GROUP 8

INCENTIVIZING CHANGE

Exploring the role of Deposit Refund Systems in e-commerce packaging

Aalto University

EXECUTIVE SUMMARY

- Problem: E-commerce needs circular solutions. How to best incentivise the Customer to participate?
- Solution: Deposit Refund System (DRS) for packaging used in e-commerce.
- A high enough deposit guarantees **+90% return rate** for packaging
- **Scope**: **Continental**/Regional, phased **country-by-country**
- **Cost scale**: ~€100mil up-front cost for infrastructure, ~€50mil p.a. to operate for Finland-sized **single market**
- **Benefits**: Sustainability, Cost reduction, Compliance
    - Deposits are the strongest incentive for consumers **to return items** (packaging)
    - Reverse-logistics more **cost efficient** when scale is guaranteed + **material costs** lower with reusable packaging
    - Pre-emptive move for legislation, industry has a chance to **set a precedence**

BACKGROUND AND CONTEXT

E-COMMERCE INDUSTRY

$4 trillion over **14%**

Growth/ **Volumes**

Packaging Waste

E-commerce Supply chains are trying to:

- Mitigate this issue as a cost-saving procedure and as a sustainability move.
- Seek out innovations to be 'Circular'.

EU REGULATION

The EU Plastic Strategy initiated in 2018

all packaging must be **reusable or recyclable**

The PPWR* (implementation starting in 2025)

- Prevent packaging waste generation.
- Ensure all EU packaging is recyclable by 2030.
- Increase recycled plastic use in packaging.

*PPWR - Packaging and Packaging Waste Regulation

RECYCLABLE vs REUSABLE PACKAGING?

Under EPR > all players are held accountable for the entire lifecycle of their products including **collection, recycling, and disposal**

01

Cost of managing recyclable packaging - production to end-of-life – requires lot of resources.

02

EU's Circular Economy Policy - Keep materials in use for long to minimize waste generation.

Although initially more expensive, reusable packaging offer **long-term savings** if efficient return system is implemented.

BREAKEVEN ANALYSIS

€0.5-1.5

Average Cost of Current Packaging

€63.2M

Yearly Cost of Current Packaging

80M

Annual Orders (Finland)

€3.5

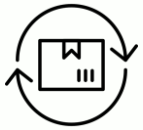
Cost of Reusable Packaging

€46.7M

Yearly Cost of Reusable Packaging

5

No. of cycles (yearly) to Breakeven



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Ideal Cycles (yearly) of a reusable box

€16.5M

Cost Reduction for company (N=6)

Note: Calculation done based on multiple assumptions

Reusable packaging succeeds only with efficient reverse logistics for the containers.

MODELS FOR CUSTOMER INCENTIVIZATION

Discount/Reward System

Customer receives a discount code/store credits once a package is returned

e.g., Zalando & RePack

Customer stands to gain without incurring loss

Library System

Customer is fined if package is not returned within a certain time period

Aversion to loss
Stick vs Carrot
Penalty-based approach
➔ Customer dissatisfaction

Deposit Refund System

Customers pays a deposit when purchasing a product, once package is returned deposit is refunded.

Aversion to loss
Stick vs Carrot(ish)
Positive reinforcement

+ Familiar model

Acquiring benefits

Avoiding losses

Proposed Solution:
Deposit Refund System for reusable e-commerce packaging

OPERATORS OF DRS

Individual e-commerce companies

- Extremely costly, challenges regarding scalability
- Fragmented system leads to poor coverage, inefficiencies due to operations overlap
- System less sustainable than the conventional approach
- Likely to exist alongside a bigger scale DRS, allows customization

National Postal Services

- **Advantages:** extensive reach, leverage existing logistics, potential government funding
- **Challenges:** broader operational mandates, integration into existing logistics network, financial and administrative burden on a single entity

