HUMBOLDT-UNIVERSITÄT ZU BERLIN

HOW PRO-POOR ARE PRODUCTIVITY GAINS IN AGRICULTURE? THE CASE OF THE NATIONAL AGRICULTURAL INVESTMENT PLAN OF BENIN

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Background – Investments in Agriculture

- Agricultural investments in developing countries:
  - → higher productivity/production
  - → lower food prices
  - → economic growth, poverty-alleviation (Breisinger et al. 2011)

- Producers may be adversely affected:
  - Cost reductions vs. decline in output prices
  - → Agricultural treadmill (Cochrane 1958; Evenson and Gollin 2003)
  - Inelastic demand for staple crops
  - → Declining prices of more productive production factors
  - → More inequality (rural ↔ urban, poor ↔ rich)

Aim of this study: Analyzing distributive effects of increases in agricultural productivity and options to make such increases more pro-poor

Benin's Agriculture and the PNIASAN

- Agriculture: 23% of GDP, 43% of labor force (World Bank 2020 a,b)
  - → Important sector for Beninese economy and development
  - → Low productivity
- National Plan for Agricultural Investment and Food and Nutritional Security (PNIASAN)
  - 2017 – 2021
  - Main aim: boost agricultural productivity, reduce poverty
  - Measures:
    - Better access to agricultural inputs
    - Training & extension
    - Improved infrastructure
    - Mechanization
  - Financing:
    - 2.7 billion USD
    - Annually: 140 USD/ha, 5% of GDP in 2015
    - 44% private funding
    - → 6% increase in overall government budget

Wikimedia, 2011

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Yield, production and implicit area growth rates under the PNIASAN, 2021 compared to 2011-15 average

	Yield	Production
	%	%
Cotton	69.9	106.4
Pineapple	35.5	63.0
Rice	51.0	78.1
Cashew	84.6	77.8
Cassava	43.6	46.1
Maize	11.4	42.3
Tomato	21.1	25.0
Pepper	15.2	25.0
Potato	14.6	25.0
Onion	13.7	25.0
Okra	13.4	25.0
Leafy vegetables	10.6	25.0
Sum		

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(MAEP 2017, p.28)

Yield, production and implicit area growth rates under the PNIASAN, 2021 compared to 2011-15 average

	Yield	Production	*Implicit Area*	
	%	%	%	*+1,000 ha*
Cotton	69.9	106.4	*21.5*	*55.6*
Pineapple	35.5	63.0	*20.3*	*1.1*
Rice	51.0	78.1	*17.9*	*11.7*
Cashew	84.6	77.8	*-3.7*	*-12.8*
Cassava	43.6	46.1	*1.8*	*4.7*
Maize	11.4	42.3	*27.8*	*261.1*
Tomato	21.1	25.0	*3.2*	*1.2*
Pepper	15.2	25.0	*8.5*	*2.1*
Potato	14.6	25.0	*9.1*	*0.0*
Onion	13.7	25.0	*9.9*	*0.4*
Okra	13.4	25.0	*10.2*	*1.5*
Leafy vegetables	10.6	25.0	*13.0*	*1.4*
Sum				*328.0*

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(MAEP 2017, p.28)

