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The Soy Connection: How Biodiesel Policies Shape Derivatives Markets

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1 – Background and Motivation

2 – Objectives

3 – Methodology and Data

4 – Results

Background and Motivation

- Global energy transition ⇒ vegetable oils for biofuel production.

- Brazil's role:
  - Longstanding ethanol program.
  - Recently, also a key player in the global biodiesel market (12% in 2023)

Policy-driven expansion ⇒ **Rapid growth** of biodiesel → significant ripple effects on **soybean markets** and beyond

2004: National Program for Biodiesel Production and Use (PNPB)
2017: National Biofuels Policy (RenovaBio)
2024: Future Fuel Law (Law No. 14,993)

} Blending mandates + incentives

Background and Motivation

Biodiesel production has been growing fast, with soybean oil as its main feedstock

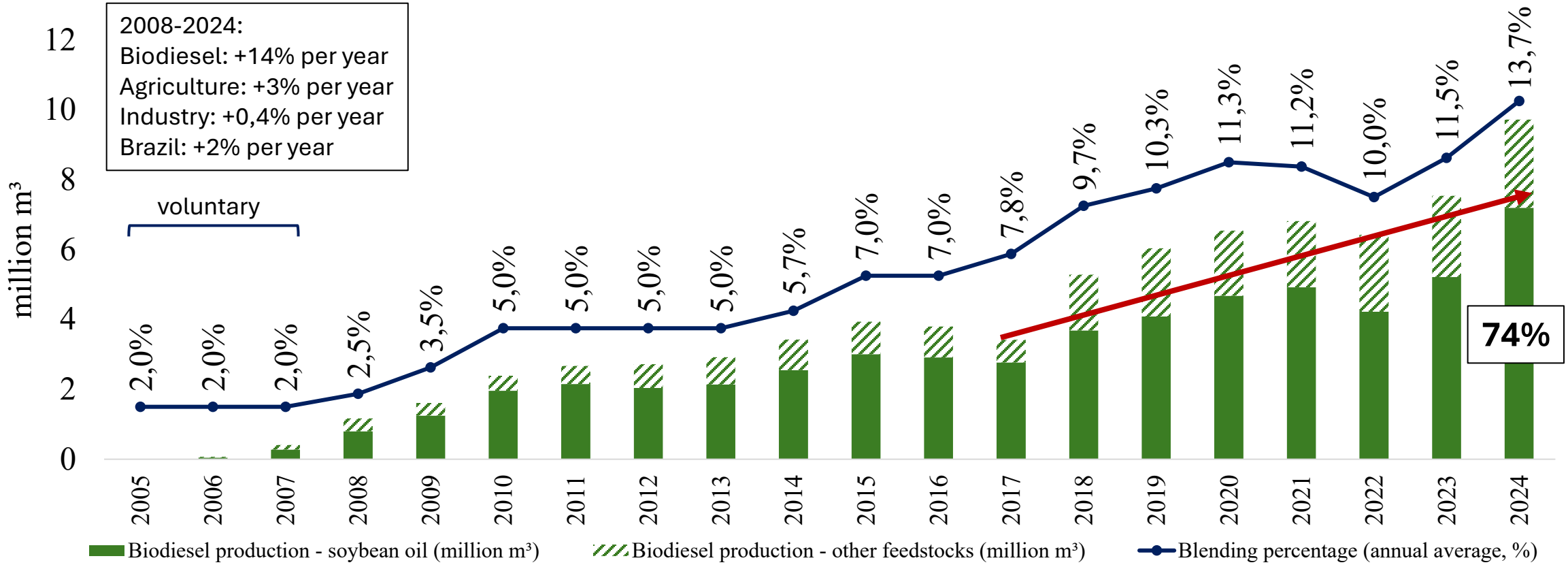
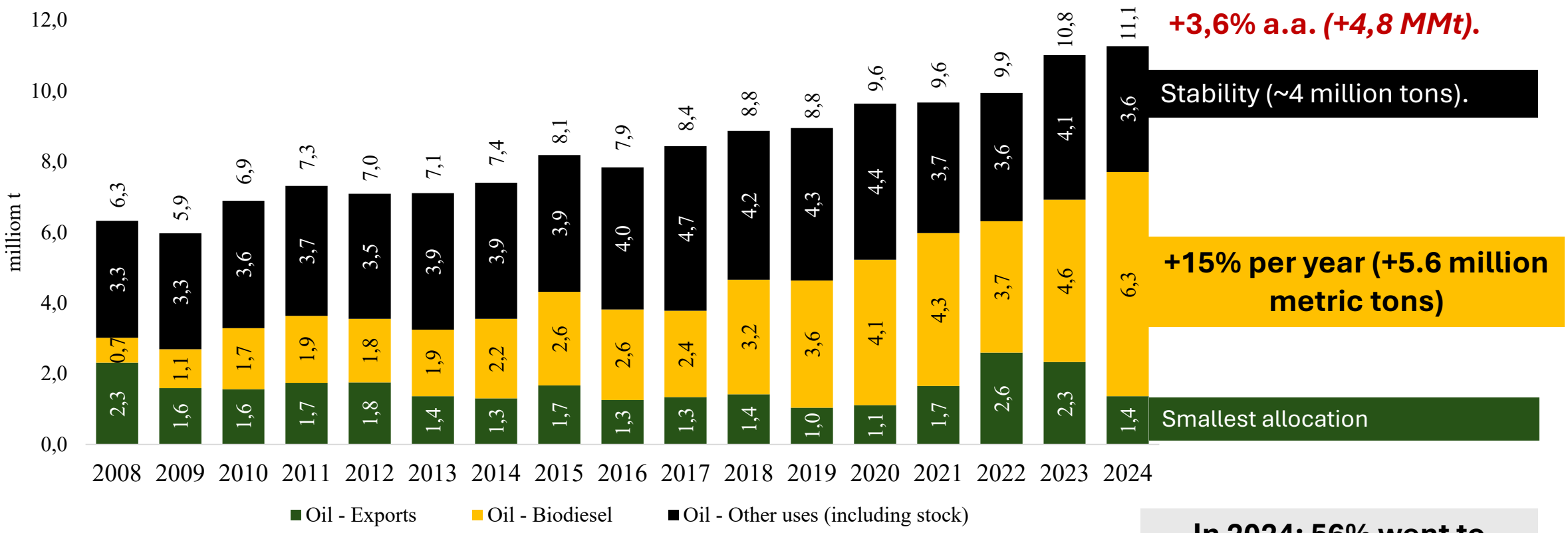


