Land scarcity and rent-seeking

Exploring interactions in a stylised SFC model

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Motivation and research question

- Fertile agricultural land is likely to be increasingly scarce
- Losses of ecosystem services, climate impacts, increased demand for biofuels, nature conservation targets
- Global Biodiversity Framework (targets 2 & 3) aims to protect and conserve 30% terrestrial ecosystems by 2030
- Under-developed understanding of macroeconomic implications of land constraints

Research question

What does a novel ecological macroeconomic model, that accounts for land rents and 'strong sustainability', reveal about the macroeconomic impacts of land constraints?

Literature review

- Existing studies (e.g., Lanz et al., 2018; Waldron et al., 2020; Naso et al., 2022; Prodani et al., 2023) use neoclassical models
- Find land constraints cause very minor economic losses because productivity increases to compensate for loss of land input
- 'Weak sustainability' perspective $\longrightarrow$ assumes rapid transition occurs automatically
- Insights from ecological macroeconomics:
  - Biophysical limits to technological compensation
  - Green transitions influenced by innovation, finance, uncertainty
  - Gap: land & nature as critical inputs, future land constraints
- Important because control over scarce resources may generate rent-seeking that threatens green transition (Stratford, 2020)

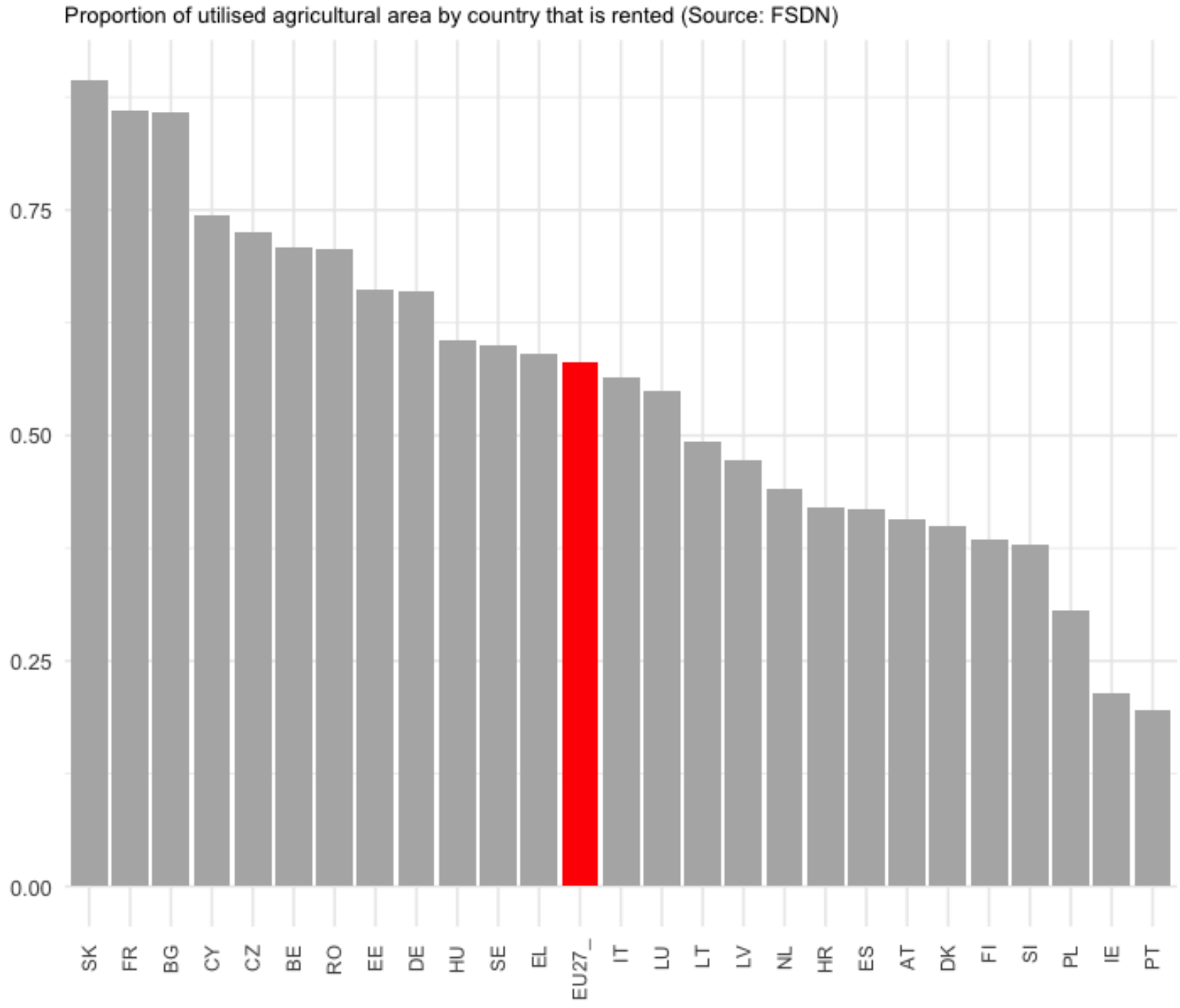
Insights from Classical political economy

- Land has special status as production input due to (i) finite supply; (ii) location specific qualities; (iii) limited substitutability
- Enables those who own land to charge rents as condition of access:
  - *Absolute rents* reflect socioeconomic power relations (Marx)
  - *Differential rents* reflect qualitative differences between different parcels of land (Ricardo and Marx)
- Following Christophers (2020) & Stratford (2020), we define rents as incomes derived from control over scarce, non-reproducible assets
- Drawing from Fine (1979), Quadrio-Curzio & Pellizzari (2018), Palma (2023), Teles (2024), Porcile & Lima (2023), Zaffari (n.d.)
- Distinction between rents and profits. When firms do not own land:
  - rents are a cost that do not contribute to production of output
  - rents must be funded out of current output
  - may influence prices, investment, growth & distribution

