

Environmental effects of EU-MERCOSUR FTA

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1

AFOLU and greenhouse gases

Why AFOLU?

The Agriculture, Forestry and Other Land Uses (AFOLU) refers to the managed land sector. It contributed around 13–21% of global total anthropogenic greenhouse gas (GHG) emissions between 2010–2019

This share is higher in developing countries, and up to 55%* and 70% in the case of Brazil and Paraguay

AFOLU CO₂ emissions are mainly driven by land use change (CO₂ LULUCF), and account for about half of total net AFOLU emissions

In Latin America LUC is believed to be influenced by international trade, as local producers have access to land resources at lower relative prices than other regions

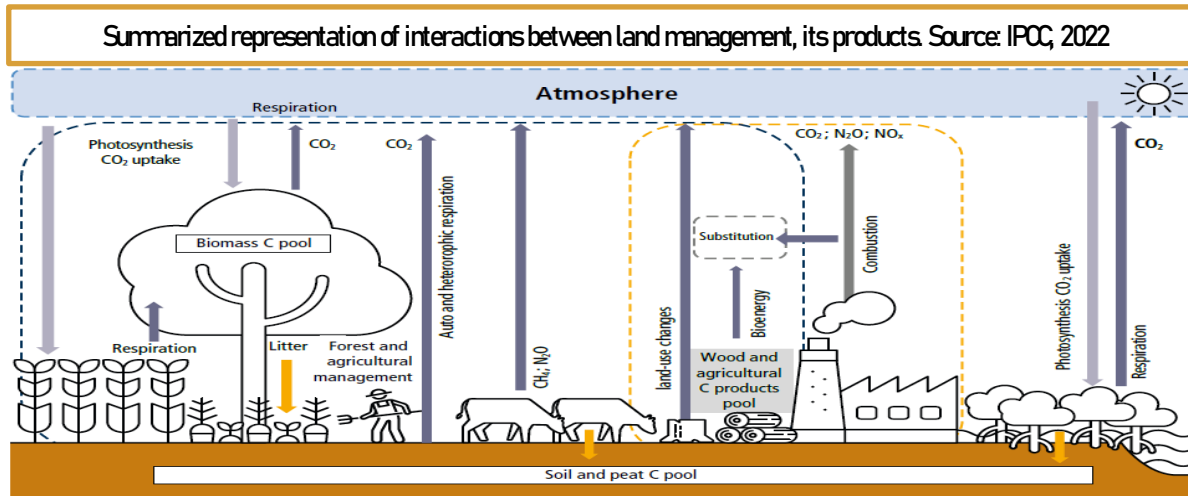
Research objective: *assess the environmental impacts of the FTA by contemplating carbon emissions from land use transitions together with those of the energy and transportation sector*

IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

** Up to 72% according to the (Sistema de Estimativas de Emissões de Gases de Efeito Estufa)

Anthropogenic AFOLU fluxes are divided into:

1. Net anthropogenic flux from Land Use, Land-Use Change, and Forestry (LULUCF)
2. Net flux from Agriculture



IPCC1996. National greenhouse gas inventory (NGHG)

MERCOSUR

Nominal GDP of €2.2 trillion by 2020
Population = 295 million habitants
Total land area = 11,667,150 Km²
Agricultural land* = 3,761,331 Km²
Percentage of total land = 32.2%
Main crops

1. Oilseeds = 582,336.4 Km²
2. Maize = 483,423.2 Km²

*Brazil and Paraguay experienced an increase of 3.5% and 11.3% respectively over the last 20 years

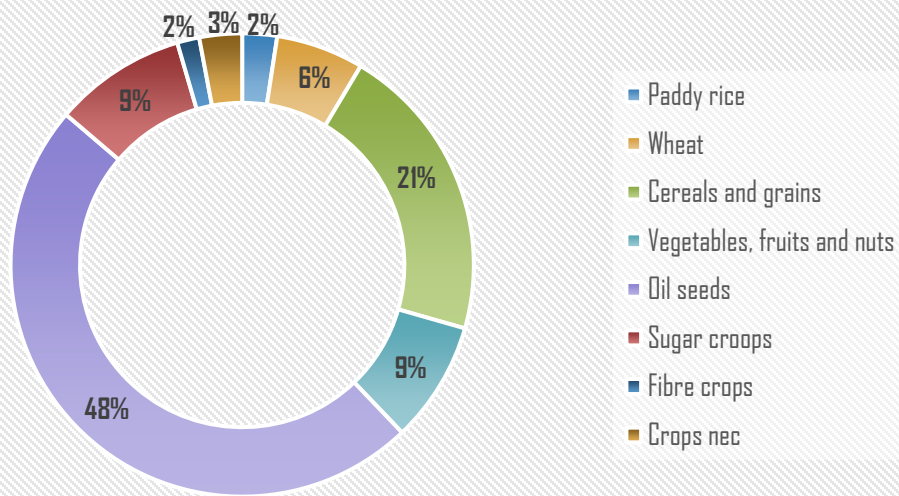
European Union

Nominal GDP €14,5 trillion in 2021
Pop = 449 million habitants
Total land area = 3,996,449.2 Km²
Agricultural land = 1,639,615 Km²
Percentage of total land = 41.0%
Main crops