Figure - Evolution of Biodiesel Production from Soybean Oil and Other Feedstocks (million m^3) and the Annual Blending Mandate in Brazil (%), 2005–2024

Source: Compiled by the authors based on data from ANP and Abiove.

Background and Motivation

The expansion of soybean oil use for biodiesel was the main driver of oil production growth.



+3,6% a.a. *(+4,8 MMt).*

Stability (~4 million tons).

+15% per year (+5.6 million metric tons)

Smallest allocation

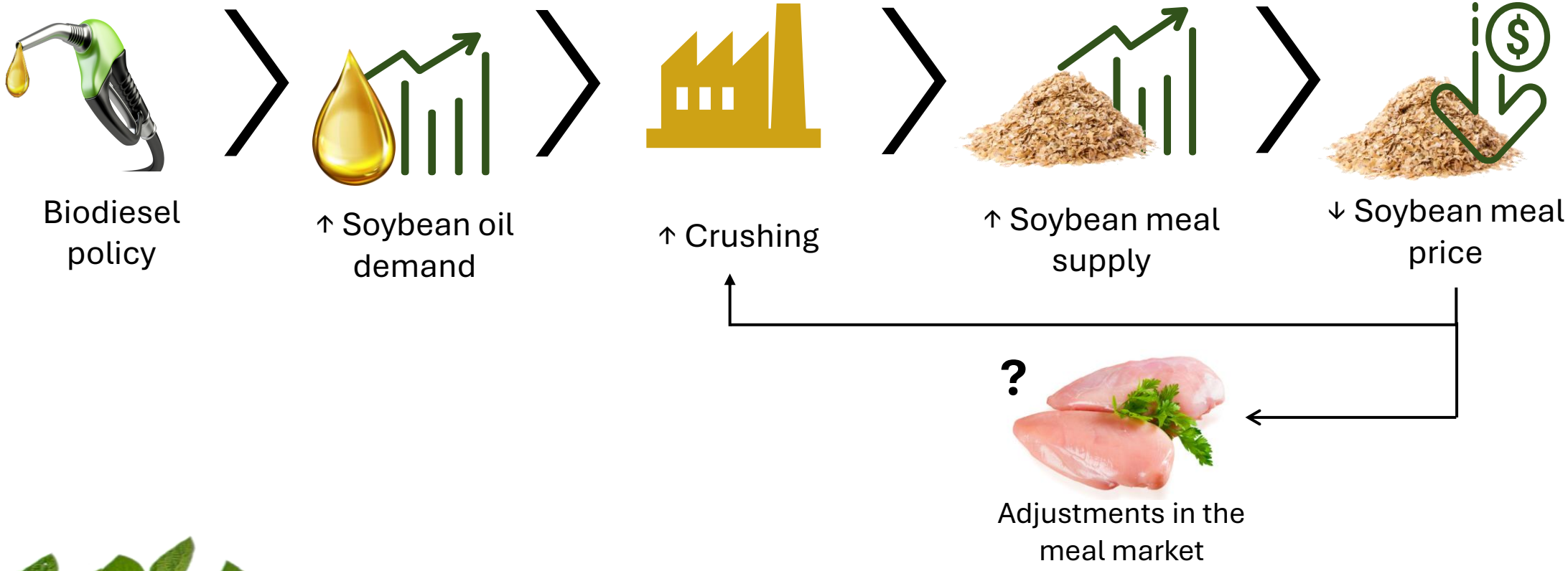
In 2024: 56% went to biodiesel.