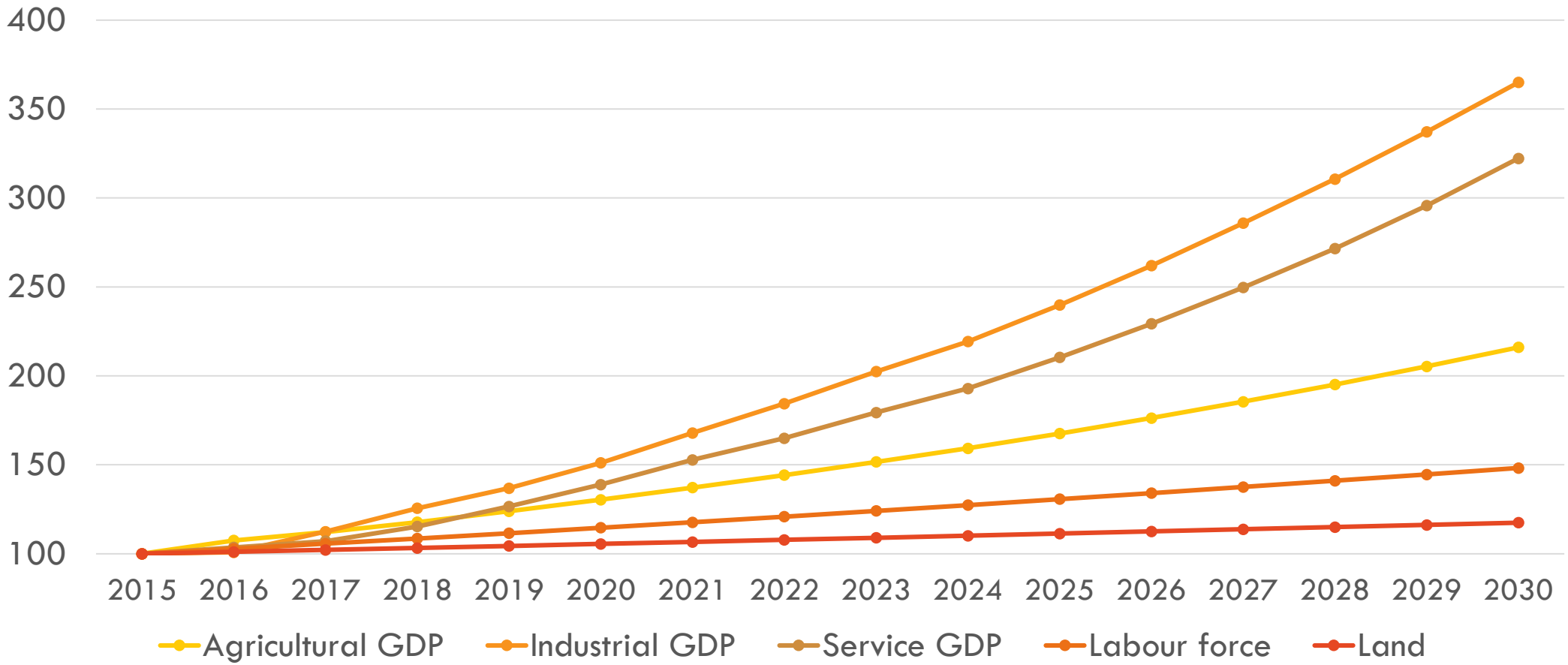
Modelling Approach – General Setup

- Recursive dynamic CGE model based on Diao and Thurlow (2012)
- 2015 Social Accounting Matrix (SAM) for Benin:
  - 4 primary factors: skilled labor, unskilled labor, capital, and land
  - 10 household groups (rural and urban, each with five income quintiles)
  - 38 production sectors, producing 38 commodities
- Transdisciplinary setting

Modelling Approach – Closure Rules

- Fixed exchange rate and foreign savings, flexible CPI
- Investments fixed as share of total absorption, saving rates change uniformly (PNIASAN scenario: savings-driven investment)
- Flexible government savings and fixed tax rates in the BAU (adjusted under PNIASAN and sensitivity analysis settings)
- Fully employed factors, labor and land: mobile, capital: activity- specific (putty-clay)
- Fixed world market prices

