

E-commerce Orientation and Post-Pandemic Recovery: Evidence from Polish Textile Firms Listed on the Warsaw Stock Exchange

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Abstract

This research analyses the financial resilience of Polish textile and clothing firms listed on the Warsaw Stock Exchange (GPW) during the period of the pandemic known as the “COVID-19 shock” and the subsequent recovery. A comparative, year-to-year analysis of ten firms’ net revenues, net profits, total assets, equity, and profitability ratios (ROA and ROE) was conducted using publicly available annual financial statements for 2017–2023, complemented by profitability heatmaps, a growth–profitability strategy map, and fixed-effects panel contrasts to assess post-pandemic recovery patterns. The findings indicate a widespread decline in performance in 2020, subsequently followed by a strong (but uneven) normalisation in 2021–2022 and a deceleration in 2023, with considerable variation among firms and business models. These patterns are consistent with the view that differences in firms’ strategic positioning, including the ability to sustain sales and operations under mobility restrictions, may be associated with faster recovery. In addition, the study operationalises digital/omnichannel orientation using public disclosures and online-sales intensity, finding that higher pre-pandemic online intensity is associated with stronger post-2020 performance in fixed-effects contrasts, while non-parametric “rebound” tests yield more mixed evidence, underscoring that the relationship is not automatic. The evidence suggests that listed firms were largely able to restore profitability after the initial shock, but financial outcomes diverged markedly across companies.

Key words

textile-clothing companies, financial results, Warsaw Stock Exchange, COVID-19, comparative analysis, firm performance, pandemic shock, e-commerce.

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Introduction

The COVID-19 pandemic and the public-health measures adopted in 2020–2021 created a systemic shock to production, trade, and consumer demand, with particularly acute effects in industries exposed to discretionary spending and physical retail. Within the European Union, the

textile and clothing (T&C) sector is economically significant in terms of turnover, exports, investment, and employment, with a large share of small and medium-sized enterprises (SMEs) and a workforce in which women are strongly represented (Euratex, 2020). The pandemic, therefore, posed both a macroeconomic and a firm-level challenge for a sector already operating under highly competitive pressure and rapid structural change.

The T&C industry is also characterised by complex, multi-stage value chains spanning fibres, yarns, fabrics, nonwovens, and final consumer products, and by strong interdependencies with downstream industries such as automotive, construction, agriculture, and healthcare (Czajkowski, 2022). In addition, the sector's competitiveness in advanced economies is often linked to innovation and design capabilities, reflected, among other indicators, in patenting and industrial design activity (Euratex, 2024). These structural characteristics amplify vulnerability to disruptions in logistics, workforce mobility, and demand shocks—while also creating opportunities for firms that can pivot to products or channels better aligned with crisis conditions.

A key structural trend accelerated by the pandemic was digital transformation across multiple sectors and domains (Antón-Sancho et al., 2024), especially in the retail segment. In this study, digital transformation is understood operationally and narrowly as the adoption and scaling of digital sales and customer-facing capabilities: primarily e-commerce, omnichannel distribution, and digitally mediated customer engagement; reported in firms' public disclosures and reflected in their strategic responses to mobility restrictions (McKinsey, 2021). Beyond sales channels, the broader literature also emphasises digital tools in supply-chain visibility, planning, inventory management, and analytics (Fatorachian & Ramesh, 2025); however, this article focuses on the sales-channel dimension because it is the most consistently observable across firms' publicly available reporting and is central to the pandemic shock affecting physical retail.

Sector-level evidence for 2020 indicates a pronounced negative impact across Europe. Euratex reported a decline in turnover in both textiles and clothing between 2020 and 2019, with heterogeneity across sub-sectors and relative resilience in nonwovens linked to medical applications (Euratex, 2021). Retail trade in textiles and clothing experienced particularly severe contraction during lockdowns, while supply-chain disruptions and customer-industry interruptions also affected firms producing technical textiles and composite-related inputs (Euratex, 2024). At the same time, shifts in consumer behaviour and restricted access to physical stores contributed to a marked expansion of online purchasing, prompting many firms to accelerate e-commerce and related digital customer interfaces as a continuity strategy.