Figure - Evolution of Soybean Oil Production and Its Allocation to Biodiesel, Exports, and Other Uses (Food Industry and Stocks), 2008–2024

Source: Compiled by the authors based on data from Abiove.

Background and Motivation

Ripple effects depend on a feature of soybeans: co-production of oil and meal with low oil content (≈18–19%).



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Objectives

To examine

i) How crushing volumes respond to key drivers? Falling soybean meal prices reduce crushing and limit biodiesel expansion?

ii) How the meal market responds?

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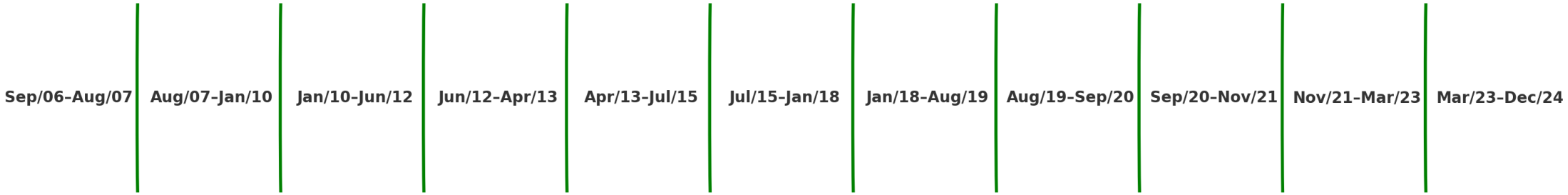
Methodology and Data

- *A theoretical model of soybean crushing was developed (not discussed in this presentation).*
- *Empirical time series analysis:*
  - TVP-VAR: relationships between variables may evolve over time.
  - IRFs are presented by sub-periods, based on structural breaks identified using the Bai-Perron multiple break test.



Methodology and Data

Variable	Description (monthly data)
pg	Soybean grain domestic price
pf	Soybean meal domestic price
po	Soybean oil domestic price
cf	Domestic consumption of soybean meal (beginning stock + production + imports – exports – ending stock)
co	Domestic consumption of soybean oil (beginning stock + production + imports – exports – ending stock) of soybean oil
procs	Soybean crushing (processing)
expf	Soybean meal exports
expg	Soybean grain exports
est	Soybean stock levels

- Seasonal adjustment was applied when necessary;
- The variables were transformed into first logarithmic differences.