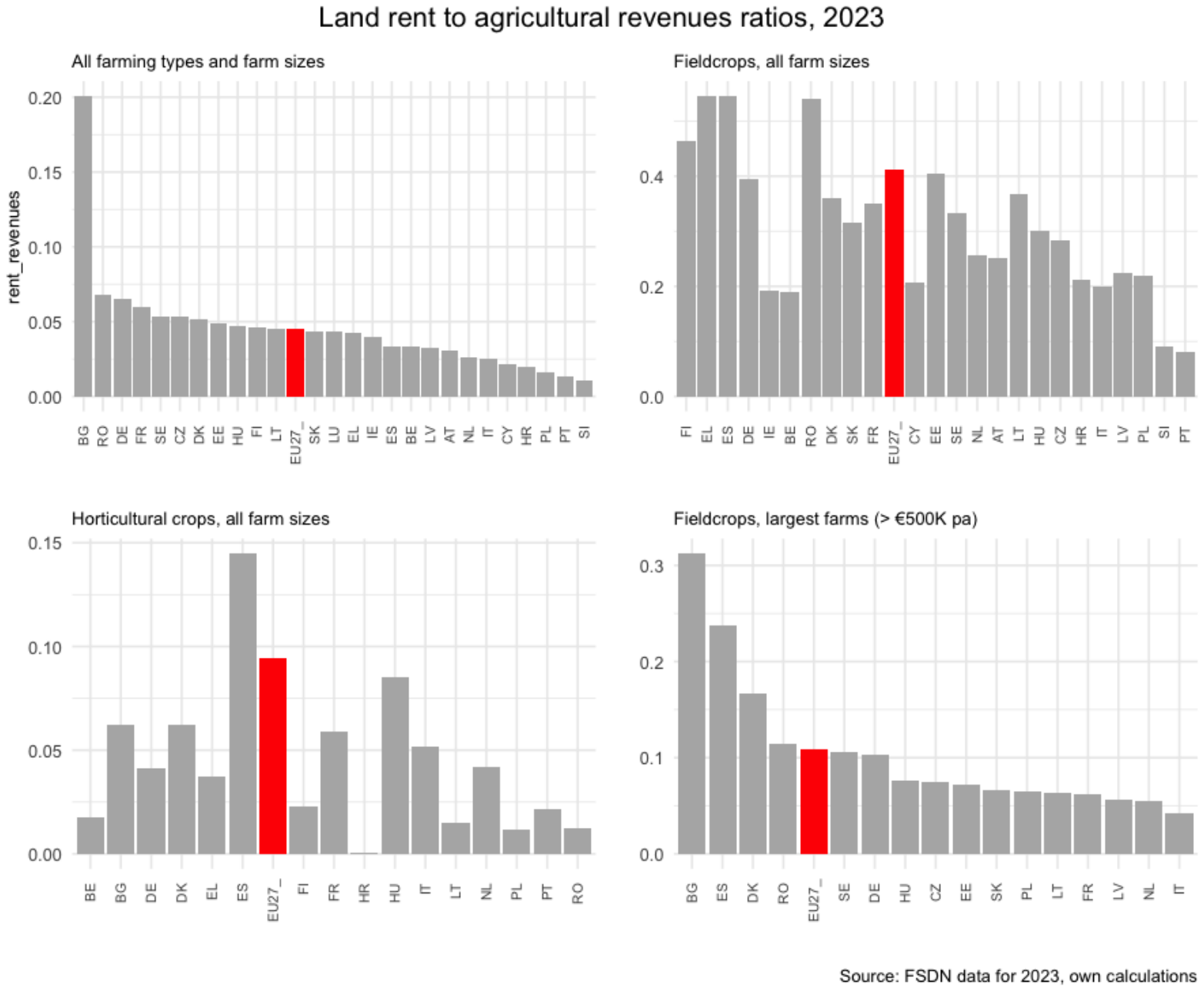
Exploring land scarcity and rent-seeking in an SFC model

- Integrate land use dynamics into multi-sector SFC-IO model of high-income, closed economy
- Focus on agricultural land use: largest land footprint, land rents are non-trivial cost of production, 'macro-critical' sector
- Novel features:
  - introduce land rents as transaction flow btw farms & rentiers
  - endogenous technical change in agri sector, but substitutability bound by biophysical limits $\longrightarrow$ strong sustainability perspective
- If suddenly scarce land allows landlords to capture more rents...
  - Under what conditions could increasing land rental costs for the agricultural sector affect the macroeconomy?
  - What are the effects on the transition to land-saving technologies in the agricultural sector?

Rented agricultural land in the European Union



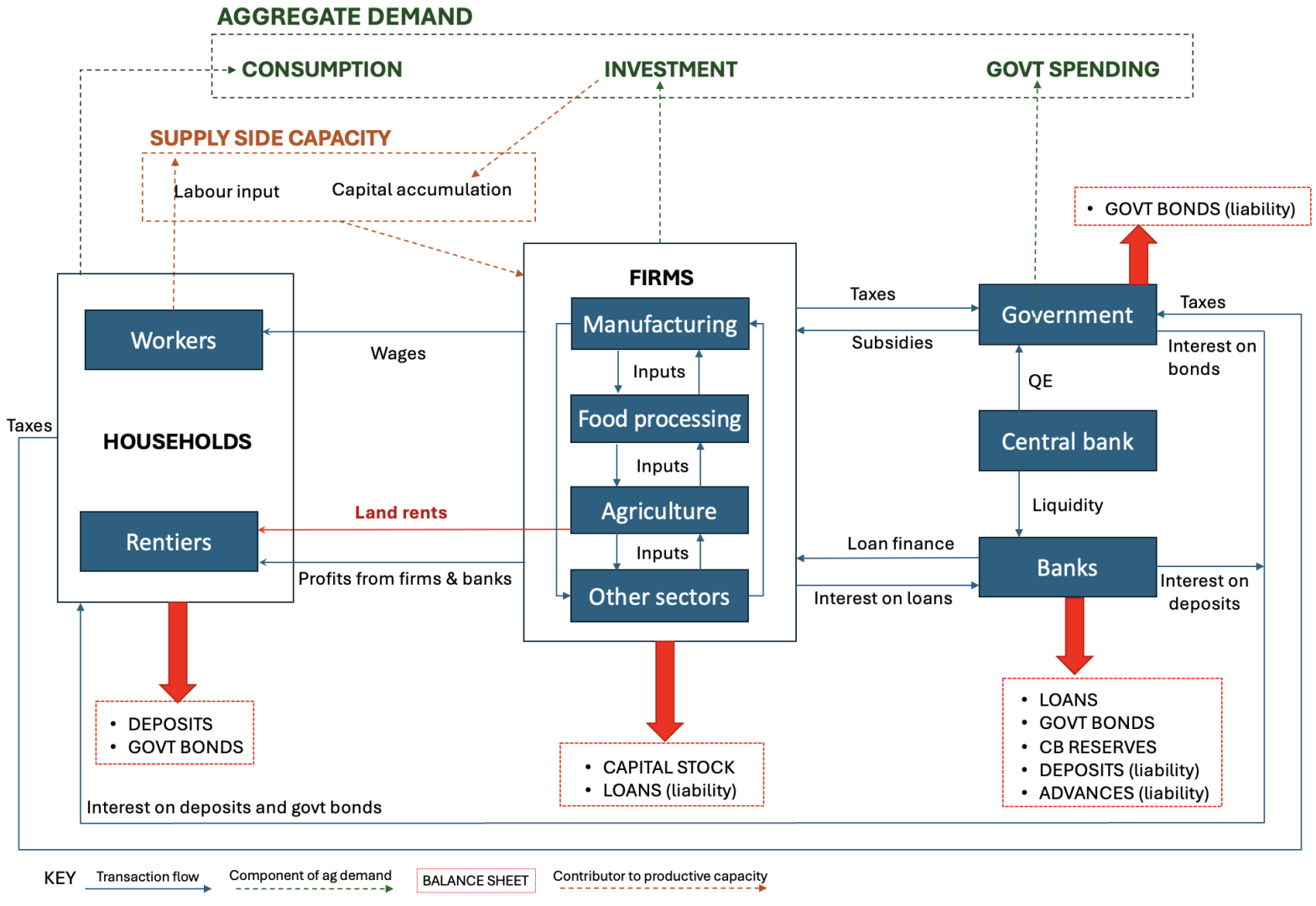
Agricultural land rents in the European Union



