

Cattle Slaughterhouses and Deforestation in Brazil

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Motivation

- Limited state capacity is ubiquitous in the developing world
 - ▶ e.g., affect law enforcement and provision of public goods
- Policies that outsource state functions to market players under incentive compatibility constraints may partially address that limitation
- We study this issue in the context of cattle ranching and slaughterhouse operations in Brazil
 - ▶ Brazil is a major player in beef markets, accounting for roughly 20% of all world beef exports (OECD/FAO, 2022)
 - ▶ slaughterhouse openings may stimulate cattle ranching, which may lead to deforestation and other land-use changes
 - ▶ instead of targeting ranchers, strained federal prosecutors decided to go after slaughterhouses, outsourcing monitoring and enforcement to key nodes of the supply chain
 - ▶ limited capacity to enforce environmental laws led to extrajudicial agreements between prosecutors and slaughterhouses

This paper

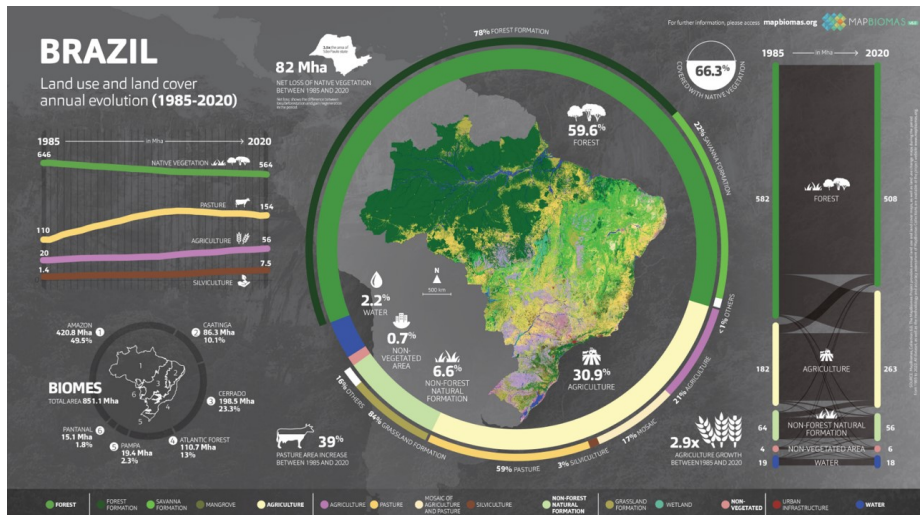
We use comprehensive Brazilian data and a staggered DiD approach (Callaway and Sant'Anna, 2021) to examine:

1. impacts of opening new slaughterhouses on cattle ranching and environmental outcomes from 1992-2019
2. effects of extrajudicial agreements (known as *TAC*) to avoid deforestation

Preview of results:

- Opening new plants do lead to land-use changes
 - ▶ ↑ cattle heads and pasture areas
 - ▶ ↑ deforestation
 - ▶ ↑ pasture degradation
- TAC agreements do avoid deforestation
 - ▶ – deforestation
 - ▶ ↓ pasture degradation
 - ▶ ↑ productivity

Background



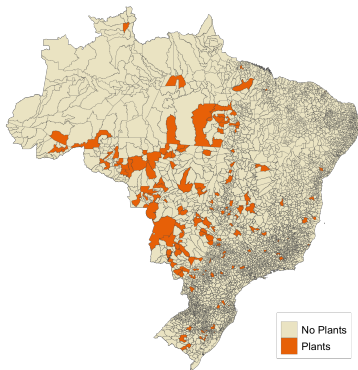
MapBiomass (2020)