In Poland, aggregate sector revenues suggest a smaller decline in 2020 than at the EU level, followed by a return to growth (Sezgin, 2025). However, aggregate figures can mask substantial heterogeneity because they include firms with very different business models and product profiles, ranging from consumer apparel retail to technical textiles and nonwovens associated with healthcare demand. Understanding the pandemic's firm-level impact therefore requires analysis not only at the sectoral aggregate level but at the company level as well.

Existing research on COVID-19 impacts in the T&C sector has examined multiple national contexts, including Türkiye, New Zealand, Sweden, Finland, the UK, Bangladesh, Ukraine, China, Pakistan, Indonesia, and India (Akşit & Kanat, 2025; Nautiyal et al., 2023; Wulff, 2022; Haukkala et al., 2023; BFTT, 2023; Pritha et al., 2022; Shandrivska & Yunko, 2021; Zhu & Chiu, 2021; Shah et al., 2024; Sari & Afiatno, 2022; Varadaraj et al., 2022). However, the literature lacks a cumulative, firm-level assessment for Poland that spans pre-pandemic, pandemic, and post-pandemic recovery years using comparable financial metrics. This constitutes a clear empirical gap, particularly for publicly listed firms where audited, longitudinal financial data are systematically available.

To address this gap, the present study analyses the annual financial performance of T&C companies listed on the Warsaw Stock Exchange (GPW) over 2017–2023. The analysis is guided by the following research questions:

RQ1: How did key financial outcomes: net revenues, net profit/loss, total assets, equity, ROA, and ROE, evolve across GPW-listed Polish T&C firms before (2017–2019), during (2020), and after the pandemic shock (2021–2023)?

RQ2: How heterogeneous were the pandemic impact and recovery patterns across firms with different business profiles (e.g., consumer apparel retail versus technical textiles/nonwovens)?

RQ3: Are observed recovery trajectories descriptively consistent with firms that intensified digital sales and omnichannel approaches during the pandemic, as indicated in public disclosures? RQ3 is examined through the following hypothesis: Firms with greater digital/omnichannel orientation exhibit stronger post-pandemic recovery in terms of revenues and profitability during 2021–2023.

The main contribution of this article is to provide a cumulative firm-level assessment of the financial resilience and post-pandemic recovery of Polish textile and clothing firms listed on the Warsaw Stock Exchange, covering the full pre-shock, shock, and recovery cycle (2017–2023) with comparable audited financial data. This contribution addresses a gap in the literature by offering the first longitudinal assessment of firms in Poland. Based on this key finding, the study also examines the variety of recovery trajectories across business models and explores whether post-pandemic performance patterns are consistent with firms' digital/omnichannel orientation. This is achieved by analysing public disclosures, online sales intensity, fixed-effects contrasts and non-parametric rebound tests.

The remainder of the article is structured as follows: First, the conceptual framework and extant evidence on financial resilience and digital transformation in the textile and apparel sector are presented. In the following section, the reader will find a detailed exposition of the sample, data sources, and procedure for constructing financial indicators for the period 2017 - 2023. Subsequently, the comparative results prior to the pandemic, during the pandemic, and in the recovery phase are presented, with a focus on the identification of common patterns and the acknowledgment of heterogeneity among companies. The results are then discussed in the light of the extant literature and differences in business models, paying particular attention to the possible association with digital strategies. In conclusion, a synopsis of the study's findings, implications, limitations, and prospective avenues for future research is provided.

1. Literature review

Financial resilience has been conceptualized as a multidimensional capacity to absorb adversity, maintain economic functioning, and recover stability (Salignac et al., 2019). This construction requires metrics that integrate resources, behaviour, and conditions of financial access. Evidence also highlights that resilience depends on enabling factors (e.g., liquidity, planning, strategy, and operational management), which can be identified and prioritized for measurement and comparison (Zahedi et al., 2021). In parallel, the literature on financial literacy shows that financial knowledge is associated with lower exposure to risky decisions and greater coping capacity in the face of shocks, providing a complementary framework for interpreting resilience (Klapper & Lusardi, 2019).

