BIOFUELS AND PHILIPPINE AGRICULTURE

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OUTLINE

- Objectives
- Methodology
  - Analytical strategy
  - Model structure
  - Scenarios
- Simulation results
- Concluding remarks

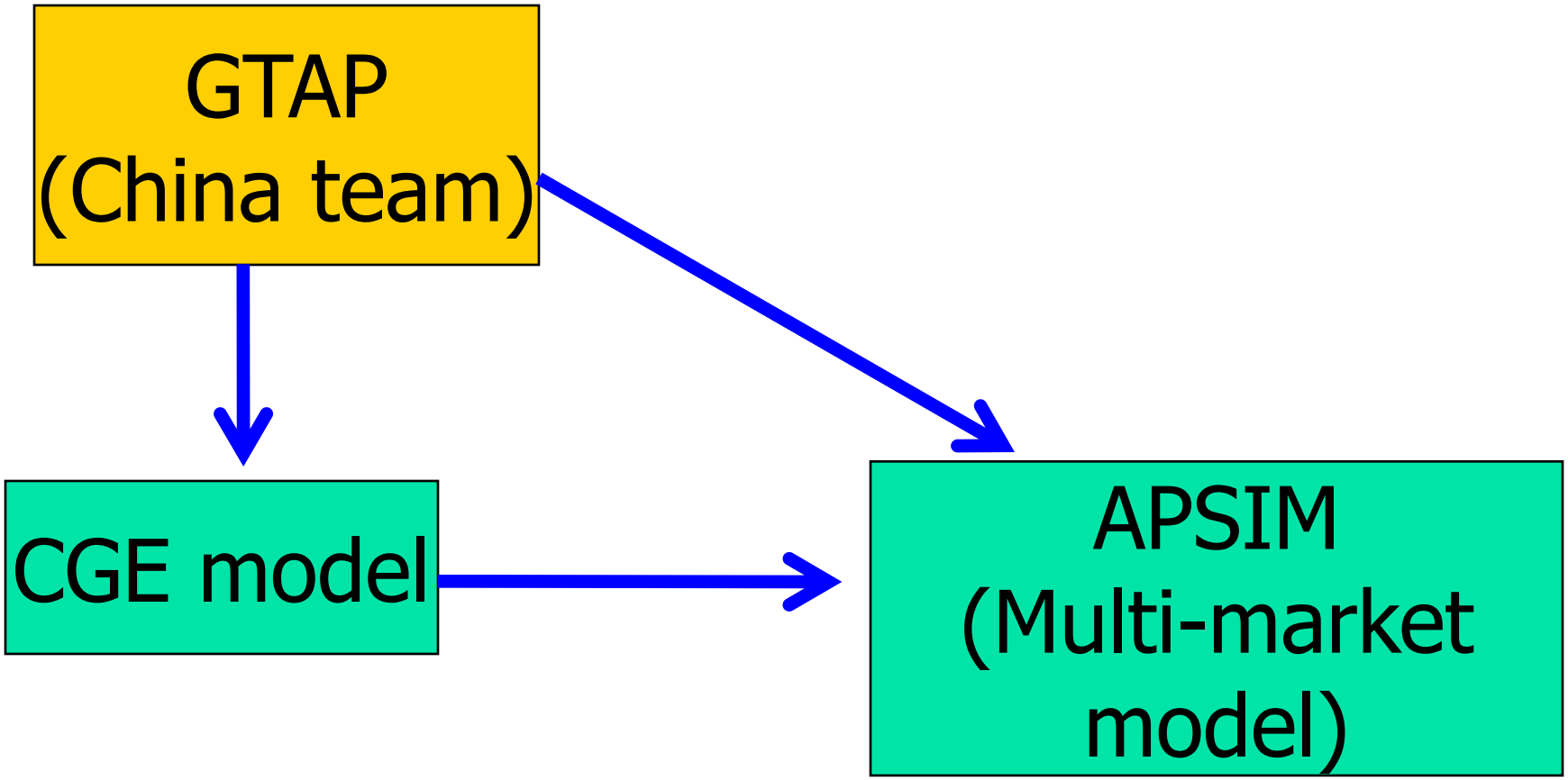
OBJECTIVE

- Examine the impacts of (a) promoting the domestic production of biofuels and (b) global developments in the biofuels sector
- Focus of the presentation is on the impacts on the biofuel industry, agriculture value added and real food expenditure.

METHODOLOGY

ANALYTICAL STRATEGY

- Analysis in the project uses 3 models



PHILIPPINE CGE MODEL

Economic agents in the model

- Household:
  - Representative household that purchases goods and services and saves
  - Income earned from labor, agricultural land and capital
  - Optimizing behavior
- Firms:
  - Representative firm per industry
  - Uses labor, capital and intermediate goods to produce output
  - Optimizing behavior (Leontief and Cobb-Douglas)

Cont..

- Government
  - Purchases goods and services, provides government services, collects taxes, transfers
  - Spending – exogenous
  - Taxes: collected from household and firm
  - Optimizing behavior
- Foreign trade:
  - Exports and imports
  - Armington assumption

- Assumptions:
  - Perfect competition
  - Product markets: prices adjust to ensure equilibrium
  - Factor markets:
    - Capital is assumed to be industry-specific.
    - Labor is mobile across industries. Wage rate adjusts to clear the labor market in each period.
    - Agricultural activities use land, where land is industry-specific.

- Modeling biofuels
  - Industries
    - Bio-ethanol: sugar as feedstock
    - Biodiesel: coconut as feedstock
  - Economic agents purchase gas or diesel composite
    - Gas = CES (fossil-based gas, bio-ethanol)
    - Diesel = CES (fossil-based diesel, biodiesel)
    - Optimization process in the selection of the fossil-based fuel source and biofuel

- **Disaggregation**
  - **Agriculture, Fishery and Forestry (19)**: (a) Palay; (b) Corn; (c) Sugar; (d) Coconut; (e) Vegetables, roots and tubers; (f) Banana; (g) Pineapple; (h) Mango; (i) Citrus fruits; (j) Other fruits and nuts; (k) Tobacco; (l) Coffee; (m) Cacao; (n) Rubber; (o) Hogs; (p) Cattle and other livestock; (q) Chicken and poultry; (r) Fishing and aquaculture; and, (s) Other Agriculture, fishery and forestry
  - **Industry (12)** - includes ***Bio-ethanol*** and ***Biodiesel***
  - **Services (2)**
- Data
  - The SAM is based on the 2000 input-output table
  - Biofuel industries in the SAM were calculated using information from the DOE
- Solved recursively from 2006-2020

Scenarios/Settings

- Settings (basis)
  - Oil price:
    - **low** = crude oil prices remain at their 2006 level
    - **high** = crude oil prices rise gradually so price in 2020 = 2 *x* price_{2006}
  - Elasticity of substitution between fossil-based fuel and biofuel:
    - **low** = 3
    - **high** = 10

- Four settings implemented in the analysis:
  - LPLE = low oil price, low elasticity
  - LPHE = low oil price, high elasticity
  - HPLE = high oil price, low elasticity
  - HPHE = high oil price, high elasticity