Source: FSDN data for 2023, own calculations

The Model

Integrating land rents into a stylised SFC-IO model



Key equations

- Kaldor-Verdoorn law for sectoral productivity growth:

$$g_{\lambda_j} = \chi_1 + \chi_2 \cdot g_{s_j}$$

- Sectoral investment demand depends positively on capacity utilisation and expected profit rates adjusted for inflation:

$$g_{k_j} = g_{k_0} + \gamma_1 \cdot u_{j-1} + \gamma_2 \cdot \left(r_j^e - \frac{1}{2} \sum_{i=1}^{2} \pi_{t-i} \right)$$

- Autonomous investment demand influenced negatively by economic uncertainty, proxied by inflation volatility:

$$g_{k_0} = gr_0 - \gamma_3 \cdot \nu$$

- Food is modelled as an essential good

1. Land rent as a transaction flow between agricultural firms and rentier households

Key assumptions

- Farmers need land to produce and must pay rents to access it
- Only the agricultural sector pays land rents
- All land is privately owned by rentier households
- Land has no underlying value, only generates rents
- All land parcels are qualitatively identical
- Land is fixed in supply, no land markets

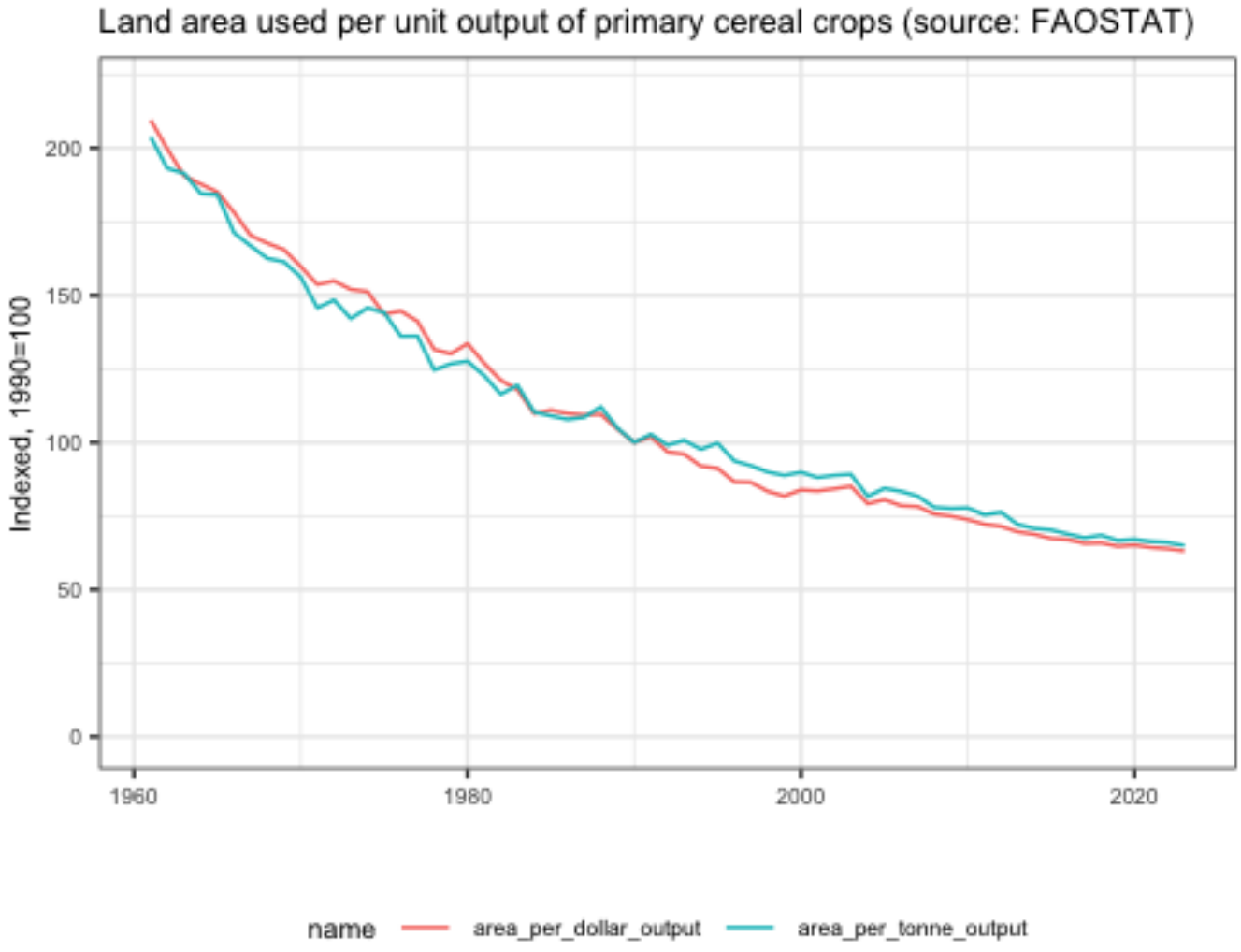
2. The rent bill (RB) equation

- Reviving Classical concept: *rent as share of product* (Fratini, 2013)
- 'Strong sustainability' approach to land/capital substitutability

$$RB = \phi \cdot S_a \cdot \eta$$

- Landlords' claim: $\phi = f(\phi_{max}, \mu)$:
  - Available cashflow: ability of agri firms to pay rent after accounting for other key costs (ϕ_{max})
  - Land availability: where increased scarcity (μ) increases landlord power to charge as much as firms can afford
- Land use efficiency $\eta = f(\kappa)$: firms can invest in land-saving technologies (new capital vintage) - efficiency gains are bounded

Data on global agricultural land use efficiency



3. Technical change in the agricultural sector

- In high-income economies, tech frontier is precision agriculture
- First, firms decide their desired *quantity* of investment
- Then, they allocate a portion (β) of gross desired investment demand to the new capital vintage

$$\beta = \beta_0 + \beta_1 \cdot \phi - \beta_2(r^L_{new} - r^L_{old}) + \beta_3 \cdot e^{\beta_4 \cdot \kappa}$$

- Endogenous demand for new vintage stimulated by the rent claim on income, the loan rate differential, and diffusion of new technology
- Baseline scenario: 20y timeframe for the new tech to be widely adopted, (75% of the capital stock replaced).
- Rapid transition scenario: 10y timeframe for wide adoption

4. Integrating land rents into prices

Building on Fratini (2013) and Zaffari (n.d.)...