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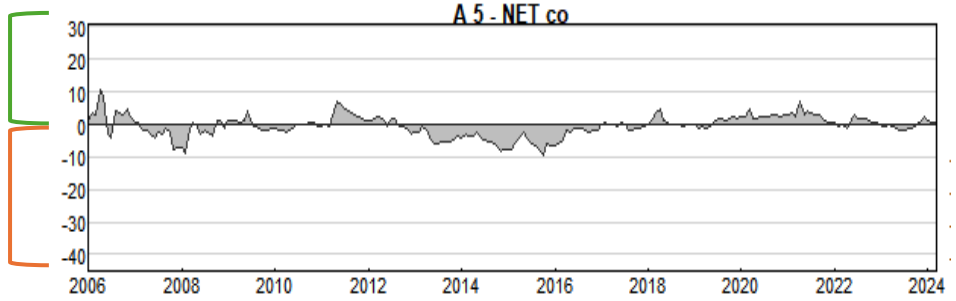
Results

Net connectedness analysis

Domestic oil consumption

net transmitters

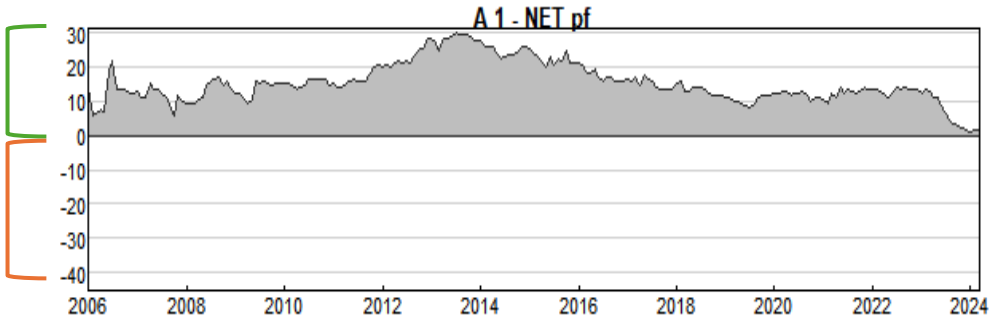
net receivers



Domestic meal price

net transmitters

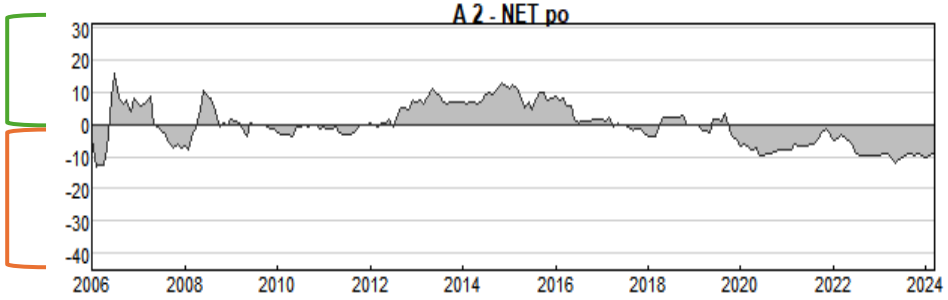
net receivers



Domestic oil price

net transmitters

net receivers



The **soybean meal price** is a major source of shocks, but its influence has been declining over time.

Domestic oil consumption, which used to respond to prices, has increasingly taken the lead in driving the soybean and biodiesel chains.