Modelling Approach – BAU Scenario



Own calculations based on IMF 2019, UN 2019, World Bank 2019

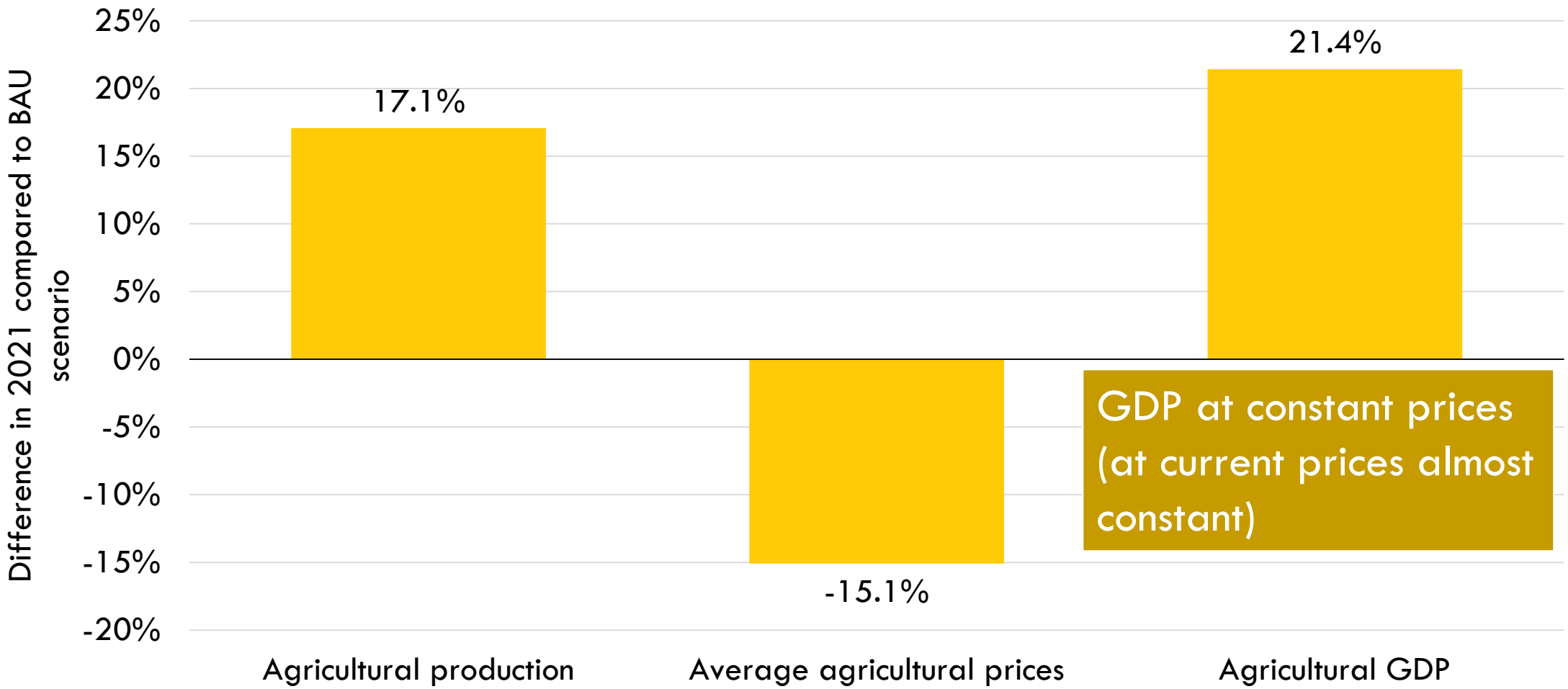
Modelling Approach – PNIASAN Scenario

		%-point differences compared to BAU				
		2017	2018	2019	2020	2021
Productivity increase of crops	Local maize	1.5	1.5	1.5	1.5	1.5
	Improved maize	10.1	10.1	10.1	10.1	10.1
	Rice	8.4	8.4	8.4	8.4	8.4
	Cassava	4.4	4.4	4.4	4.4	4.4
	Yam	1.5	1.5	1.5	1.5	1.5
	Pineapple	8.9	8.9	8.9	8.9	8.9
	Fresh vegetables and spices	1.5	1.5	1.5	1.5	1.5
	Other food crops	1.5	1.5	1.5	1.5	1.5
	Cotton	10.9	10.9	10.9	10.9	10.9
	Cashew	3.1	3.1	3.1	3.1	3.1
	Palm nut	1.5	1.5	1.5	1.5	1.5
	Other crops for industry or export	1.5	1.5	1.5	1.5	1.5
Productivity increase of animal products	Meat	5.6	5.6	5.6	5.6	5.6
	Milk	6.6	6.6	6.6	6.6	6.6
	Eggs and other husbandry	10.7	10.7	10.7	10.7	10.7
Investment in fishing/aquaculture sector		27.0	27.0	27.0	27.0	27.0

Modelling Approach – PNIASAN Scenario

		%-point differences compared to BAU				
		2017	2018	2019	2020	2021
Land supply		2.4	2.4	2.4	2.4	2.4
Household direct tax rate	Rural quintile 4	0.5	0.4	0.4	0.4	0.4
	Rural quintile 5	0.6	0.5	0.5	0.5	0.5
	Urban quintile 3	0.9	0.8	0.8	0.8	0.8
	Urban quintile 4	1.2	1.1	1.0	1.0	1.1
	Urban quintile 5	2.5	2.2	2.1	2.1	2.2
		Million USD				
Additional government revenue from direct tax		92.1	92.2	103.6	119.2	139.5

Effects of the PNIASAN: Agriculture



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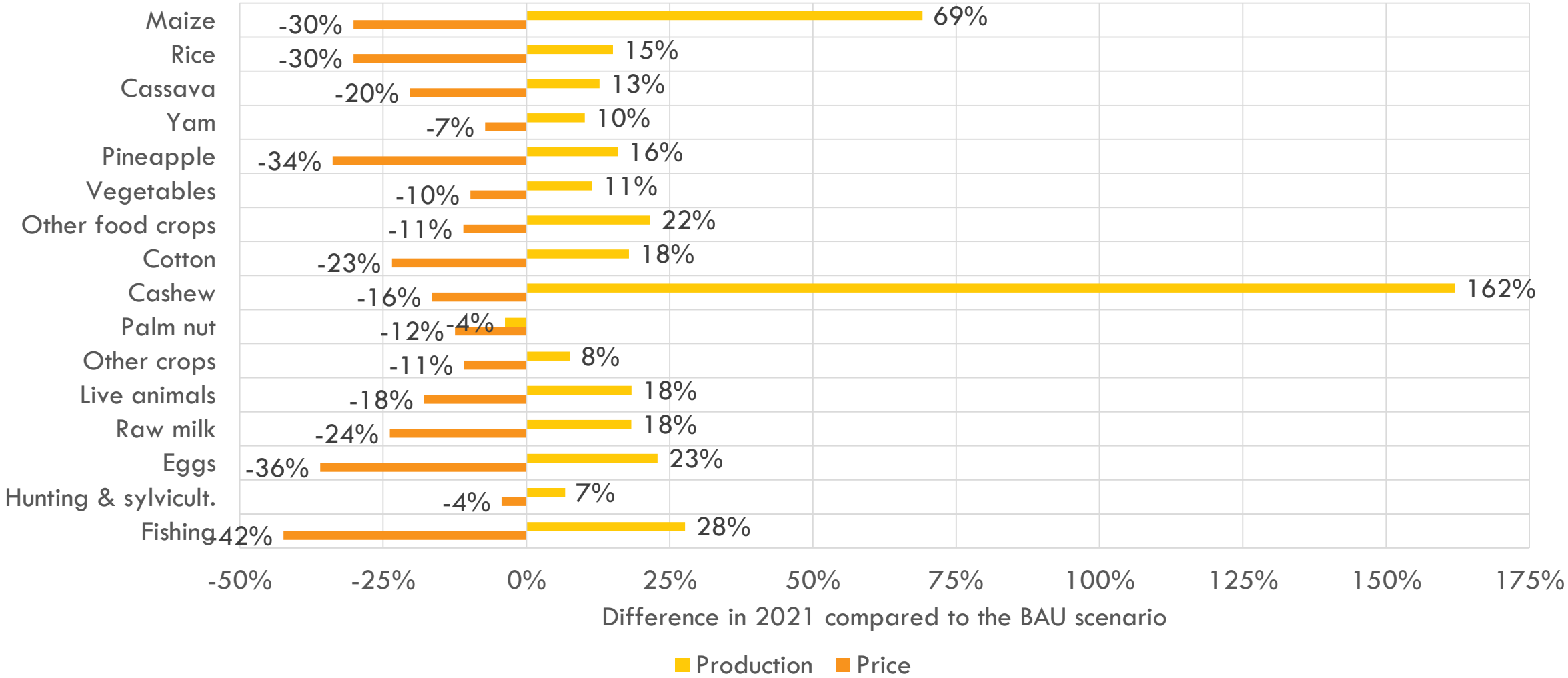
Effects of the PNIASAN: Agricultural production quantities and prices