Agricultural prices:

$$p_a = (1 + \psi_a) \cdot UC_a \quad + \quad \alpha \cdot \frac{RB}{k_a \cdot u^N \cdot pr_K}$$

- Farms pass on a portion (α) of rent bill (RB), depending on market power
- Dynamic mark-ups: farms seek to cover required retained earnings and loan servicing; other sectors seek to make a return on capital
- Baseline scenario: $\alpha = 0.7$, sensitivity with $\alpha = 0.35, 0.55, 0.75$

Scenarios

To understand effects of land scarcity, we simulate a shock where:

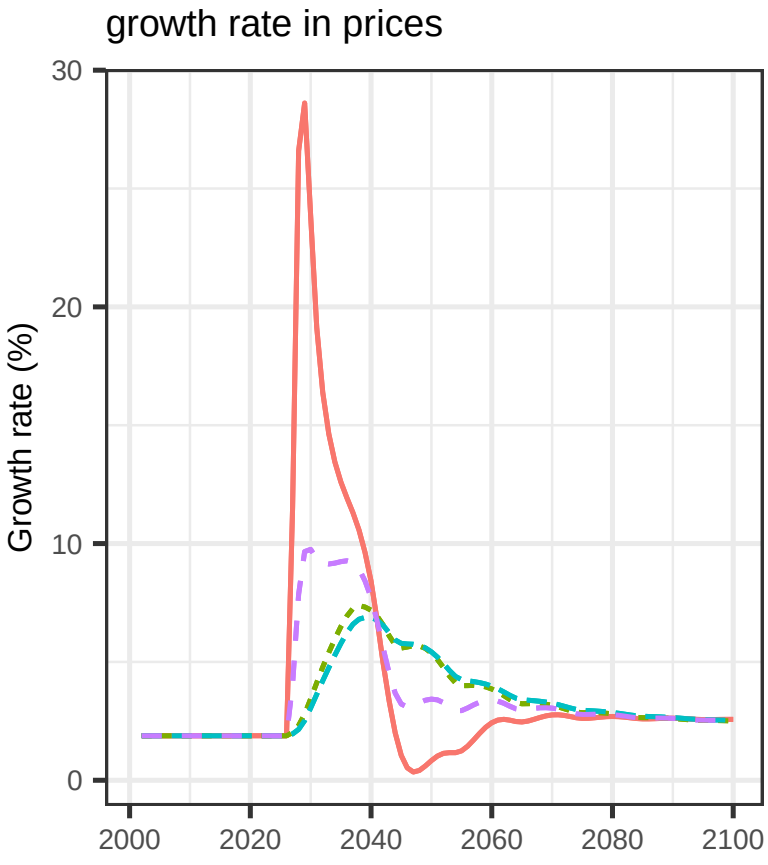
- agricultural land becomes rapidly scarce over 5yr
- corresponding to time frame of the 30x30 targets
- similar shock as explored in previous studies (e.g., Prodani et al., 2023)

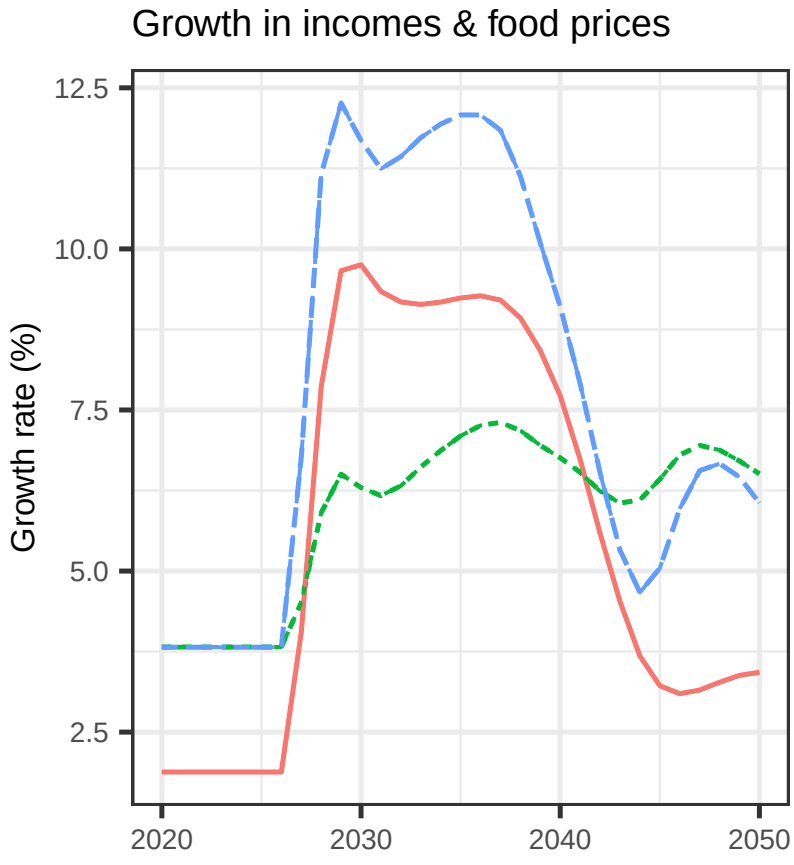
To test different substitutability assumptions, we explore two capital transition scenarios:

	Baseline scenario	**Rapid scenario**
Transition speed	20 years	10 years
Alternative pathways	High/low pass-thru of rents to prices	Loan vs profit financing