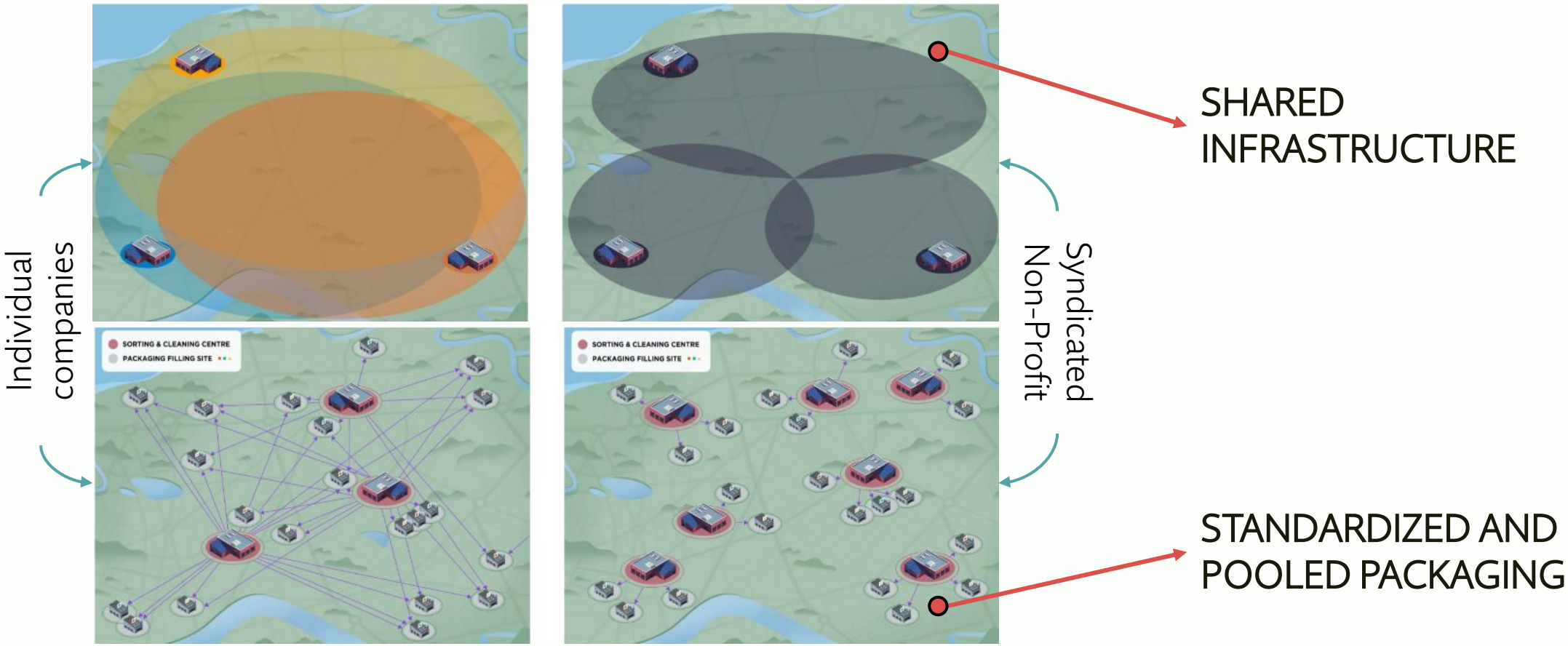
Syndicated Non-Profit

- Neutral party fostering industry-wide cooperation (government funding)
- Facilitates a managed pooling system: shared infrastructure & standardized, pooled assets
- Unified return system: consumer incentivization
