The Economic Impacts of Digital Product Passports in the EU



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The introduction of DPPs has the potential to deliver significant benefits for firms, consumers and the wider EU single market, including...



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## **Executive summary**

In 2024, the European Union introduced the Ecodesign for Sustainable Products Regulation (ESPR) requiring nearly all products sold in the European single market to feature a Digital Product Passport (DPP). This represents an ambitious step towards improving product transparency and sustainability. DPPs provide product-related information digitally, going beyond traditional labels by offering dynamic, real-time updates and significantly expanding the amount of accessible data. In light of this, Oxera has been commissioned by Amazon to examine the economic impacts of DPPs on firms—including SMEs—consumers, regulators, and the broader European single market.

The benefits of DPPs broadly fall into three key categories: cost efficiencies, lower barriers to trade, and increased transparency. One of the key cost efficiencies arises from the transition of product labels from static physical documents to dynamic digital resources. Physical labels are frequently updated, for example, to reflect product changes on packaging or to comply with new labelling requirements at the EU or member state level. Indeed, in fast-moving consumer goods (FMCG), packaging is updated for 30–35% of products annually, leading to a complete overhaul roughly every three years. By shifting product information to a digital format, DPPs can eliminate costly reprinting and repackaging, reduce packaging sizes, and streamline logistics. In sectors such as consumer electronics, compliance costs in Europe are estimated at €797m per year, and digital labelling could reduce these costs by around 15%, notwithstanding the other potential benefits and cost reductions.

Another advantage of DPPs is the potential to reduce compliance costs for firms operating across multiple jurisdictions. DPPs may allow manufacturers to consolidate this information into a single digital system, reducing the need for multiple physical labels and simplifying cross-border compliance. Beyond regulatory labelling, DPPs can streamline reporting obligations. With product-level data stored digitally, firms may be able to automate the extraction data and improve the accuracy of compliance reports. This shift could transform compliance from a resource-intensive process into a more efficient, integrated operation, generating cost savings and operational flexibility.

At a macroeconomic level, DPPs can improve the functioning of the single market by supporting regulatory harmonisation across the EU. A standardised DPP system could reduce market fragmentation, lowering the complexity and cost for firms operating across multiple countries. By minimising the need for country-specific product versions and duplicative labelling requirements, DPPs reduce barriers to trade and enhance firms' ability to scale efficiently.

DPPs may also unlock supply chain efficiencies by providing standardised and centralised product data. This improves the flow of information across supply chains, reducing errors, improving coordination, and streamlining processes such as inventory management and order fulfilment. While DPPs do not inherently enable real-time tracking, related technologies such as the Radio Frequency Identification (RFID) technology—which has been implemented by some firms for separate purposes—demonstrate the potential efficiency gains that digital systems can deliver in stock management and logistics.

Alongside firms, regulators and market surveillance authorities also stand to benefit significantly from DPPs. For example, by integrating detailed and standardised data into a digital registry, DPPs enable customs authorities to conduct more effective risk assessments and improve the efficiency of border controls. This improved customs oversight is likely to contribute to the safety and security of products entering the market, ensuring that consumers are less likely to encounter unsafe or counterfeit goods. Consumers will also benefit from enhanced product transparency, as access to up-to-date product data will enable them to make more informed purchasing decisions, fostering greater trust in product quality, authenticity, and safety.

DPPs also have the potential to improve the functioning of secondary markets by reducing information asymmetries. By granting refurbishers and resellers access to detailed product composition data, DPPs can reduce the need for manual inspection, testing and sorting of secondhand products, making refurbishment and resale more economically viable. This is particularly relevant for sectors such as textiles and batteries, where both sustainability and economic factors drive demand for a more robust secondary market.

Despite these benefits, DPPs also come with potential costs, such as accessibility challenges, implementation costs, and a potential loss of immediacy. However, these can mostly be mitigated through careful design. Digital literacy is rising, with 91% of EU consumers expected to have a smartphone by 2030. A phased approach and maintaining physical labels for key safety information can also ensure inclusivity for the remaining 9%. DPPs can also enhance accessibility by enabling the automatic translation of product information into a user's chosen language. Standardising an open-source DPP format can also reduce compliance and customisation costs for firms while ensuring interoperability across markets.

In the short term, the benefits of DPPs will depend on how they are implemented, in terms of the extent of information they capture and the technology they use. However, in the longer term, by creating the infrastructure of a centralised data depository, DPPs open up new opportunities for businesses to streamline operations, innovate new and existing products and respond more effectively to changing regulatory and market conditions. This infrastructure positions firms to unlock longterm benefits as the market environment evolves, driving increased competitiveness and growth.

As a result, over the medium to long term, DPPs have the potential to generate wider economic benefits. More efficient production processes can lower operational costs, allowing firms to reinvest in innovation or expand production capacity. Cost reductions may also be passed on to consumers, stimulating demand. Enhanced transparency and product assurance could build consumer confidence, leading to higher spending. Additionally, by lowering EU-specific barriers relating to language and regulatory divergence, DPPs could enhance market integration, improving competition and economic growth across the European single market.

# 1 Introduction

## 1.1 What is digital product labelling?

- 1.1 Digital product labelling, also known as e-labelling or electronic labelling, refers to the growing practice of providing product-related information through digital means rather than relying solely on physical labels. Indeed, in 2024 the European Union announced the ESPR requiring that nearly all products sold in the European single market (single market) to feature a 'Digital Product Passport' (DPP).<sup>1</sup> This shift towards digital formats allows manufacturers, retailers, regulators, and consumers to access detailed, dynamic information about a product using electronic devices such as smartphones and tablets.<sup>2</sup> Unlike traditional labels, which are constrained by space and static content, digital labels can be updated in real-time and have the potential to contain significantly more data.
- 1.2 The information provided digitally may describe use characteristics, such as safety instructions, regulatory compliance, and technical specifications, or non-use characteristics, including environmental impact, sustainability credentials, and the moral or ethical elements<sup>3</sup> associated with the product's manufacturing process.<sup>4</sup> Digital labelling aims to enhance transparency, traceability, and consumer access to detailed product data while offering opportunities for businesses to reduce packaging, lower compliance burdens, and improve supply chain efficiency. However, digital labelling may also have limitations, including accessibility challenges for consumers without digital tools and a potential loss of immediacy compared with physical labels. Firms may also face both one-off and ongoing costs for implementation, such as data maintenance.
- 1.3 The concept of digital labelling has been explored globally since the early 2000s, driven initially by the shrinking size of technology including smartphones that could not accommodate

<sup>&</sup>lt;sup>1</sup> European Union (2024), '<u>EU's Digital Product Passport: Advancing transparency and sustainability'</u>, 27 September, accessed 16 January 2025.

 $<sup>^2</sup>$  For instance, barcode readers, in-store devices and RFID scanners.

<sup>&</sup>lt;sup>3</sup> This terminology is used in the labelling literature, e.g. in Teisl, M.F. and Roe, B. (1998), 'The economics of labelling: an overview of issues for health and environmental disclosure', *Agricultural and Resource Economics Review* 27(2): p. 140. Moral and ethical issues could include whether employees receive fair compensation for their labour and work under safe conditions.
<sup>4</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 17.

traditional physical labels.<sup>5</sup> The use of digital labels has grown significantly in certain regions and sectors. For example, digital labels have been featured in an estimated 78-90% of smartphones sold in Australia, Singapore and the USA.<sup>6</sup> Adoption has also been prominent in pharmaceutical markets across the Asia-Pacific—with Japan, Singapore, and Taiwan leading efforts through digital labelling since 2020.7

- 1.4 Outside technology and pharmaceuticals, sustainability initiatives have driven the voluntary adoption of digital labels in industries such as textiles. Brands such as Nobody's Child, H&M, and PANGAIA have started to introduce QR codes on garment care labels, enabling consumers to trace the journey of their clothing from fabric sourcing to production.<sup>8</sup> Similarly, Ford has introduced a digital battery passport to track the lifecycle of electric vehicle batteries, documenting their journey from raw material sourcing to recycling.9
- 1.5 However, as of the time of writing this report, the uptake of voluntary digital labels has remained slow in some sectors, and while some companies make use of digital labels, most still rely solely on physical labels. More recently, policymakers have begun expanding digital labelling frameworks to a broader range of goods, including the DPP requirements under the ESPR in the EU.<sup>10</sup> These developments signal a growing recognition of the potential for digital labelling to enhance transparency, sustainability, and regulatory compliance across diverse sectors.

#### 1.2 The introduction of 'Digital Product Passports' in the EU

#### 1.2.1 **Regulatory context**

The DPP is a regulatory initiative introduced under the Ecodesign 1.6 for Sustainable Products Regulation (ESPR) by the European

<sup>&</sup>lt;sup>5</sup> For example, the U.S. Federal Communications Commission (FCC) allowed voluntary e-labelling for software-defined radios (SDRs) as early as 2001, recognising the practical challenges of affixing surface labels to micro-devices. See Information Technology & Innovation Foundation (2017), 'How E-Labels Can Support Trade and Innovation in ICT', September, p. 18.

<sup>&</sup>lt;sup>6</sup> It is estimated that digital labels were present in: 78% of the smartphones sold in 2016 in Australia, 80–90% of the smartphones sold in Singapore in the period 2013–2016 and 87% of the 14.6m smartphones sold in the USA in 2015. Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, Table 2.

<sup>&</sup>lt;sup>7</sup> Matsui, R., Yamaguchi, K., Lee, J.J.V., Ting, I., Khairilisani, D., Chang, J., Seo, J.M., Park, I., Chee, A.S.M., Quizon, P.M., Harnpramukkul, U., Sem, E., Nguyen, T., Padhye, A. and Mo, R. (2022), 'Survey Result for E-labeling Initiatives in Asia', 10 October.

<sup>&</sup>lt;sup>8</sup> Bluestone PIM (2024), '<u>10 Examples of Digital Product Passport-like Initiatives'</u>, 12 November, accessed 16 January 2025. 9 Ibid.

<sup>&</sup>lt;sup>10</sup> European Union (2024), 'EU's Digital Product Passport: Advancing transparency and sustainability', 27 September, accessed 16 January 2025.

