

# The price and nutritional value of meat and milk substitutes on the European market

Armin Siegrist<sup>1</sup>, Ashley Green<sup>1</sup>, Fabienne Michel<sup>2</sup>, Alexander Mathys<sup>1</sup>

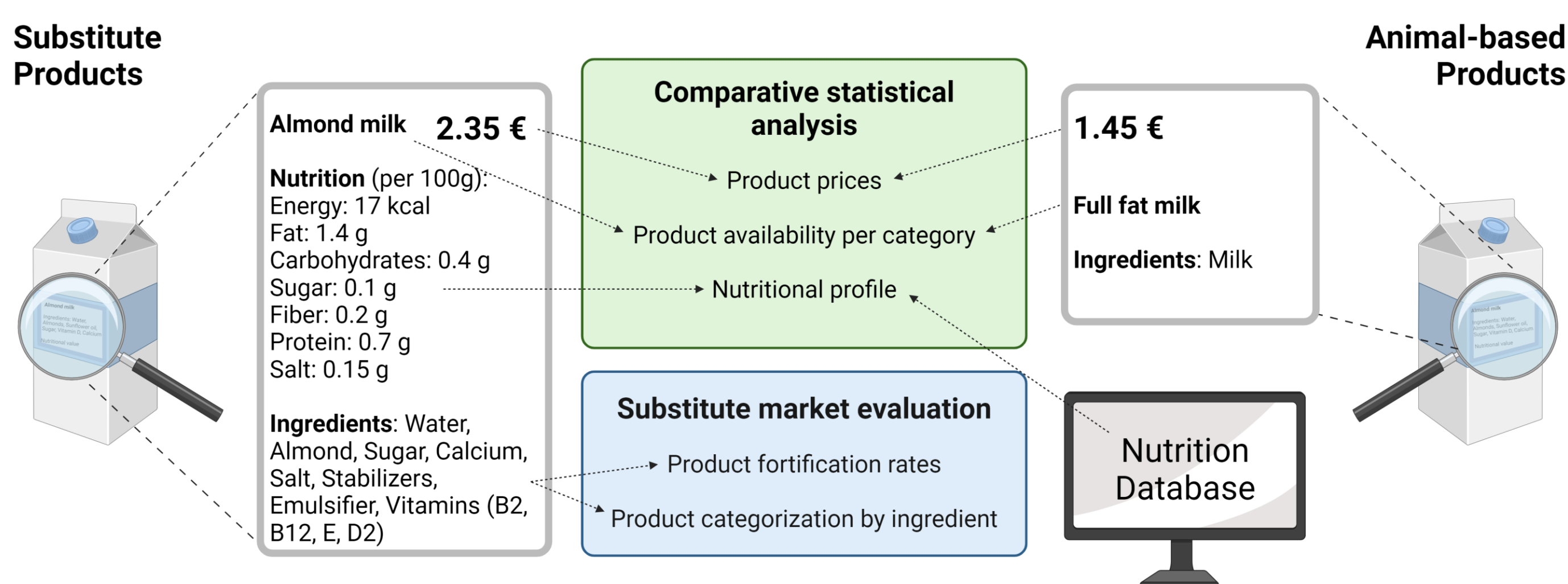
<sup>1</sup>ETH Zurich, Laboratory of Sustainable Food Processing, Schmelzbergstrasse 9, Zurich, 8092, Switzerland

<sup>2</sup>ETH Zurich, Consumer Behavior Group, Universitätsstrasse 22, Zurich, 8092, Switzerland

## 1 Introduction

Substitutes for meat and milk products have gained popularity in recent years and are considered a promising approach to promote alternative protein sources and plant-based diets among consumers. However, to facilitate a transition away from animal-based products, substitutes should be tailored to consumer demand and provide a similar or even better nutritional profile at a comparable price. To get a better understanding of the current situation on the European market, this work compared substitute products sold in 13 major supermarket chains across six European countries with their animal-based counterparts based on product type, nutritional quality, and price.

## 2 Method overview



**Fig. 1. Methodological overview of the project.** The price, product type, ingredients, and nutritional profile of substitute products were collected together with product types and prices of animal-based benchmarks from online shops of retailers in France (n=3), Germany (n=1), Italy (n=2), the Netherlands (n=2), Spain (n=2) and the UK (n=3) in 2023. Additionally, the nutritional composition of animal-based products was obtained from nutritional databases. The collected information was manually screened and used for comparative statistical analysis.