- Scenarios
  - Reference = biofuel outputs of the Philippines and other countries fixed at 2006 levels; trajectory in world prices of goods provided by China team
  - Unilateral = biofuel outputs allowed to change but pattern of change in world prices same as reference scenario

- Scenarios… continued
  - Market = Biofuel outputs of the Philippines and other countries allowed to change.
  - Mandate = Successful implementation of the biofuel mandates for the US, EU and Brazil.
- Summary of Scenario/settings

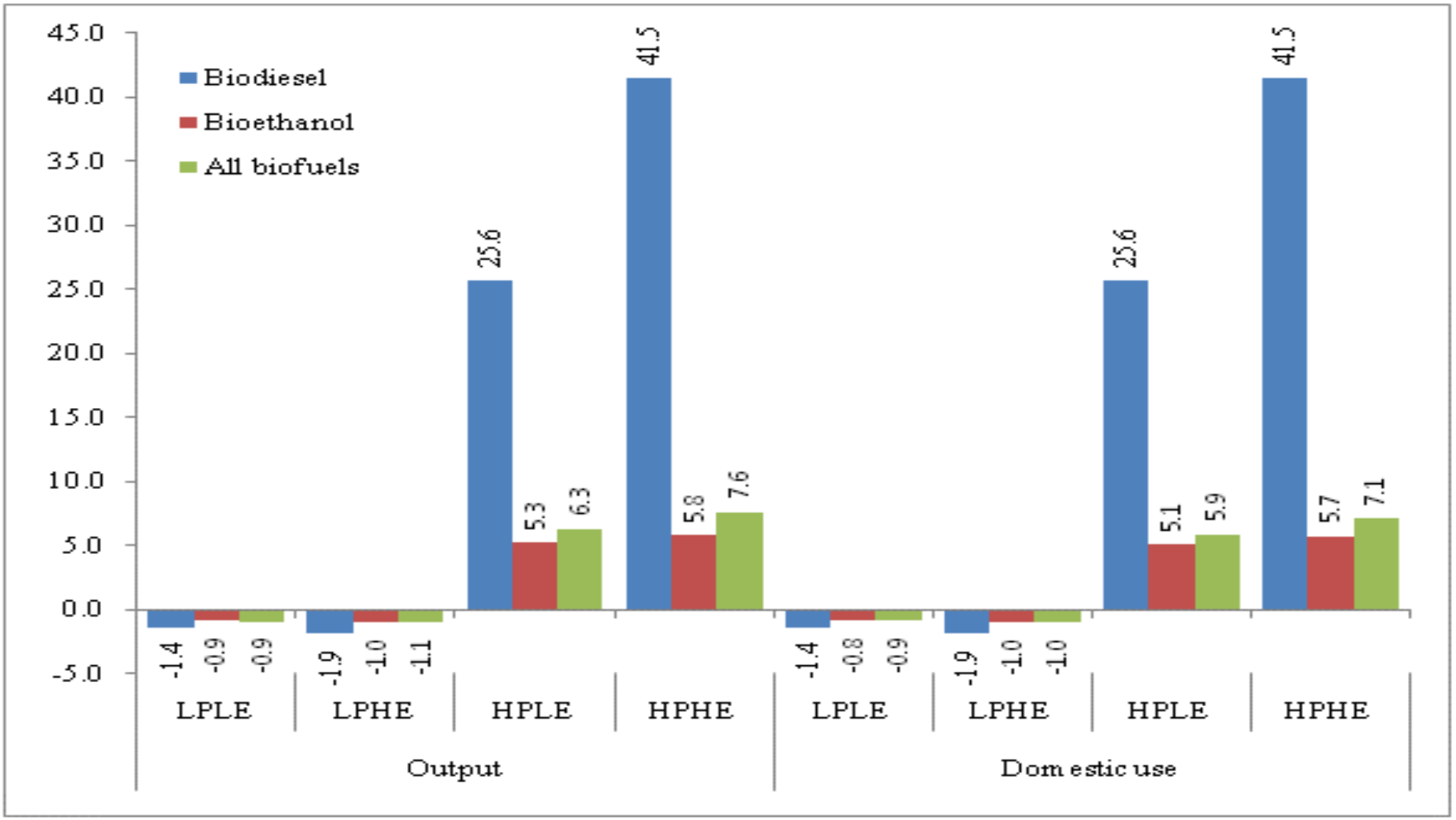
Environments	Scenarios			
	Reference	Unilateral	Market	Mandate
LPLE	X	X	X	X
LPHE	X	X	X	X
HPLE	X	X	X	X
HPHE	X	X	X	

SIMULATION RESULTS

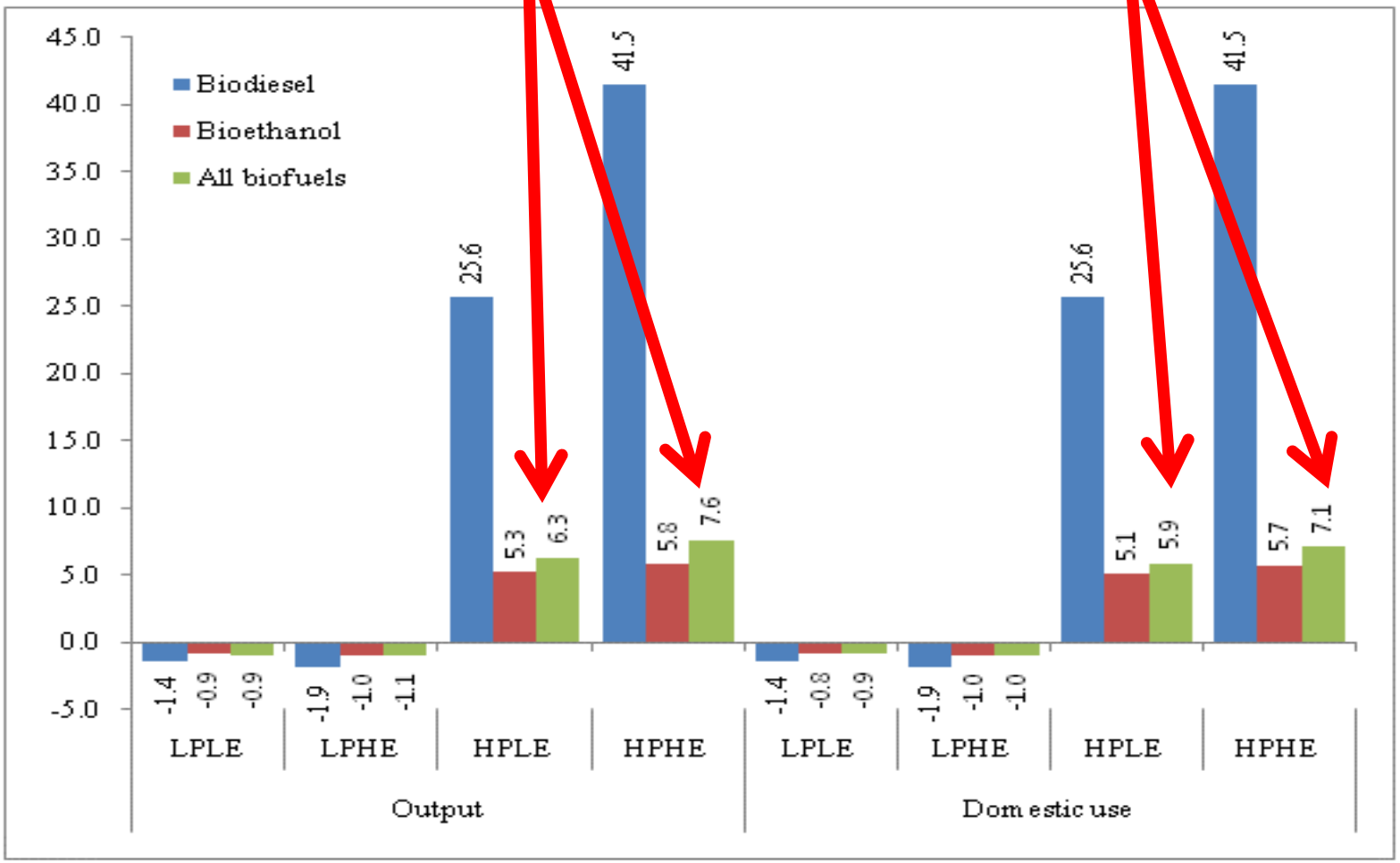
- We will present the results for 2020 only.
- Interpretation of values: For a given setting, the results for the alternative scenarios (unilateral, market and mandate) were compared to the reference scenario
- Sequence of presentation
  - Unilateral scenario
  - Market and mandate scenarios