Results

Baseline scenario: high-pass through of rents to prices

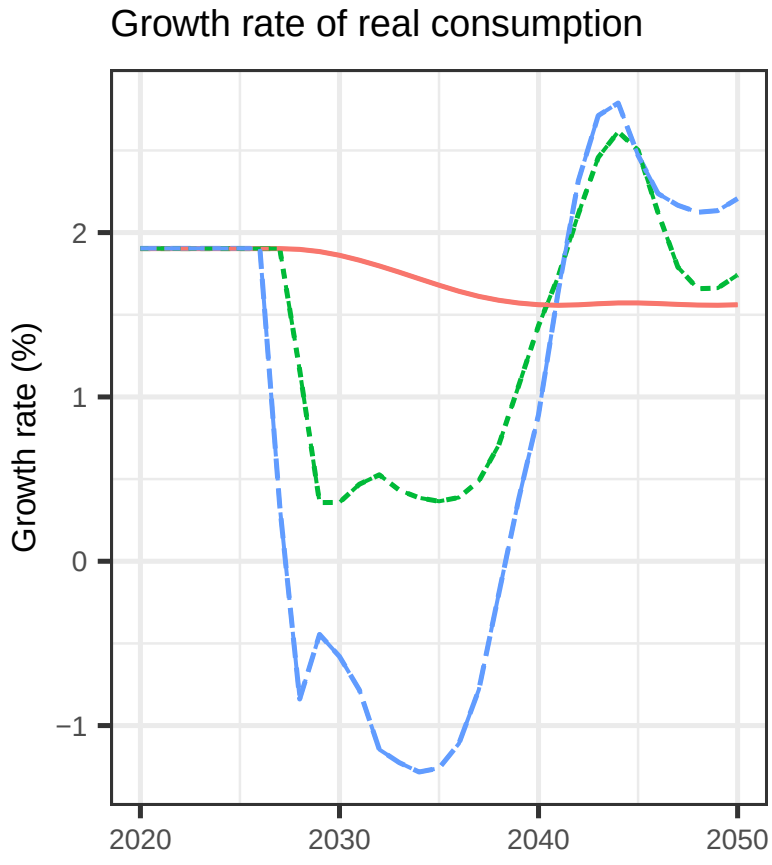


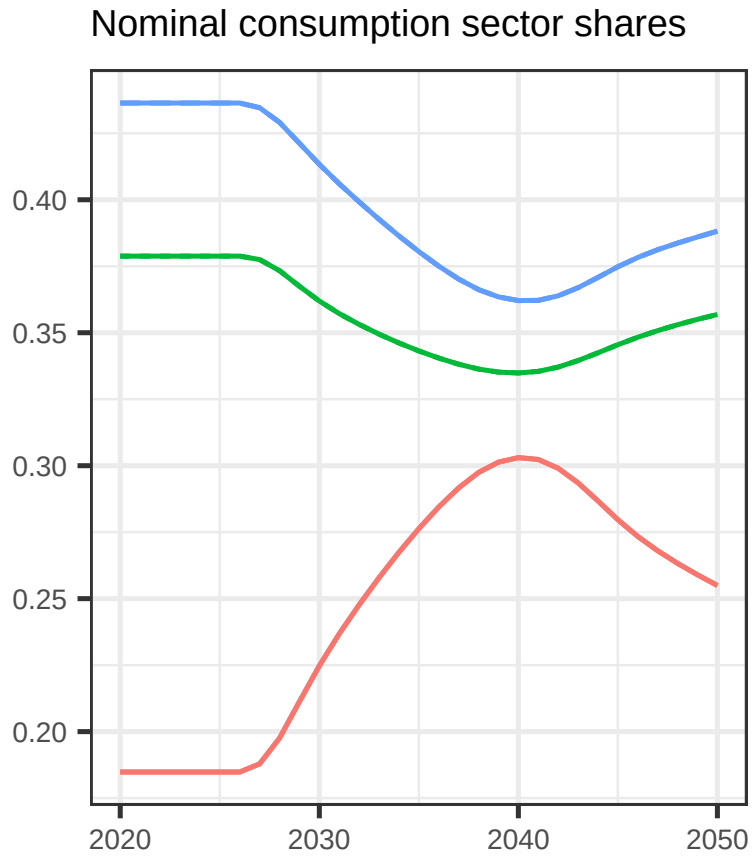


agri manuf other food

Food prices Worker income rentier income

Real consumption growth falls; households prioritise food





Real wage rate

Real consumption

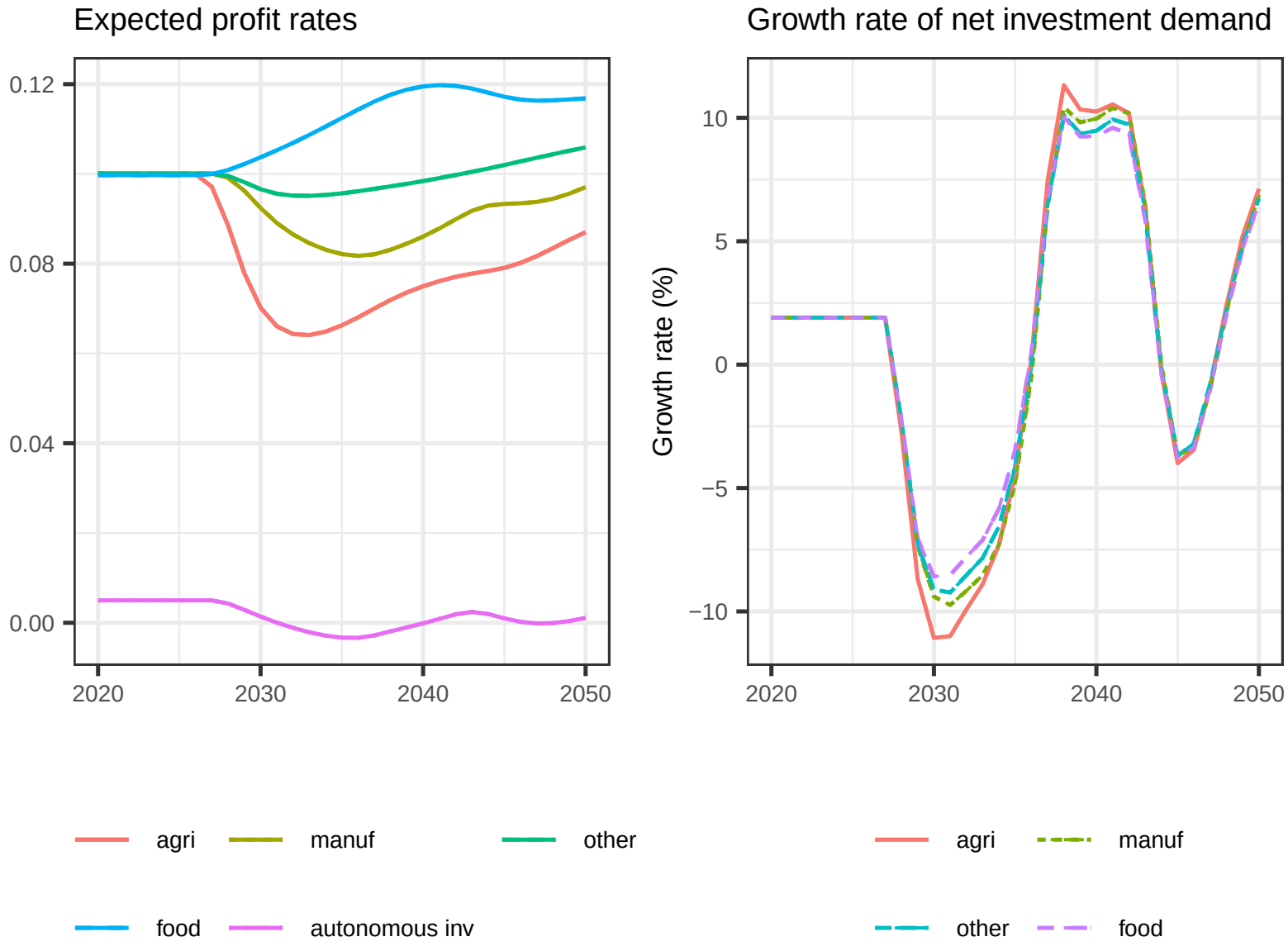
Workers real disposable income

Food

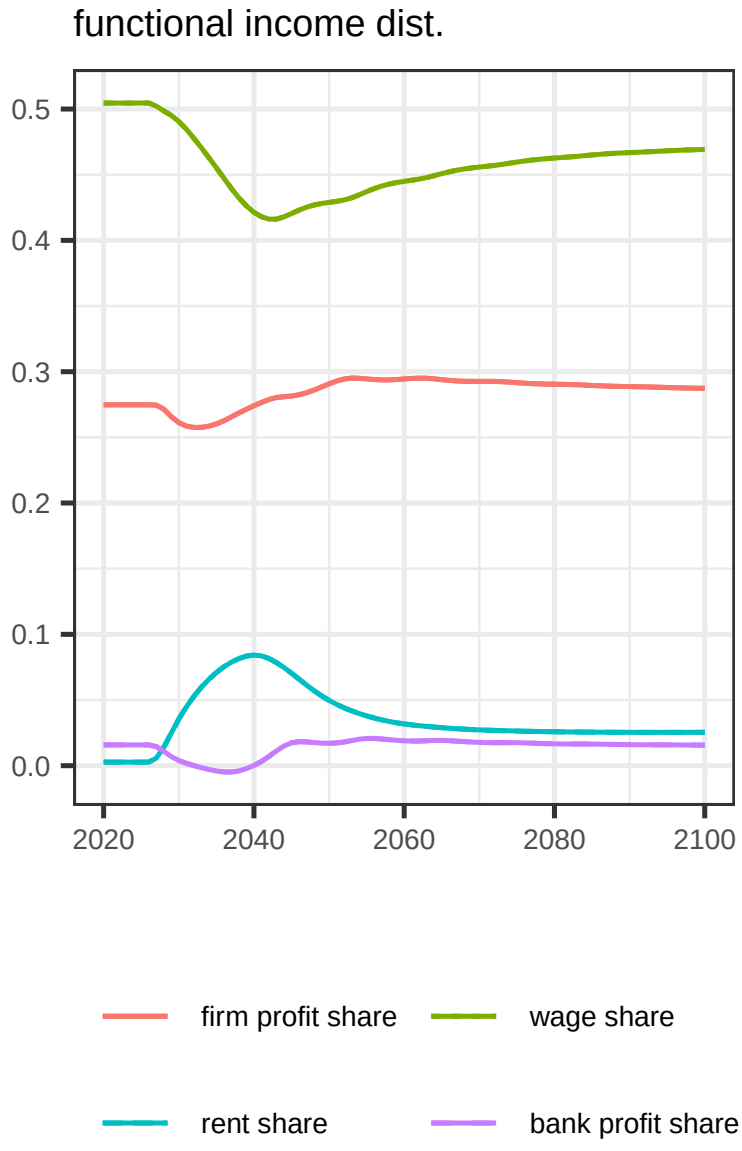
Manuf

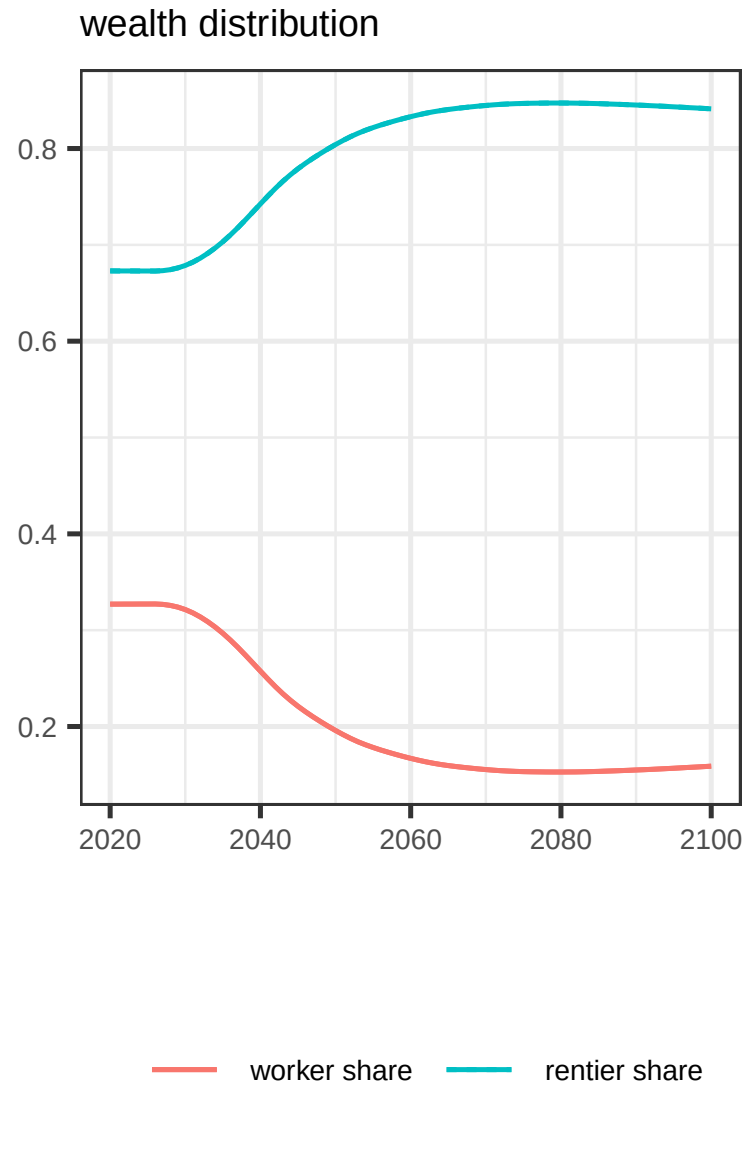
Other

Effects on firm net investment

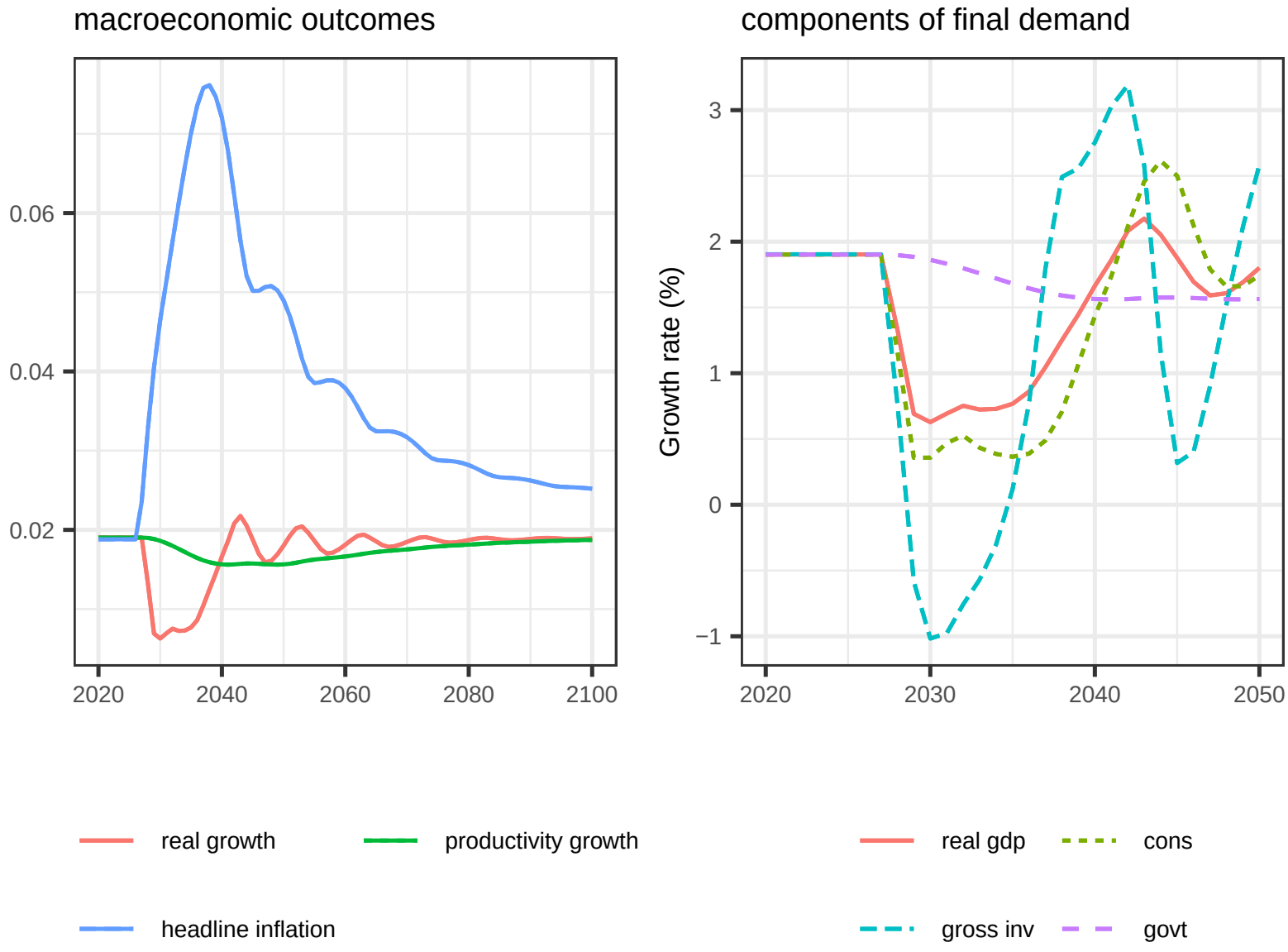