Commission.<sup>11</sup> It aims to enhance product transparency and sustainability by providing a comprehensive digital record of a product's lifecycle, and is initially expected to be implemented for specific product groups from mid-2027 onwards.<sup>12</sup> The DPP serves as a key tool for making information available to actors across the entire value chain, significantly improving end-to-end traceability.

- 1.7 The ESPR currently only explicitly requires sustainability and circular economy information to be included in the DPP, and at this stage, it is not strictly required to hold other types of information.<sup>13</sup> However, the introduction of the DPP offers an opportunity to create the necessary infrastructure to include *additional* product information that can unlock wider benefits.
- 1.8 By centralising and standardising product information, the DPP will allow various stakeholders—including manufacturers, importers, distributors, professional repairers, recyclers, market surveillance authorities, customs officials, civil society organisations, and consumers—to access, update, and utilise relevant data.<sup>14</sup> This enhanced information flow is expected to support better-informed consumer choices, facilitate more efficient repairs and recycling, and improve compliance monitoring by authorities. Additionally, it aims to provide economic operators with streamlined access to regulatory and sustainability data, reducing administrative burdens and supporting circular economy objectives.
- Other regulations, such as the Toy Safety Regulation, the Construction Products Regulation and the Detergents Regulation, while not finalised, also specify the use of DPPs for

<sup>&</sup>lt;sup>11</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, accessed 16 January 2025.

 <sup>&</sup>lt;sup>12</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR): Frequently Asked Questions (FAQ)</u>', 25 September, p. 30, accessed 16 January 2025.
 <sup>13</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u>

<sup>&</sup>lt;sup>13</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, accessed 16 January 2025.

<sup>&</sup>lt;sup>14</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, para. 32, accessed 16 January 2025.

additional purposes, including safety and quality assurance.<sup>15,16,17</sup> The requirements under these regulations are designed to be technically compatible with the DPP framework established under the ESPR.<sup>18</sup> This alignment aims to ensure consistency across regulatory frameworks and avoid the need for multiple solutions, thereby streamlining compliance processes for businesses. However, discrepancies across product regulations, such as those above, may still exist, requiring adaptations to the DPP framework to address the unique requirements of each sector.

#### 1.2.2 Type of information included

- 1.10 Informational requirements for DPPs will differ depending on the type of product, reflecting the most relevant data needed for a specific category. However, products within the same product group will share uniform DPP requirements, for example, all washing machines will follow a standardised set of requirements, as will all sofas.<sup>19</sup>
- 1.11 In addition to product-specific data, DPPs can integrate information required under other relevant EU laws—this will be the case in toys and detergents, as mentioned above.<sup>20</sup>
- 1.12 While the EU regulatory framework is still evolving, certain principles are clear. There will be minimum informational requirements for labels dependent on product group, though it remains uncertain whether there will be a mandatory obligation for third-party certification or conformity assessments for the information disclosed.<sup>21</sup> These details will be finalised as the framework develops.

<sup>19</sup> European Commission (2022), 'Impact Assessment: Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC: Part 1/4', 30 March, p. 32.

<sup>&</sup>lt;sup>15</sup> We note that the Toys Safety Regulation is still in the process of being finalised (as of March 2025). European Commission (2023), '<u>Regulation of the European Parliament and of the Council on the safety of toys and repealing Directive 2009/48/EC'</u>, 28 July, accessed 16 January 2025.
<sup>16</sup> We note that the Detergents Regulation is still in the process of being finalised (as of March 2025). European Commission (2023), '<u>Regulation of the European Parliament and of the Council on detergents and surfactants, amending Regulation (EU) 2019/1020 and repealing Regulation (EC) No 648/2004', 28 April, accessed 16 January 2025.
<sup>17</sup> European Commission (2024), 'laying down harmonised rules for the marketing of construction
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 <sup>&</sup>lt;sup>17</sup> European Commission (2024), 'laying down harmonised rules for the marketing of construction products and repealing Regulation (EU) No 305/2011', 17 November, accessed 16 January 2025.
 <sup>18</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR): Frequently Asked Questions (FAQ)</u>', 25 September, p. 16, accessed 16 January 2025.
 <sup>19</sup> European Commission (2022), 'Impact Assessment: Proposal for a Regulation of the European

 <sup>&</sup>lt;sup>20</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework for the setting of ecodesign requirements for sustainable products</u>', 28 June, para. 32, accessed 16 January 2025.
 <sup>21</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR): Frequently</u>

<sup>&</sup>lt;sup>21</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR): Frequently</u> <u>Asked Questions (FAQ)</u>', 25 September, pp. 30–32, accessed 16 January 2025.

- 1.13 The type of data stored on the DPP is still to be determined but may include the product materials and their origins, technical performance, repair and recycling options, and lifecycle environmental impacts.<sup>22</sup> An illustrative example comes from the battery sector, one of the most advanced in implementing DPPs. As seen in Figure 1.1, the proposed battery passport includes up to 90 data attributes grouped into seven categories:
  - general information;
  - labels and certifications;
  - carbon footprint;
  - supply chain due diligence;
  - materials and composition;
  - circularity & resource efficiency;
  - performance & durability.

# Figure 1.1 An example of the informational requirements for the Battery Pass

Ch Pattony	Labels and certifications <sup>1</sup>	Supply chain due diligence	Circularity & resource efficiency	
Pass	Symbols and labels	Due diligence report	Recycled content shares	
Battery ID: 0101010 Battery passport ID: 1111010	? Meaning of labels & symbo	s Materials and composition	Manuals for removal, disassembly, dismantling	
Responsible economic operator General information	Declaration of conformity	A Hazardous substances	© Component part numbers & spare parts information	
Manufacturing info	© Compliance of test results	र्द्भ Battery chemistry	Safety measures/instructions	
(identity, place, date)	Carbon footprint	Critical row materials	Performance & durability	
🚓 Battery category	Carbon footprint (5 metric	) Materials used in cathode,	Capacity, energy, power, SoH	
Battery weight	Weblink to CF study	anode, electrolyte	Expected lifetime	
Battery status	A CF performance class		Provide a second	

Source: CEN-CENELEC, (2023), '<u>JTC24 –Digital Product Passport – Framework and</u> <u>System'</u>, p. 9, accessed 16 January 2025.

#### 1.2.3 Choice of technology

1.14 The technological framework for DPPs is still under development, with the DPP IT architecture set to rely on harmonised standards being created by the European

<sup>22</sup> European Commission, '<u>Ecodesign for Sustainable Products Regulation</u>', accessed 16 January 2025.

Standardisation Organisations, CEN and CENELEC, with delivery expected by the end of 2025.<sup>23</sup>

- 1.15 A variety of technologies could be suitable for implementing DPPs, each with unique advantages, trade-offs, and implications. For example, these include the below.<sup>24</sup>
  - **QR Codes:** a type of matrix barcode that stores data. These are a strong contender due to their widespread familiarity and adoption by consumers. QR codes can be easily scanned using smartphones, making them an accessible and cost-effective solution. Indeed, a survey found that over four-fifths of EU, US and UK consumers have scanned a QR code at least once.<sup>25</sup>
  - NFC (Near Field Communication): technology that allows devices to exchange data over short distances, typically used in contactless payments and product interactions via taps with NFC-enabled devices.
  - **RFID (Radio Frequency Identification):** a technology that uses electromagnetic fields to automatically identify and track tags attached to objects. While less common for consumer interactions, RFID technology has the potential to enable real-time product tracking and automated inventory management. This is set out in more detail in section 3.2.2.
- 1.16 Given the varying strengths of these technologies, it is possible that multiple technologies will be used in parallel to maximise both consumer accessibility and operational benefits.

#### 1.2.4 How will it be implemented?

1.17 It is not yet clear when the regulation will be fully implemented across all product categories, as the process is gradual and sector-specific. However, there will be an initial focus on specific product categories, with electronics, batteries, and textiles expected to be among the first sectors to adopt the regulation.<sup>26</sup> This prioritisation is likely driven by parallel

 <sup>&</sup>lt;sup>23</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR): Frequently</u> <u>Asked Questions (FAQ)</u>', 25 September, p. 32, accessed 16 January 2025.
 <sup>24</sup> IMPINJ '<u>Digital Product Passports: What you need to know</u>', accessed 16 January 2025.

 <sup>&</sup>lt;sup>24</sup> IMPINJ '<u>Digital Product Passports: What you need to know</u>', accessed 16 January 2025.
 <sup>25</sup> Information Technology & Innovation Foundation (2021), '<u>How E-labels Can Support Trade and Innovation in ICT, Medical, and Other Products'</u>, 27 October, accessed 15 January 2025.

Innovation in ICT, Medical, and Other Products', 27 October, accessed 15 January 2025. <sup>26</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR)</u>: Frequently <u>Asked Questions (FAQ)</u>', 25 September, p. 33, accessed 16 January 2025.

regulations already being published in these sectors, which may help to streamline the integration of DPPs.

- 1.18 In addition, while the goal is to create a digital infrastructure, the ESPR regulation also acknowledges the need for complementary non-digital forms of information, such as traditional product manuals or physical labels.<sup>27</sup> This means that physical labels will not be eliminated entirely, at least in the short-to-medium term. Despite this, the size of physical labels may be reduced as some information is transferred to the DPPs. For example, it may be that some sectors choose to rely on more harmonised symbols on physical labels, similar to practices in sectors such as financial instruments and food labelling, with more detail written into the DPP. The use of symbols typically takes up less label space than written text, especially if provided in multiple languages.
- 1.19 Moreover, given space constraints, DPPs can provide additional information beyond what has traditionally been included on physical labels in the past, such as details on carbon footprint and product durability. This dual approach of streamlined orreduced physical labels complemented by DPPs ensures that critical information remains accessible directly on the product while allowing more detailed data to be hosted digitally.