- Lower financial burden on individual companies, benefits from economies of scale

FRAGMENTED VS COLLABORATIVE APPROACH

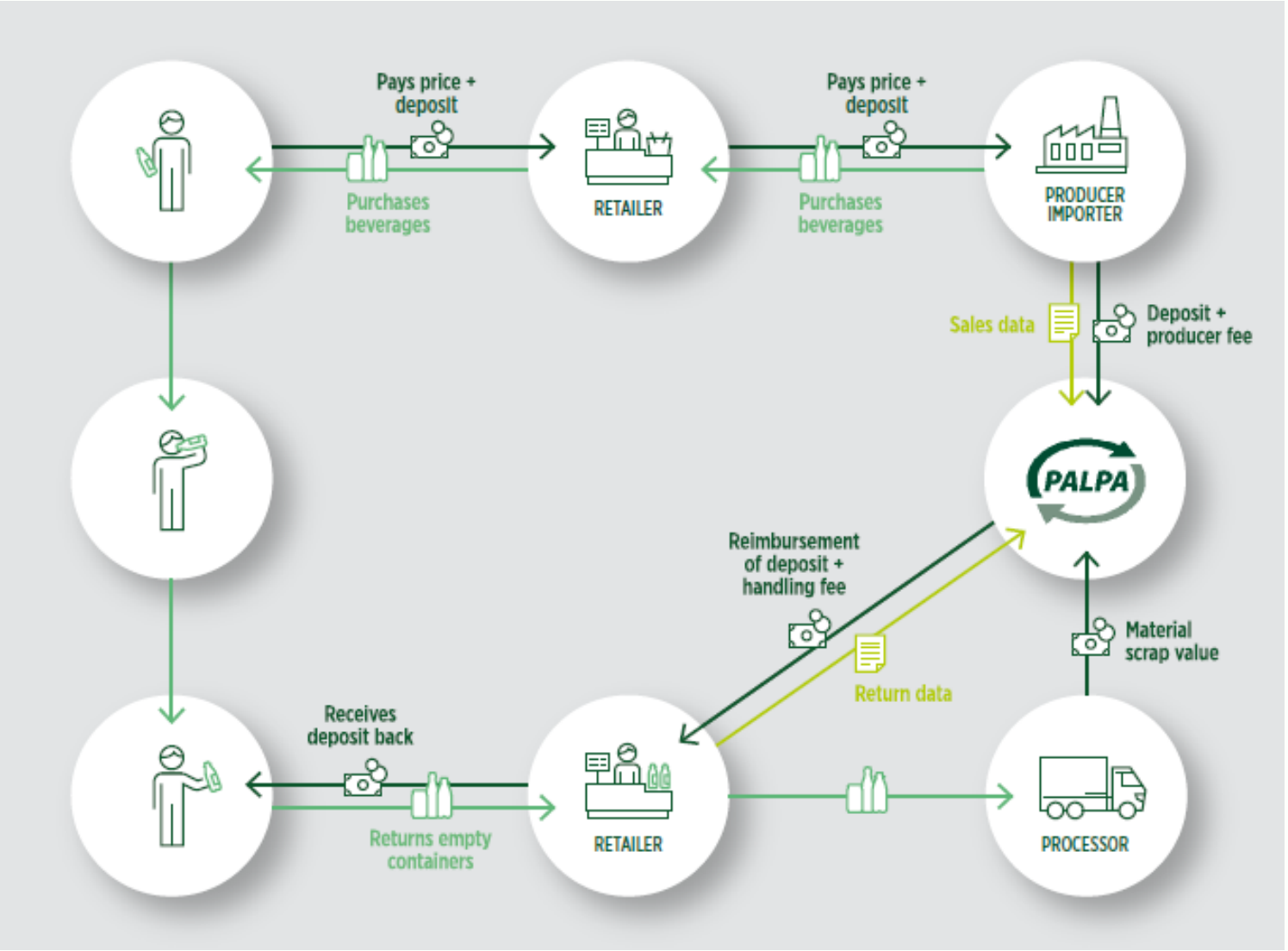
Tackling a key barrier of DRS implementation for reusable packaging