During the SARS-CoV-2 pandemic, commonly referred to as “COVID-19,” the resilience and recovery capacity of organizations was significantly affected by supply chain disruptions, strengthening the need to investigate and understand adaptation processes in environments characterized by a high degree of uncertainty (Ozdemir et al., 2022). In this context, digitalization emerges as a potential mechanism, as indicated by Abidi et al. (2023). In a company level study, these authors find that companies with greater digital investments and capabilities suffered smaller declines in sales and showed greater adjustment capacity. Furthermore, the findings suggest that the comprehensive and large scale implementation of digital technologies is favourably associated with the ability to recover from disruptions, although with variations depending on the degree of adoption (Li et al., 2022). From a financial perspective, digital finance infrastructure has the potential to facilitate access to sources of financing and accelerate recovery, which can contribute to strengthening corporate resilience in listed companies (Xia et al., 2022).

In the textile and clothing sector there is evidence that the emergence of the disease known as SARS-CoV-2, had a simultaneous impact on demand, supply, and value chain factors at the global level, causing asymmetrical effects among the different subsectors of this industry, such as the fashion sector in contrast to the nonwovens and healthcare sectors. This situation required a rapid reconfiguration of production and logistics processes (Seidu et al., 2024; Zhao & Kim, 2021). In this context, studies highlight that resilience is not limited to “withstanding” the impact, but also involves the application of strategies to adapt supplies, reduce delivery times, and mitigate disruptions through the use of nearshoring/local sourcing and interorganizational coordination. This approach is aligned with dynamic capabilities approaches in textile chains (Farrukh & Sajjad, 2024; Pallás-Rocafull et al., 2023). Empirical evidence at the company level show heterogeneity in performance during the pandemic, associated with company level characteristics (structure, exposure to retail trade, etc.) and size, with different results between transnational companies and smaller or more specialized profiles (Cho & Saki, 2021; Santos & Castanho, 2022). At the same time, there is a growing emphasis on sustainability practices (including circularity) as complementary levers of competitiveness and resilience in the post - Covid era, although the evidence is often cross cutting and context dependent (D'Adamo & Lupi, 2021; Weerasinghe et al., 2023). More broadly, recent literature has also linked digital transformation with sustainable development and ESG performance, suggesting that digitalization may have implications beyond operational continuity and financial resilience (Kwilinski, 2023a, 2023b). Taken together, this literature supports the need for comparative longitudinal analyses of listed companies to capture pre-shock/shock/recovery trajectories and their sectoral mechanisms.

In turn, in the textile and clothing industry, financial resilience and recovery are intrinsically linked to efficient working capital management. This relationship is attributed to factors such as the seasonal nature of demand, inventory levels, and trade terms. Consequently, there is evidence of the relevance of adopting a “dynamic” approach in assessing working capital and operating liquidity needs (Ramos et al., 2018). During the COVID-19 pandemic, evidence obtained for companies in the fashion sector in Poland show that liquidity assessment requires context sensitive metrics (e.g., cash ratio) and allows for the detection of differential changes compared to the retail sector as a whole (Piosik, 2022). From a financial stress perspective, methods based on financial statements have been proposed to estimate liquidity needs under scenarios of falling sales, which are useful for anticipating illiquidity points and quantifying financing gaps (Schivardi & Romano, 2020). In the Polish context, evidence from industrial enterprises show that financial threat (distress) evolves heterogeneously across firms and can be profiled using early warning modelling approaches, reinforcing the usefulness of firm level, longitudinal comparisons when assessing crisis exposure and recovery patterns (Kaczmarek et al., 2021). At the same time, studies on European textiles suggest that corporate size and structure influence performance during the crisis, reinforcing the need for firm level comparisons (Santos & Castanho, 2022). Ultimately, the push toward advanced textiles and “smart textiles” in the wake of the pandemic has the potential to generate technological opportunities, but also to increase investment demand and, thus, increase liquidity and financing pressures (Ivanoska-Dacikj et al., 2023).