What a slaughterhouse looks like

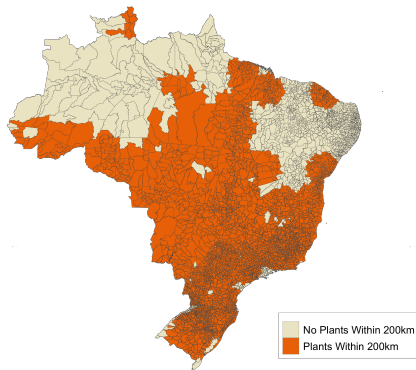


SOURCE: Globo Rural (2021)

Municipalities with Slaughterhouse Plants (1992-2019)

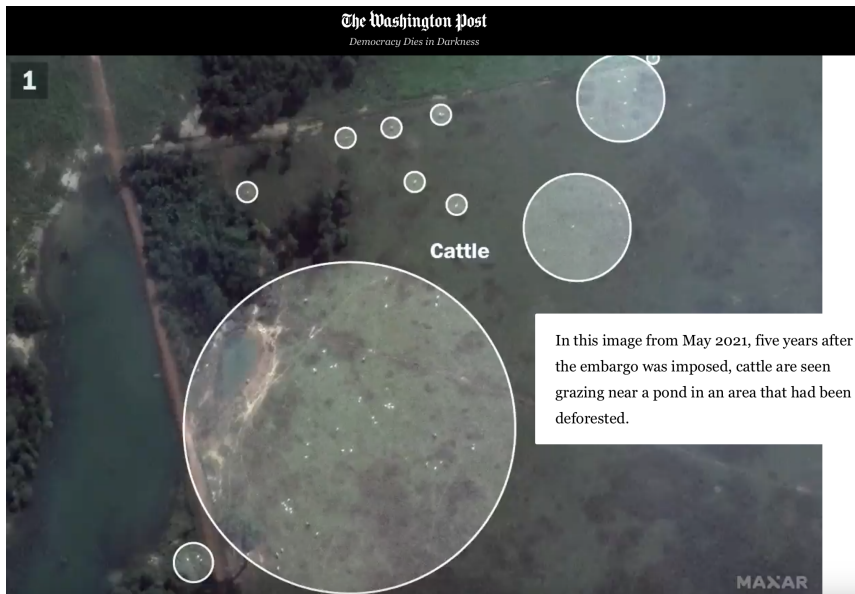


Municipalities w/ Plants



Municipalities w/ Plants within 200km

Slaughterhouses linked to deforestation



Slaughterhouses linked to land degradation

The Washington Post

Democracy Dies in Darkness

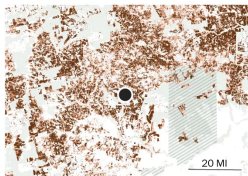


Level of damage in pasture areas
around JBS meatpacking plants

Moderate Severe

Meatpacking plants Indigenous territory

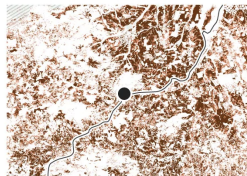
1 Confresa, Mato Grosso



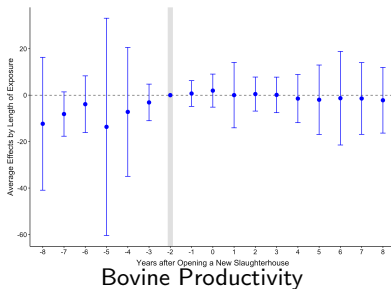
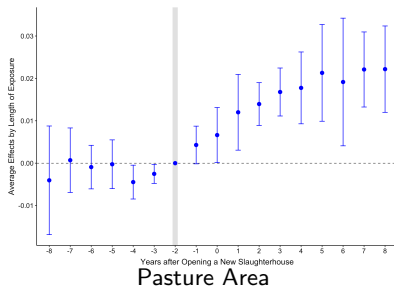
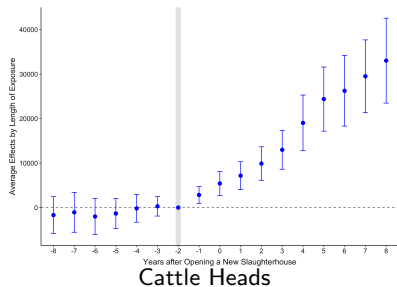
2 Vilhena, Rondônia