1. Wheat = 237,007.5 Km²
2. Maize = 194,875.8 Km²

*The EU Agricultural land has decreased about 10.2% since 2000

Crop distribution in MERCOSUR by area*



LUC in South America

AMAZON

- Between 1985–2017, the Amazon lost nearly 360,000 Km² hectares of native vegetation
- From 2004 Amazon deforestation rates decreased to a record low 4,571 Km² in 2012. It has been increasing since
- Main drivers are cattle ranching, agriculture, mining

CERRADO

- Since 1985 Cerrado has lost 1,100,000 Km² of natural vegetation through conversion
- About 45% is attributed to agricultural activities such as Soybean, sugarcane, pastureland, cotton and eucalyptus
- While land use policies slowed cropland expansion within Amazon, no such decrease was found for Cerrado savannas
- From 2000 to 2014 intensive crop industry in Brazil went from 26.0 Mha to 46.1 Mha feeding from repurposed pastures (80%) and than conversion of natural vegetation (20%) **

There are four main types of forest biomes in South America



1. Follador, M et al. "Assessing the impacts of the EU bioeconomy on third countries"
2. Mitchell E, Elwin P, Rautner M, Gran Chaco: the Deforestation Dozen, : Planet Tracker (2022)



GRANCHACO

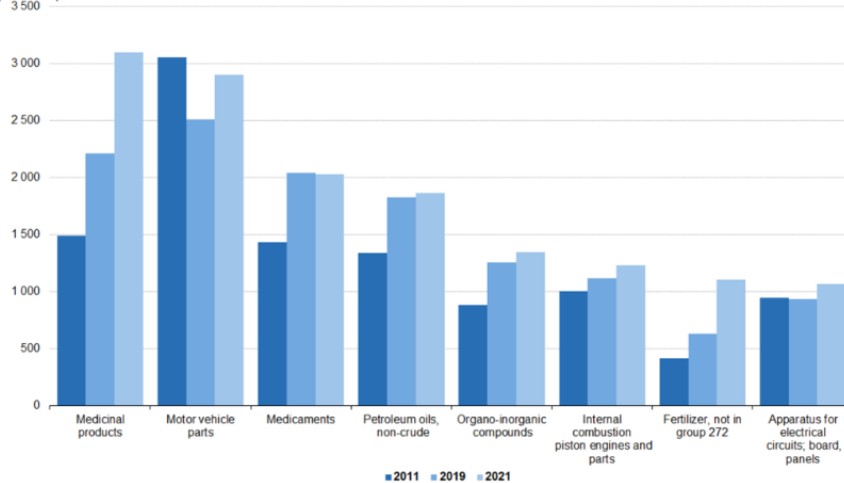
- Gran Chaco covers about 650,000 Km² in Argentina, Paraguay, Bolivia, and Brazil—making it the largest dry forest in South America.
- From 2010 to 2018, more than 29,000 Km² of the Gran Chaco was cleared for farms and ranches in Argentina. Legislation like the “forest law” from 2007 has not helped since local governments were unable to enforce the law.
- Gran Chaco in Paraguay lost nearly 44,000 Km² mainly due to the expansion of cattle farms in the western part of the country.

2

The free-trade agreement

Most exported products to Mercosur, 2011, 2019 and 2021

(€ million)

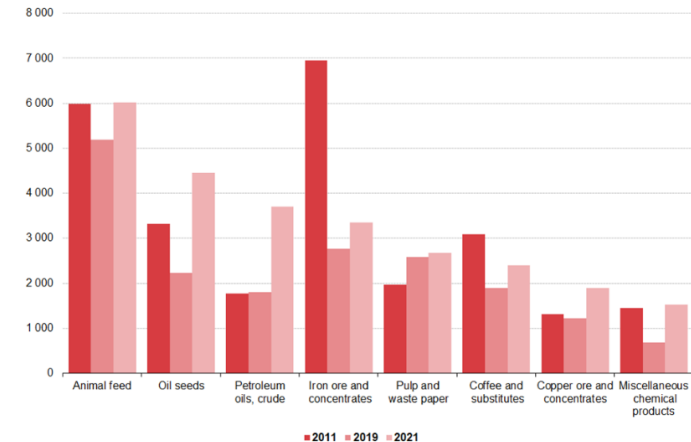


SITC-3 codes shown are: 541, 784, 542, 334, 515, 713, 562 and 772.
Source: Eurostat (Comext data code: DS-018995)

eurostat

Most imported products from Mercosur, 2011, 2019 and 2021

(€ million)



SITC-3 codes shown are: 081, 222, 333, 281, 251, 071, 283 and 598.
Source: Eurostat (Comext data code: DS-018995)

eurostat

- MERCOSUR currently holds some MFN* trade benefits with the EU. Some Ad-valorem tariff include:
- Tariffs on agricultural products in the EU reach an average of 13.2%. Beverages and tobacco products are about 8%.
- EU tariff on textiles industry can be as high as 20%.
- EU tariffs on beef products and dairy products are above 30%. Live animals and other animal products is about 21%.
- Mercosur tariffs on textiles are over 20%. Motor Vehicles and machinery are around 16%.
- MERCOSUR applies agro-industrial products such as sugar, beverages and tobacco, vegetable oils and dairy products tariff of around 18%.

