

MOTIVATION

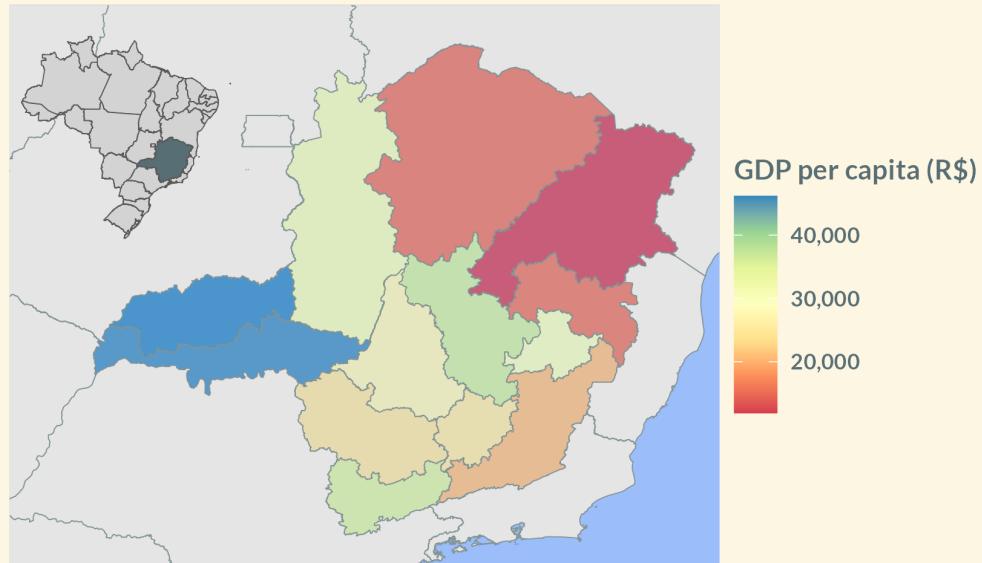
- What role does tourism plays in a developing economy?
- Minas Gerais, Brazil:
 - Highly dependent on the mining industry
 - Rich cultural and architectonic heritage
- How related it is to the rest of the economy?
- What about regional disparities?

We have a lot of questions, but not so many answers.

MINAS GERAIS: AN OVERVIEW

- Population: 21.4 million
 - #2 in Brazil
- HDI: 0.774 (2010)
 - #4 in Brazil
- GDP: US\$ 177 billion
 - 9.3% of national output