According to the recent research, existing literature agrees that the outbreak of the pandemic caused “forced” digitization in the fashion and textile sectors, widening the gap between leaders and laggards in digital capabilities and omnichannel execution (Gonzalo et al., 2020; Zhao & Kim, 2021). In the context of SMEs, digital transformation is conceived as a set of responses aimed at operational continuity, based on knowledge strategies and process redesign, rather than isolated technological changes (Klein & Todesco, 2021). Evidence from other organizational settings point in the same direction: in agri-food cooperatives, information technologies are associated with greater efficiency when combined with innovation capacity and knowledge-oriented leadership, while research on worker-owned enterprises highlight that the pandemic accelerated digitalization and reinforced the need to promote the use of digital technologies (Moreno-Domínguez et al., 2025; Fernández-

Guadaño et al., 2025). In the apparel retail sector, empirical findings indicate that the economic crisis acted as a catalyst for channel integration (online-offline) and business model reconfiguration, with the aim of maintaining sales in contexts of mobility restrictions (Acquila-Natale et al., 2022; Wulff, 2022). At the same time, sectoral studies emphasize that digitalization must be understood broadly: including data capabilities, chain coordination, and business model redesign in order to link it to performance and resilience (Akhtar et al., 2022). Recent e-commerce research likewise indicate that e-commerce performance depends not only on channel adoption itself, but also on complementary organizational and technological capabilities, including management orientation, digital competency, innovation capability, accounting information systems, and artificial intelligence (Johri et al., 2025). In addition, emerging perspectives such as Society 5.0 emphasize the growing role of AI, big data, blockchain, personalization, and sustainability-oriented practices in shaping the future evolution of e-commerce (Bernovskis et al., 2024). In turn, the pandemic puts significant pressure on commercial channels, fostering the need to reconfigure them toward e-commerce. This process has been driven by the acceleration in the adoption of e-commerce strategies, which have emerged as a crucial mechanism for ensuring continuity and recovery in the current context. A sector review shows how the impact of the shock affected performance and how innovation (in products and processes) helped sustain activity in different branches of the textile industry (Seidu et al., 2024). In the Chinese context, the growth of e-commerce in the textile sector has been associated with the emergence of new business models and the accelerated expansion of digital platforms during the novel coronavirus disease pandemic (Junzhi, 2021). In the SME sector, various empirical studies have shown that the adoption of e-commerce and digital marketing strategies has been positively associated with financial performance and aspects of sustainability in health crisis contexts (Budiarto et al., 2021; Gao et al., 2023). In addition, several studies establish a correlation between e-commerce and resilience, as well as export capacity, suggesting a buffering role in the face of disruptions (Onjewu et al., 2022; Vo et al., 2022). In the fashion and textile sector, several business case studies have shown that the online channel has played a crucial role in mitigating sales declines and recovering economic activity (Rađenović et al., 2023).

In the textile sector and its business performance in the face of the COVID-19 crisis, research have been conducted combining market approaches, such as event studies and profitability, with accounting metrics, such as profitability, efficiency, and liquidity. Consistent with this mixed perspective, evidence from WIG30 firms on the Warsaw Stock Exchange show that expectations based market value creation metrics reveal heterogeneous value creation profiles and periods of insufficient value creation, highlighting that accounting profitability and market-based assessments may diverge in stress and recovery contexts (Kaczmarek & Náñez Alonso, 2025). In the US context, stock market reactions and fluctuations in the performance of textile and apparel companies have been recorded in the context of health shocks and economic assistance measures (Cho & Saki, 2021). Simultaneously, sectoral research reveal that the pandemic increased volatility and amplified heterogeneous impacts across industries, including the textile and apparel sector (Zhang et al., 2022). Similarly, the pandemic has been associated with variations in stock market returns in emerging markets such as Vietnam (Hung et al., 2021). Accounting evidence in Indonesia and Bangladesh also suggest a deterioration in the performance of listed companies during 2020, with results sensitive to the subsector and financial structure (Devi et al., 2020; Kabir & Bin Saleh, 2020). In the textile context, there is evidence of a disparity in impact, which can be modulated by factors such as size and fixed costs, as suggested by findings in textile corporations in Portugal (Santos & Castanho, 2022). In addition, measures of market power and productivity (e.g., price-cost margin) have been used to identify the determinants of pre/post-COVID performance in the Indonesian TPT (Setiawan & Septiani, 2025). From a financial slack perspective, financial flexibility has been positively associated with performance in the machinery and textile industries during periods of economic instability (Teng et al., 2021). With regard to risk management, higher ESG standards have been found to be associated with reduced price volatility (with effects that may vary depending on size), which is