1. Deregulation measures

"Mercosur will remove tariffs on 91% of the goods imported from the EU and the EU27 will exempt duties on 95% of goods imported from Mercosur, along with 83% of agricultural imports" or TRQ

For the EU8 "sensitive products", tariff will remain the same but quotas

- Ethanol quota of 450,000 tons (EU imported 966,000 tons of ethanol in 2019) of ethanol for all uses, including fuel
- Beef quota of 99,000 tons divided into 55 fresh and 55% frozen
- Poultry 180,000 tons (50 50% boneless and regular)
- Swine meat 25,000 tons
- Sugar products 180,000 tons for Brazil and 10,000 tons for Paraguay
- Honey, rice and maize 60,000, 45,000 and 1000 tons quota

Both parties will enjoy TRQ of

- Cheese products 30,000 tons
- Milk powder products 10,000 tons
- Milk formula 5000 tons

2. Key trade sector

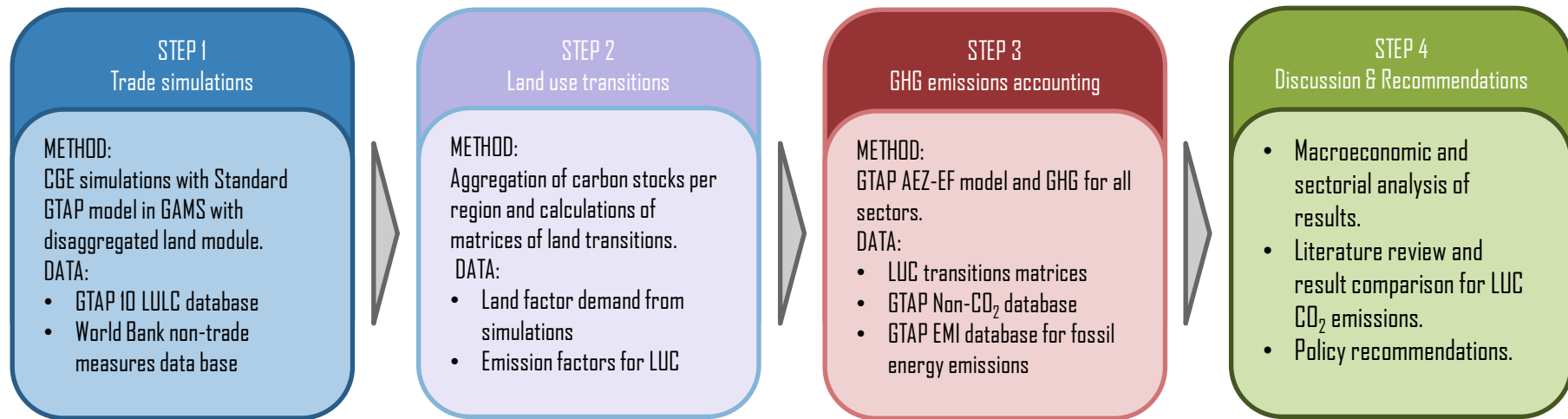
- From 2015-2019, MERCOSUR had a 7% market share in the EU for ethanol exports
- 74% of EU imports of beef already come from MERCOSUR
- Mercosur countries accounted for 65% of all soy exports to the EU in 2020 with Brazil and Argentina comprising the largest shares
- By 2030, the EU will account for 30% of Brazilian ethanol exports if the EU phases out biodiesel. Sugar cane is the main source of Brazilian ethanol

Oilseeds and cakes imports into the EU are free of duty since the Dillon Round of the GATT (1962), so they are not directly affected by the EU-Mercosur Agreement.

3

Modeling and data

Methods



Data base. Region Aggregation

DATASETS EMPLOYED

1. GTAP v10 LULC
2. GTAP EMS
3. GTAP Non-CO2 emission data Base
4. GTAP EF Carbon Stocks
5. OECD-FAO Agricultural Outlook 2018-202
6. World Bank. AVE estimates at GTAP sector

Regions	12 region aggregation 4 countries (Argentina, Brazil, Paraguay and Uruguay), the European Union post-brexit, and 8 regional aggregations
Sectors	44 different activities One-to-one mapping between the activities and commodities
Factors	Factors: Land composite, skilled and unskilled labor, capital and natural resources 18 different Agro-econological zones (AEZ) 12 sectors that employ land

Reduced

- MERCOSUR cuts 80% of industrial tariffs, 60% of agricultural, 30% Processed foods
- EU EU27 cuts 90% on industrial tariffs and 10% on agricultural tariffs and 30% reductions of processed foods
- NTM 10% NTM reductions for all sectors by all parties