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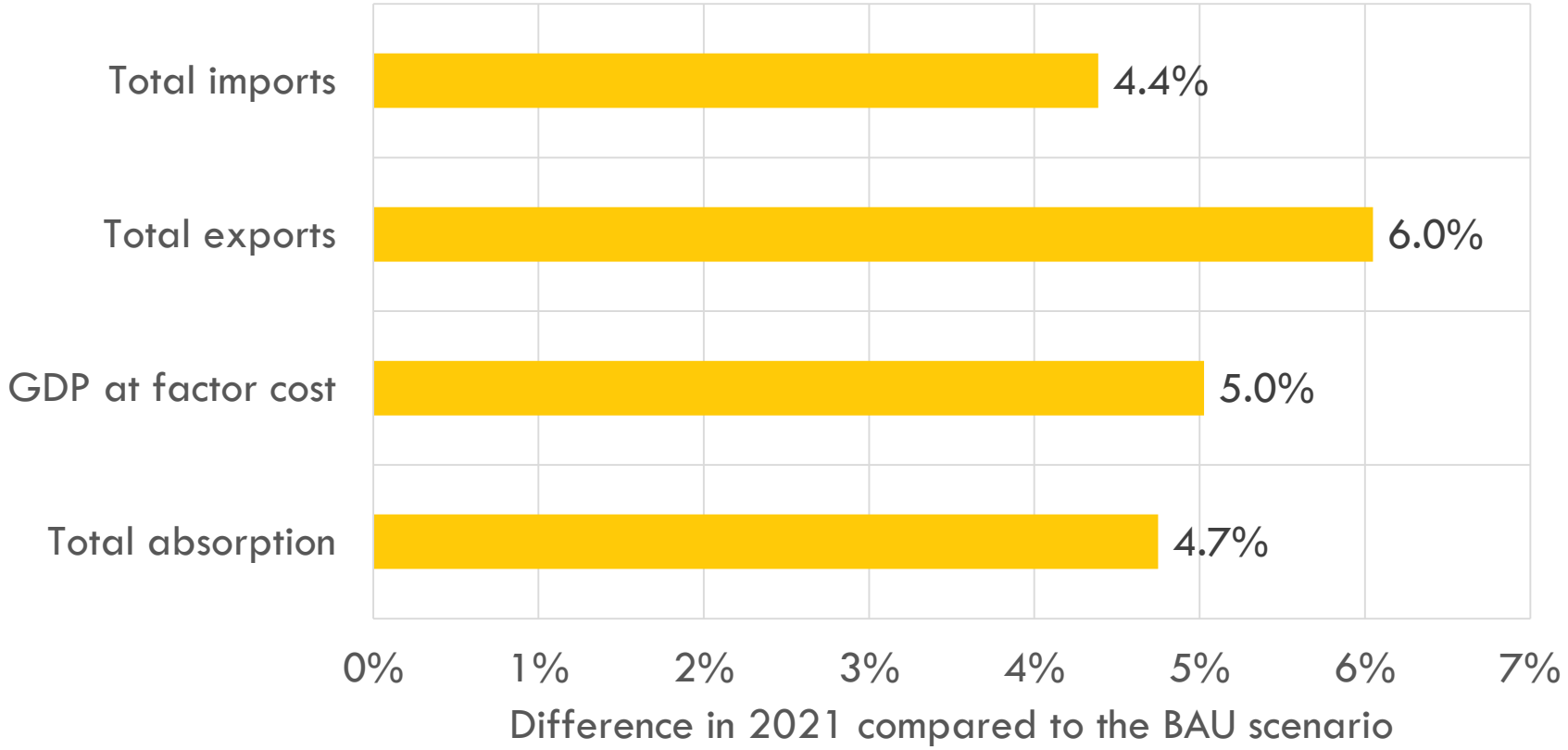
Effects of the PNIASAN: Macroeconomic indicators