UNILATERAL SCENARIO

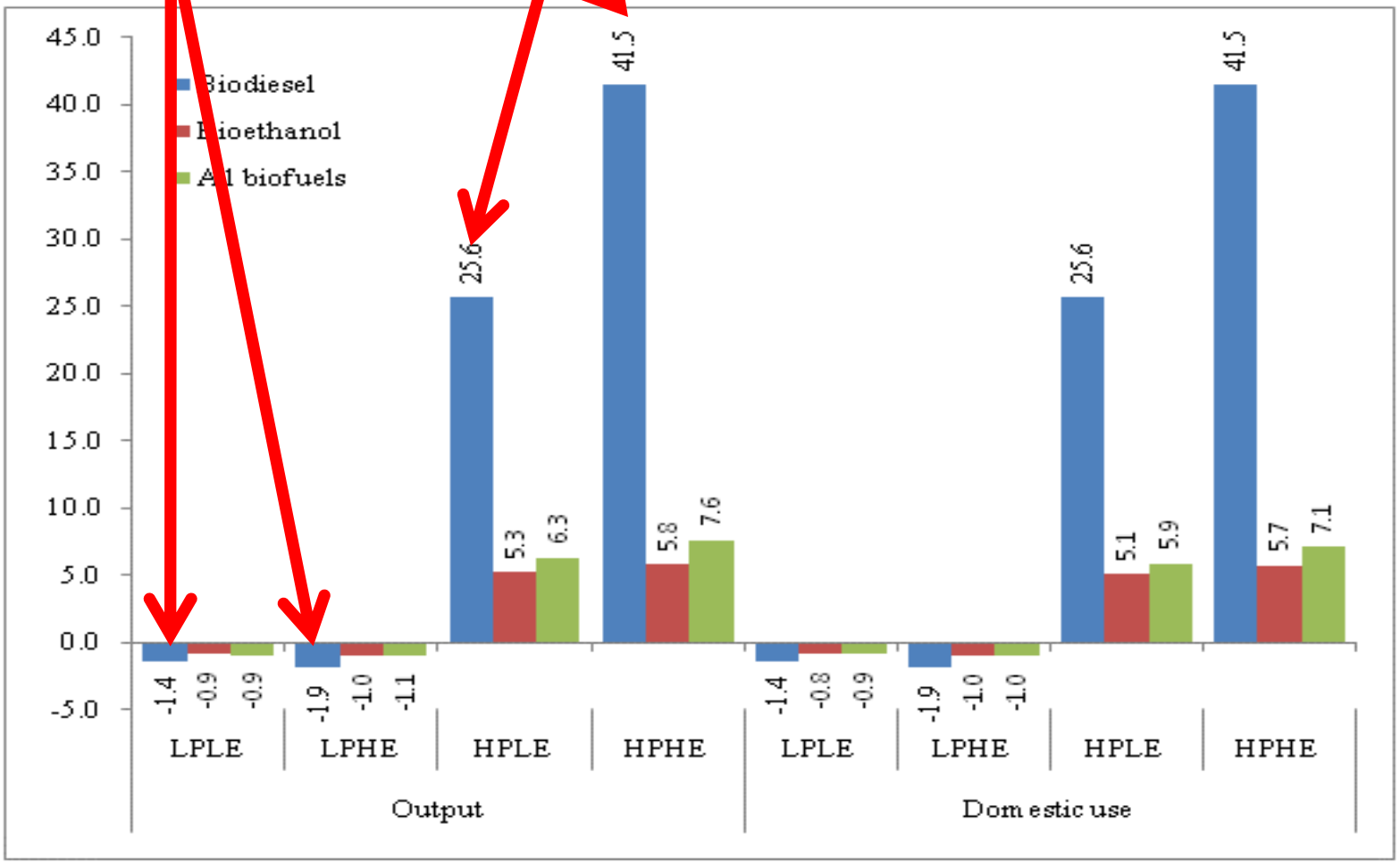
- Impacts on the biofuel industries, 2020,
  % deviation from reference scenario