Moderate

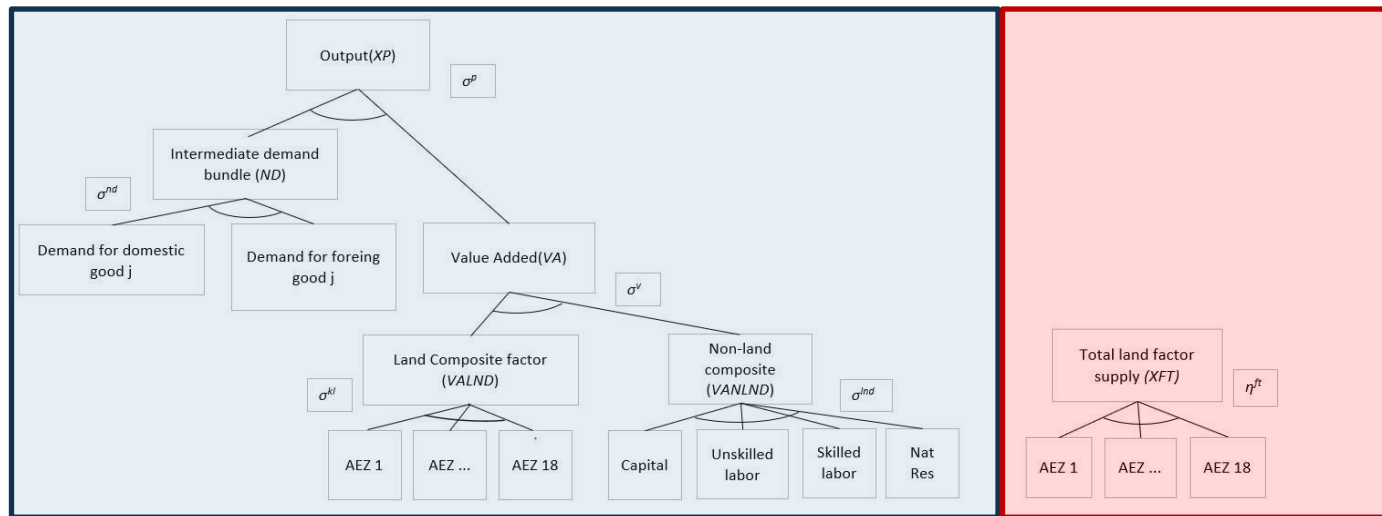
- MERCOSUR cuts 95% of industrial tariffs, 80% of agricultural, 50% Processed foods
- EU EU27 cuts 100% on industrial tariffs and 20% on agricultural tariffs and 50% reductions of processed foods
- NTM 15% NTM reductions for all sectors by all parties

Advanced

- MERCOSUR cuts 100% of industrial tariffs, 100% of agricultural and 100% on processed foods
- EU EU27 cuts 100% on industrial tariffs and 30% on agricultural tariffs and 90% reductions of processed foods
- NTM 20% NTM reductions for all sectors by all parties

Model productive structure

Supply and
demand for
sector *a*



Endogenous Factor supply

Positive supply elasticity of, which creates an eased upward sloping supply curves, to simulate an imperfect price response

$$XFT_{r, fm} = A_{r, fm}^{ft} \left(\frac{PFT_{r, fm}}{PABS_r} \right)^{\eta_{r, fm}^{ft}}$$

XFT = Total factor supply

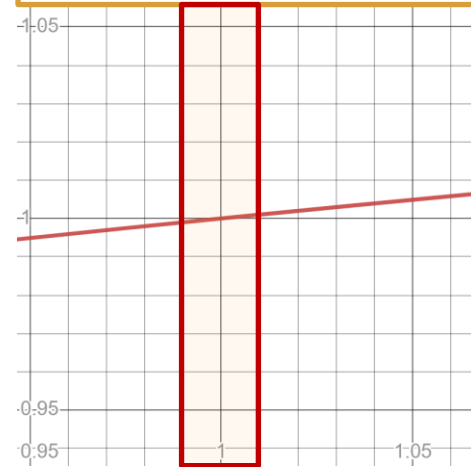
A^{ft} = Aggregate shifter

PFT = Aggregate price of mobile factors

$PABS$ = price index of domestic absorption

η^{ft} = supply elasticity

Land supply schedule for $\eta^{ft} = 0.1$

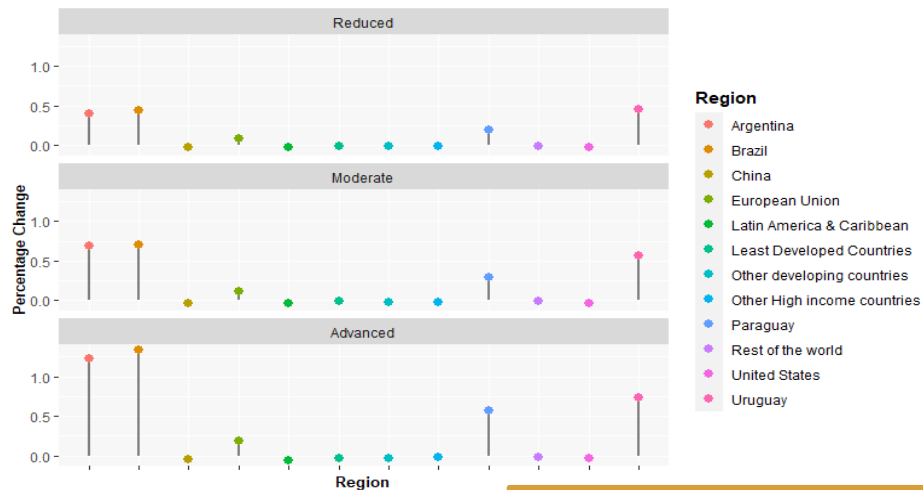


4

Results and discussion

MACROECONOMIC RESULTS

Terms of trade change. Percentage %



Aggregate bilateral price of import change. Percentage %

		SOURCE				
DESTINATION		Argentina	Brazil	Paraguay	Uruguay	EU
	Argentina		(0.171)	(0.027)	(0.003)	(4.620)
	Brazil	(0.326)		(0.027)	(0.003)	(4.468)
	Paraguay	(0.324)	(0.171)		(0.005)	(3.283)
	Uruguay	(0.326)	(0.171)	(0.027)		(3.455)
	EU	(2.537)	(2.131)	(0.769)	(1.017)	
	ROW	(0.330)	(0.173)	(0.029)	(0.004)	0.104