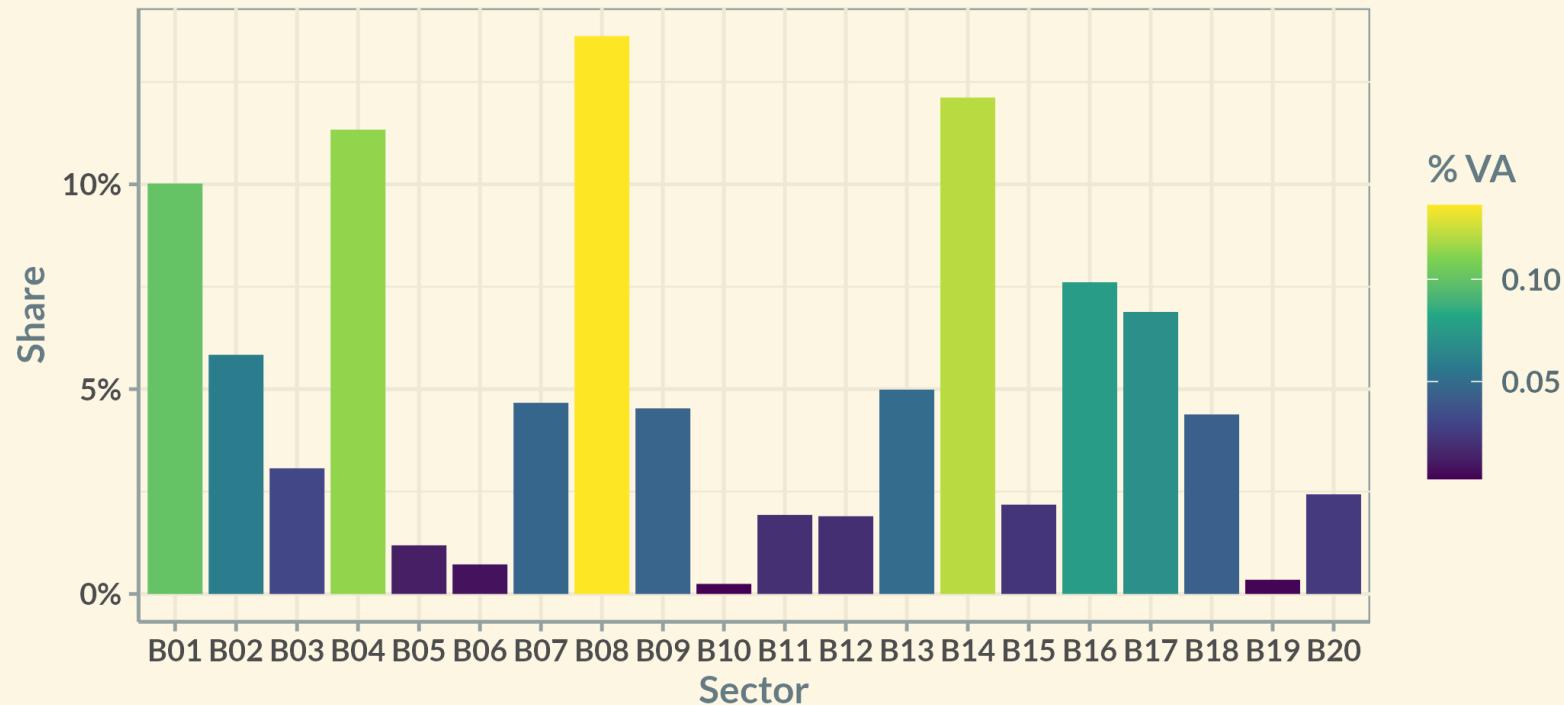
GDP per capita by Region, 2018



Minas Gerais is a snapshot of Brazil: It reproduces national patterns of income and quality of life disparities

MINAS GERAIS: AN OVERVIEW

Minas Gerais: Value Added by Sector



- Trade (B08), Real Estate (B14), Manufacturing (B04), and Agriculture (B01) account for 46% of the Value Added
- Services (B05-B07, B09-B20): 56% of VA

MINAS GERAIS: AN OVERVIEW

SUMMARY STATISTICS

Code	Region	Population	% MG	GVA (R\$M)	% MG	HDI-M
R01	Belo Horizonte	2,530,701	11.82%	71,892	12.69%	0.810
R02	Barão de Cocais	33,232	0.16%	723	0.13%	0.722
R03	Caeté	45,364	0.21%	575	0.10%	0.728
R04	Catas Altas	5,465	0.03%	501	0.09%	0.684
R05	Congonhas	55,863	0.26%	2,281	0.40%	0.753
R06	Diamantina	47,924	0.22%	686	0.12%	0.716
R07	Mariana	61,830	0.29%	3,832	0.68%	0.742
R08	Ouro Preto	74,824	0.35%	5,978	1.05%	0.741
R09	Sabará	137,877	0.64%	2,947	0.52%	0.731
R10	Santa Bárbara	31,873	0.15%	1,159	0.20%	0.707
R11	São João del Rei	90,897	0.42%	1,951	0.34%	0.758
R12	Serro	20,915	0.10%	192	0.03%	0.656
R13	Tiradentes	8,160	0.04%	118	0.02%	0.740
R14	Rest of MG	18,267,025	85.31%	473,863	83.62%	0.667

THE BAROQUE HERITAGE

- Gold run, 17th and 18th centuries
- Portuguese-inspired with local features
- Sacred art, buildings, landmarks
- Three Unesco World Cultural Heritage sites
 - Diamantina
 - Ouro Preto
 - Congonhas Sanctuary



THE BAROQUE HERITAGE



FIRST CHALLENGE: LACK OF REGIONAL DATA

- Framework: Interregional Input-Output Setting (IIOAS)
 - Haddad, Gonçalves Júnior, and Nascimento (2017)
 - Homogenous production and utility functions across regions
 - Consistent with national aggregates
 - 15 regions, 20 sectors
- Trade matrices between regions
 - Supply: $\text{TOT SUP} := \text{DOM SUP} + \text{EXP}$
 - Exports data (EXP) known for each region and sector
 - Domestic supply (DOM SUP): labor microdata as proxy