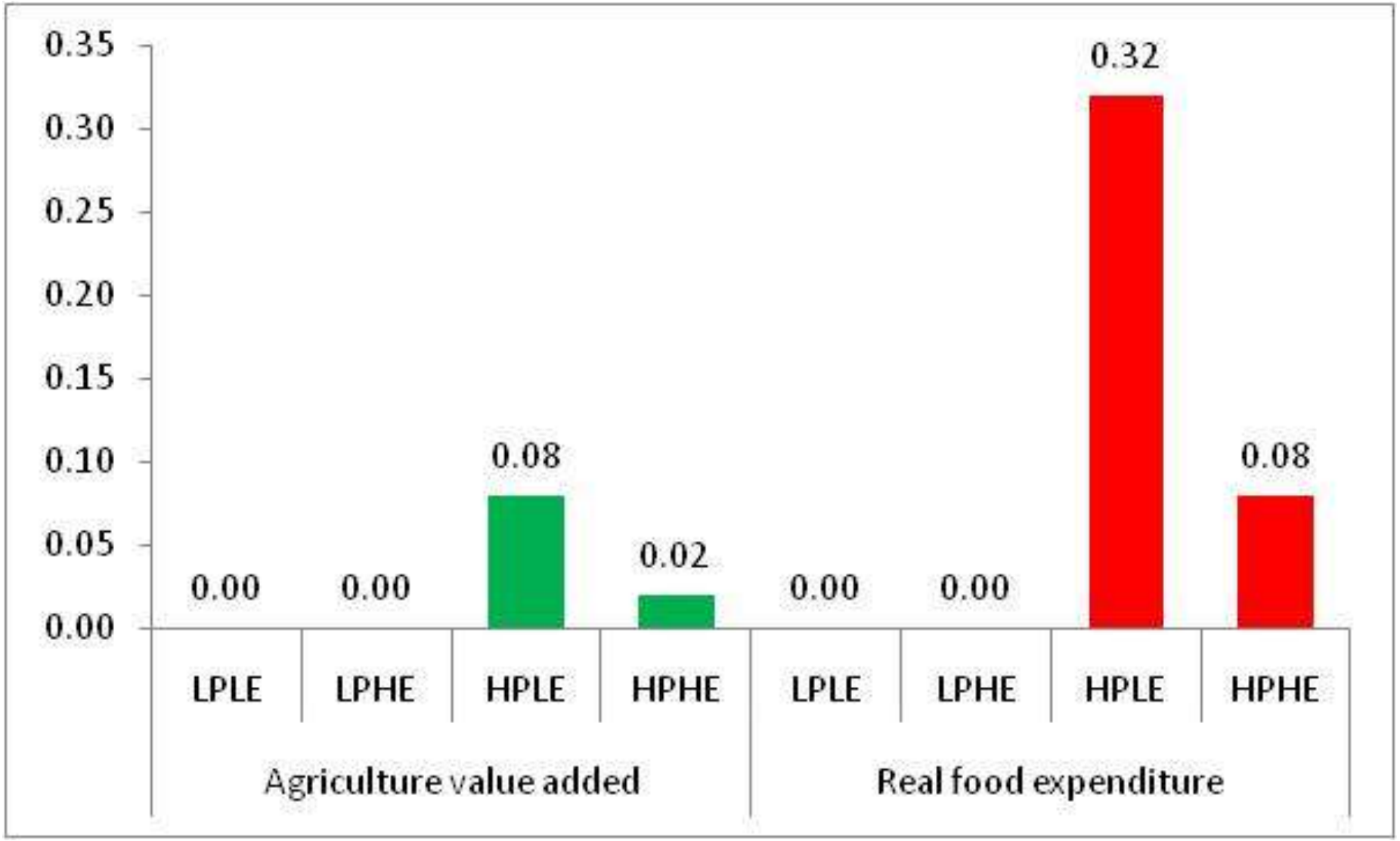
The outputs of and domestic demand for biofuels are likely to be higher in a high oil price environment.



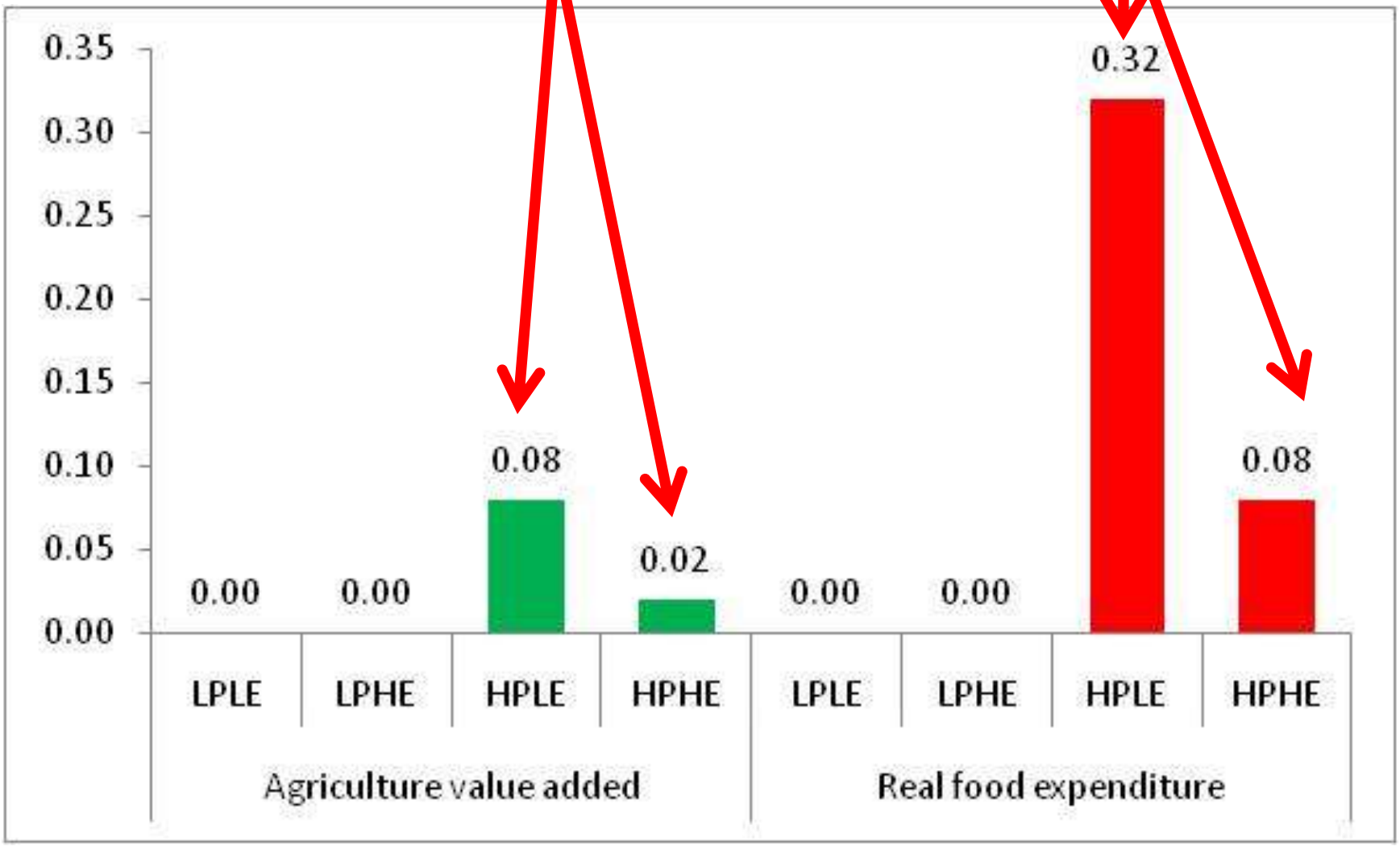
Impacts on the industry are more pronounced in a setting with higher elasticities of substitution.