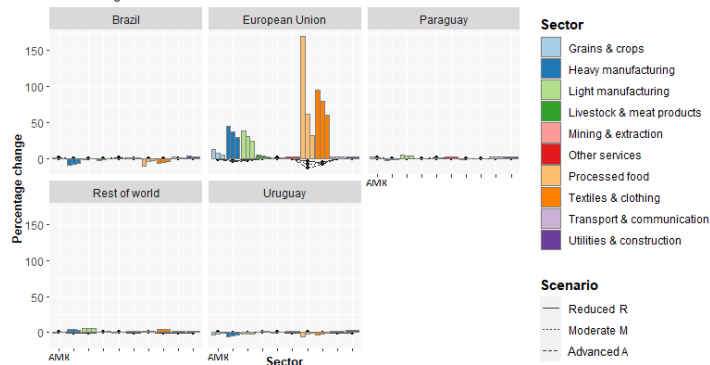
All MERCOSUR countries improve their TOT

Regions outside the FTA are barely impacted

For the EU, changes in TOT are predetermined by original 1.8% and 1.9% import and export share of MERCOSUR

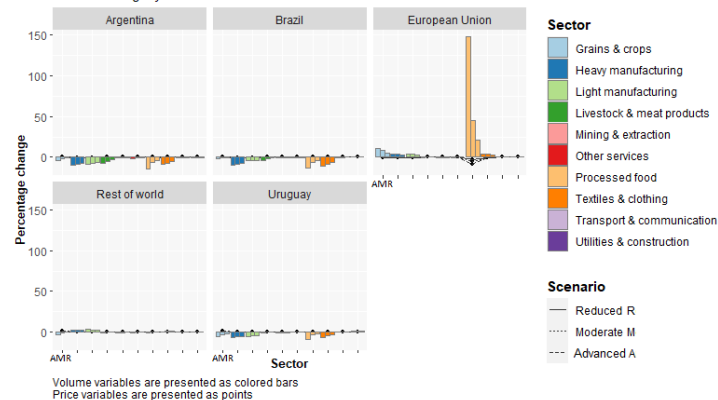
Exports by destination. Price and volume change

Source: Argentina



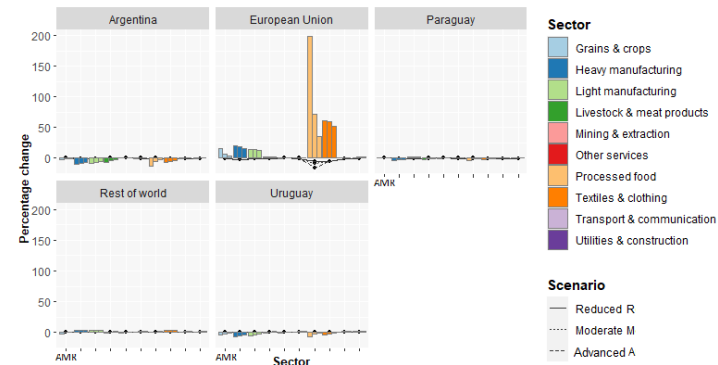
Exports by destination. Price and volume change

Source: Paraguay



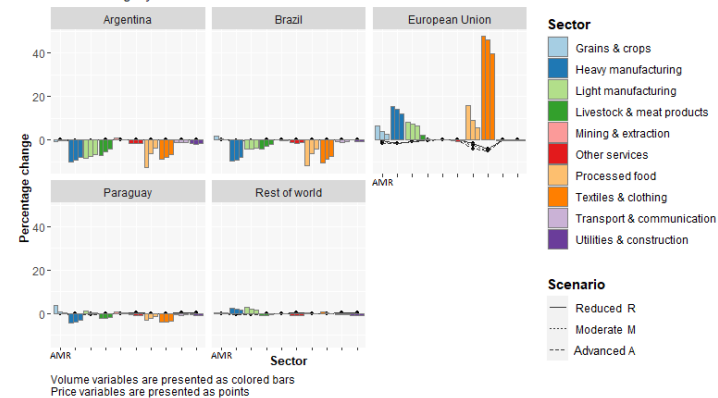
Exports by destination. Price and volume change