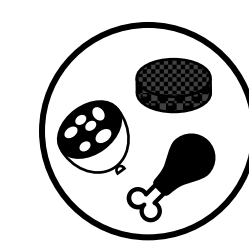
## 3 Main findings

### Nutrition

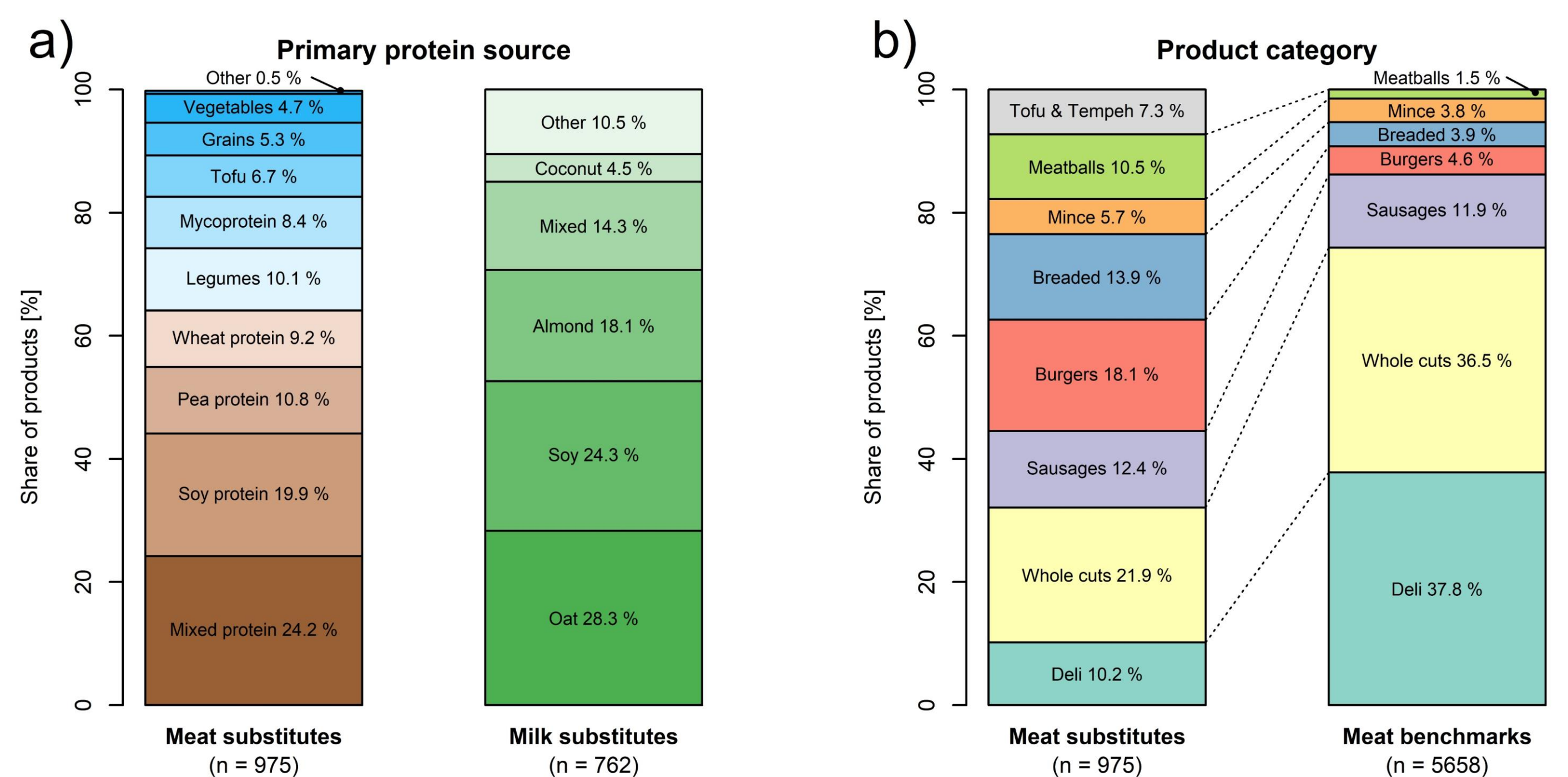
- Meat substitutes contain more dietary fiber and less saturated fat
- Soy-based milk substitutes have a favorable macronutrient profile
- Meat substitutes often have higher sugar and salt contents
- All but soy-based milk substitutes are no valid replacement for milk
- Protein quality of substitutes strongly depends on the (combination of) ingredients and should be further investigated in final products
- The variety among products is large, particularly for meat substitutes