## 1.3 Scope and structure of this report

- 1.20 Oxera has been commissioned by Amazon to conduct a study examining the economic impacts of DPPs for firms (including SMEs), consumers and regulators in the EU. We also consider how the potential efficiencies may also lead to indirect consumer and societal benefits, including the reduction of fragmentation in the single market.
- 1.21 While DPPs are recognised as a key tool for promoting sustainability in the EU, including climate-related objectives, this study abstracts from these broader environmental effects. Instead, the report focuses exclusively on the economic impacts.
- 1.22 Additionally, it is important to note that the benefits and costs discussed in this report are considered in general terms, without

<sup>&</sup>lt;sup>27</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, para. 32, accessed 16 January 2025.

reference to specific implementation choices. The impact of DPPs will ultimately depend on various factors, including the type of information included in the passports, the technologies used for data management, and the regulatory requirements for different sectors. However, this report aims to explore potential economic outcomes under a range of generalised scenarios in order to provide insights for firms and policymakers on the implementation of the DPP.

- 1.23 The remainder of this report is structured as follows.
  - Section 2 outlines the economic framework underpinning the potential impact of enhanced DPPs. It takes a topdown approach to outline the broader, macroeconomic impacts of DPPs. This section focuses on the general benefits DPPs can provide, such as cost efficiencies, reduced trade barriers, and enhanced transparency, without examining the specifics of how these outcomes are achieved. We then explore the aggregate effects of these benefits on areas like economic growth, demand, and market dynamics.
  - Section 3 on the other hand, takes a bottom-up approach, providing a more granular analysis of how these macro-level outcomes materialise in practice. This section assesses the qualitative and quantitative evidence relating to the various categories of benefits. It begins by examining supply-side impacts, including direct cost savings for manufacturers and retailers from reduced physical label usage and improvements in firm time management and operational efficiency. The section then explores broader consumer and broader societal-level impacts in the EU, concluding with a summary of the key findings.

# 2 Economic framework

2.1 This section sets out the economic mechanisms and framework underpinning the potential benefits and costs of DPPs, drawing on relevant economic literature for context.

#### 2.1 Economic concepts related to digital labelling

2.2 This section sets out several economic principles that are relevant to DPPs. While the concepts discussed in the literature are not specific to DPPs, they draw on foundational economic principles related to information provision. These concepts help illustrate how digital labelling, by improving the availability of information, can improve economic outcomes, enhance firm and consumer welfare, and promote market efficiency.

#### 2.1.2 Information asymmetries

- 2.3 Information asymmetry occurs when one party in a transaction has more or better information than the other, creating imbalances that can lead consumers to make decisions they would not make if they were fully informed. For example, when consumers purchase clothing marketed based on a specific environmental attribute, they may not be aware of the full environmental impact of production, such as water usage, chemical treatments, or labour conditions. The ability to fully review the supply chain of the product may allow them to make purchasing decisions that better match their preferences.
- 2.4 Applied to this context, a key function of labels is to provide information to consumers,<sup>28</sup> thereby reducing information asymmetries among firms and consumers. DPPs, as opposed to physical labels, help resolve these by providing consumers with real-time, easily accessible data. This empowers consumers to make more informed choices. Therefore, DPPs, by ensuring greater transparency, will lead to better economic outcomes due to consumers and downstream firms benefitting from the

<sup>&</sup>lt;sup>28</sup> See Kolodinsky, J. (2012). 'Persistence of Health Labeling Information Asymmetry in the United States: historical perspectives and twenty-first century realities', *Journal of Macromarketing*, **32**:2, pp. 193–207; and Nadvi, K. and Wältring, F. (2004), 'Making Sense of Global Standards', *Local enterprises in the global economy: Issues of governance and upgrading*, pp. 53–94

ability to base their choices on more complete and accessible data.  $^{\mbox{\tiny 29}}$ 

#### 2.1.3 Externalities

2.5 An externality is a cost or benefit arising from an economic transaction that affects third parties that are not directly involved in the transaction. For instance, when a consumer purchases a good, they may cause positive or negative externalities (e.g. purchasing a highly polluting vehicle affects public health and the environment). As a result of increased transparency, DPPs provide consumers and firms with more information about the broader impact of their choices. Since individuals and businesses do not always internalise externalities when making decisions—focusing instead on private costs and benefits—greater visibility over environmental or social consequences may lead them to adjust their behaviour. This improved decision-making can contribute to better overall outcomes for society.

#### 2.1.4 Search and monitoring costs

2.6 Search costs are the time, effort and resources that consumers and firms spend in making a purchase or decision. DPPs may reduce search costs for firms and consumers if information is more easily available—meaning that less effort has to be exerted by consumers to make optimal purchasing decisions, and downstream firms can quickly understand product specifications from upstream firms without extensive communication or testing. For example, detailed data on materials or compliance standards in a DPP can supply retailers with information on products they may stock more easily, allowing them to make purchasing decisions more efficiently, saving time and resources. Regulators' and consumer bodies' monitoring costs may also be reduced by DPPs as the additional transparency means that they can easily verify whether firms

<sup>&</sup>lt;sup>29</sup> As noted in a seminal paper by Akerlof (1970), the need for labelling is derived from the presence of information asymmetries about quality between firms and consumers, and may require regulatory intervention to prevent inefficiencies in the allocation of resources. Note that this is not specific to *digital* labelling, but labelling in general. See Akerlof G.A. (1970), 'The Market for 'Lemons': Quality Uncertainty, and the Market Mechanism,' *Quarterly Journal of Economics*, **84**, pp. 488–500. On a smaller scale, on an online platform, better certification of products has solved information asymmetries and led to higher quality products offered on the platform, both by encouraging efforts in increasing quality of existing sellers as well as entry of new high-quality firms. See Hui, X., Saeedi, M., Spagnolo, G. and Tadelis, S. (2023). 'Raising the Bar: Certification thresholds and market outcomes', *American Economic Journal: Microeconomics*, **15**:2, pp. 599–626.

are compliant and subsequently quickly remediate situations where firms are not compliant.

#### 2.1.5 Competition and innovation

2.7 Greater transparency may enhance competition and innovation among firms, making it easier and less costly for firms to gather information on how competitors develop and produce their goods. For example, a firm may use the DPP to compare the sustainability characteristics of a product (e.g., carbon footprint or use of recyclable materials) against those of a competitor's product. By understanding the environmental impacts of its competitors' products, a firm could innovate in areas such as more efficient use of resources or improved environmental impact, helping them to stay competitive in the market. This may allow firms to identify gaps, optimise their own processes, and adapt market trends or consumer demands more quickly, leading to more competitive market outcomes. This also has the potential to lead to potential cost savings in the supply chain, which may ultimately be passed on to downstream firms and consumers.

#### 2.2 Benefits

2.8 The economic concepts outlined above highlight how DPPs can address key issues related to the flow of information. This leads to benefits for various stakeholders in society, such as reducing costs for businesses, increasing transparency for consumers, and lowering barriers to entry for new market participants. Figure 2.1 below provides an overview of the potential economic benefits to different stakeholders when digital product labels are introduced.



Source: Oxera.

#### 2.2.2 Cost efficiencies

- 2.9 First, DPPs can reduce firms' costs by streamlining regulatory compliance, reducing the need for multiple physical labels and packaging, and lowering administrative costs related to certification and reporting. They enable real-time updates to product information without reprinting labels, minimise the complexity of managing different regulatory requirements across jurisdictions, and improve supply chain efficiency by enhancing traceability and product data management. This is discussed in more detail in section 3.
- 2.10 Some of these cost savings are likely to be passed on in the form of lower prices to firms lower down in the value chain or to end consumers. Standard economic theory suggests that the degree of pass-on is typically expected to range from 50% to 100% if a cost shock is common—which applies to both a cost increase and decrease—and depends on the level of competitiveness in a market.<sup>30</sup> Therefore, insofar as the DPP

<sup>&</sup>lt;sup>30</sup> Oxera (2018), '<u>Pass it on: the draft EU guidelines on pass-on and volume effects</u>', *Agenda*, 26 October.

lowers common costs for firms (e.g. in production or compliance) this is likely to lead to lower final prices for consumers.

#### 2.2.3 Transparency

- 2.11 By providing detailed, accessible information, DPPs also increase transparency, allowing consumers to make more informed decisions. As mentioned in section 2.1, several findings from economics highlight how an increased level of transparency (for example as a result of the DPP) can lead to better outcomes through the reduction of information asymmetries and negative externalities.
- 2.12 By providing transparent and reliable product information, DPPs empower consumers with heterogeneous preferences—for example, some may particularly value environmental impact, while others put more weight on supply chain ethics—to identify the most suitable product for them. The DPP could further enhance this by enabling consumers to compare products side by side based on key attributes that are important to them. Furthermore, as a result of improved consumer decisions, firms are better able to specialise. For example, some retailers may want to sell only ethically sourced goods and can use DPPs to do due diligence on the supply chain much more quickly at a lower cost. In this sense, the benefits for consumers and firms are interlinked.
- Moreover, consumers benefit from DPPs from a language 2.13 perspective because they provide access to product information in a language of their choice, rather than being limited to the language of the country where the product is sold. For example, a consumer purchasing a household appliance while travelling or living abroad could scan the DPP and access user instructions, safety information, and warranty details in their native language, improving understanding and reducing the risk of misuse. This makes key details—such as ingredients, sustainability credentials, or safety instructions-more accessible to a wider range of consumers, including those who do not speak the local language fluently. By reducing language barriers, DPPs in particular present a significant opportunity to improve product accessibility and consumer trust to reduce fragmentation across the multilingual Single Market.

#### 2.2.4 Lower barriers to entry

- 2.14 DPPs reduce barriers to entry by providing the infrastructure to streamline regulatory compliance, which could allow firms to meet different national requirements through a single, harmonised digital system rather than needing separate labels and packaging for each market. This reduces administrative costs, simplifies certification processes, and makes it easier for smaller firms and new entrants to expand into multiple markets.
- 2.15 Given the scope of this report is the EU, considering barriers to entry in the EU specifically is important. DPPs can help lower these barriers as the harmonisation of DPP requirements can facilitate cross-border trade within the EU by reducing compliance costs associated with differing national regulations. Additionally, by providing product information in a structured and potentially multilingual format, DPPs may help overcome language-related barriers that can make it harder for firms especially SMEs—to scale across the single market. This increased transparency and harmonisation can support a more integrated and competitive internal market.