Source: Brazil

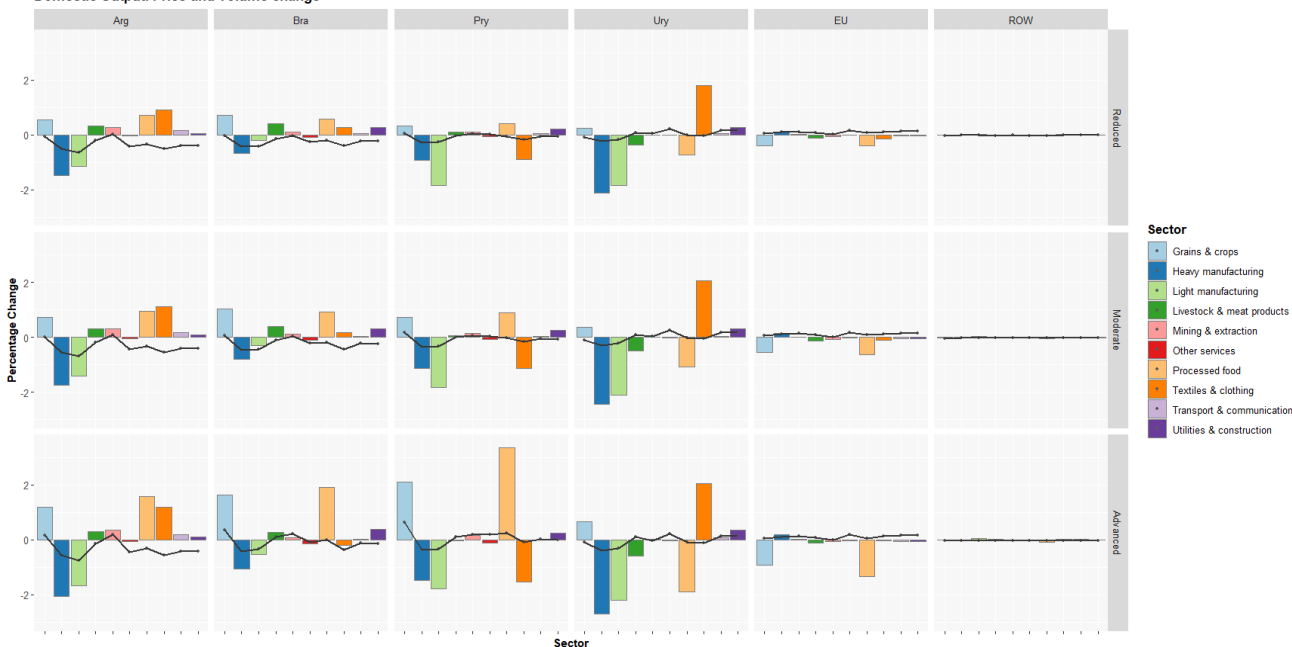


Exports by destination. Price and volume change

Source: Uruguay



Domestic Output, Price and volume change

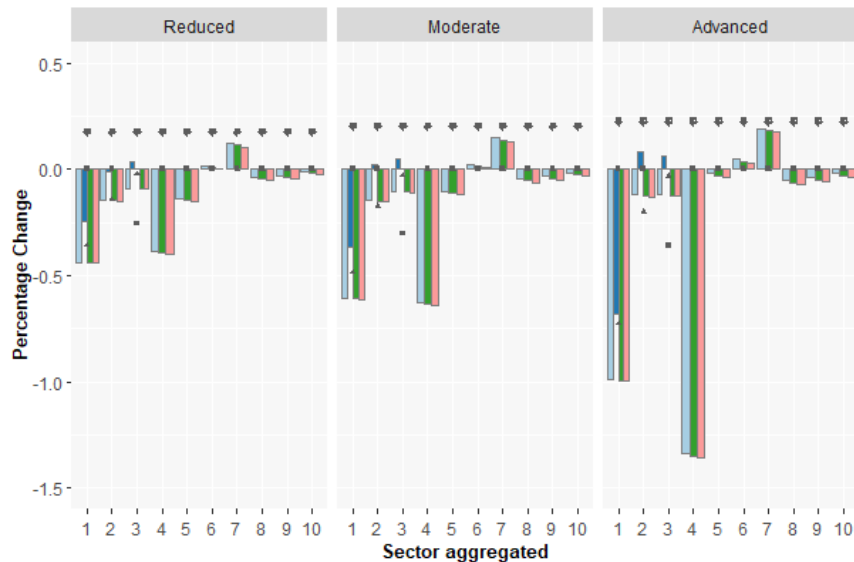


HIGHLIGHTS

- “Grains & crops” is the only sector that increases in all MERCOSUR countries on each scenario
- “Processed food” increase is especially high in scenarios that include a hypothetical reduction in NIM measures, mostly in the form food safety standards
- For instance, in the adv scenario exports of “paddy rice” from Brazil to the EU increment more than 105%, but overall output of that sector decreases about 0.06%

