Public Goods and Ethnic Diversity: Evidence from Deforestation in Indonesia

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Deforestation and Ethnic Diversity

Does ethnic diversity matter for deforestation (illegal logging)?

This paper:

- Illegal logging is driven by the corruption of local officials
- Fractionalised communities are less able to keep local politicians accountable
- In contexts with endemic corruption ethnic diversity increases illegal logging

A Relevant Topic

- Tropical forests are located in very ethnically diverse countries
- Up to 1/3 of total CO2 emissions attributed to deforestation (IPCC)
- Mainly in tropical areas and mostly illegal

→ Tropical deforestation/illegal extraction put at the top of the global policy agenda

Indonesia

- 3rd largest tropical forest
- More than 300 ethnicities
- Forests are state-owned and managed
- Decentralization since 1998: Local bureaucrats (district heads) are responsible to enforce national logging rules
- Often politicians allow logging above legal limits (gray area between "legal" and "illegal" permits)

The paper studies under what circumstances politicians have the incentive to behave illegally

An Illustrative Model

Setting

- Large number of logging firms in a district which seek to obtain a permit to log
- District heads decide how many permits to sell
- A bribe is needed to obtain permits beyond legal quotas
- Control of politicians, through electoral or legal punishment, is under-supplied when social capital is low (more ethnically diverse)

Main Prediction

Greater ethnic diversity decreases the cost of bribing and increases deforestation