- Impacts on agriculture value added and real food expenditure, 2020, % deviation from the reference scenario

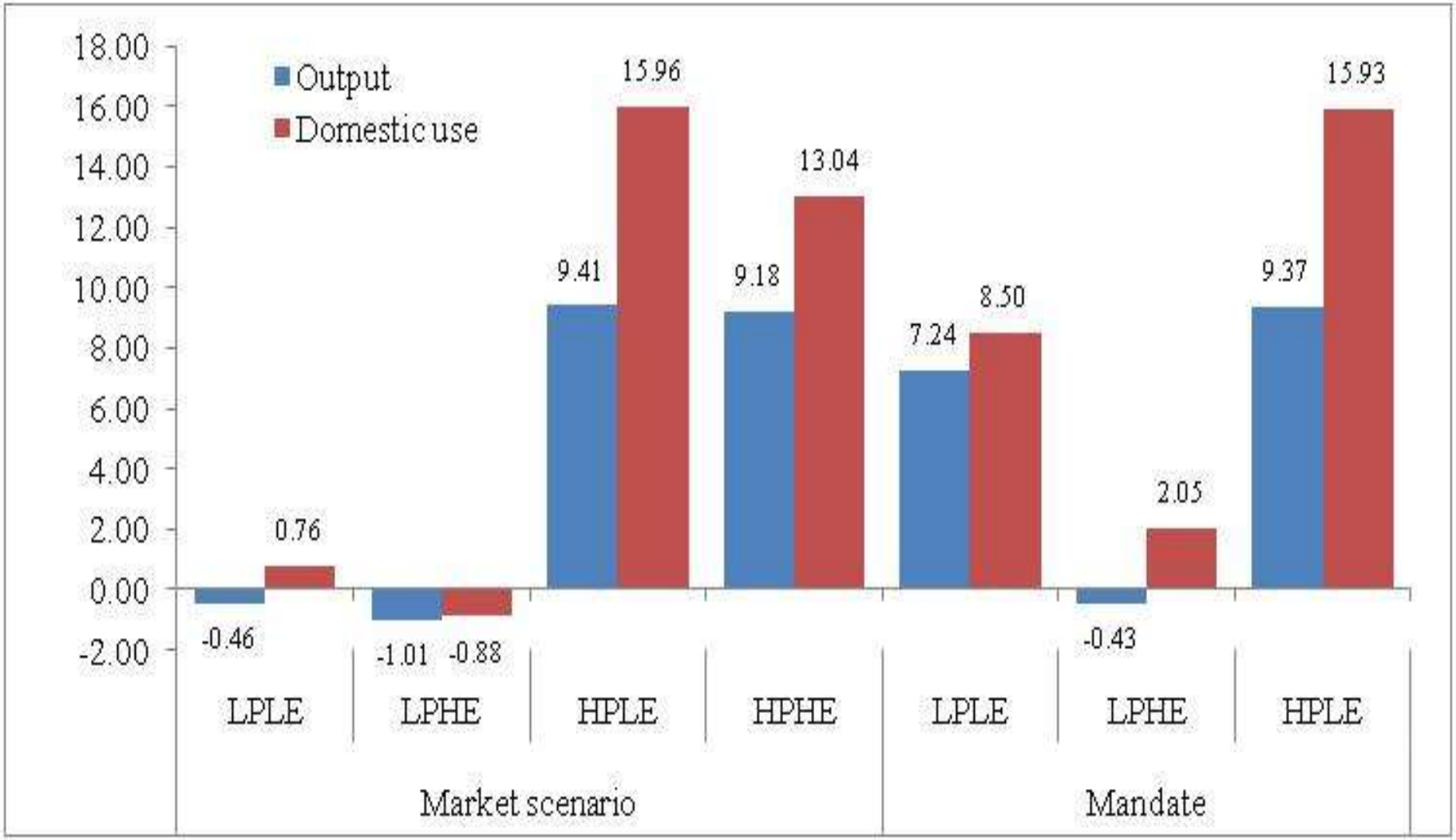


(a) Impacts are small; and, (b) gains are more pronounced in a high oil price environment.