### Price

- Meat and meat substitutes at German retailer were priced equally
- In all other countries consumers pay a premium of 24-115% for meat substitutes compared to meat products of the same type
- The price premium paid for plain milk substitutes compared to full fat milk was between 35% and 58%
- The variety among products is very large



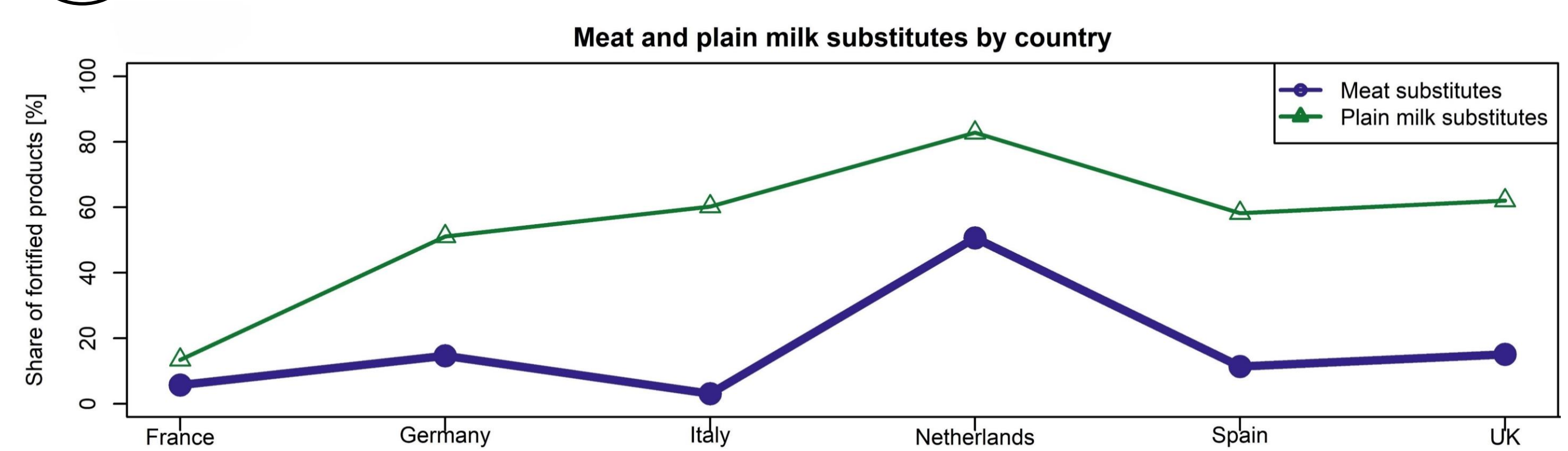
## Main protein ingredients and meat product types



**Fig. 2. Main ingredients and product type.** Over 60% of meat substitutes contain extracted pea, soy, or wheat protein or a mixture thereof while main ingredients for milk substitutes are almonds, oats, and soy (Panel a). The share of meat substitutes and benchmarks grouped by product types shows a clear mismatch in terms of product availability (Panel b).



## Fortification rates of substitutes by country



**Fig. 3. Fortification of substitutes.** There are observable differences in fortification rates between product types, main ingredients, and countries (shown here). Particularly, the low fortification rate among meat substitutes in most countries could become problematic for micronutrient intakes, e.g., for Vitamin B12, if meat is consequently substituted. For some countries, fortified products were also found to be more expensive, which forces consumers to make trade-offs between price and nutritional value.

## 4 Conclusions for food system transformation

Despite good individual examples, further improvements are necessary for substitutes to become a compelling alternative to animal-based products and thus a relevant driver of the food system transformation:

- Prices of substitutes must reach the level of benchmarks
- Macronutrient profiles must be further improved with a focus on protein quality and lower sugar and salt contents
- Fortification with micronutrients should be increased if substitutes are adopted on a large scale to ensure healthy diets in the future
- Product development should focus on convincing substitutes for whole cuts and deli meat to tackle the main segments of meat consumption and thus the main drivers of meat production

## 5 References

- Siegrist, A., Green, A., Michel, F., Mathys, A. Comparing the nutritional value and prices of meat and milk substitutes with their animal-based benchmarks across six European countries. (2024) *Food research international*. Accepted.