## 2.3 Aggregated benefits

- 2.16 In the short term, the benefits of DPPs will depend on how they are implemented, in terms of the extent of information they capture and the technology they use. However, in the longer term, by creating the infrastructure of a centralised data depository, together, the benefits of DPPs listed in the previous subsections are likely to result in improved market outcomes, which translate into economic growth in the EU in the longer term. This could occur through several mechanisms, as follows.
  - Increased productivity: more efficient production processes means that firms may be able to lower operational costs which can be reinvested into innovation or expanding production capacity.
  - Innovation: by acting as a data repository, DPPs create opportunities for firms to develop new products, services, and business models based on the detailed product information they provide. The consistent and structured data generated through DPPs enables firms to gain valuable insights into market trends, consumer preferences, and competitive dynamics. This data can be leveraged for a wide range of purposes, such as enhancing product development. Additionally, the data could support the training of advanced technologies

such as large language models, helping firms to improve automation, decision-making processes, and overall efficiency. This information can be used to innovate existing and new products, which, in turn, can lead to dynamic effects on innovation and competition.

- Stimulated consumer demand: similarly, economic theory says that firms will pass-on at least a part of lower costs into lower consumer prices depending on the level of competition, boosting demand for products. Moreover, greater transparency, product assurance and the availability of product information in their preferred language may also build consumer confidence, encouraging higher levels of spending. Greater transparency and access to product information can also increase customer engagement, encouraging more frequent interaction with the brand. This can lead to faster feedback loops, where firms can quickly adapt to consumer preferences or address concerns.
- Enhanced competition: greater transparency and lower barriers to entry may encourage more firms to enter markets, fostering competitive pressures which ultimately benefit consumers.
- **Supply-chain efficiencies:** standardised information requirements across the supply chain could improve coordination among firms and reduce compliance inefficiencies. This may enhance the overall value generated within supply chains, particularly for industries with complex global networks.
- Lowering of EU specific barriers: while the diversity of the EU—encompassing language, culture, and various industries—adds to its unique character and value, it also presents specific challenges that other large markets, such as the USA or China, do not face. These challenges include the complexity of navigating different regulations, languages, and consumer preferences across member states. DPPs can help lower these EU-specific barriers by standardising product information, and increasing transparency, making it easier for firms to operate across borders and for consumers to access consistent and clear information in a language of their preference, thereby removing the risk of market fragmentation within the EU.
- 2.17 Over time, the interplay of these factors—higher productivity, stronger consumer demand, more competitive markets, efficient

supply chains and removal of EU barriers—may collectively raise the EU economy's potential output. These improvements may not only support GDP growth, but also generate broader societal benefits, such as enhanced consumer welfare, improved product quality, and more sustainable production practices. However, the scale of these benefits will depend on the successful implementation of DPPs and the extent to which firms and consumers respond to the changes they introduce.

#### 2.4 Potential drawbacks

- 2.18 As with any new technologies with clear benefits and significant potential (as mentioned above), there may be costs or potential drawbacks that should be considered. In this context, critics have raised potential concerns relating to DPPs such as a loss of immediacy of information, accessibility challenges and the cost of implementation. We discuss each of these factors in turn.
- 2.19 One of the concerns with the adoption of DPPs is the potential loss of immediacy. Traditional physical labels provide consumers with instant access to essential product information at the point of purchase. This immediacy is crucial for consumers to make quick, informed decisions. With DPPs, there is a potential risk that consumers may find it more difficult to access information quickly, for example if they do not have immediate access to a smartphone or other digital device.
- 2.20 However, as mentioned in section 1.2.4, the EU DPP initiative does not intend to replace printed labels entirely, but instead provide complementary or additional information.<sup>31</sup> This can enhance the consumer experience by offering information that goes beyond what is feasible on a physical label, for instance, DPPs could include interactive elements such as videos demonstrating product usage, or links to further resources. This approach ensures that essential information remains accessible to all consumers, while also providing a richer, more comprehensive set of data for those who seek it.
- 2.21 Another potential challenge associated with DPPs is the perceived lack of digital readiness among certain customer groups. Although an estimated 94% of EU households have

<sup>&</sup>lt;sup>31</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, para. 32, accessed 16 January 2025.

internet access as of 2024,<sup>32</sup> there is still a relatively small group of people lacking access to smartphones or with limited digital literacy.<sup>33</sup> That said, as of 2024, 83% of EU consumers own a smartphone, and this is predicted to rise to 91% by 2030.<sup>34</sup> Furthermore, digital technologies such as QR codes have become more prevalent in recent years, with a 2020 survey of consumers in the USA, UK and EU finding that 83% of respondents had scanned a QR code at least once, with 72% having scanned a QR code within the previous month.<sup>35</sup> This suggests that the majority of consumer groups would be able to access DPPs, with this expected to grow in future. We note that this criticism does not apply to online sales, as by definition, engaging in online shopping are already accessing digital platforms.

- 2.22 That said, for those consumer groups who are less digitally literate, as mentioned above, if physical labels continue to provide information essential for purchase, all customers, regardless of digital proficiency, will be at least as well off.
- 2.23 Furthermore, DPPs can actually improve accessibility of information for some groups, by offering features that are not possible with traditional labels.<sup>36</sup> By streamlining physical labels in place of digital information, it may be possible to increase the legibility of the essential information remaining on the packaging. In addition, DPPs can provide adjustable font sizes and language options, making information more user-friendly for a diverse audience. DPPs can also offer search functionality, so consumers can quickly find the information they are searching for. Moreover, DPPs can enable the possibility of offering further functionalities, such as text-to-speech technology, providing audio options for individuals with visual impairments.
- 2.24 In order to minimise the potential risks associated with loss of immediacy and lack of digital accessibility, possible solutions could include: (i) offering print-on-demand options for

January 2025.

 <sup>&</sup>lt;sup>32</sup> See Eurostat (2024), '<u>Digital economy and society statistics – households and individuals',</u>
 <u>December</u>, December, accessed 29 January 2025.
 <sup>33</sup> Digital literacy rates differ across EU member states, as evidence on the use of public authorities'

 <sup>&</sup>lt;sup>33</sup> Digital literacy rates differ across EU member states, as evidence on the use of public authorities' websites and apps suggests. See Eurostat (2024), '<u>Digital economy and society statistics –</u>
 <u>households and individuals', December</u>, December, accessed 29 January 2025.
 <sup>34</sup> GSMA (2025), '<u>The Mobile Economy Europe 2025'</u>, January, accessed 16 January 2025.

 <sup>&</sup>lt;sup>34</sup> GSMA (2025), '<u>The Mobile Economy Europe 2025</u>', January, accessed 16 January 2025.
 <sup>35</sup> Information Technology & Innovation Foundation (2021), '<u>How E-labels Can Support Trade and Innovation in ICT, Medical, and Other Products'</u>, 27 October, accessed 15 January 2025.
 <sup>36</sup> Chaudhary, P. and Shetty, V. (2020), '<u>E-Labeling: Change is Underway'</u>, 29 June, accessed 15

consumers shopping in-store without digital access (indeed, this was a solution proposed by Ikea in the context of the textile labelling consultation);<sup>37</sup> (ii) a gradual phase-in of digital labelling accompanied by awareness-raising campaigns run by EU governments to familiarise consumers with new symbols which may replace words and bring more immediate benefits to firms in terms of reduced labelling and translation costs; (iii) ensuring that DPPs are presented in a structured, easy-to-navigate format; (iv) ensuring that DPPs are compatible with widely-used, well-understood technologies, i.e. not requiring specialist apps to access. We note that the latter two are already accounted for in the ESPR.<sup>38</sup>

- 2.25 Another consideration of DPPs is the financial cost. This may include both the one-off administrative setup costs of DPPs and an ongoing cost of maintaining and storing the data. These costs may be more or less than the existing costs firms incur to label their products physically, and their scale will depend on how the DPP is ultimately implemented.
- 2.26 These costs may affect firms differently depending on their scale and size, for example, as one-off costs are likely to be distributed across the number of products sold by a particular firm, so the per-product cost will be higher for low-volume firms. Furthermore, in the short term, depending on the amount of competition in the market, some of these costs may also be passed on to consumers in the form of higher prices. The amount of cost pass on can range from 50% in oligopolistic markets to 100% in competitive markets where costs are common.<sup>39</sup>
- 2.27 Despite this, in the medium to long term, we expect the benefits of DPPs to outweigh the costs. Not least because there are expected to be direct cost savings associated with DPPs (see section 3.1), but also because DPPs will have indirect effects

 <sup>&</sup>lt;sup>37</sup> Ikea (2024), 'EU Textile Labelling Regulation (TLR) Call for Evidence – The IKEA position', 11 April.
 <sup>38</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, para. 32, accessed 16 January 2025, para. 37 and Article 10.
 <sup>39</sup> ten Kate, A. and Niels, G. (2005), 'To what extent are cost savings passed on to consumers? An

<sup>&</sup>lt;sup>39</sup> ten Kate, A. and Niels, G. (2005), 'To what extent are cost savings passed on to consumers? An oligopoly approach', *European Journal of Law and Economics*, **20**:3, pp. 323–37.

that can benefit businesses and regulators alike, and ultimately consumers as well. As stated by the European Commission:40

In the short term, the added regulatory cost will drive a products' price increase [...] In the medium term, price increase associated with higher quality will drive a change in consumer behaviour. As companies access information that can lead to more efficient processes, the pressure on prices is also expected to diminish.