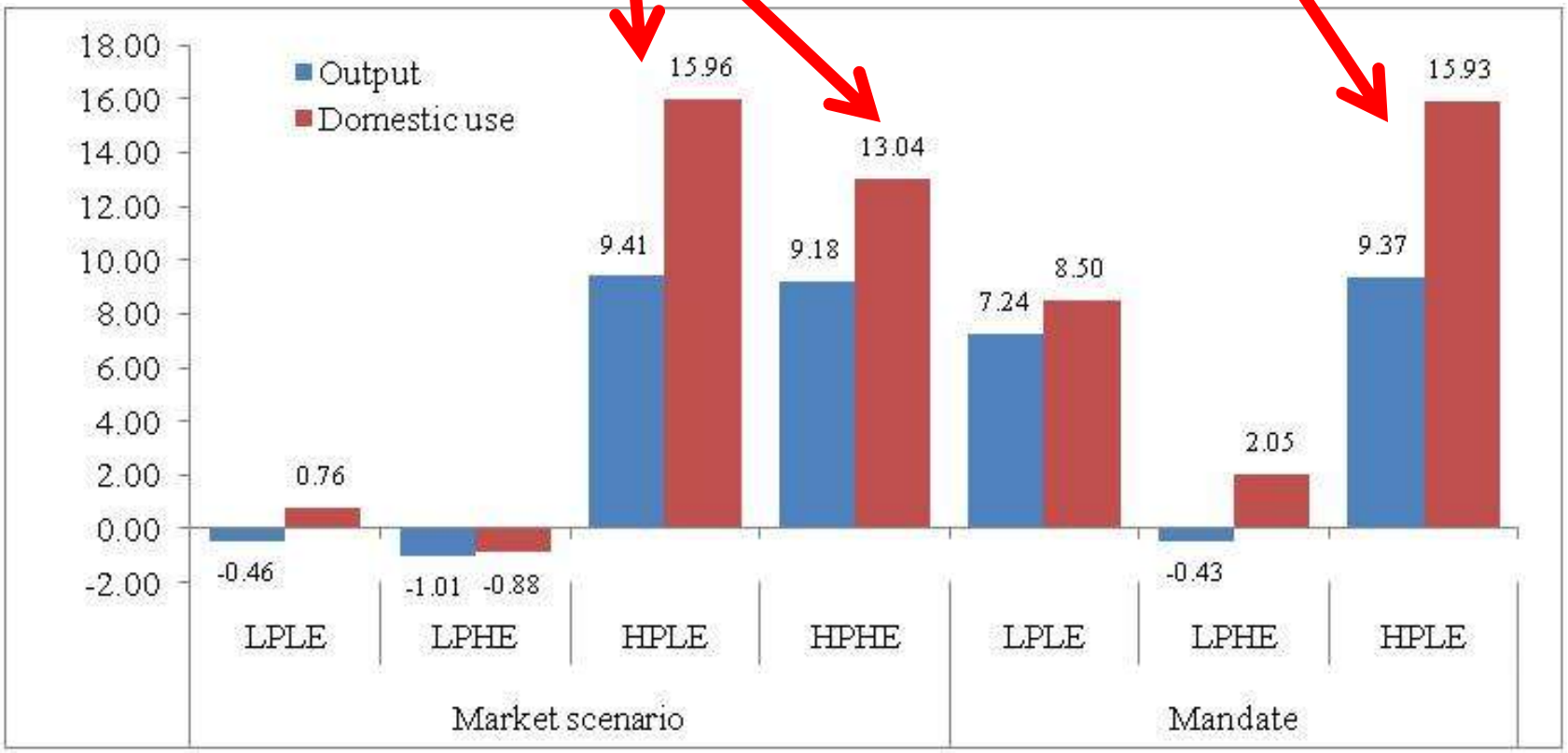


MARKET AND MANDATE SCENARIOS

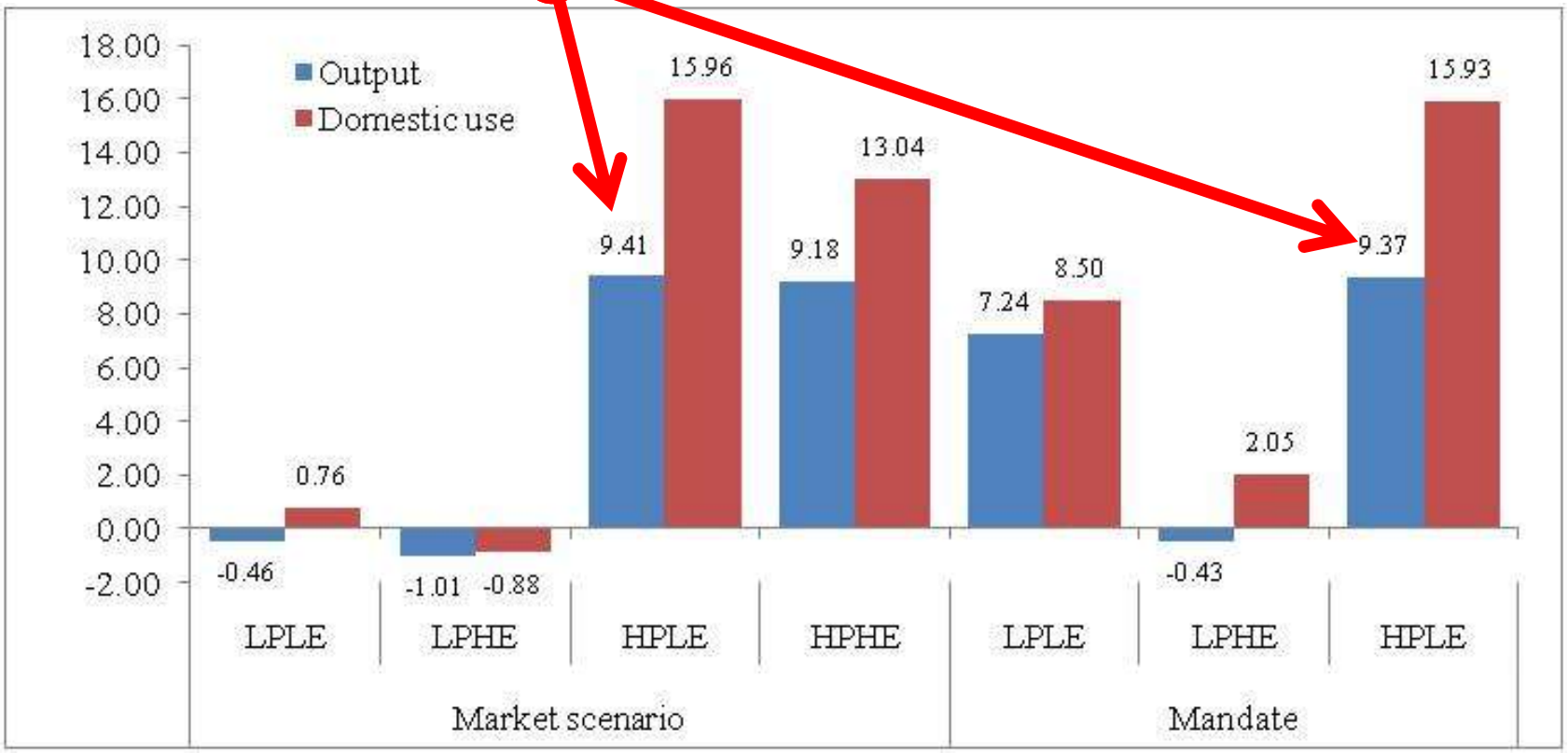
- Impacts on biofuel industries, 2020,
  % deviation from reference scenario



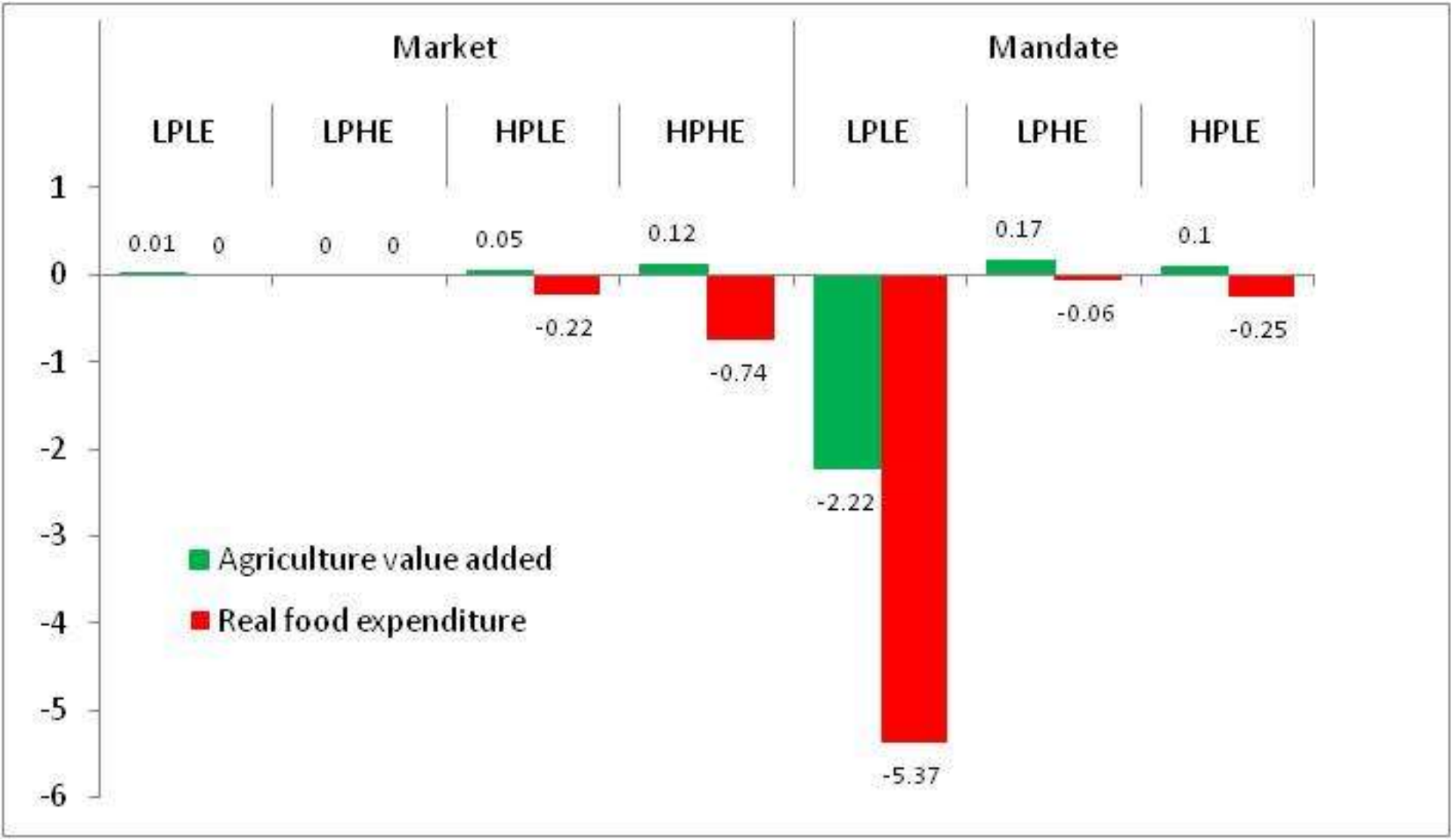
The outputs of and domestic demand for biofuels are still likely to be higher in a high oil price environment.