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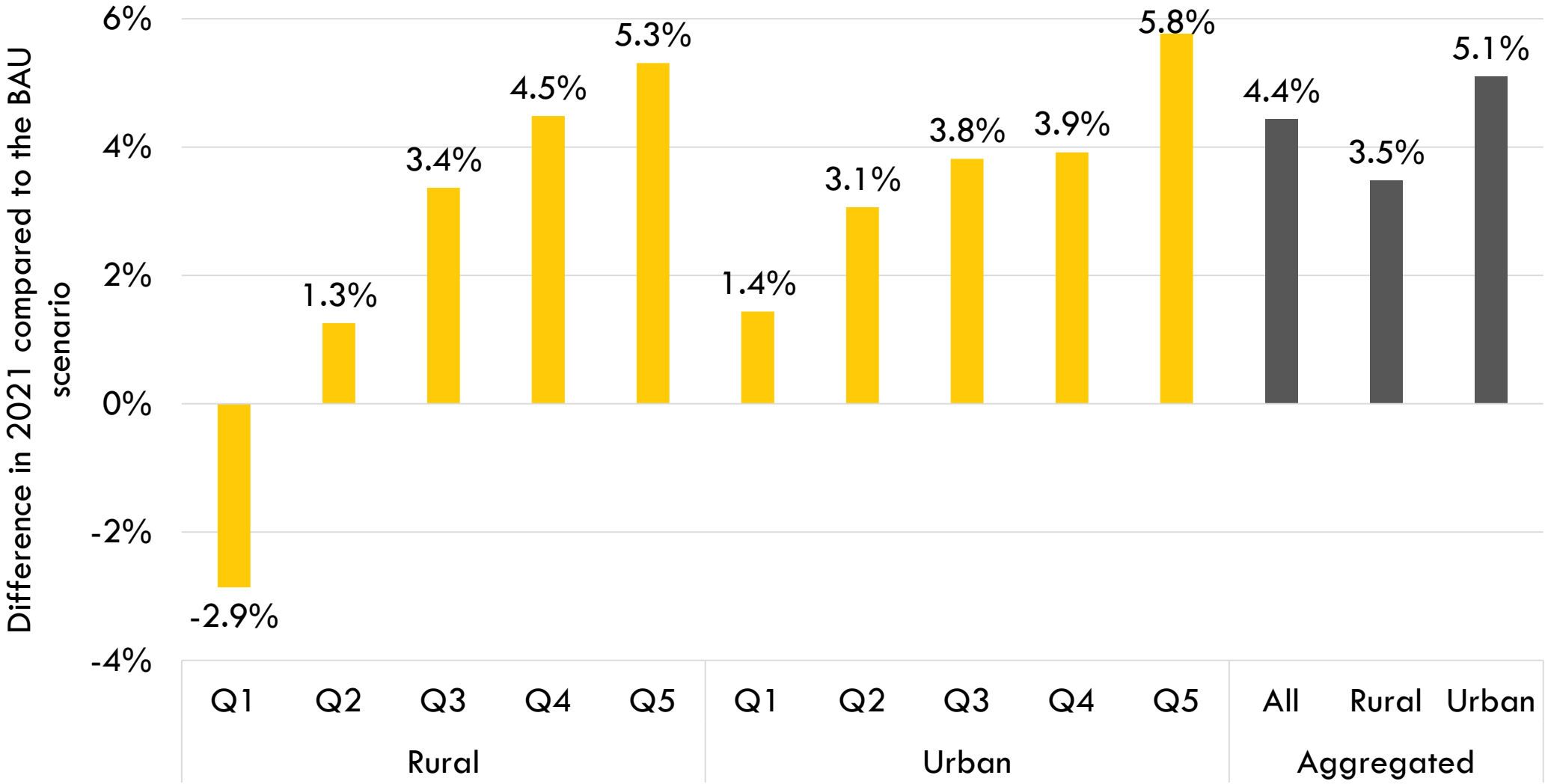
Effects of the PNIASAN: household income