- 2.28 In addition, despite the presence of one-off and maintenance costs, DPPs can be introduced and designed so that these costs are mitigated. For example, firms could be provided phased implementation timelines from the EU to spread costs over time. Alternatively, there could be standardised and open-source DPP formats so that firms save costs on compliance and customisation. In particular, SMEs-lacking the economies of scale and scope to spread the cost over a wide product basemay receive additional support to ensure adoption is feasible and not too costly in the short run. Indeed, in the ESPR, EU member states are urged to help SMEs comply with the ecodesign requirements, including through financial support and specialised management and staff training.<sup>41</sup> Finally, the EU may opt to encourage interoperability with existing databases to prevent wasteful investments in setting up unnecessary new databases.
- 2.29 As a final note on the costs of DPPs, it is worth considering the tension between the concepts of the loss of immediacy and the financial costs of DPPs. That is to say, if DPPs are introduced in addition to existing physical labelling without any further changes, there will be no exclusion of digitally illiterate consumers, but this could lead to higher costs for firms due to the need for additional resources to manage and present both sets of labels. Conversely, if DPPs partially replace or reduce the size and complexity of existing labels, firms may benefit from lower costs associated with packaging and labelling. However,

<sup>&</sup>lt;sup>40</sup> European Commission (2022), 'Impact assessment: Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC: Annex 10', p. 334.
<sup>41</sup> European Union (2024), '<u>Regulation (EU) 2024/1781 of the European Parliament and of the</u>

<sup>&</sup>lt;sup>41</sup> European Union (2024), '<u>Regulation (EU) 2024/1781 of the European Parliament and of the</u> <u>Council</u>', 13 June, Article 22, part 3. 'Member States shall take appropriate measures to help SMEs, in particular microenterprises, comply with the ecodesign requirements set out in delegated acts adopted pursuant to Article 4. [...] In addition, without prejudice to applicable State aid rules, such measures may include: (a) financial support, including by providing fiscal advantages and investing in physical and digital infrastructure; (b) access to finance; (c) specialised management and staff training'.

this could come at the expense of accessibility. The balance between these two concepts will depend on the ultimate implementation of DPPs and how much of the physical label stays.

# 3 Evidence of the impact of digital product labelling

3.1 This section presents qualitative and, where available, quantitative evidence on the diverse range of potential impacts associated with the introduction of DPPs in the EU. It begins by examining the supply-side impacts on businesses, including SMEs, focusing on cost reductions and efficiency gains. The discussion then broadens to consider the wider economic implications for consumers and society. Where relevant, the report draws on case studies from sectors where DPPs are more advanced to illustrate some of the potential benefits.

#### 3.1 Supply-side: savings due to reduced physical label requirements

- 3.2 The first category of benefits relates to the direct cost savings that firms, including manufacturers and retailers, may achieve by relying less on physical labels. As outlined in section 1.2.4, DPPs will not fully replace physical labels, as certain product information and key safety information, must remain on packaging to enable customers to make informed purchasing decisions at the point of sale.
- 3.3 However, some reduction in the size and complexity of physical labels is expected. For instance, if translations into multiple languages are hosted digitally through DPPs, physical labels could feature less text, thereby reducing space requirements. Similarly, harmonisation of symbols on physical labels, with additional language-specific information accessible via the DPP, could further minimise label size. This is thought to be a particular benefit in industries with small physical products that require large label spaces, such as ICT devices, where etching the labels requires more design time and expensive equipment.<sup>42</sup>
- 3.4 The extent of these cost savings will depend on how DPPs are ultimately implemented and will likely vary by product category. For example, small cosmetics may still require relatively large physical labels to accommodate safety warnings and ingredient lists, while other products may have fewer constraints. In the consumer electronics industry in the USA, where digital labels have been permitted since 2014, sources have estimated that

<sup>&</sup>lt;sup>42</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 34.

manufacturers would save over \$80m a year.<sup>43</sup> Regardless, the types of cost reductions that firms could realise include lower design and printing costs, reduced packaging expenses, and savings in logistics and transport due to smaller label sizes.

#### 3.1.1 Cost savings from dynamic information updates

- 3.5 One of the potential cost savings of DPPs arises from the reduced need for frequent physical label updates. Unlike physical labels, which require costly print runs each time product information changes, DPPs can be updated instantaneously, avoiding the need for reprinting and repackaging. This is particularly relevant in the EU where frequent regulatory changes often require updates to product information and labelling to maintain compliance.
- 3.6 DPPs transform static labels into dynamic resources, allowing product information to be updated instantaneously without requiring new print runs or packaging changes. In fast-moving consumer goods (FMCG), packaging is estimated to be updated for 30–35% of products annually, resulting in a complete overhaul of packaging across all items approximately every three years.<sup>44</sup> In other industries, such as pharmaceuticals, product labels may be updated as much as five times per year.<sup>45</sup> In some cases, errors found may necessitate the recalling or scrapping of physical products. Each label revision involves redesigning and reprinting, incurring significant costs and delays in disseminating information to consumers.
- 3.7 By shifting to a dynamic digital system, manufacturers and retailers can avoid these recurring expenses. Information can be added or modified in real time, eliminating reprinting costs and ensuring that consumers receive the most up-to-date product details without delays. This flexibility enhances responsiveness to regulatory changes, product updates, and new consumer safety information, potentially improving both cost efficiency and consumer trust.

 <sup>&</sup>lt;sup>43</sup> The Hill (2014), '<u>House passes 'E-labeling' bill'</u>, 11 September, accessed 16 January 2025.
 <sup>44</sup> Skalatskaia, E. (2024), '<u>Reducing packaging update costs: proven methods'</u>, 15 May, accessed 16 January 2025. Note that fast-moving consumer goods are those that move off retail shelves quickly and require constant replenishing, for example, groceries. Source: Law, J. (2009), 'A dictionary of business and management', Oxford England: Oxford University Press.
 <sup>45</sup> Chaudhary, P. and Shetty, V. (2020), '<u>E-Labeling: Change is Underway'</u>, 29 June, accessed 16 January 2025.

#### 3.1.2 Packaging cost reduction

- 3.8 Another of the supply-side benefits of implementing DPPs is the potential reduction in the size and complexity of physical labels and user manuals, which could lead to significant cost savings for businesses. While physical labels will not be eliminated entirely, DPPs will allow additional or less frequently used information to be hosted digitally. This can result in smaller physical labels and user manuals that require fewer materials and less space on packaging.
- 3.9 A relevant example of the potential scale of savings comes from the mobile phone sector. According to the Mobile & Wireless Forum, the inclusion of printed compliance information for smartphones within the EU alone accounts for approximately 48m sheets of A4 paper each year.<sup>46</sup> By shifting much of this content to a digital format, such as through DPPs, firms could substantially reduce their reliance on printed material. The move towards digital labelling on radio frequency devices (including smartphones) in the USA in 2014 was partly motivated by costsaving opportunities, with industry bodies highlighting that eliminating certain physical labels would reduce labelling costs.<sup>47</sup> This example demonstrates that sectors where products are small but require extensive information, such as smartphones, present particularly large opportunities for cost reductions through smaller labels.
- 3.10 The extent of these benefits will depend on the information requirements of each product category and the regulatory design of the DPP system. For example, toys may continue to require relatively large physical labels to accommodate safety warnings, whereas electronics and other products could see more significant reductions in label size and user manuals.

## 3.1.3 Logistics cost reduction

3.11 In addition to the direct cost savings from reduced packaging and user manuals, smaller and lighter packaging resulting from reduced physical labelling requirements may also lead to savings in logistics and transport costs.

<sup>&</sup>lt;sup>46</sup> The Parliament (2023), '<u>Why electronic labelling could be good news for consumers and the planet</u>', 27 April, accessed 16 January 2025.

<sup>&</sup>lt;sup>47</sup> House of Representatives (2014), '<u>113-575 - Enhance Labeling, Accessing, And Branding Of</u> <u>Electronic Licenses Act Of 2014'</u>, accessed 16 January 2025.

- 3.12 Packaging design plays a critical role in influencing logistics costs across the supply chain by affecting handling, transport, storage, and distribution efficiency. Appropriate packaging design facilitates further cost reductions, particularly transport costs, by improving palletisation and container fill rates, reducing empty space, and thereby decreasing fuel consumption.<sup>48</sup>
- 3.13 Packaging operates at three interconnected levels. Primary packaging refers to the immediate packaging that directly contains the product, this would include the physical label and user manuals.<sup>49</sup> Secondary packaging groups multiple units of primary packaging together; common examples include boxes or trays.<sup>50</sup> Tertiary packaging, such as pallets or shipping containers, facilitates bulk transport and storage of secondary packaging.<sup>51</sup> Since tertiary packaging depends on the volume and arrangement of secondary packaging, which in-turn relies on the primary packaging, decisions about labels and user manuals made at the primary level cascades through the logistics chain, impacting overall cost, space utilisation, and transport emissions.
- 3.14 A case study in the textiles sector illustrates how improvements in primary and secondary packaging design can deliver substantial logistics cost savings.<sup>52</sup> By rearranging garments within primary packaging, they were able to design secondary cardboard boxes with reduced volume but increased height the redesign enabled better space utilisation. This change increased the number of garments packed per secondary-level box by 10–20%. When tested at the tertiary level using standard shipping containers, the number of garments per container rose by 25–28%. This primary packaging redesign resulted in an overall average reduction of 25% in logistics costs across the supply chain.
- 3.15 A similar effect could be achieved with the introduction of DPPs.
   For example, a small electronic device packaged with a relatively large user manual may currently require larger boxes, reducing the number of units that can be packed in a single

<sup>&</sup>lt;sup>48</sup> García-Arca, J., Comesaña-Benavides, J., Gonzalez-Portela G. and Prado-Prado, J.C. (2020), 'Rethinking the Box for Sustainable Logistics', 2 March.

<sup>&</sup>lt;sup>49</sup> Ibid.

<sup>&</sup>lt;sup>50</sup> Ibid.

<sup>&</sup>lt;sup>51</sup> Ibid.

<sup>&</sup>lt;sup>52</sup> Ibid.

shipment. By replacing the physical manual with a digital version accessible through the DPP, the box size could be reduced, allowing for an increase in the number of units per shipment. This could have a meaningful impact on reducing logistics costs, improving overall supply chain efficiency.

3.16 This example demonstrates how targeted improvements in primary packaging design have the potential to drive significant efficiencies. Therefore, if the adoption of DPPs allows retailers and manufacturers to reduce label sizes, user manuals and overall primary packaging (e.g. bottles or boxes), it could generate knock-on effects, leading to cost savings across the entire packaging and logistics hierarchy.