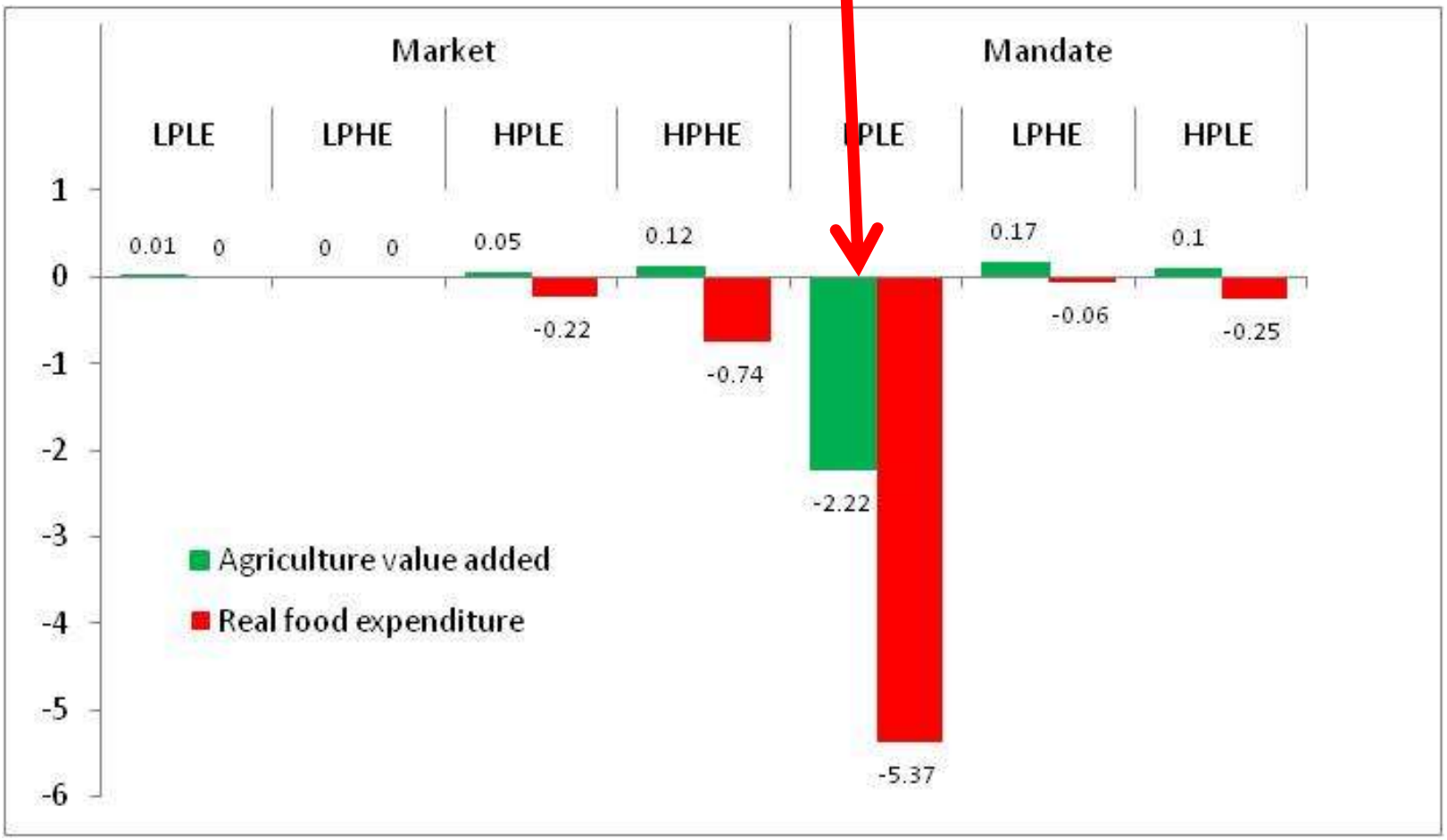
Moreover, these impacts are larger compared to the unilateral scenario; e.g. HPLE under unilateral scenario only has a 6.3% increase in biofuel outputs.



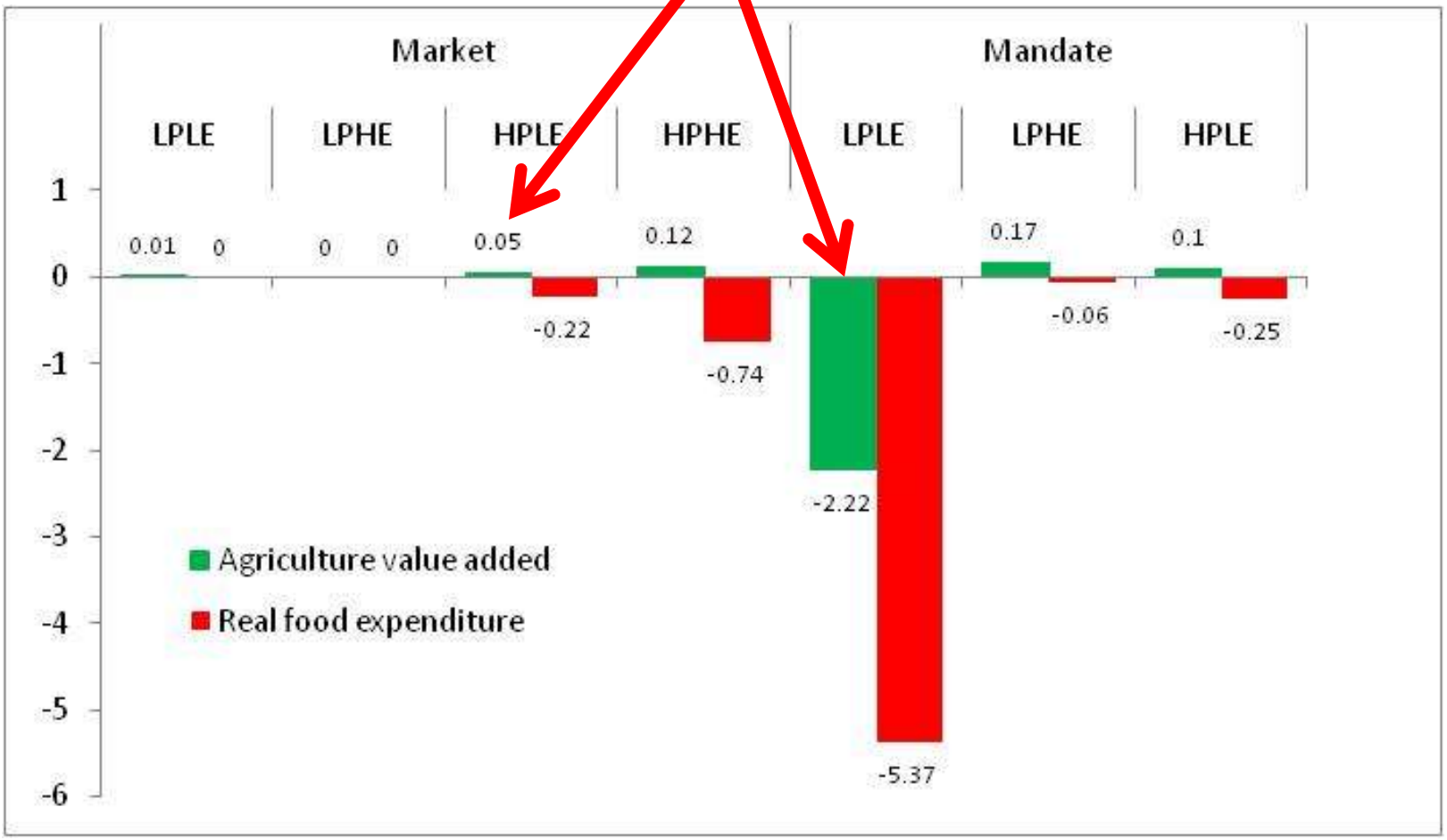
- Impacts on agriculture value added and real food expenditure, 2020, % deviation from the reference scenario