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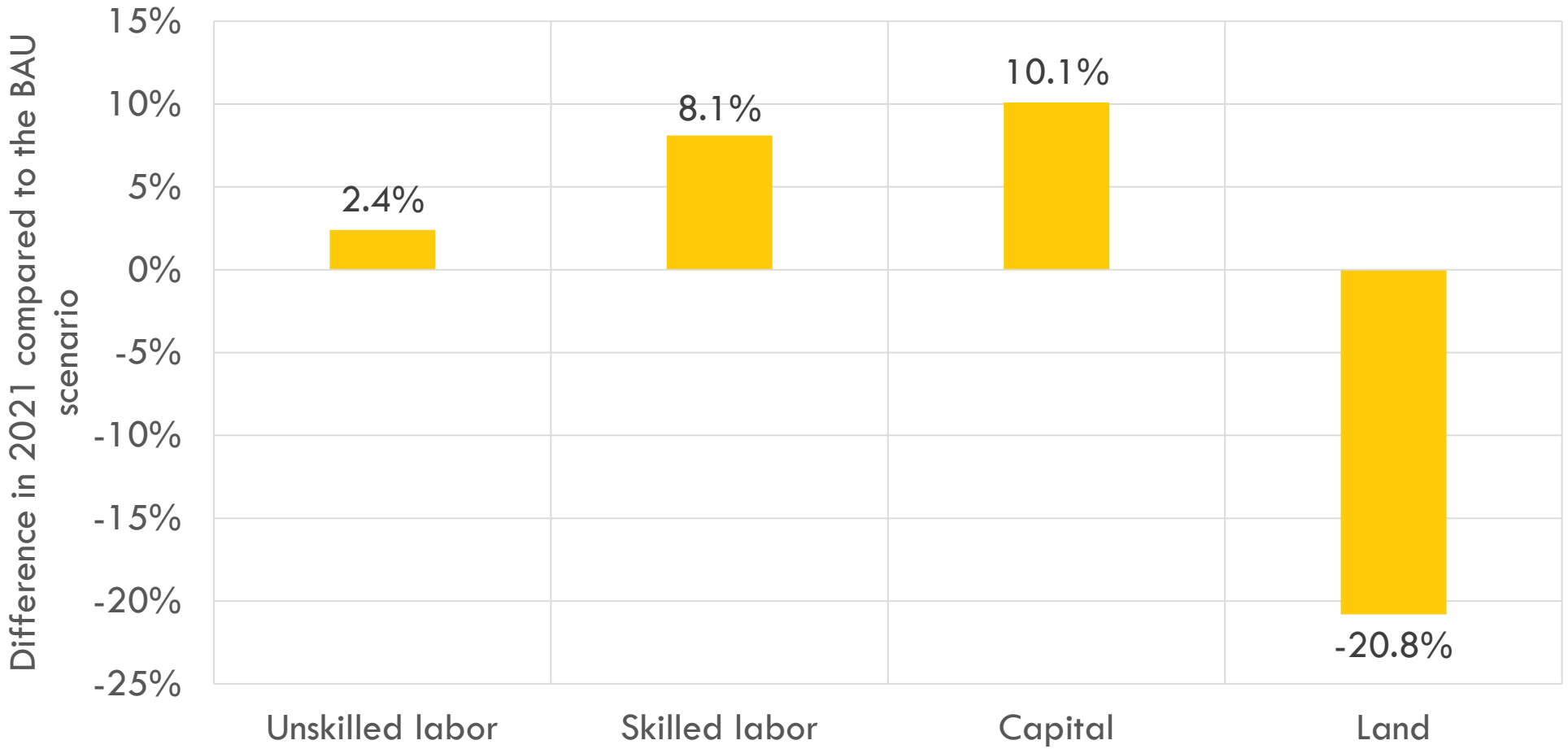
Effects of the PNIASAN: factor prices



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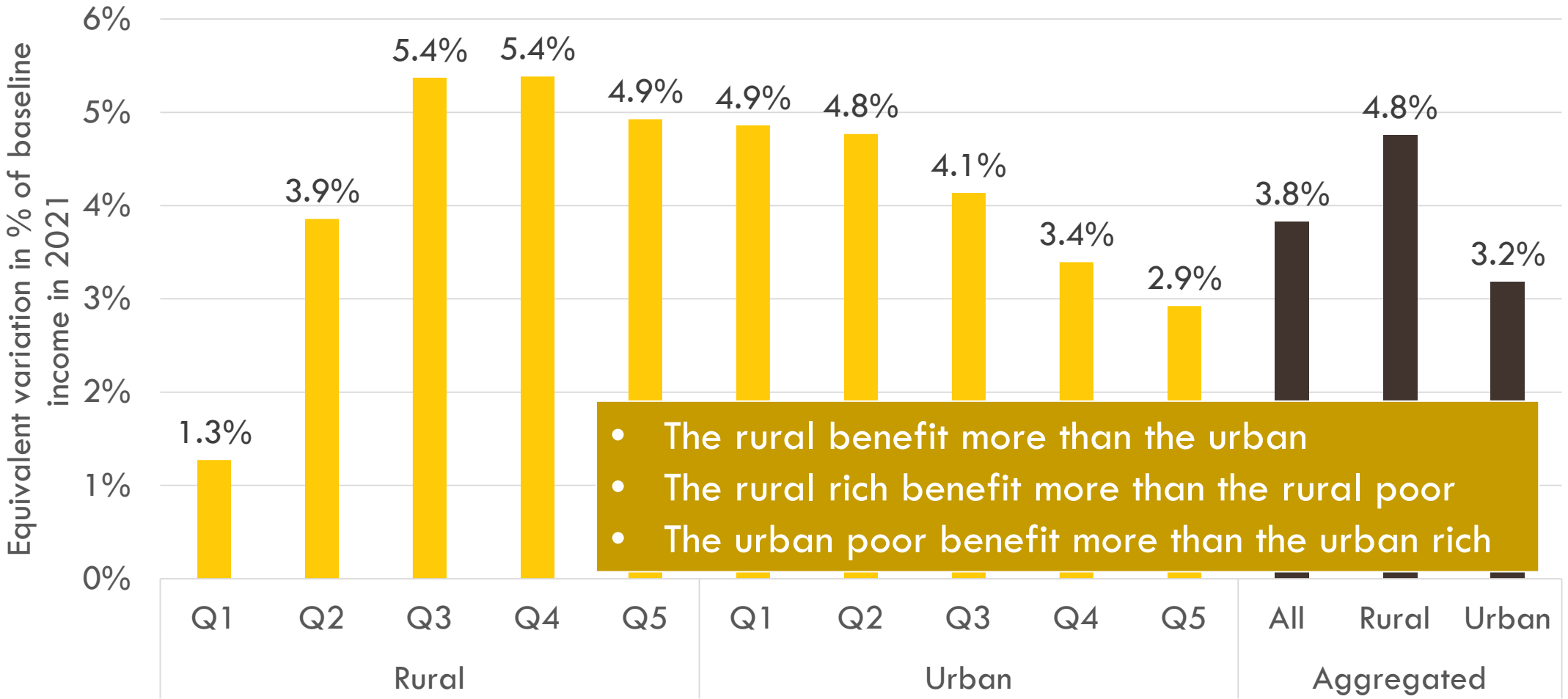
Effects of the PNIASAN: Household welfare