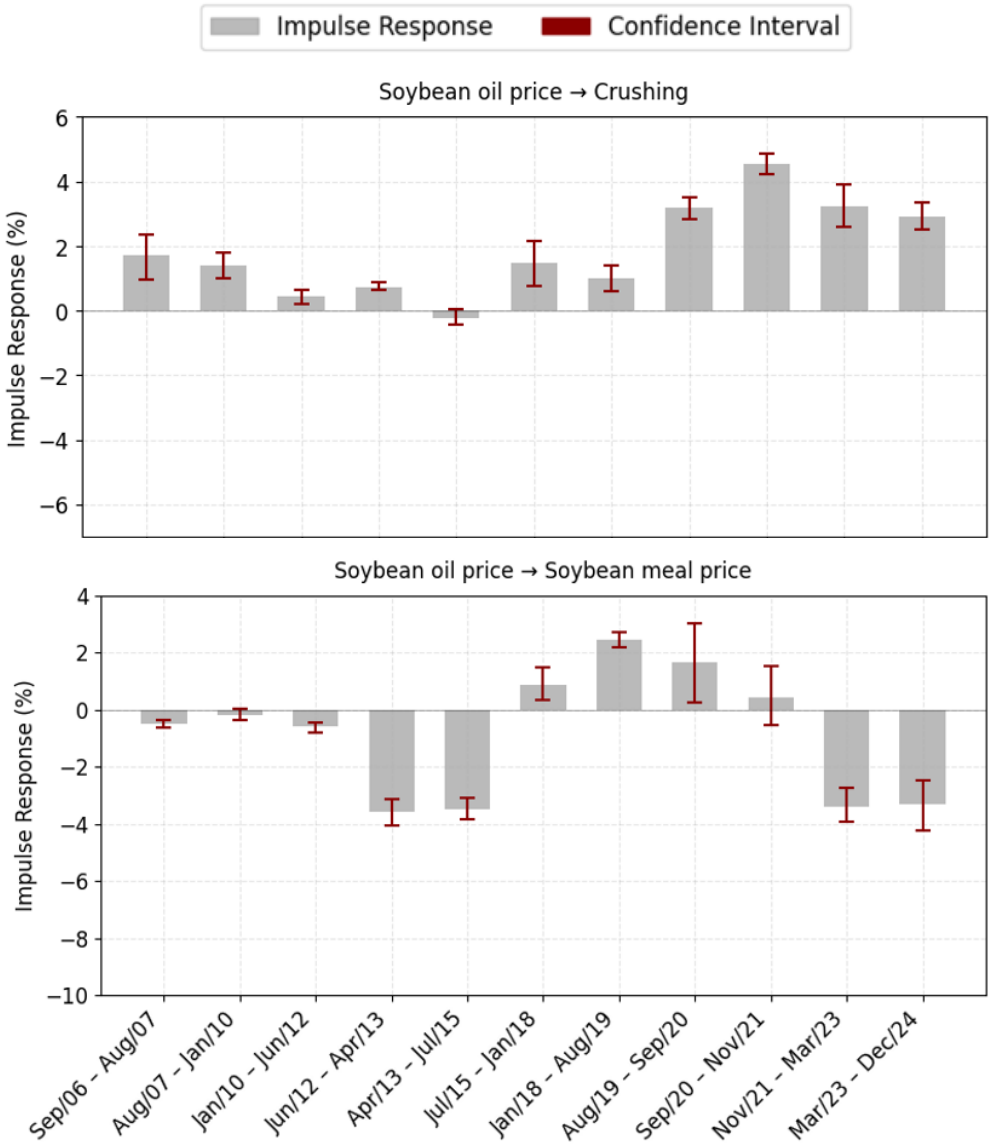
Results

Can a drop in soybean meal prices limit crushing and the expansion of the biodiesel industry?

[i] ↑ Oil price → ↑ Crushing

(even with the usual negative effect from meal price decline)

BUT: the sharper the ↓ in meal prices, the more moderated the crushing response tends to be.