TRANSPORTATION COST



BENCHMARK: FINNISH BOTTLE RECYCLING SYSTEM

PALPA



PALPA – PRICING STRATEGY

Estimation based on announced return rates and total returned amounts.

Number of Returns:

1.4 billion cans, 662 million PET bottles, and 125 million glass bottles returned

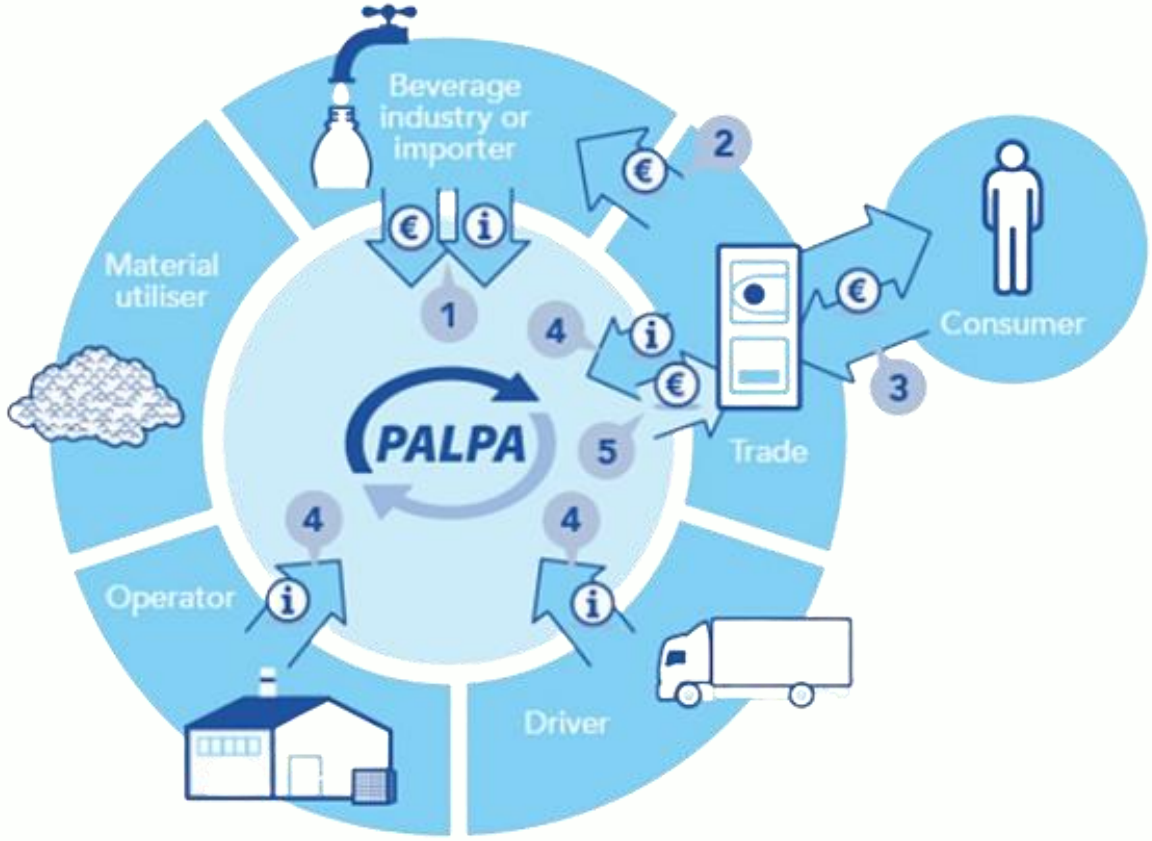
Gross profit estimation for 2023:

€93 million from producer fees + €19 million from unclaimed deposits – €57 million fees to retailers = €55 million

Exclusion:

Other operating expenses like transportation and RVM capital costs

The capital required to build this DRS with 4000 RVM's (reaching 96% success rate) can be estimated to be in the range of €60-€148 million.



TECHNICAL ADAPTATION

The technology is available - should be easy to replicate for reusable packages

Replicate properties of the PALPA Vending Machine such as:

Measuring containers dimensions

+

Measuring weight, optical characteristics

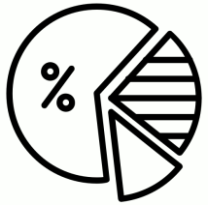
=

Match it with the barcode of individual container

Major barrier and driver for success:
Incorporating standardized product design for the e-commerce packages

PROJECT OUTCOMES

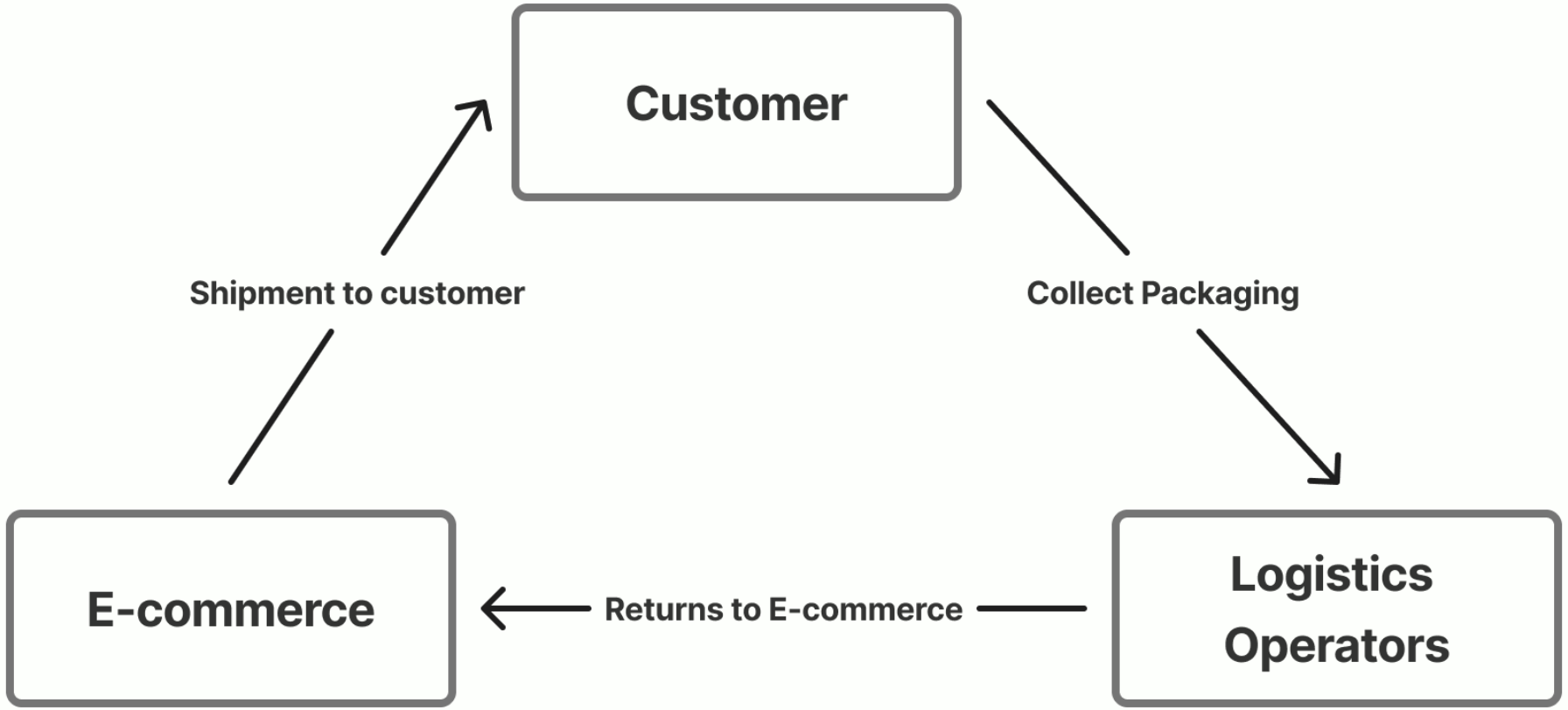
Proposed Model for E-commerce



Total Addressable Market

Model for calculating Optimal Deposit Cost

PROPOSED MODEL FOR E-COMMERCE