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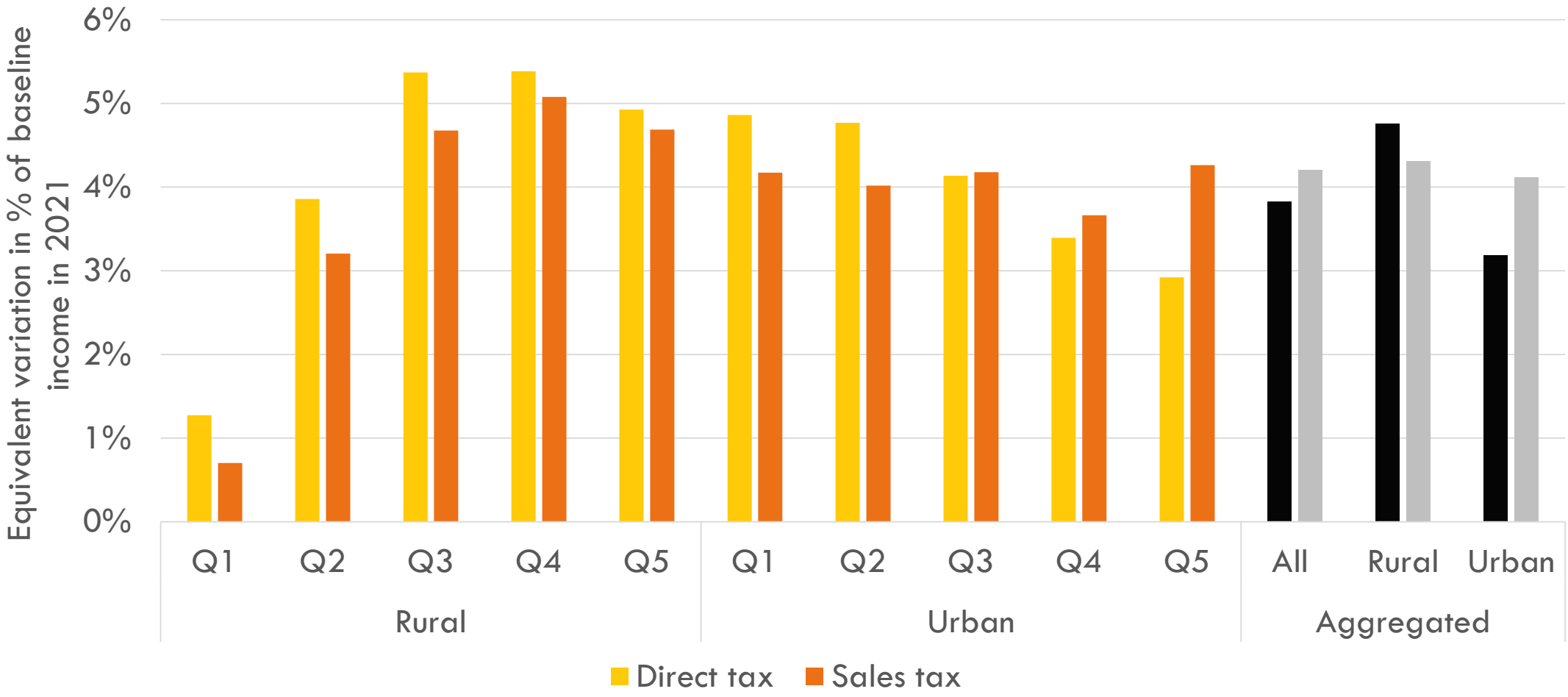
Alternative: Funding via sales tax