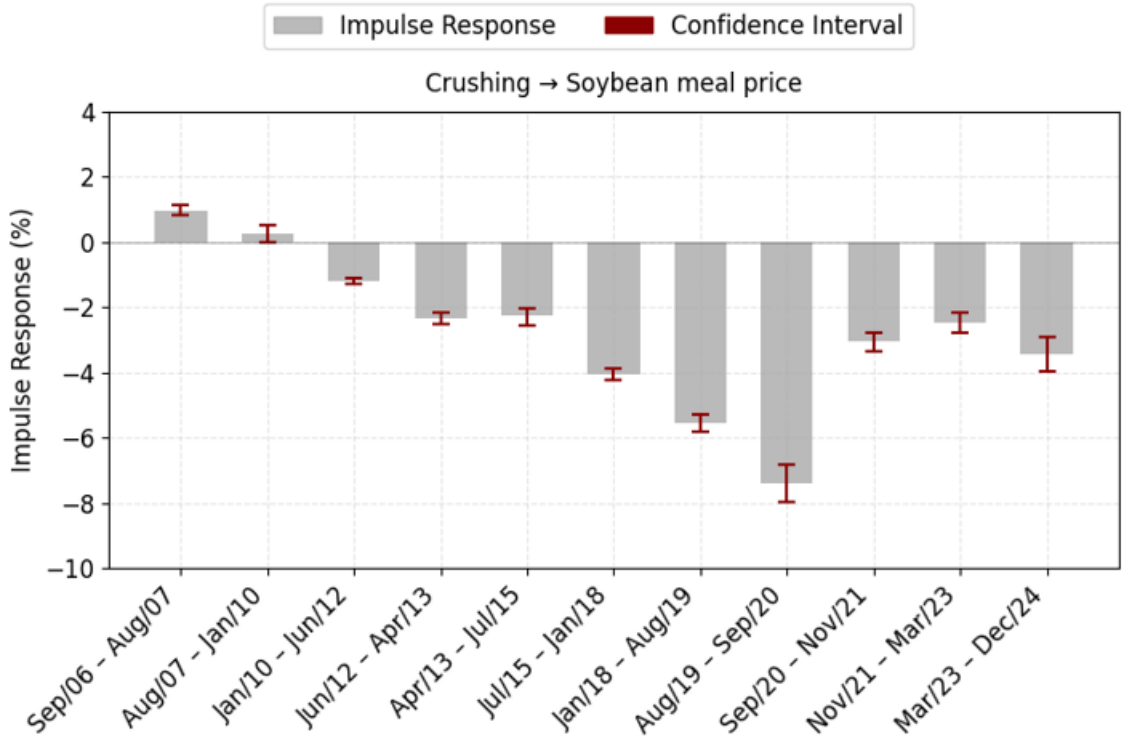


Results

How much do meal prices fall?

[ii] ↑ Crushing → ↓ Meal price

BUT: Response varies over time.



>>>> Potential to reduce livestock production costs.

Results

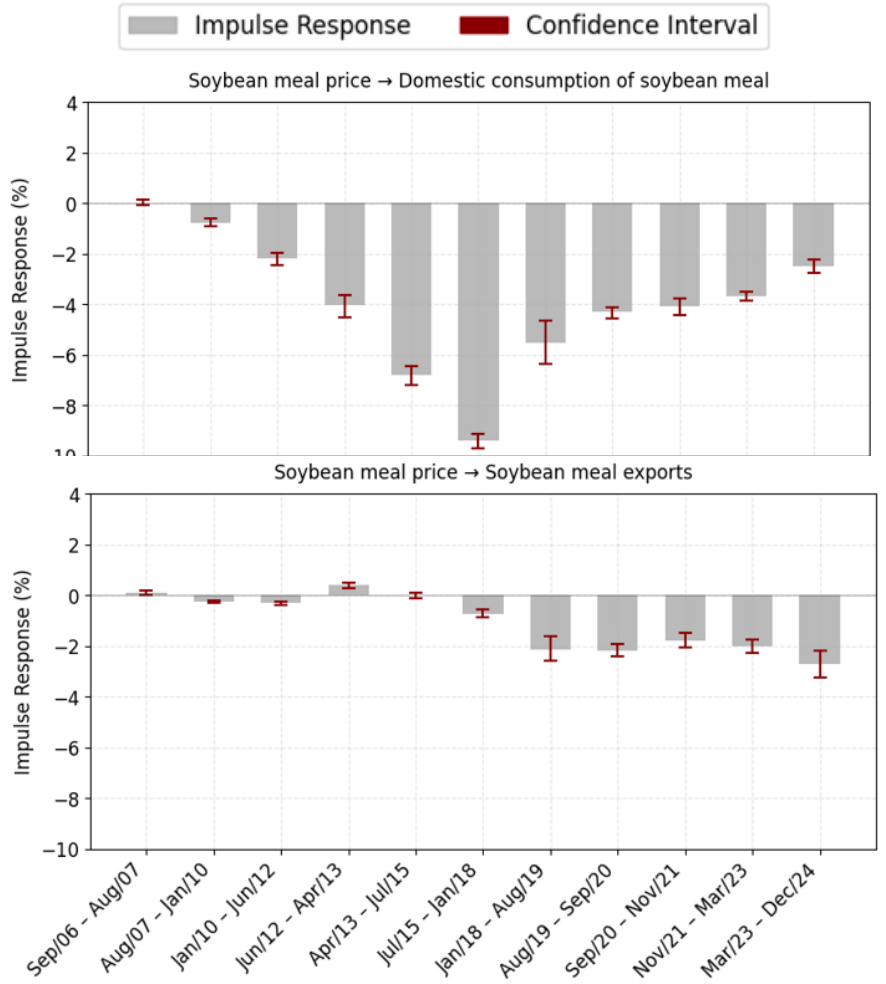
How do meal consumption patterns respond to lower prices?

[iii] ↓ Meal price → ↑ Domestic consumption

[iv] ↓ Meal price → ↑ Meal exports

Sensitivity of domestic consumption has varied greatly over time

Overall, domestic consumption is more price-sensitive than meal exports



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