Functional income and wealth distribution

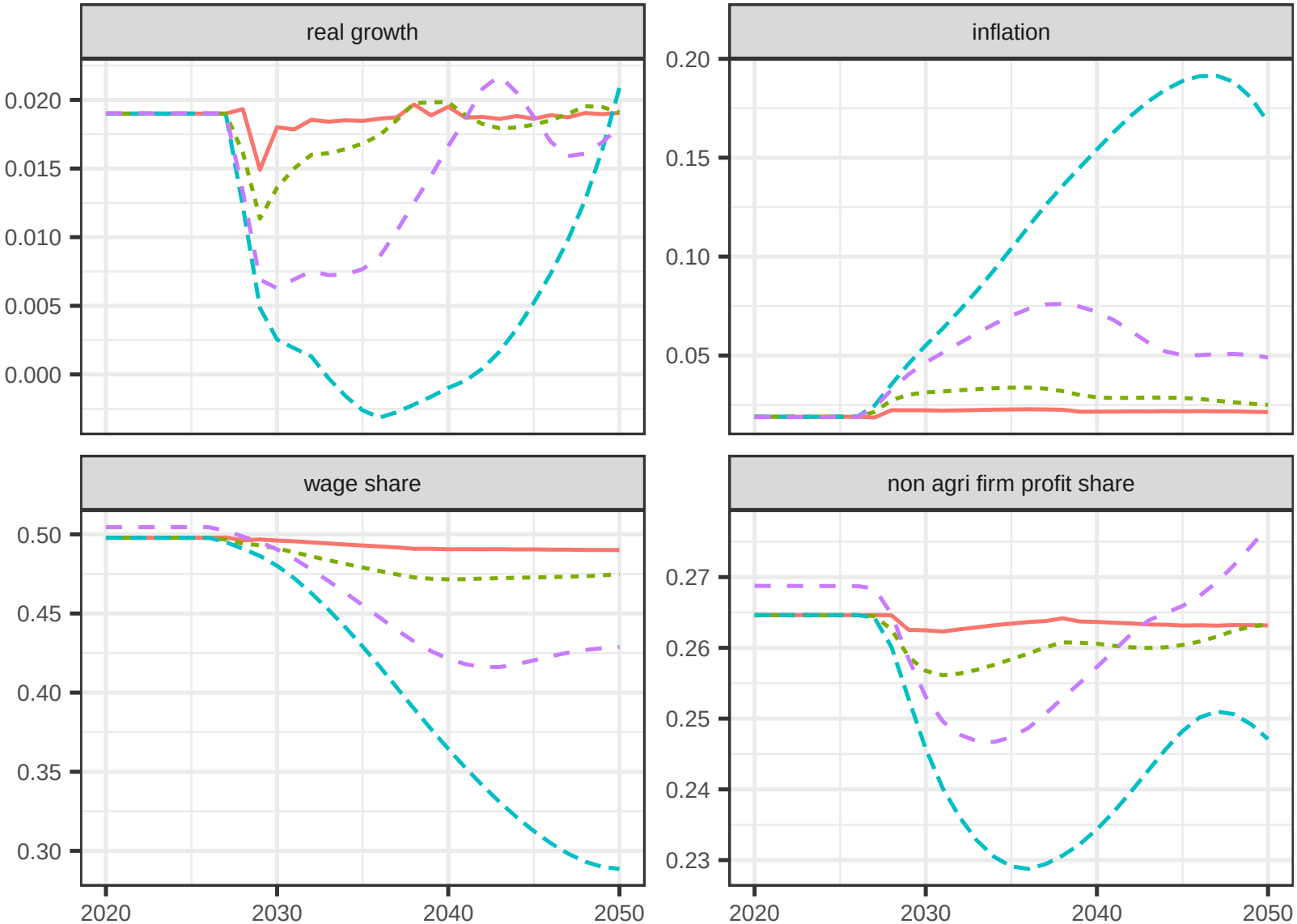




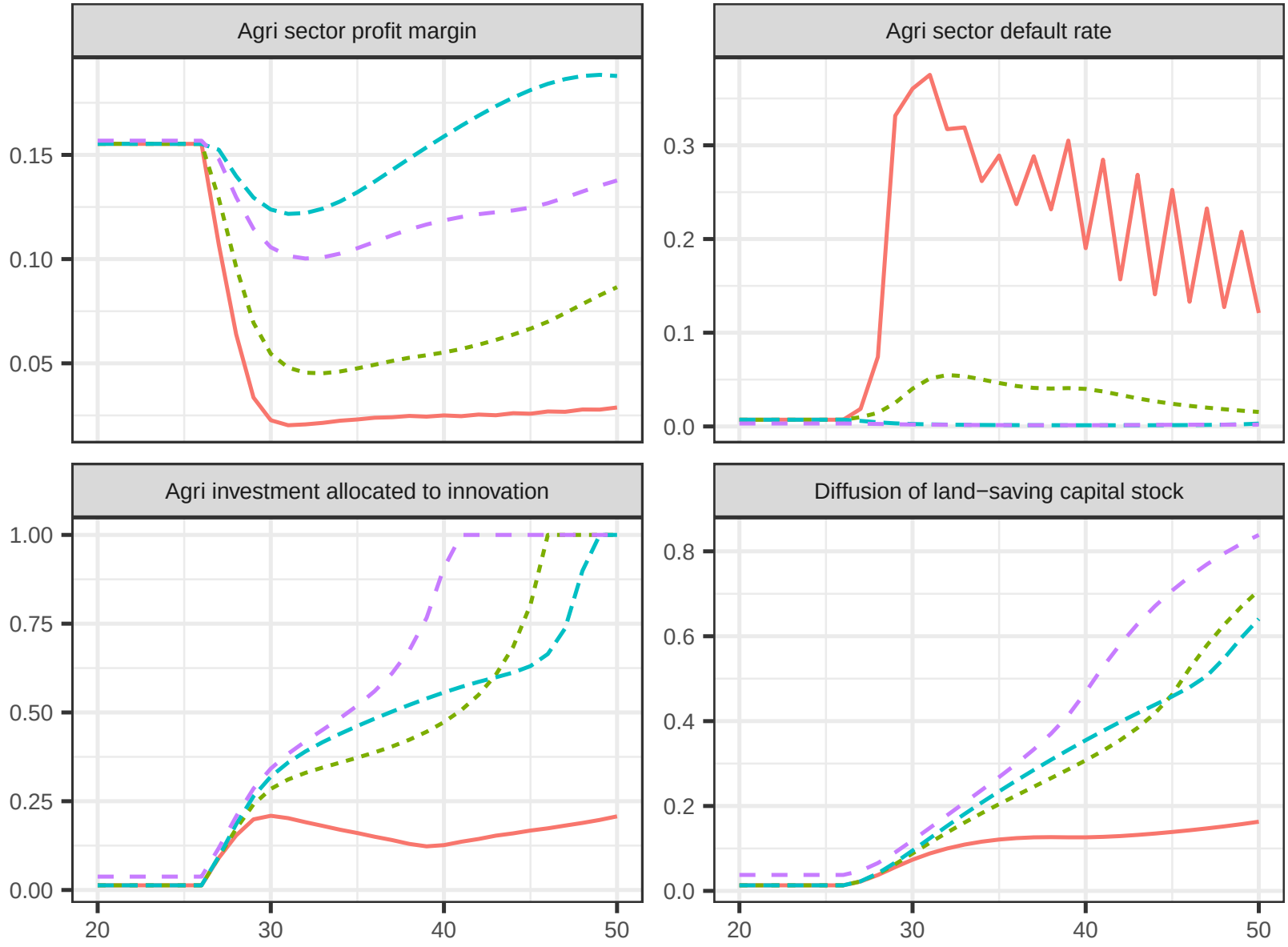
Macro-level results



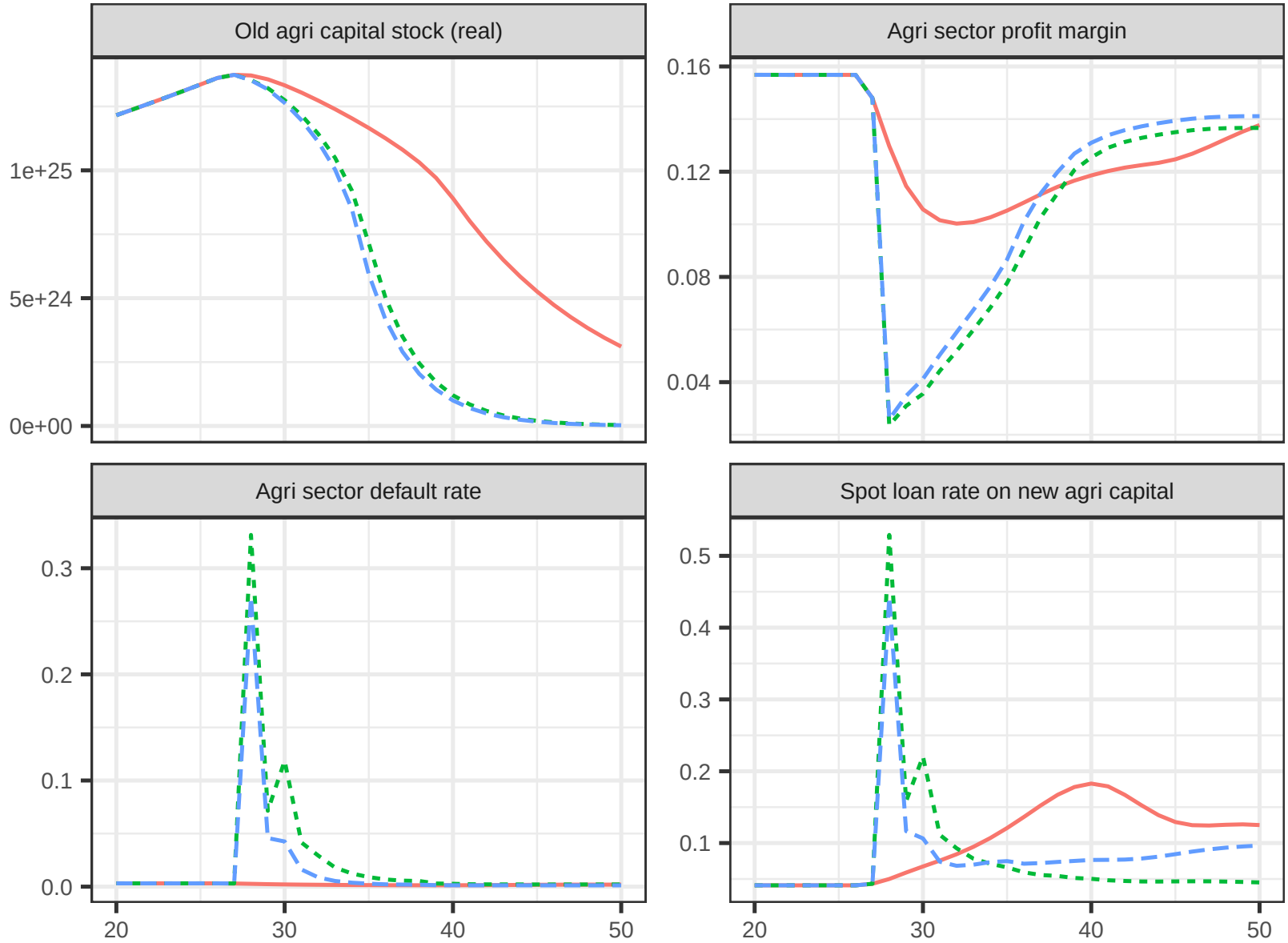
Lower pass through mitigates macro-level effects. . .



. . . but at the expense of health of agricultural sector



Rapid transition also has negative effects on agri sector



Discussion of findings

Economic effects of land scarcity determined by who stands to gain and who to lose from rent-seeking: banks & non-agri firms able to protect income shares

When farms pass on most of increase in rents, we see...

- Macro-level impacts (stagflation) & rising inequality
- Even though agri is small % GDP & only sector paying rents

When farms absorb most of increase in rents...

- Macro-level impacts are mitigated but agri sector suffers
- Slows technological shift to land-saving technology
- Similar effects from forcing a rapid transition

Conclusion: substituting scarce land with capital cannot be assumed to proceed without generating some transition risks

Future work

- Redistributive policies are warranted (to be explored soon in this model...)
  - taxing land rents
  - subsidise green transition in agriculture
  - support households facing higher food prices
- More radical reforms: addressing structural inequalities in land ownership, separation of agricultural land ownership from farming
- Limitions of model: no trade, inventories, high income economy context only
- Future work: integrating land as financial asset, interaction with loans (as collateral) and wealth (as portfolio asset)

Thank you! Questions and feedback. . . ?

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