EU E-COMMERCE MARKET SIZE

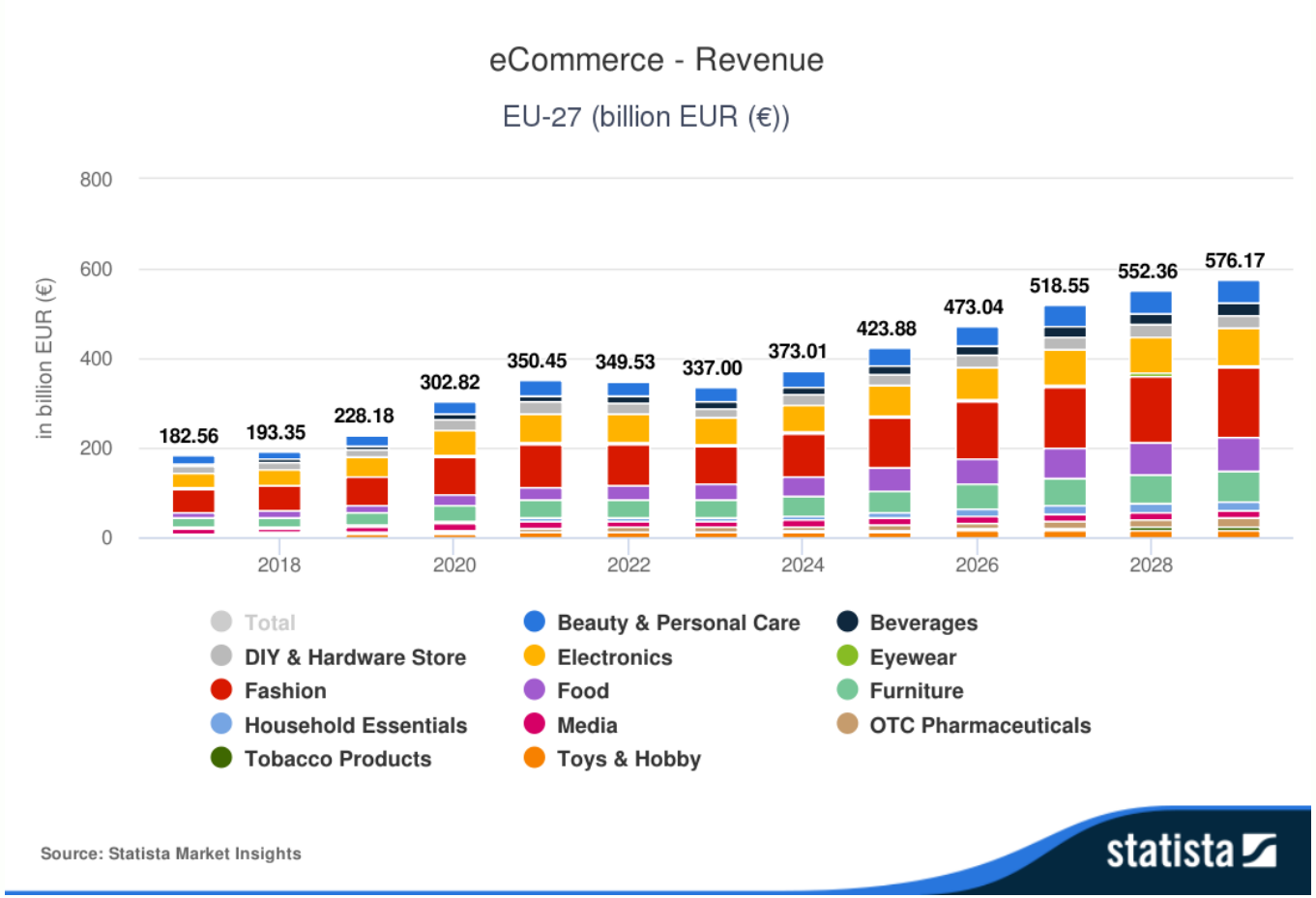
€337B

Total E-commerce Revenue in 2023

€576B

Estimated E-commerce Revenue by 2029

Steadily growing market



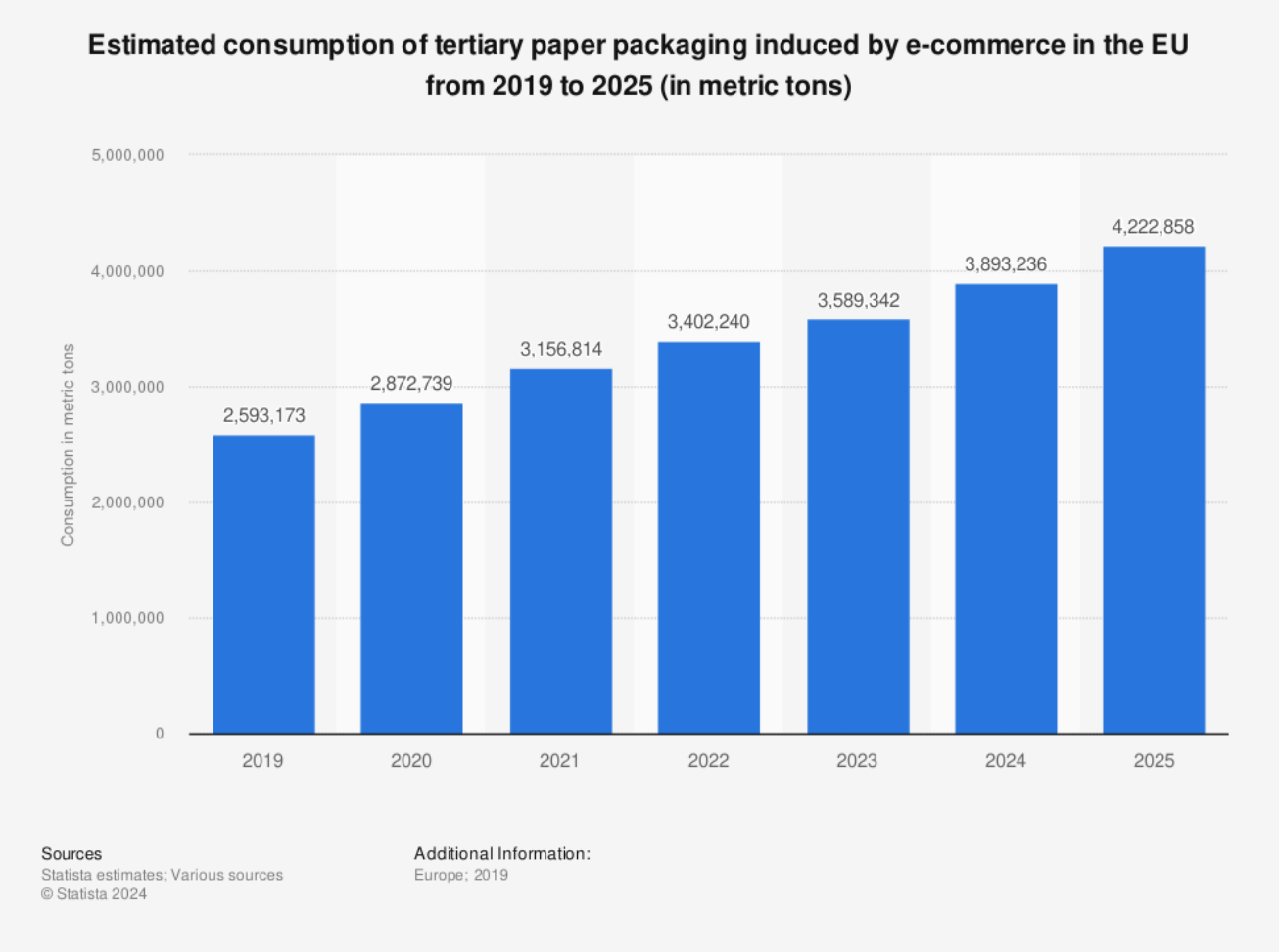
PAPER PACKAGING CONSUMPTION

3.5 million tons

Tertiary Packaging Consumed in **2023**

≈ 6%

Annual growth in consumption



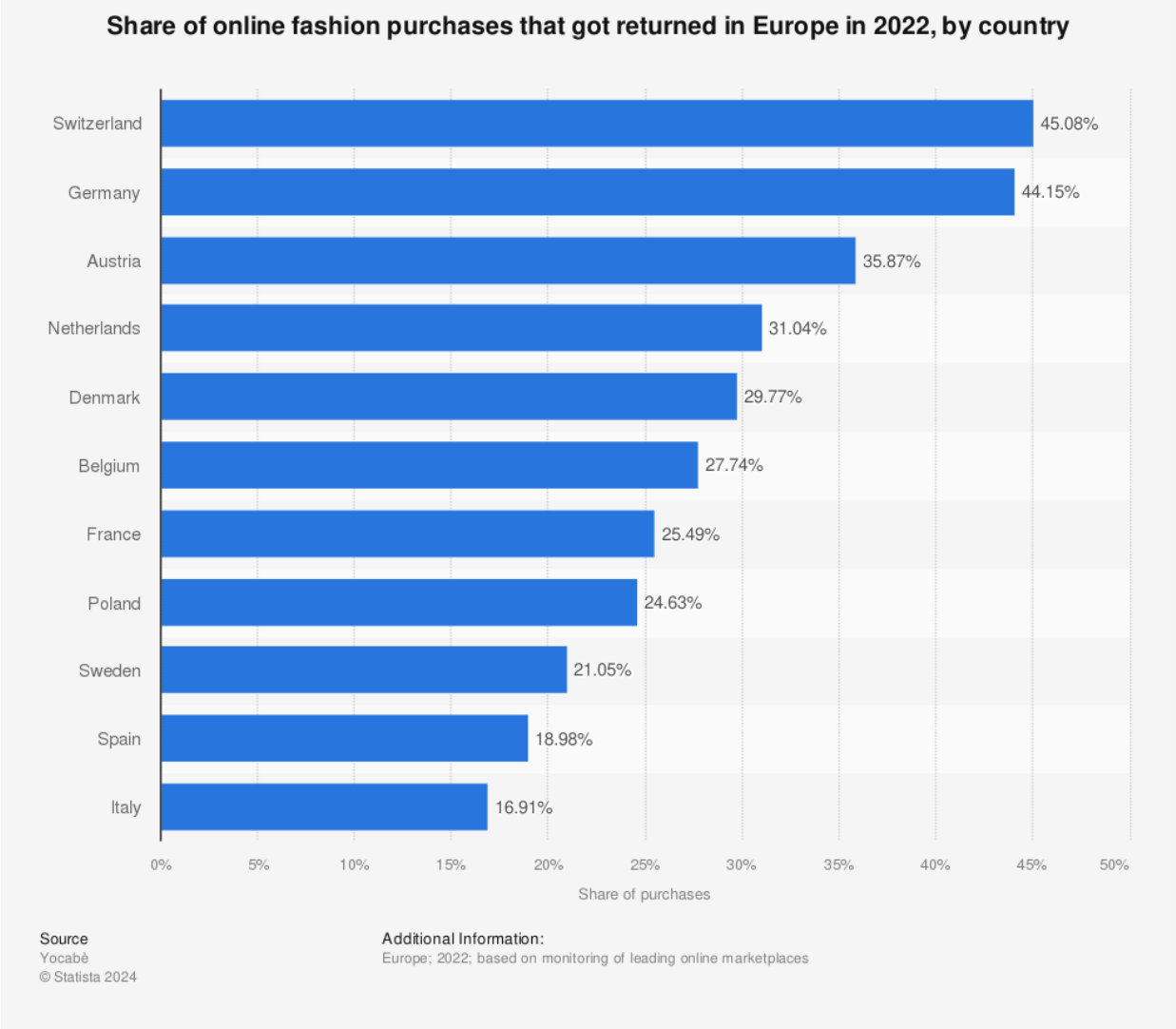
Other materials are also used, but there is no reliable data for other materials.