METHODOLOGY

LINKAGES

- Within regions (intra)
- Key sector: $FL > 1$ and $BL > 1$
- E.g.: Backward linkages for region 1
 - FLs are likewise, but on rows instead of columns

$$BL_A^{\text{intra},1} = \frac{2^{-1} (l_{AA}^{11} + l_{BA}^{11})}{2^{-2} \sum_{j=1}^{15} \sum_{k=1}^{15} l_{jk}^{11}}$$

HYPOTHETICAL EXTRACTION

- Total extraction (backward and forward)
- Intermediate consumption and final demand
 - Simulates sudden vanishing of the extracted industry
 - Otherwise: assumes agents would substitute with imports

SECOND CHALLENGE: TOURISM IS A CROSS-SECTOR INDUSTRY

- Common approach: tourism satellite account (TSA)
 - Not available for the state
- Our approach:
 - Estimate tourism shares in each sector and region
 - Tourism Characteristic Activities (TCA)s, classified by the state government
 - Sensitivity analysis + state survey
 - Apply shares as extraction coefficient

Example: if 10% of a sector's output in a city is tourism-related, then 10% of the sector is extracted.

METHODOLOGY

SENSITIVITY ANALYSIS

	Region	B09	B10	B11	B14	B15	B19
R01	Belo Horizonte	-	-	-	-	-	-
R02	Barão de Cocais	25%	98%	25%	1.25%	0.25%	25%
R03	Caeté	25%	100%	25%	1.25%	0.25%	50%
R04	Catas Altas	25%	98%	25%	1.25%	0.25%	50%
R05	Congonhas	25%	96%	25%	1.25%	0.25%	50%
R06	Diamantina	50%	92%	75%	5.00%	1.00%	100%
R07	Mariana	50%	96%	50%	5.00%	1.00%	100%
R08	Ouro Preto	50%	100%	75%	5.00%	1.00%	100%
R09	Sabará	13%	98%	25%	1.25%	0.25%	25%
R10	Santa Bárbara	25%	98%	50%	2.50%	0.50%	50%
R11	São João del Rei	25%	100%	25%	5.00%	1.00%	100%
R12	Serro	50%	98%	50%	5.00%	1.00%	100%
R13	Tiradentes	75%	100%	100%	5.00%	1.00%	100%
R14	Rest of MG	-	-	-	-	-	-
R15	Rest of Brazil	-	-	-	-	-	-

- *Accommodation (B10): data from state survey*
- *Transportation (B09), Food Services (B11), and Arts, Culture, Sports, and Recreation (B19): relative to city size and its importance as touristic destination*
- *Real Estate (B14) and Administrative Services (B15): minor role, smaller coefficients*

DATA

- Brazilian 2018 I-O Matrix ([Guilhoto 2021](#))
- Exports: International Trade Statistics ([Brazil 2022a](#))
- Labor: Goverment database on firms and workers by economic activity ([Brazil 2022b](#))

RESULTS

LINKAGES

- Except for Transportation, no TCA is a key sector
- Most key sectors are services
 - Especially *Construction, Wholesale and Retail Trade, Transportation, and Finance*
- *Extractive Industries*
 - Biggest part of Value Added in most cities
 - Key sector only in Sabará
 - Mostly export commodities, with little local processing

RESULTS

Table 1: Linkages

Code	Region	B02	B03	B04	B05	B06	B07	B08	B09	B12	B13	B14	B15
R01	Belo Horizonte				Key			Key	Key	Key	Key		
R02	B. Cocais			Key			Key	Key	Key		Key		
R03	Caeté						Key	Key	Key		Key		
R04	Catas Altas						Key	Key			Key		
R05	Congonhas						Key	Key	Key				
R06	Diamantina						Key	Key	Key	Key	Key		
R07	Mariana						Key	Key	Key				
R08	Ouro Preto				Key		Key			Key	Key		
R09	Sabará	Key		Key			Key	Key	Key				
R10	Santa Bárbara						Key	Key	Key		Key		
R11	São João del Rei						Key	Key	Key	Key	Key		
R12	Serro						Key	Key			Key		
R13	Tiradentes			Key			Key	Key			Key		
R14	Rest of MG			Key	Key		Key	Key	Key				
R15	Rest of BR	Key	Key	Key	Key		Key						