Aggregate factor demand. Price and volume change

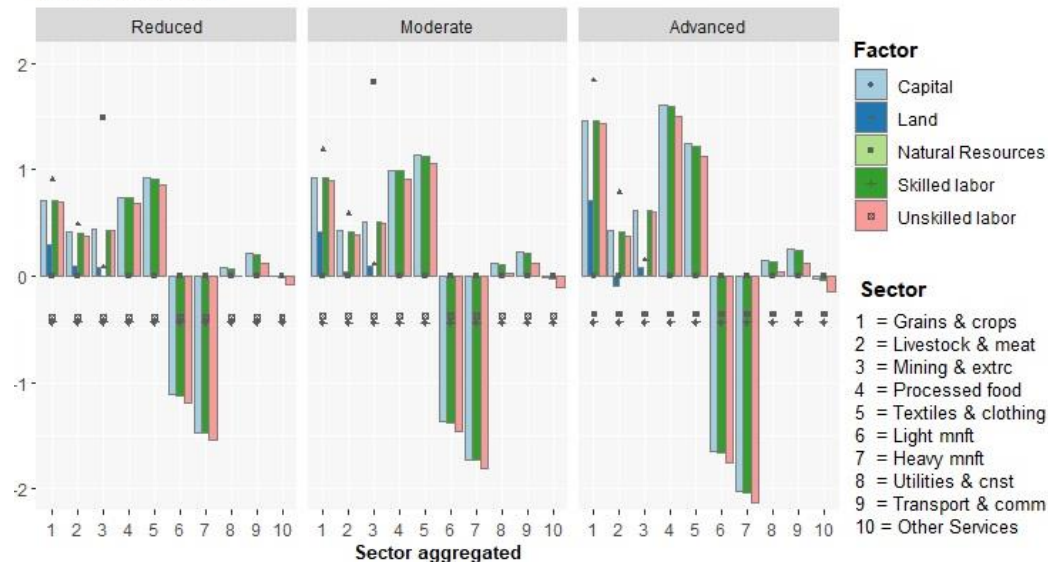
Region: European Union



Volume variables are presented as colored bars
Price variables are presented as points

Aggregate factor demand. Price and volume change

Region: MERCOSUR



Volume variables are presented as colored bars
Price variables are presented as points

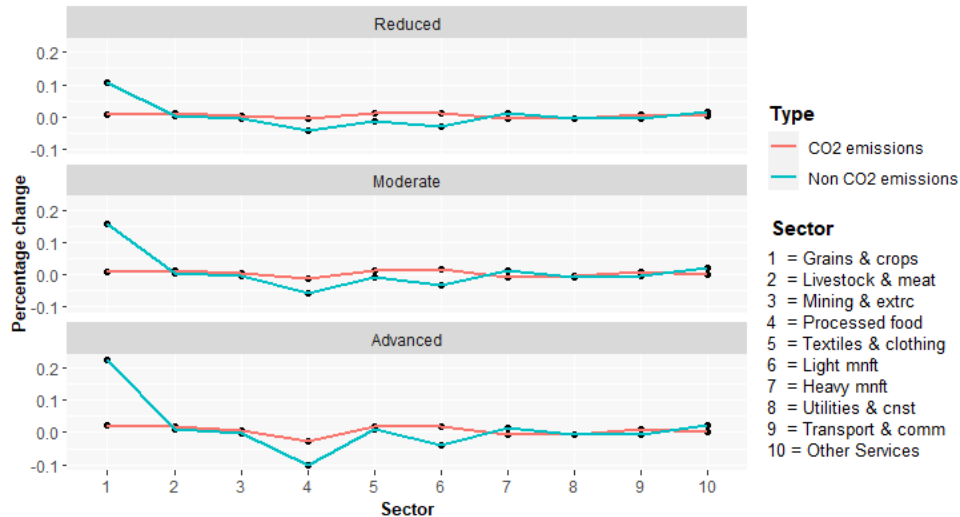
Perfectly mobile factor prices show uniformity across sectors

Brazil see the highest land price increase, with AEZ 10, 11, 12 and 5 increasing 11.2, 9.3, 4.8 and 4.5% in average

Cattle ranching and other pasture activities shift to more capital intensive practices

ENVIROMENTAL EFFECTS

Global CO2 and non-CO2 emissions change*. Percentage %.



* These values do not include CO2 emissions from LUC

CO2 emissions from fossil energy remain stable in all three scenarios

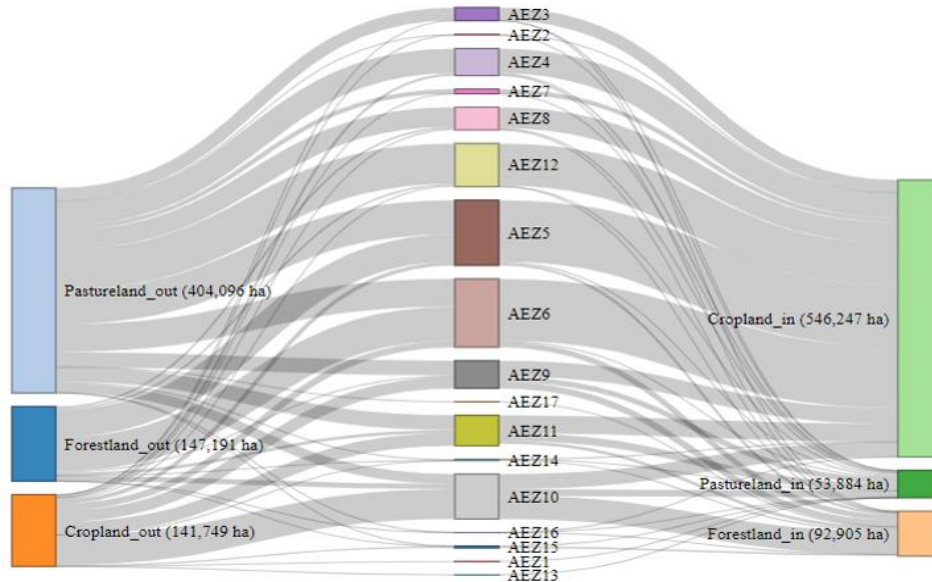
Total non CO2 increase in a range of 0.028% in red scenario to 0.045% in adv, mostly pushed by "Grains & crops"