## 3.2 Supply-side: firm time and efficiency improvements

3.17 In addition to direct cost savings from reducing the size of physical labels and packaging, DPPs also offer firms potential improvements in time, staff efficiency, and operational processes. These benefits span various areas, including more accurate and efficient inventory management, streamlined reporting to meet compliance requirements, and reduced time and effort associated with launching products in new markets due to standardised labelling requirements. This section examines these efficiency gains and their potential impact on firms' overall productivity.

## 3.2.2 More efficient supply chains

- 3.18 Another potential area of benefit from implementing DPPs is improved inventory management and operational efficiency across supply chains. DPPs can contribute to supply chain efficiency by providing standardised and centralised product data that simplifies the flow of information across the supply chain. By offering consistent, digital product information that is accessible at multiple points in the supply chain, DPPs can help to reduce errors, improve communication, and streamline processes such as inventory management and order fulfilment.
- 3.19 For example, platforms or retailers who stock products from multiple manufacturers can benefit from the standardisation of information held in DPPs. This standardisation may simplify the process of integrating product details into their websites, store displays, or inventory systems. Additionally, it can optimise their logistics and supply chain management, as having consistent data formats makes it easier to streamline backend operations such as stock tracking, reordering, and supplier coordination.

Additionally, there may be less of a burden to verify whether the retailers the stock are compliant.

- 3.20 A similar technology is RFID, which goes beyond the basic functionalities required by DPPs, by enabling real-time tracking of products across the supply chain. RFID technology allows for the automatic identification and tracking of items, providing real-time data on their location and status. While RFID has been implemented by various firms for purposes unrelated to DPPs, it has led to significant benefits, this is outlined in Box 3.1.
- 3.21 The extent to which firms who are implementing DPPs can realise similar benefits depends on the specific technology adopted for their DPP solution. While QR codes fulfil basic regulatory requirements, more advanced technologies such as RFID or NFC can enable significant efficiency gains by integrating DPPs into back-end inventory systems. However, it is important to maintain a tech-neutral and future-proof approach to data carriers, ensuring that DPP solutions remain accessible and adaptable to future technological developments.



## Box 3.1 Case study: RFID and DECATHLON

A number of manufacturers and retailers in the EU have already adopted RFID technologies with successful outcomes. One study followed the results of ten major retailers, with combined annual sales of approximately €94bn, and found they realised substantial benefits from implementing RFID, including the below.

- **Higher stock accuracy:** inventory accuracy improved from 65–75% to 93–99%.
- **Reduced out-of-stock items:** one retailer observed a 20% reduction in SKUs being out of stock.
- **Sales uplift:** due to fewer out-of-stocks, and improved stock availability. Seven retailers reported sales increases ranging from 1.5% to 5%, with one firm linking a 1% sales increase to every 3% improvement in stock accuracy.
- **Lower stockholding costs:** five companies shared data showing reductions in stock levels of 2–13%. This can increase profit because a company can hold less stock in the business.

• **Lower audit costs:** one company reported the ability to reduce the frequency of stock audits from once per month to once per year, saving 75% of budgeted staff costs for this activity.

Focusing on one retailer, DECATHLON's adoption of RFID technology has significantly improved its stock management processes, offering a clear example of how digital innovations can enhance operational efficiency. The company has implemented RFID tagging across its entire product portfolio, creating a comprehensive digital infrastructure that tracks product events from manufacturing to customer purchase.

One of the key advantages of RFID technology is its ability to provide real-time geolocation data for products. This capability allows DECATHLON to monitor inventory levels across factories, warehouses, and stores with exceptional accuracy. By integrating RFID data into operational databases, DECATHLON has streamlined order preparation processes, reducing errors and improving fulfilment speed. The ability to locate products quickly also enables the company to respond more effectively to customer demand, optimising stock distribution across its supply chain.

RFID technology has also improved DECATHLON's understanding of customer behaviour. By identifying customer journeys, DECATHLON can better predict purchasing patterns, leading to more informed decisions regarding stock replenishment and product availability. This data-driven approach not only reduces overstocking and understocking, but also minimises associated costs—enhancing overall profitability.



Source: Beck, A. (2018), 'Measuring the Impact of RFID in Retailing: Key Lessons from 10 Case-study Companies', February, accessed 16 January 2025; DECATHLON (2024), 'Digital Product Passport Call for Evidence', December; and DECATHLON, '<u>A decade of leadership to benefit customers</u> <u>and employees'</u>, accessed 15 January 2025.

- 3.2.3 More efficient reporting to meet compliance obligations
- 3.22 The introduction of DPPs offers significant potential to reduce the compliance and certification burden on manufacturers and retailers. Many industries face substantial costs associated with managing compliance requirements across multiple jurisdictions. For example, products distributed across the EU often require multiple regulatory labels, each providing evidence of compliance with different national standards, reflecting the broader issue of market fragmentation within the EU.
- 3.23 Product labels are essential for facilitating market access (which we discuss in section 3.2.4), but the compliance processes behind them are costly and time consuming. This is exacerbated by the frequent updates and introductions of product regulations in the EU in recent years, that present challenges for businesses.<sup>53</sup> Studies have estimated that varying standards, technical regulations, and the associated costs of testing and compliance certification can account for 2-10% of total production costs.<sup>54</sup> Focusing on the consumer electronics sector, according to one study, compliance costs amount to approximately €797m per year in Europe.<sup>55</sup> Importantly, the largest share of this cost stems from the administrative work needed to obtain and manage regulatory certifications, rather than the physical labelling itself.<sup>56</sup> It is estimated that introducing digital labelling could reduce these costs by around 15%.<sup>57</sup>
- 3.24 DPPs can streamline compliance by allowing manufacturers to indicate regulatory conformity through digital labelling instead of, or alongside, traditional physical labels or compliance documents such as a Declaration of Conformity (DOC).<sup>58</sup> This provides flexibility in how compliance information is presented,

 <sup>&</sup>lt;sup>53</sup> See, for example, Financial Times, (2024), '<u>Is red tape strangling Europe's growth?</u>', 9 September.
 <sup>54</sup> Information Technology & Innovation Foundation (2017), '<u>How E-Labels Can Support</u> Trade and Innovation in ICT' September accessed 15 January 2025.

<sup>&</sup>lt;u>Trade and Innovation in ICT'</u>, September, accessed 15 January 2025. <sup>55</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 7.

June, p. 7. <sup>56</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 48.

June, p. 48. <sup>57</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 7.

<sup>&</sup>lt;sup>58</sup> Under the Toy Safety Regulation, the Declaration of Conformity (DOC) — which is a document where manufacturers self-certify that their product meets regulatory requirements — is being replaced by the DPP. European Commission (2023), '<u>Regulation of the European Parliament and of</u> <u>the Council on the safety of toys and repealing Directive 2009/48/EC</u>', 28 July, accessed 15 January 2025.

reducing the need for multiple physical labels on products intended for global distribution.

- 3.25 Digital labelling can be combined with other solutions to streamline compliance processes further. A relevant example is the electronic compliance labelling scheme introduced by the Infocomm Media Development Authority (IMDA) in Singapore.<sup>59</sup> The scheme first introduced a digital labelling system where compliance with telecoms equipment regulations could be verified electronically, rather than requiring physical labels on the products. Alongside this, it upgraded its online Telecoms Licensing portal to make it easier and faster for telecoms equipment dealers to renew the registration of their equipment. By using digital labelling and an improved online system, IMDA allowed dealers to manage their compliance with regulations more efficiently, reducing administrative burdens and costs associated with physical labelling or manual processes.
- In addition to compliance cost savings, DPPs offer potential 3.26 efficiencies for reporting obligations. This aligns with the European Commission's goal to reduce administrative burdens linked to reporting by 25%, in order to boost the EU's long-term competitiveness and provide relief for SMEs.<sup>60</sup> One area where DPPs could aid reporting is firms subject to the Corporate Sustainability Reporting Directive (CSRD).<sup>61</sup> Introduced for large companies and listed SMEs for the first time in the financial year 2024, the CSRD requires firms to provide detailed data on the impact of their activities on people and the environment.<sup>62</sup> With product-level information stored in a DPP, firms may be able to automate the extraction of sustainability metrics, reducing the need for manual data collection and processing.<sup>63</sup> This could facilitate more efficient reporting by integrating standardised, real-time product data into broader corporate sustainability reports. Automating these processes may not only decrease

<sup>&</sup>lt;sup>59</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, Section 7. <sup>60</sup> European Commission (2023), '<u>Delivering today and preparing for tomorrow: The 2024</u>

<sup>&</sup>lt;u>Commission Work Programme</u>', 17 October, accessed 16 January 2025. <sup>61</sup> European Commission (2024), '<u>Ecodesign for Sustainable Products Regulation (ESPR)</u>: Frequently Asked Questions (FAQ)', 25 September, p. 16, accessed 16 January 2025. <sup>62</sup> European Commission '<u>Corporate sustainability reporting</u>', accessed 16 January 2025.

<sup>&</sup>lt;sup>63</sup> Indeed, the Battery Pass value assessment notes that 'Data reporting and exchange systems could increase the efficiency of the data collection process and thus reduce cost of reporting (compared to manual reporting)'. See Battery Pass (2024), '<u>Unlocking the Value of the EU Battery</u> Passport', November, accessed 15 January 2025, slide 93.

administrative costs, but also improve the accuracy and reliability of reported environmental performance metrics.

3.27 By integrating compliance documentation and sustainability data into a single digital system, DPPs can transform compliance and reporting from resource-intensive processes into streamlined, efficient operations, providing significant cost savings and operational flexibility.



#### Box 3.2 Case study: detergents

The detergents industry in the EU is heavily regulated, with manufacturers required to comply with several overlapping pieces of legislation. This regulatory complexity leads to significant duplication in labelling requirements, creating an administrative burden that complicates compliance.

The cost of compliance in the detergents sector in the EU is estimated at €670m per year, representing 33.4% of the industry's total profits. Furthermore, 28% of all costs are estimated to be related to administrative processes for managing legal compliance. Recognising these burdens, the EU is introducing updated detergents regulation aimed at simplifying and streamlining compliance requirements, including the introduction of a DPP.