RESULTS

HYPOTHETICAL EXTRACTION

Simultaneous extraction

- Negligible impacts outside the Baroque Circuit
- Lowest: Catas Altas, < 1%
- Highest: Tiradentes, 65%
- Average: 10%
- Median: 6%

Local extractions

- Smaller than in the simultaneous scenario
 - Modest regional dependency
 - Biggest difference in Tiradentes (33%), average 17%
- Almost no intraregional impacts
 - Notable exceptions: Ouro Preto & Mariana and Tiradentes & São João del Rei

HYPOTHETICAL EXTRACTION

Region	Global	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	Diff.
Belo Horizonte	-0.33	0.00	-0.01	0.00	-0.01	0.00	-0.01	-0.02	-0.04	0.00	0.00	0.00	0.00	0
B. Cocais	-3.97	-3.02	-0.01	0.00	0.00	0.00	-0.02	-0.02	-0.01	-0.15	0.00	0.00	0.00	-23
Caeté	-6.62	0.00	-5.75	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	-13
Catas Altas	-0.75	0.00	0.00	-0.65	0.00	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00	-13
Congonhas	-2.05	0.00	0.00	0.00	-1.93	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-6
Diamantina	-6.50	0.00	0.00	0.00	0.00	-4.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-31
Mariana	-8.41	0.00	0.00	0.00	0.00	0.00	-5.25	-0.15	0.00	0.00	0.00	0.00	0.00	-37
Ouro Preto	-6.37	0.00	0.00	0.00	0.00	0.00	-0.13	-4.08	0.00	0.00	0.00	0.00	0.00	-35
Sabará	-4.82	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-2.96	0.00	0.00	0.00	0.00	-38
Santa Bárbara	-3.29	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-2.50	0.00	0.00	0.00	-24
S. João del Rei	-8.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	-3.43	0.00	-0.21	-57
Serro	-9.22	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-5.52	0.00	0.00	-40
Tiradentes	-64.67	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	-0.17	0.00	-43.34	-32
Rest of MG	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Rest of BR	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Note: values as percentage of Gross Value of Production (GVP)

WHY ARE RESULTS SO DIFFERENT?

Sabará, Ouro Preto, and Tiradentes: a case study

Region	Population	Value Added (R\$ M)	Extractive Industries (%)	Trade (%)	TCAs (%)	Other Services (%)	Others (%)
Sabará	135421	2690.69	33.45	12.28	19.26	24.87	10.14
Ouro Preto	73994	6630.11	46.56	6.23	8.50	34.47	4.23
Tiradentes	7886	152.05	1.84	17.11	46.85	22.03	12.17

- Sabará
 - Mining industry and part of the capital's metropolitan area
 - Not a well-known touristic destination
- Ouro Preto
 - Mining industry, large university, regional center
 - UNESCO World Heritage Site, famous touristic destination
- Tiradentes
 - Small town
 - Highly dependent on tourism activity

FINAL REMARKS

- IIOAS framework as an estimate for regional figures
 - Reproduces regional disparities and each city's main industries adequately
- Determining Tourism Characteristic Activities
 - Room to improve the sensitivity analysis
- Tourism seems disconnected from other industries
- While some cities are consolidated touristic destinations, others have potential to develop their tourism industry
- Investment in accessibility (road paving, regional airports) have potential to increase tourism traffic

THANKS!

ARTHUR BAZOLLI ALVARENGA

 arthur.bazolli@estudante.ufjf.br

 [baarthur.github.io](https://github.com/baarthur)

 [@baarthur0](https://twitter.com/baarthur0)

 [@baarthur](https://github.com/baarthur)

CLÁUDIO EURICO SEIBERT

 claudioseibertf@gmail.com

ELVIRA HELENA OLIVEIRA DE MEDEIROS

 helena.elvira@estudante.ufjf.br

FILIPE SANTIAGO DOS REIS

 filipe.santiago@estudante.ufjf.br

FERNANDO SALGUEIRO PEROBELLI

 fernando.perobelli@ufjf.br

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