Non-CO2 gases change by aggregated sector. Percentage %

		SCENARIO		
		Reduced	Moderate	Advanced
SECTOR	Grains & crops	0.1081	0.1552	0.2257
	Livestock & meat prod	0.0028	0.0055	0.0111
	Mining & extraction	(0.0028)	(0.0029)	(0.0031)
	Processed food	(0.0399)	(0.0585)	(0.1006)
	Textiles & clothing	(0.0143)	(0.0077)	0.0088
	Light manufacturing	(0.0284)	(0.0330)	(0.0384)
	Heavy manufacturing	0.0106	0.0124	0.0141
	Utilities & construction	(0.0050)	(0.0061)	(0.0078)
	Transport & communic	(0.0047)	(0.0051)	(0.0048)
	Other services	0.0166	0.0198	0.0224

Trade and land transitions

SCENARIO: REDUCED ADVANCED



LLC transitions are attributed to changes in land factor demand

Net cropland increases in a range of 728.40 Km² in *red* to 4,044.98 Km² in *adv*

Pastureland has a net decrease in three scenarios ranging from 1,416.65 Km² in *red* to 3,502.12 Km² in *adv*

Forestland, who although has a net increase of 688.61 Km² in *red* decreases 325.50 Km² in *mt* and 542.86 Km² in the *adv*

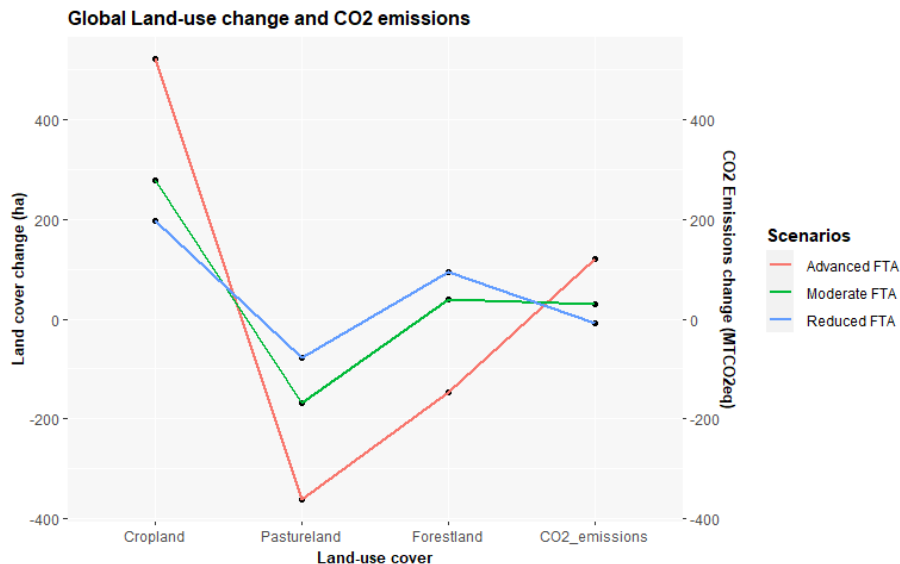
Research* show that the FTA will cause additional deforestation in Brazil ranging from 560.0 to 1,730 Km² to accommodate increases in cropland

*(Arima, Barreto, Taheripour, & Aguiar, 2021)

- Crop output in MERCOSUR can be as high as 2.45%, 1.84% and 1.29% for Paraguay, Brazil, and Argentina respectively
- Emissions of N₂O from crop sectors reach 3.94 Mm ton of CO₂-eq or 89.3% of total N₂O global
- FAOSTAT values for 2021 and estimates for 2031 of oilseeds area in MERCOSUR countries are 627,765 Km² ha and 645,435.8 Km² area. Our results show an increase to 735,610 Km²
- “Cereals and grains” harvest area for MERCOSUR countries increases only 0.44%.
- “Sugar crops” expands 2.27% in Brazil and 16.04% in Paraguay and a reduces – 3.49% in the EU Harvest area increases from 10,916k ha in the baseline to 12,728k ha in MERCOSUR
- “Bovine cattle, sheep, goats” increases up to 2% in Brazil and Argentina.
- Global CH₄ emissions from paddy rice decrease 0.01% while those from cattle ranching, increase 0.028%



GHG emissions and LUC



Global GHG emissions change with LUC CO2 emissions. Percentage %.

		Non-CO2	CO2	GHG
SCENARIO	Reduced	0.028	(0.028)	(0.014)
	Moderate	0.037	0.100	0.084
	Advanced	0.046	0.406	0.314

GTAP-EF model, gives an ex ante estimate of the amount of CO2 emissions from all global LUC

Land transitions in *red* induces a net reduction in CO2 of around -9.1 MT CO2, due to the decrease of pastureland in benefit of forestland activities.

An opposite trend appears with higher levels of demand for land factors. In *mod* and *adv* cropland expansion is supplied against forestland

Net CO2 emissions are 29.21 and 121.02 MT CO2 in *mod* and *adv*. In *adv* we see a gross increase of 546,247 ha of cropland, and net decrease in forestland are the main driver of the CO2 released into the atmosphere

Discussion

- The 121.02 MT CO₂ emissions from LUC emissions represent 99.92% of all total CO₂ emissions changes, and 96.03% of all GHG emissions changes
- LUC CO₂ can increase total GHG gases change by a factor of 24
- The final increment of total global GHG emissions product of the FTA can be as high as 0.31%.
- Counting non CO₂ emissions from agricultural activities, the impacts of AFOLU sector increase to 98.3% of all GHG emissions change
- Our results show consistence with (Novaes, et al., 2017)



THANK YOU!