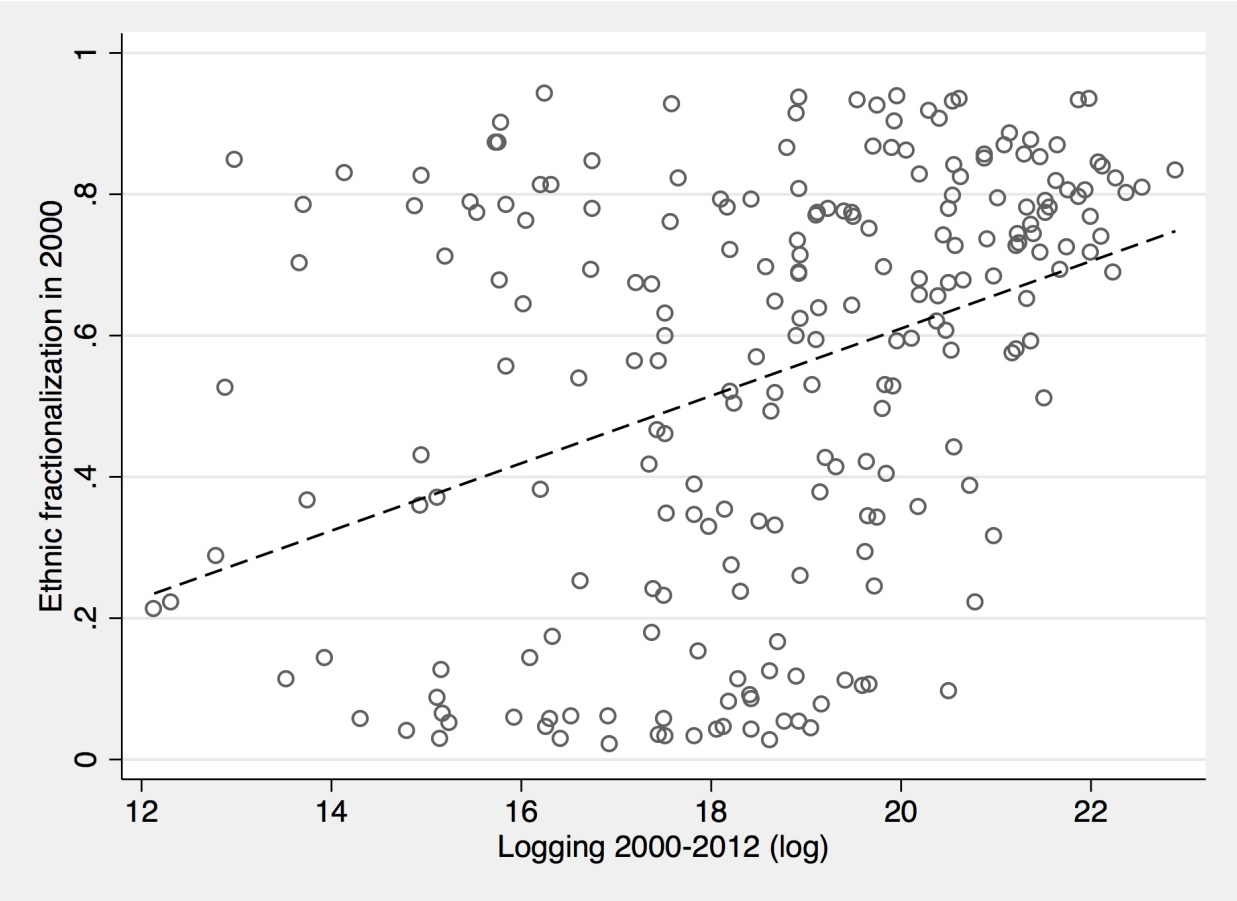
Data

- Unit of analysis: 337 districts in Indonesia based on 2000 administrative borders
- Period: 2000-2012
- Deforestation: Number of pixels deforested by district and forest zone (Sumatra, Kalimantan, Sulawesi, Papua) from Hansen et al. (2014)
- Ethnic Fractionalization from 2010 Indonesian census (BPS):

$$EF_i = 1 - \sum s_j^2 = \sum s_j(1 - s_j)$$

- Other data: geography, fi
res, Javanese, agricultural activities, etc.

Cross-section Analysis



$$f_i = \alpha + \beta EF_i + \gamma X_i + \mu_{pi} + \epsilon_i$$

Identification

- Proliferation of district splits after 1998
- In most cases the new districts were more ethnically homogeneous
- Time varying ethnic fractionalization measure:

2000	2002	2003	2006	2010
$EF = \sum_i s_i^2$	$EF = \sum_i s_i^2$	$EF = w_A EF_A + w_B EF_B + w_C EF_C$	$EF = w_A EF_A + w_B EF_B + w_C EF_C$	$EF = w_A EF_A + w_B EF_B + w_C EF_C$

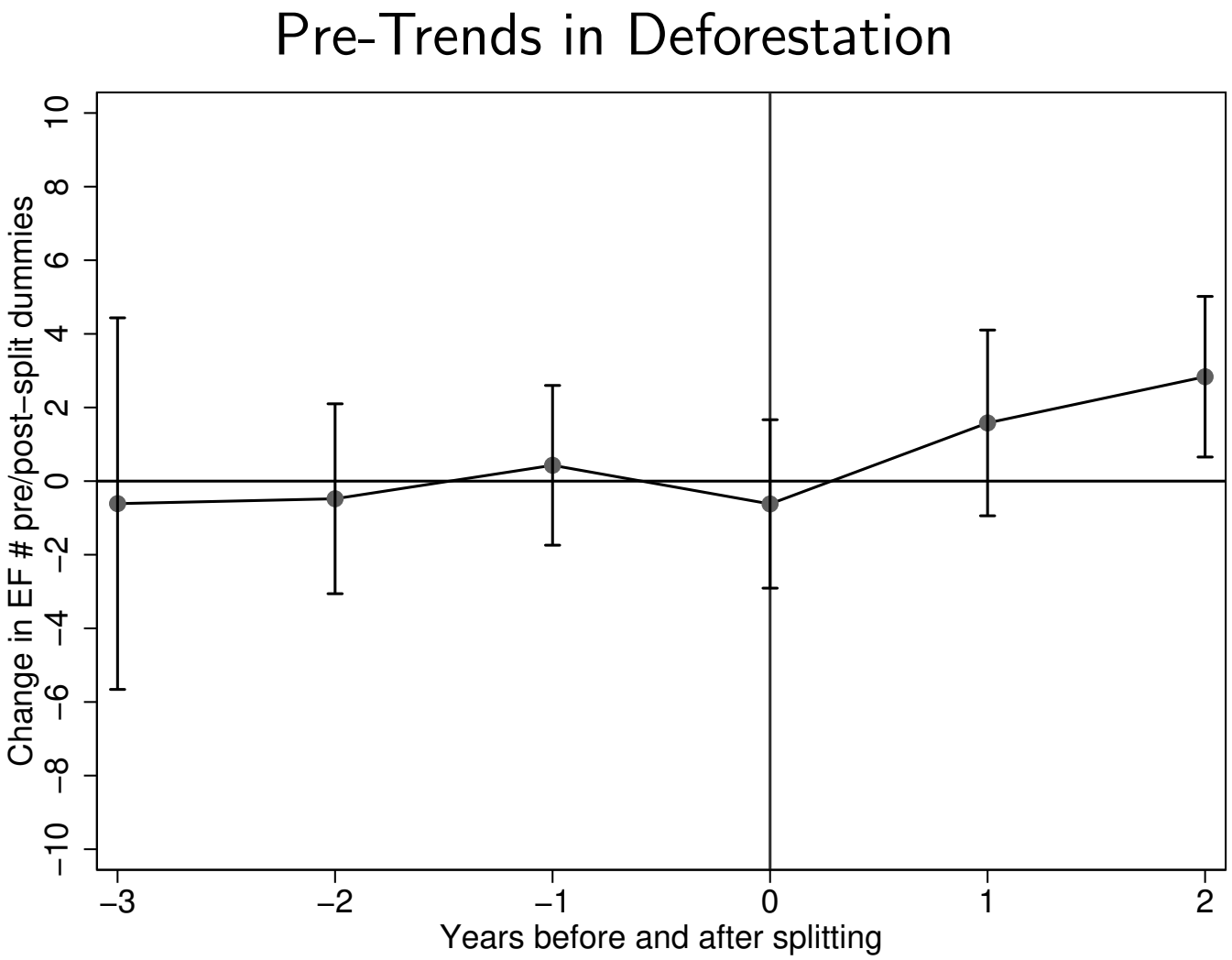
Empirical framework:

$$f_{ipt} = \beta EF_{ipt} + \gamma X_{ipt} + \delta ysplit_{ipt} + d_t + u_i + d_t \times v_p + \epsilon_{ipt}$$

Identification Cont'

- Exogeneity of the timing of the splits
- The government unexpectedly halted the process twice
- Uncertainty due to bureaucratic delays
- Several checks rule out concerns of endogeneity, e.g.:
  - Role of initial characteristics
  - Distribution of natural resources across ethnic groups (pre-splitting)
  - Employment in the forestry/agricultural sector by ethnic group

Event Study


Pre-Trends in Deforestation
Change in EF # pre/post–split dummies
10
8
6
4
2
0
−2
−4
−6
−8
−10
−3
−2
−1
0
1
2
Years before and after splitting

Main Results

	(1)	(2)	(3)	(4)
EF	1.181**	1.428**		
	(0.484)	(0.532)		
EF (sum of L0 - L1)			1.711***	
			(0.529)	
EF (sum of L0 - L2)				2.379***
				(0.732)
Controls	No	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province-by-year FE	Yes	Yes	Yes	Yes
Observations	4044	3937	3937	3611
Districts that split	95	95	95	95
Total Number of Districts	337	331	331	331

Robustness Checks

- Ethnic diversity and other initial characteristics
- Unobservables that work at the level of the areas equivalent to post-splitting administrative units
- Exclude one island at a time
- Internal migration
- Village level regressions

Logging and Incumbent Reelection

Empirical framework:

$$Reelection_i = \gamma \tilde{f}_i + \beta \tilde{f}_i * EF + \delta EF + p_i + t_i + \epsilon_i$$

Dep. Var.: re-election	(1)	(2)	(3)	(4)	(5)	(6)
Deviation from average pre-elec	-0.0000	-0.0005*				
	(0.0001)	(0.0003)				
EF		0.2338		0.2261		0.2463
		(0.1556)		(0.1575)		(0.1547)
Deviation from average pre-elec # EF		0.0007*				
		(0.0004)				
Deviation from previous year			0.0000	-0.0004		
			(0.0001)	(0.0004)		
Deviation from previous year # EF				0.0006		
				(0.0005)		
Deviation from initial deforestation					-0.0000	-0.0005
					(0.0000)	(0.0003)
Deviation from initial deforestation # EF						0.0006
						(0.0004)
Year Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Districts	222	222	222	222	222	222

Political Deforestation Cycles

	(1) Full sample	(2) EF>median	(3) EF<median
Lead 2	0.0950	0.2733*	-0.0805
	(0.397)	(0.050)	(0.640)
Lead 1	0.2270**	0.3755***	0.0740
	(0.029)	(0.002)	(0.641)
Election year	0.1229	0.2375*	0.0072
	(0.210)	(0.057)	(0.961)
Lag 1	0.3085**	0.4479***	0.1992
	(0.010)	(0.004)	(0.240)
Lag 2	0.1584	0.2350	0.0719
	(0.338)	(0.198)	(0.778)
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2465	1225	1240
Districts	310	154	156
EF (mean)	0.56	0.79	0.34

Conclusions

- Ethnic fractionalization increases deforestation
  - The average change in ethnic diversity decreases deforestation by 6%
  - Channel: lower control of politicians through electoral punishment in more heterogenous districts
- Decentralization of natural resource management and deforestation
  - Negative effects of decentralization due to greater competition (Burgess et al., 2012)
  - Positive effects due to reduced ethnic heterogeneity
  - Considering only districts that split, the benefits of homogeneity outweigh the costs of increased competition in 45% of the observed splitting events