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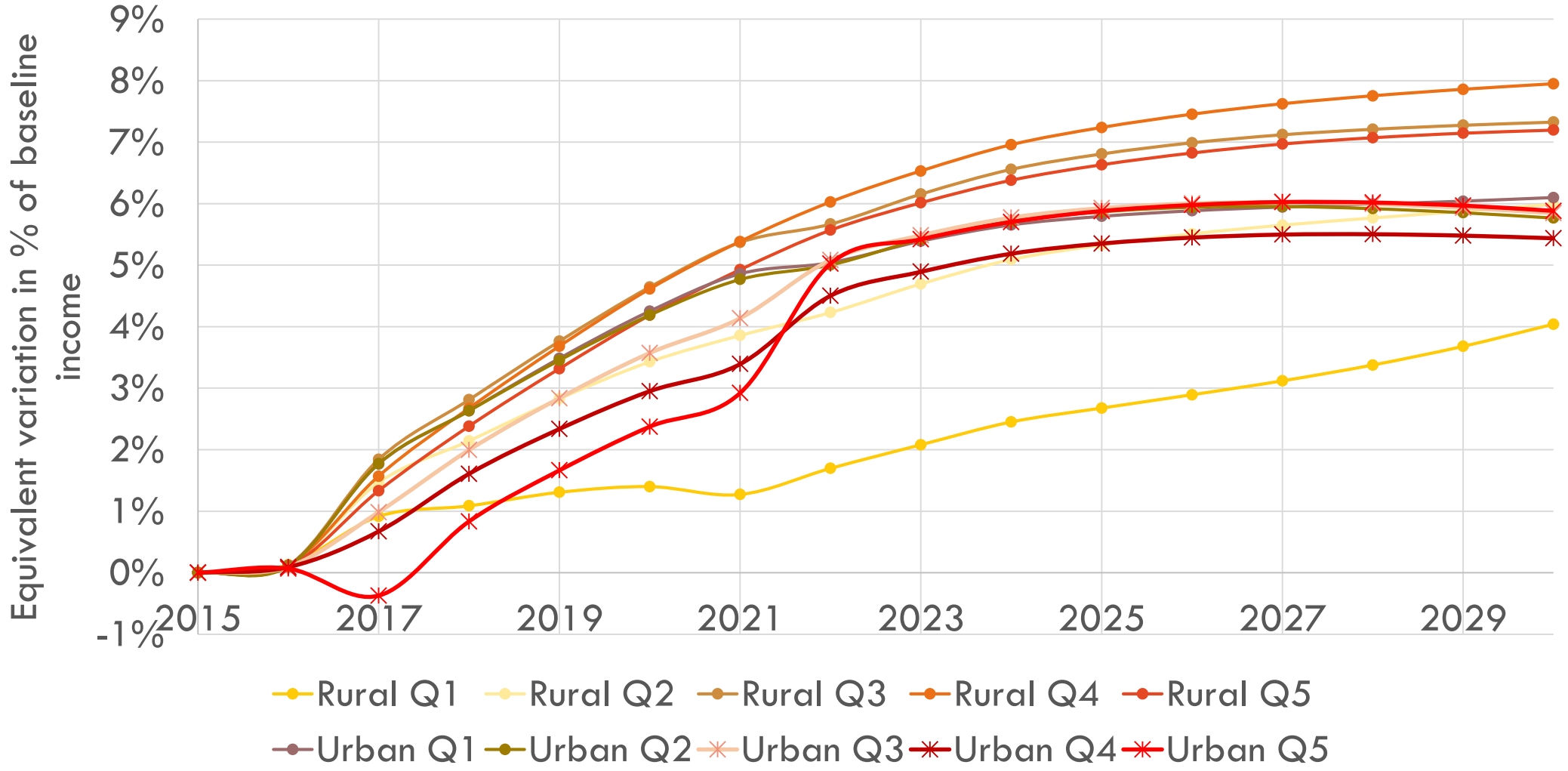
Effect until 2030 – Household welfare



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Conclusions and policy implications

Two policy implications:

1. Increasing productivity in agriculture and enhancing land supply leads to lower agricultural and food prices
   - → Desirable from a consumer perspective but problematic for agricultural producers
   - → Facilitate agricultural supply from Benin to be processed as well as traded especially to neighboring countries
     - → Market information systems
     - → Roads
     - → Reduced red tape in export
     - → …

Conclusions and policy implications

2. While the productivity and land targets of the PNIASAN make the economy of Benin better off, their effects are not automatically pro-poor:

- With respect to income, richer households benefit more than poorer households
- Looking at total welfare, the effects are not pro-poor in rural areas

→ Complementary policies/measures needed in order to reach more balanced growth

Conclusions and policy implications

- Pro-poor plan implementation
  - Targeting of measures at low-income farm households:
    - Extension services
    - Micro-finance
    - Access to inputs
  - As high income households benefit most in absolute terms from the plan:
    - Involve them overproportionally in the funding
    - Collect taxes from a wider tax base and focus tax collection on high income groups

Thank you for your attention!

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Sources

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