3 Barra do Garças, Mato Grosso



Results: Production Response to Slaughterhouse Openings



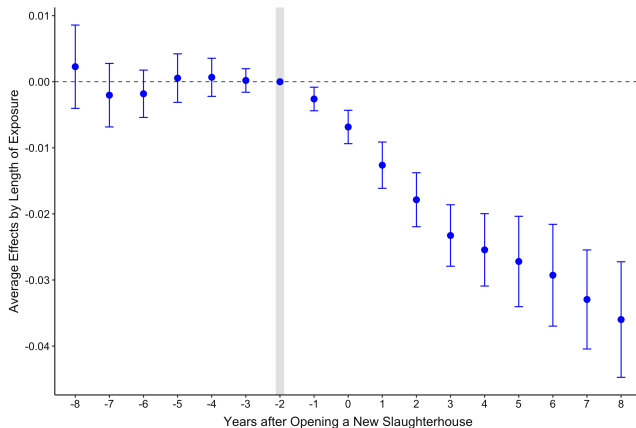
Example of Extensive Pasture Area

Figure: Extensive Pasture Areas with Cattle



By Valdir Pacheco

Deforestation Response to Slaughterhouse Openings



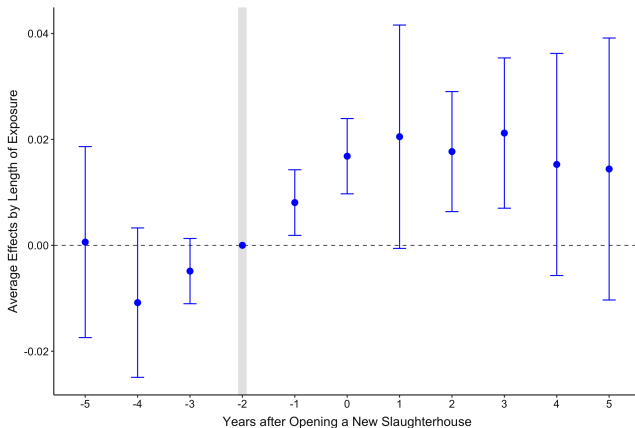
Natural Forest Areas

Example of Cattle Activity and Forest Areas



SOURCE: <https://www.kcrw.com/news/shows/all-things-considered/npr-story/746192595>

Land Degradation Response to Slaughterhouse Openings



Degraded Pastureland

Example of Degraded Pastureland

Figure: Degraded Pasture Area with Cattle



SOURCE: Compre Rural

Thus far – summary

- Opening new plants lead to land-use changes
 - ▶ ↑ cattle heads and pasture areas
 - ▶ ↑ deforestation
 - ▶ ↑ pasture degradation

We move to our next question: does *TAC* effectively outsource state capacity to market players and decouples deforestation from industrial activity?

Background on *TAC* (Termo de Ajustamento de Conduta)

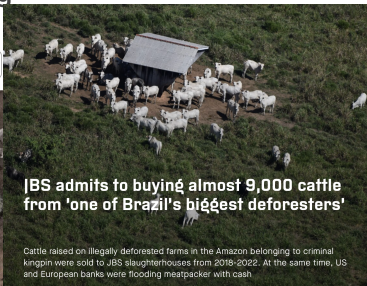
- *TAC*: certification-like, legally-enforceable commitment
 - ▶ it is an agreement between public prosecutors and slaughterhouses
- In 2009, Brazil's government prosecuted slaughterhouses in the Amazon region for buying cattle of unknown origins (Barreto et al., 2017)
- Greenpeace also launched a global campaign to raise awareness that Brazilian slaughterhouses were associated with illegal deforestation
- To avoid legal measures, slaughterhouses signed *TACs* and agreed on buying cattle only from farms that:
 - ▶ did not deforest after 2009
 - ▶ were not located in Protected Areas
 - ▶ were registered on CAR (environmental registry for rural properties)

