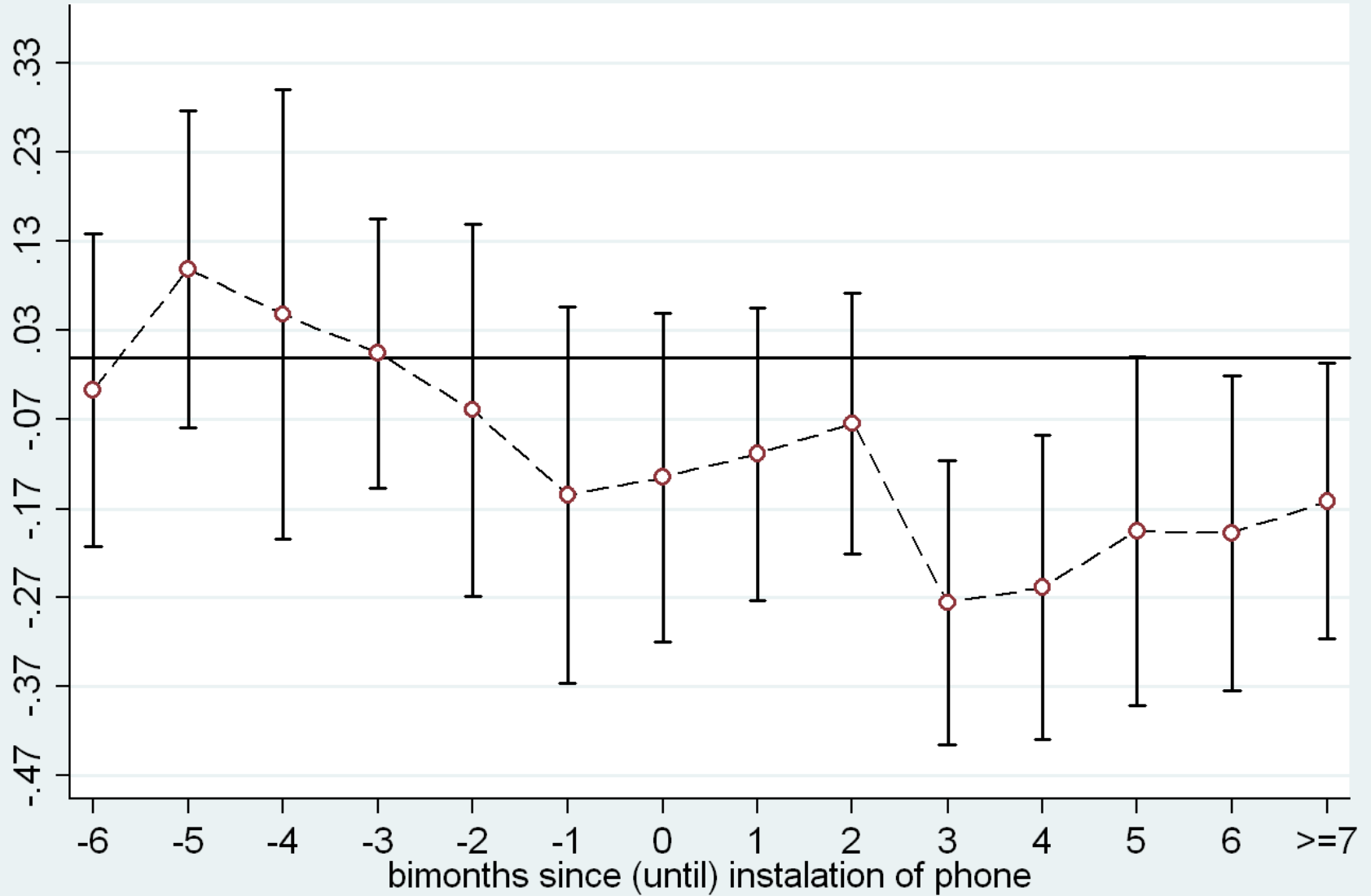
Robustness

Event Studies: Child Market Work



Robustness

Event Studies: Child Agricultural Work



Conclusions

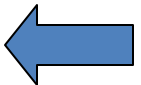
- New evidence about the effects of TCs on child labor has been provided.
- Effects of TCs in highly isolated areas appear to be substantial not only in profitability, but also in children's time allocation.
- Findings suggest that an income effect dominates in the demand for child labor among isolated rural villages in Peru.
- A preference for boys over girls among agricultural households was also found.

Previous Literature on Child Labor

- Evidence suggesting a dominant substitution effect on child labor: Duryea and Arends-Kuenning (2003).- child labor was higher when average wages increased urban Brazil. Kruger (2006).- children more likely to work during coffee booms in Nicaragua. Kruger (2007).- boys more likely to work during positive coffee production shocks in Brazil.

Previous Literature on Child Labor

- However others suggesting a dominant income effect: Beegle et.al. (2006).- adverse agricultural crop shocks increase child labor in Tanzania. Dehejia and Gatti (2007).- find significant negative relationship between child labor and access to credit (cross-country). Del Carpio (2008)/Del Carpio and Macours (2009).- decrease in hours worked plus intra-HH compensations after CCT in Nicaragua. Dammert (2008).- after an effective coca eradication program, child labor rose by 12.3 pp. in Peru.





Source: The Economist, September 2009