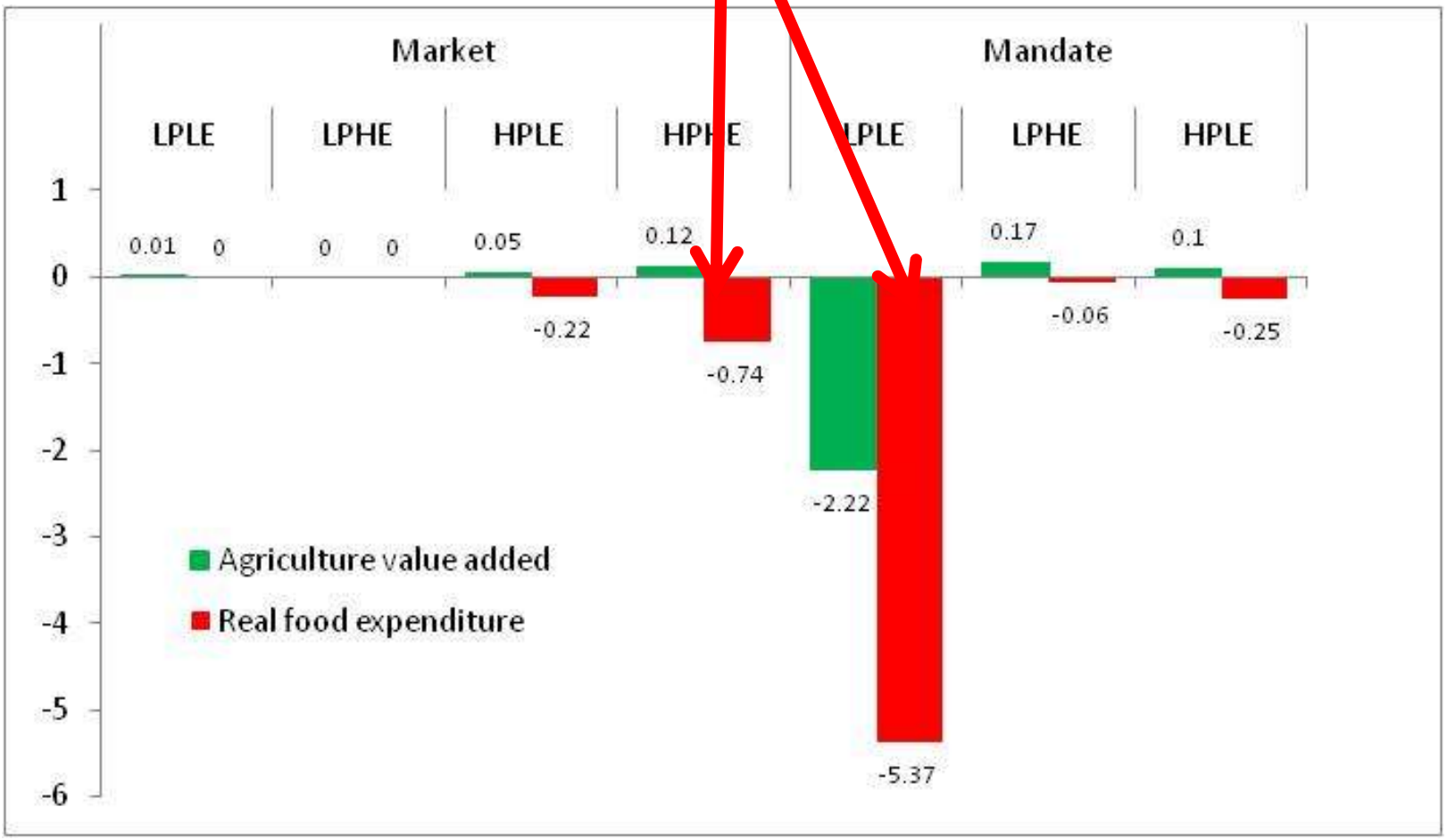
Generally, there are positive impacts for agriculture value added but with a very large decline in the LPLE setting of the Mandate scenario.



Considering the LPLE of Mandate scenario and HPLE of Market scenario: The change under the Unilateral scenario is more favorable



There are strong negative impacts on real food expenditure.



Concluding remarks

- Simulation results show that potentials for the development of the biofuel industries and its impacts on the rest of the economy are sensitive to (a) potential trends in oil prices and (b) the substitutability of biofuels for fossil fuels.
- In the unilateral scenario, increases in biofuels output, agriculture value added and real food expenditure are more pronounced in a high oil price setting.

- Unilateral vs market and mandate scenarios:
  - Changes in the international prices of goods and services under the market and mandate scenario are more favorable to the biofuel industries as a whole.
  - Results for agriculture value added do not reveal clear patterns. But there are instances in which the outcomes under the mandate and market scenarios are less favorable to agriculture.
  - However, changes in world prices under the mandate and market scenarios have a negative impact on real food consumption. These are generally the opposite of the findings under the unilateral scenario.

- **A policy question**: Given the negative impacts on food expenditure of the price changes under the mandate and market scenarios, should the Philippines then pursue a policy that hinders the growth of its biofuel industries?
- **Answer**: **No**. The decline in real food expenditures is larger if the country hinders biofuel output growth under the market and mandate scenarios (see next slide).

- Impacts on real food expenditure,
  % deviation from the reference scenario