E-COMMERCE RETURN RATES IN THE EU

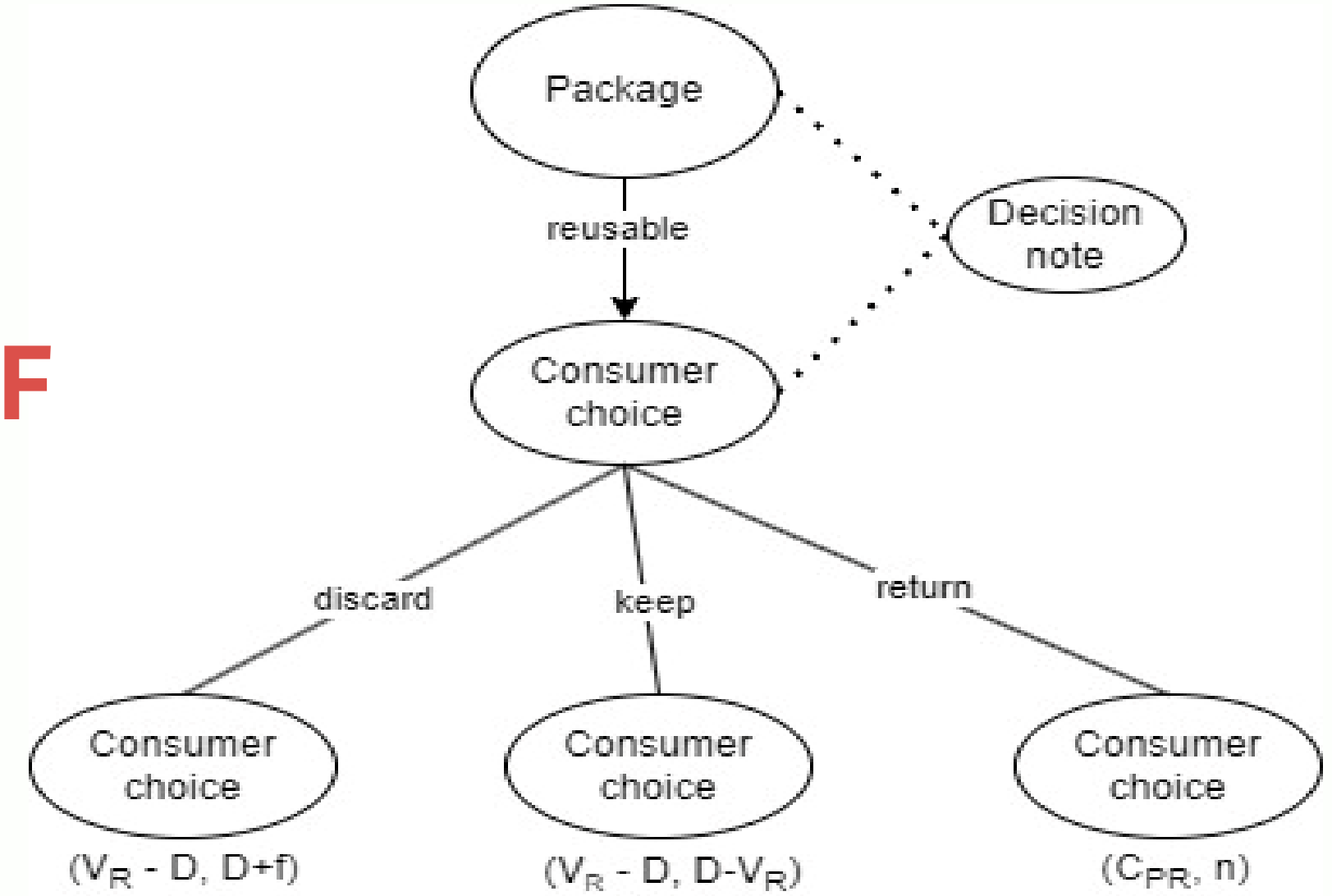
- Exceptionally high return rates
- Up to **45%** in some EU countries

Future Scope:

Reusable packaging could be used for returns



DESIGNING OF INCENTIVES



ESTIMATION OF DEPOSIT (D)

$$D > V_R + n$$

$$\rightarrow D > V_R + C_T + C_E + C_F + C_P + C_C$$

$$\rightarrow D > \alpha * C_{Packge} + C_T + C_F$$

C_T: Time cost

C_E: Effort cost

C_F: Financial cost

C_P: Psychological Cost

C_C: Convenience Factors

C_{packge}: The actual cost of a reusable package.

α: Coefficient value denoting the share of the packaging cost is shared with the consumers.

OPTIMAL DEPOSIT

Assumption: The effort cost, psychological cost, and convenience factors are negligible.

$$Total\ Deposit\ =\ \alpha\ \times\ Cost\ per\ Unit\ of\ Packaging\ +C_F\ +\ C_T$$

Estimating C_T – Avg. €1.57 for a 20-minute round trip (basis Finland's median monthly income)

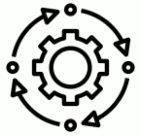
Estimating C_F – Avg. €1.50 Gasoline Cost, [0.8 litters of fuel for a 20-minute trip]

$$Total\ Deposit\ =\ 0.5\ *\ €3.50\ +\ 0.8\ *\ €1.87\ +\ €1.57\ =\ €5.16$$

FACTORS THAT INFLUENCE THE DEPOSIT COST

Cost of Time, C_T

Count of Deposit Points

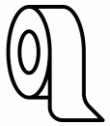


Process Efficiency

Hourly Wage

Financial Cost, C_F

Transportation Cost



Additional Packaging Cost

Cost of Reusable Package, V_R

Material Used

Order Consolidation

RISKS

1. Fluctuating demand planning for packaging in ecommerce
2. Increased investment cost if return rate is low

FUTURE RESEARCH

1. Dynamic demand planning for optimizing quantity of reusable packages
2. More advanced approach to calculating the optimal deposit costs and scalability.
3. API/Technical solutions for controlled scaling of the DRS coverage
4. The logistics of returning processes through cost minimization
5. Possibilities for dynamic deposit amounts

PROJECT TEAM BIOS

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THANK YOU ☺

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