Under the new framework, DPPs will be used to centralise compliance and product information. The DPP will include an identifier for traceability, the name and address of the manufacturer, and its labelling information. Additionally, the passport will reference the legal acts and standards with which the product complies and provide a full list of ingredients.

By reducing duplication of information and enabling centralised, digital management of compliance data, DPPs may lower administrative costs and improve the efficiency of information sharing within supply chains and with consumers. Source: European Commission (2023), '<u>Commission proposes simplified,</u> <u>clearer and digital rules for detergents in the Single Market</u>', 28 April; International Association for Soaps, Detergents and Maintenance Products (2021), '<u>Inception impact assessment regarding simplification and</u> <u>digitalisation of labels on chemicals</u>', September; and Ecomundo (2024), '<u>EU</u> <u>Detergent Regulation Revision: New Developments and Perspectives</u>', 12 November.

#### 3.2.4 Harmonised label requirements reduce costs

- 3.28 If implemented in such a way that they reduce the need for multiple localised product versions, DPPs can simplify market entry for firms operating across the EU.<sup>64</sup> As mentioned above, currently, compliance with divergent national labelling requirements may necessitate separate physical labels and packaging for each market, increasing production complexity and reducing the ability of companies to increase productivity through economies of scale.<sup>65</sup> With DPPs, firms may be able to produce a single physical version of a product with one harmonised label, complemented by a digital label containing the detailed, multilingual compliance information required by individual member states.<sup>66</sup> However, this would only be possible if physical labelling requirements are also streamlined at the regulatory level, allowing key compliance details to be shifted from packaging to the digital format.
- 3.29 This streamlined labelling process reduces direct administrative costs, including translation and legal expenses associated with regulatory compliance. Harmonisation of label requirements, such as standardised symbols and terms recognised across the EU, also minimises the need for local/national compliance checks. While DPPs alone may not eliminate divergent labelling rules without further regulatory change, they provide the infrastructure that could enable a shift towards greater harmonisation by centralising regulatory and compliance information in a digital format, enabling consistent and easily

<sup>&</sup>lt;sup>64</sup> For instance, in some cases DPPs could reduce the need for multiple language versions by enabling automatic translation within the digital format. At a broader level, they could encourage regulatory harmonisation within specific sectors, such as electronics, where common EU-wide technical and safety standards already exist. However, national regulations may still apply in certain cases, meaning firms could be required to comply with both the DPP framework and additional local requirements, this will likely depend on the sector in question. <sup>65</sup> Valdini Viceri & Associati (2018). (Study for the introduction of an exheming scheme in Europe'

<sup>&</sup>lt;sup>65</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 55.

<sup>&</sup>lt;sup>66</sup> Even in cases where it is not possible to create one physical product version, i.e. because some member state differentiation exists, there is likely to be opportunities to reduce the number of required product versions.

accessible product data across multiple jurisdictions. Harmonising at an EU level will provide simplifications for manufacturers active on multiple markets and level the playing field.<sup>67</sup> Moreover, fewer product versions and simplified compliance may allow companies to scale their operations more quickly and efficiently, enabling faster expansion into new markets. Indeed, in a survey of pharmaceutical firms in Asia that have adopted digital labelling, the second most cited reason for doing so after 'better readability & searchability' was the 'reduce[d] lead time for launching new products'.<sup>68</sup>

3.30 As mentioned in the examples above, in sectors such as consumer electronics, telecoms and chemicals, where compliance and labelling requirements are particularly stringent, digital labelling systems have already demonstrated success in reducing the burdens of associated certification procedures and global labelling processes. For smaller firms and SMEs, these benefits are especially significant, as lower entry barriers reduce the costs and complexity of scaling into new markets, making it easier to expand their operations across the EU.

#### 3.3 Broader consumer and market impacts

3.31 The introduction of DPPs is expected to generate far-reaching benefits beyond immediate firm cost savings and operational efficiencies. By improving the accessibility and transparency of product information, DPPs can enhance consumer decisionmaking, support the growth of secondary markets, and foster trust in product quality. Moreover, DPPs lower barriers to crossborder trade, creating a more integrated single market and enabling European firms to access new opportunities abroad. This section qualitatively assesses various wider benefits to European markets of DPPs.

#### 3.3.2 Improved single market: lower barriers to cross-border trade

3.32 At a macroeconomic level, DPPs support the harmonisation of regulatory requirements across the EU, reducing market fragmentation and enhancing the functioning of the Single Market. As mentioned above, divergent national regulations and

<sup>&</sup>lt;sup>67</sup> European Commission (2022), 'Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC: Impact Assessment', 30 March, p. 21.

<sup>&</sup>lt;sup>68</sup> Matsui, R., Yamaguchi, K., Lee, J.J.V., Ting, I., Khairilisani, D., Chang, J., Seo, J.M., Park, I., Chee, A.S.M., Quizon, P.M., Harnpramukkul, U., Sem, E., Nguyen, T., Padhye, A. and Mo, R. (2022), 'Survey Result for E-labeling Initiatives in Asia', 10 October.

labelling standards currently create barriers to trade by limiting economies of scale, increasing compliance costs, and delaying product launches. For firms active in multiple member states, the alignment of regulatory frameworks under the DPP reduces the need for separate conformity assessment procedures.

- Harmonised digital labelling systems can also clarify conflicting 3.33 provisions across different EU regulations, such as overlaps between product labelling rules, providing legal certainty and a more consistent regulatory environment. For example, when developing DPPs for each sector, product-specific regulations need to be aligned with the broader ESPR requirements. This means that firms are effectively tackling compliance for multiple regulations at once through the DPP, rather than having to create separate labels or processes for each set of rules. For example, in the toys sector, the DPP is being used for both product information and regulatory compliance, reducing the need for multiple labels and simplifying the overall process. While the DPP provision alone cannot resolve these conflicts without broader regulatory alignment, it provides the infrastructure that could enable greater harmonisation and consistency in the future. By enabling EU firms to compete more effectively within a streamlined single market, these measures create a more stable economic landscape and incentivise innovation and sustainability at scale.
- 3.34 Additionally, harmonised labelling may extend benefits to non-EU firms seeking to enter the Single Market, further enhancing cross-border trade potential and reinforcing the EU's influence in setting international standards. A standardised DPP system would also reduce the complexity and cost for international manufacturers by minimising the need to create countryspecific versions of products or meet duplicative labelling requirements. By streamlining regulatory compliance through a unified digital system, firms from outside the EU could more easily navigate the single market, provided they meet the necessary safety and compliance standards, lowering barriers to entry. The increased market participation of non-EU firms would intensify competition, leading to greater product differentiation and innovation. This would likely result in a broader range of choices for EU consumers and potentially lower prices as firms compete more effectively.

#### 3.3.3 Opportunities for European firms abroad

3.35 Furthermore, the implementation of a harmonised DPP presents an opportunity for the EU to align with other regions or encourage global adoption of its standards. Currently, estimates show that around 56% of the global economy has already adopted some form of digital labelling, a figure projected to rise to 78% once the EU adopts its system.<sup>69</sup> By coordinating efforts internationally, the EU could drive greater regulatory convergence, reducing trade frictions and facilitating smoother market entry for EU firms worldwide. Crucially, ensuring that DPP standards are globally interoperable would help EU firms expand into non-EU markets without needing to create market-specific DPPs, while also reducing the burden on global firms that would otherwise have to develop separate DPPs for the EU and other markets. This alignment would also enhance global sustainability reporting and compliance efficiency, benefiting consumers and businesses alike.

#### Customs efficiencies and product quality assurance 3.3.4

- 3.36 The implementation of DPPs has the potential to improve product quality assurance and streamline customs procedures, while also reducing fraud.
- 3.37 By integrating detailed and standardised data into a digital registry, DPPs provide customs authorities with more precise information to enhance risk management and improve the efficiency of border controls.<sup>70</sup> Current physical labelling practices can present challenges, such as inconsistent label placement across products, damage that obstructs readability, and potential errors in printed information.<sup>71</sup> By contrast, labelling information stored digitally is consistently accessible, always readable and available in a variety of languages, reducing ambiguity for inspectors and minimising administrative burdens.<sup>72</sup> By reducing unnecessary delays for compliant products and focusing resources on higher-risk shipments, DPPs may create a more efficient and predictable trade environment,

<sup>&</sup>lt;sup>69</sup> Digital Europe (2018), '<u>e-labelling for Europe - key facts & figures</u>', 22 June, accessed 15 January

<sup>2025.</sup> <sup>70</sup> European Parliament and Council (2024), '<u>Regulation (EU) 2024/1781 on establishing a framework</u> for the setting of ecodesign requirements for sustainable products', 28 June, accessed 16 January 2025.

<sup>&</sup>lt;sup>71</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe',

June, p. 49. <sup>72</sup> We note that it is possible that if the DPP is placed on the outer packaging and this is damaged, customs authorities may not be able to instantly access the DPP. However, the information will still be retained digitally, which is an improvement over relying solely on physical labels, where damaged or lost labels would result in the permanent loss of information.

benefiting both regulators and businesses. The European Commission notes potential cost reductions through synergies between the DPP system and the EU Single Window Environment for customs, further enhancing regulatory efficiency.73

- In 2023, EU customs authorities intercepted counterfeit goods 3.38 worth nearly €3.4bn. This marked a 77% increase against the previous year, with around 152m items seized, including toys, games and packaging materials.<sup>74</sup> DPPs offer significant advantages in detecting counterfeit products. Physical labels are more easily replicated by counterfeiters, undermining their effectiveness in distinguishing genuine products. Digital labels, however, may be more difficult to falsify, and provide an added layer of security through traceability advantages.<sup>75</sup> DPPs have the potential to track a product's materials and components to verify its provenance and authenticity. By incorporating a unique identifier, DPPs could facilitate supply chain transparency by allowing products to be scanned at multiple checkpoints. This ensures complete traceability from production to end use, reducing the risk of counterfeit goods entering the market. For added security, this information could be stored using digital ledger technology (e.g. blockchain) to create the product's 'digital twin'. This could help prevent non-compliant or unsafe products from reaching the EU market, reducing the need for costly inventory removal, recalls, and other corrective actions.
- 3.39 That said, this benefit will depend on how DPPs are ultimately implemented, including which technology they use and the information they capture.<sup>76</sup> As a result, while DPPs may not solve the issue of counterfeit goods in every case, it is expected that in some instances consumers will benefit from this enhanced authenticity assurance, fostering greater trust in product quality and safety.