International consumers care about beef origin

European supermarkets stop selling Brazil beef over deforestation links

By Jake Spring and Anthony Deutsch

December 15, 2021 11:29 PM GMT · Updated 2 years ago



JBS admits to buying almost 9,000 cattle from 'one of Brazil's biggest deforesters'

Cattle raised on illegally deforested farms in the Amazon belonging to criminal kingpin were sold to JBS slaughterhouses from 2018-2022. At the same time, US and European banks were flooding meatpacker with cash

Brazilian consumers care about beef origin

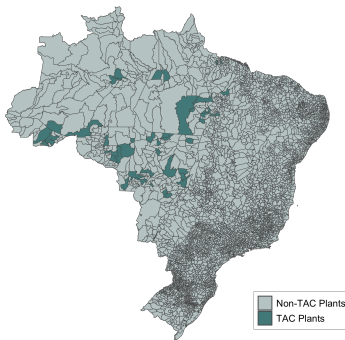
58% dos brasileiros querem saber se carne está relacionada com o desmatamento da Amazônia

Pesquisa, realizada pelo Reclame AQUI, foi encomendada pelo Radar Verde para trazer mais transparência para a cadeia da carne

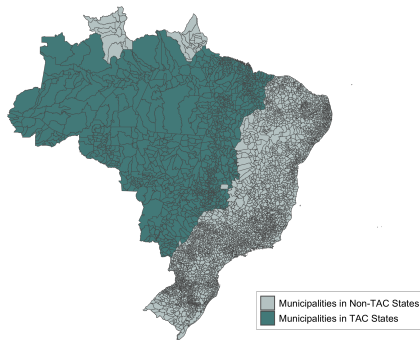
JULIANA TINOCO · 30 de julho de 2022 · 1 anos atrás



Municipalities with Slaughterhouses with TACs



Municipalities with at least one
TAC-signatory Slaughterhouse Plant



Municipalities in States with at least
one TAC-signatory Slaughterhouse Plant

Opening Effects on TAC and Non-TAC Areas

Table: Effects on Natural Forest Areas, Pasture Degradation, and Bovine Productivity

	Dependent Variable					
	Natural Forest Area		Degraded Pastureland		Bovine Productivity	
	TAC	Non-TAC	TAC	Non-TAC	TAC	Non-TAC
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
1 {Slaughterhouse}	0.0019 (0.0074)	-0.0131*** (0.0025)	-0.0161*** (0.0053)	0.0144 (0.0113)	0.8085*** (0.1996)	4.3709 (6.7407)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Weather Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Socioeconomic Covariates	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the overall summary of ATT's based on time/group/length of exposure aggregation according to Callaway and Sant'Anna (2021) for the following dependent variables: "Natural Forest Area / Municipality Area", "Severely Degraded Pastureland / Municipality Area", and "Bovine Productivity" (cattle counts divided pasture area). All columns take covariates into account. Control group is "not-yet-treated" and anticipation period equals 1. Statistical significance is given by * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. We use data from 2009 to 2019.

Concluding Remarks

- Opening new plants has production and environmental impacts
 - ▶ **extensive** production increases
 - ▶ more forest area becomes pasture
 - ▶ pasture quality worsens
- However, under *TAC* enforcement, new openings lead to
 - ▶ improvement on pasture quality
 - ▶ no further deforestation
 - ▶ increased productivity
- Policy implications
 - ▶ Limited state capacity may be partially addressed with IC market players
 - ★ slow judiciary can align players' behavior w/ incentive compatibility constraints
 - ▶ For this particular setting, this affects licensing for slaughterhouses/ranchers
 - ▶ This may have numerous applications in developing nations
 - ★ developed nations already use this: online platforms may be liable for crimes committed through them

THANK YOU!

Questions? Comments?

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