<sup>&</sup>lt;sup>73</sup> European Commission (2022), 'Impact Assessment: Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC: Part 1/4', 30 March, p. 45. <sup>74</sup> Eucrim (2024), '<u>EU Customs Report 2023: €3.4 Billion Worth of Counterfeit Goods Seized to</u>

Protect Single Market', 5 December, accessed 15 January 2025. <sup>75</sup> This however, does depend on the authority using the DPP actively for verification purposes. Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 34. <sup>76</sup> For example, a simple QR code may be easily replicable.

The toy industry has stringent safety standards to protect children. Despite existing regulations, non-compliant and unsafe toys regularly enter the EU market. One operation that ran between October 2021 and January 2022 seized €18m worth of fake and illegal toys from 21 countries in the EU.<sup>1</sup>

In 2023, the European Commission proposed updating the Toy Safety Directive to introduce a DPP to replace the Declaration of Conformity as a tool to improve product compliance and safety enforcement. The upcoming regulation aims to ensure that all toys presented at customs are placed on the EU market only if they have a corresponding DPP. This passport will provide real-time access to critical compliance information, including the Declaration of Conformity, allowing customs and market surveillance authorities to automatically verify a product's safety credentials without the need for physical documentation. While the Declaration of Conformity does not guarantee the safety of the product itself, it confirms that the product meets specific safety standards required for market entry. Such a system reduces administrative burdens and inspection costs, enhancing the efficiency of border controls while preventing the circulation of potentially unsafe toys. By adopting DPPs, cost savings are projected to range between €2.62m and €3.93 million annually for manufacturers and €13m to €20m in savings due to improvements in market surveillance.

More significantly, the DPP is expected to contribute to a substantial reduction in non-compliant toys on the market, improving overall consumer safety and competitiveness for compliant manufacturers. Parents and guardians gain confidence in the safety of the toys they purchase, knowing that digital labelling provides consistent and verifiable information on compliance with EU safety standards. This transparency strengthens the reputation of manufacturers that adhere to the rules, supporting fair competition and sustainable market practices.

Source: <sup>1</sup>OLAF (2022), '<u>Over 5 million potentially dangerous toys seized'</u>, 25 March, accessed 15 January 2025; and European Commission (2023), '<u>Regulation of the European Parliament and of the Council on the safety of</u> toys and repealing <u>Directive 2009/48/EC</u>', 28 July, accessed 15 January 2025.

#### 3.3.5 Secondary market impacts

- 3.40 The introduction of DPPs offers significant potential to enhance the efficiency, transparency, and overall competitiveness of secondary markets. Unlike traditional physical labels, which can degrade or be removed for aesthetic reasons, digital labels remain intact and accessible throughout the product's lifecycle.<sup>77</sup> This durability offers several advantages that extend beyond the initial point of sale, creating positive multiplier effects in secondary markets.
- 3.41 One of the primary economic benefits of DPPs is reducing information asymmetry in resale markets. Consumers purchasing second-hand goods often face uncertainty regarding product specifications, condition, or compliance with relevant standards, which may lower their willingness to pay.<sup>78</sup> A DPP, if located on the product as opposed to the packaging, provides immediate, verifiable information on a product's origin, materials, and safety compliance, enhancing buyer confidence and allowing sellers to achieve better prices. This increased trust and transparency can reduce information asymmetries and encourage greater participation in the resale market, contributing to its growth and long-term viability.
- 3.42 Additionally, DPPs bring cost savings and operational efficiencies to businesses engaged in refurbishment and recycling.<sup>79</sup> Access to detailed product composition data reduces the need for costly manual testing and sorting processes, allowing firms to more efficiently allocate resources and lower processing times.<sup>80</sup> The availability of reliable product data may also enable smaller recyclers and refurbishers to compete effectively without investing heavily in specialised testing equipment or proprietary databases. In turn, this can drive down prices, increase supply, and create more dynamic, competitive secondary markets.

<sup>&</sup>lt;sup>77</sup> Valdini Vicari & Associati (2018), 'Study for the introduction of an e-labelling scheme in Europe', June, p. 46.

<sup>&</sup>lt;sup>78</sup> See para. **Error! Reference source not found.** and accompanying footnotes for an explanation of information asymmetries.

<sup>&</sup>lt;sup>79</sup> As above, this assumes that the DPP is included on the product as opposed to the packaging, which may have been disposed of.

<sup>&</sup>lt;sup>80</sup> DECATHLON Sustainability, '<u>Product traceability and RFID technology at DECATHLON'</u>, accessed 15 January 2025.

#### Box 3.4 Case study: secondary textiles market

The textile sector exemplifies how DPPs can enhance efficiency and competitiveness in secondary markets by addressing information gaps that hinder sorting, recycling, and resale activities. Currently, physical textile labels are often damaged, removed, or inaccurate, creating significant barriers to the reuse and recycling of garments. It is estimated that 62% of EU citizens cut garment labels, and 41% of physical labels misstate fibre composition. These issues reduce transparency and undermine the reliability of information needed to process textiles effectively in secondary markets. The key difference to physical labels is that the information would remain accessible digitally even if the physical label is lost or damaged.

By incorporating uniform, standardised digital labelling accessible through a DPP, textile recyclers and second-hand dealers gain access to detailed and reliable data on fibre content, manufacturing processes, and maintenance histories. This streamlines sorting processes, reduces manual inspection costs, and improves the accuracy of material classification, leading to higher efficiency and profitability. Accurate fibre information also helps recyclers optimise recovery techniques, resulting in less material wastage and lower processing costs.

As second-hand fashion is projected to surpass the fast fashion market by 2028, integrating DPPs offers a scalable solution to meet growing demand. With 52% of millennials already researching product information before purchasing textiles, a robust DPP system can fuel informed buying decisions and foster more competitive secondary markets.

Note: All sources last accessed 15 January 2025. Source: European Parliament (2024), '<u>Digital product passport for the textile</u> <u>sector</u>', June; Valmet (2024), 'Textile Labelling Regulation (EU) 1007/2011', 2 April; Ginetex (2017), '<u>A Barometer for textile care labelling in Europe'</u>, 20 June; and Fashion United (2020), <u>'#Whatsinmyclothes: The truth behind the</u> <u>label'</u>, 23 April.

#### Box 3.5 Case study: batteries

The introduction of digital Battery Passports under the EU Battery Regulation from February 2027 is set to transform the secondary market for batteries. By providing comprehensive information on composition, performance, and dismantling, battery passports can significantly enhance economic efficiency across the value chain.

For recycling, the availability of detailed composition and dismantling data in the Battery Passport is expected to reduce pre-processing and treatment costs by 10–20%, as it minimises the need for sampling, sorting, and manual testing. Improved data also optimises dismantling and reduces material contamination, increasing recovery rates and lowering waste. These cost efficiencies are expected to improve the overall business case for recycling facilities, resulting in faster turnaround times and greater throughput.

In second-life applications, reliable performance and durability data from battery passports could simplify residual value determination, reducing procurement and testing costs for independent operators by 2–10%. This transparency enables more accurate assessments of whether a battery should be repurposed for second-life use or recycled. As a result, batteries entering second-life markets could fulfil 6– 20% of the demand for stationary battery energy storage in Europe, contributing to more efficient use of resources.

By streamlining both recycling and resale processes, Battery Passports not only reduce transaction costs, but also foster greater participation in secondary markets—ensuring economic and environmental benefits across the lifecycle of batteries.

Source: Battery Pass (2024), '<u>Unlocking the Value of the EU Battery</u> <u>Passport'</u>, November, accessed 15 January 2025. The introduction of DPPs has the potential to deliver significant benefits for firms, consumers and the wider EU single market, including...



Source: Oxera.

#### 3.4 Summary of impacts

- 3.43 In conclusion, the introduction of DPPs in the EU has the potential to deliver significant benefits for firms, consumers, and the wider economy. As shown above in Figure 3.1 for firms, DPPs may drive efficiencies in production processes reducing compliance costs, fostering innovation through greater transparency, and lowering barriers to entry across the EU. For consumers, DPPs could improve product assurances, enhance access to information, increase choice, and lead to lower prices through cost pass-through.
- 3.44 While there are potential costs to DPPs, such as loss of immediacy, digital accessibility challenges, and financial costs, these can be mitigated through careful implementation. Digital literacy is increasing, with 91% of consumers expected to have a smartphone by 2030, but a phased approach could help ensure inclusivity.<sup>81</sup> Retaining physical labels with key information alongside DPPs would prevent the exclusion of less digitally engaged consumers. In terms of financial costs, adopting a standardised, open-source DPP format could reduce compliance and customisation expenses, making implementation more cost-effective for businesses while maintaining interoperability across markets.
- 3.45 On balance, we expect the potential wide-ranging benefits, though difficult to quantify at this stage, to outweigh the costs particularly in the medium to long term, as efficiencies accumulate. These benefits may collectively translate into improved single market outcomes, characterised by enhanced competition, higher productivity, and greater innovation. There is widespread agreement that innovation is a key driver of longterm economic growth, as it fosters new business models, job creation, and productivity gains.<sup>82</sup> As a result, the introduction of DPPs may not only generate direct efficiencies, but also enable unforeseen business opportunities and technological advancements, further reinforcing growth dynamics. Over time, these effects could contribute to economic expansion by creating more efficient supply chains, reducing fragmentation in the single market, and increasing consumer confidence and spending. While the scale of these benefits will depend on the

 <sup>&</sup>lt;sup>81</sup> GSMA (2025), '<u>The Mobile Economy Europe 2025</u>', January, accessed 16 January 2025.
 <sup>82</sup> OECD (2015), 'The Innovation Imperative: Contributing to Productivity, Growth and Well-Being', OECD Publishing, Paris.

exact implementation of DPPs and market responses, the framework offers a pathway to more sustainable, transparent, and competitive markets within the EU.