relevant for listed textiles in periods of stress (Shakil, 2020). Ultimately, the specialized literature concludes that the global economic crisis resulted in a combination of factors that affected demand, supply chain, and incentives for innovation in the textile sector. These changes conditioned business results and strategies (Seidu et al., 2024). On the other hand, sustainability practices have been found to be associated with organizational performance in the textile and clothing sector in crisis economies (Weerasinghe et al., 2023).

2. Methodology

This research is based on audited and publicly available financial information from companies listed on the Warsaw Stock Exchange (GPW). The sample includes entities belonging to the textile and clothing sectors that (i) are listed on the GPW, (ii) disclose annual reports with comparable accounting items, and (iii) were still operating at the time of the study and data collection. This research is based on company yearly observation, which constitutes the unit of analysis. Specifically, the companies in the textile and apparel sector included are: Wittchen, Vistula Group (VRG), Sanwil, Novita, Monnari, Lubawa, LPP, Lentex, Esotiq & Henderson, and Answear. These companies constitute a heterogeneous sample of business models within the Polish textile and clothing sector in general: retail/clothing brands, e-commerce, technical textiles, and nonwovens, allowing for an exploratory assessment of the behavior of different profiles during the pandemic crisis and recovery. More information on these companies is provided in the Annex, as Table A.1. The observation period covers the fiscal years 2017 to 2023, allowing for comparisons between the pre-pandemic (2017-2019), crisis (2020), and recovery (2021-2023) periods.

The financial data was collected between July and August 2025 by reviewing two financial information portals (bankier.pl and stockwatch.pl) and, where necessary, the companies' official annual reports, depending on the availability and quality of the data. The following basic accounting variables were considered for the analysis: net income, net profit/loss, total assets, and net equity (shareholders' equity). Based on these items, the study derives three main results: (i) year-on-year changes for each company and variable, (ii) the cumulative change (2023 vs. 2017) to capture overall performance over the seven-year period, and (iii) profitability ratios (ROA and ROE) to summarize operating efficiency and return on equity.

In our research, we started with a comparative, descriptive, and annual (YoY) analysis of the financial statements of publicly traded textile and apparel companies during the period 2017 - 2023. The objective was to document patterns consistent with financial resilience, i.e., the ability to absorb the 2020 crisis and recover performance during the period 2021–2023. For each company i , and each year t , the year-over-year (YoY) percentage change is calculated for each accounting item as follows, as shown in equation 1:

$$\Delta X_{i,t}(\%) = \frac{X_{i,t} - X_{i,t-1}}{X_{i,t-1}} \times 100 \quad (1)$$

The cumulative change is then calculated as shown in equation 2:

$$\Delta X_{i,2023/2017}(\%) = \frac{X_{i,2023} - X_{i,2017}}{X_{i,2017}} \times 100 \quad (2)$$

In addition to the results at the company level, aggregate dynamics between companies (totals) have been calculated and, when used, cross-sectional summaries (averages) intended to serve as a sectoral indication. To complement the gross accounting items, the analysis calculates the return on assets (ROA) and return on equity (ROE) for each company year. ROA is interpreted as the efficiency in generating profits from the asset base, while ROE reflects profitability in relation to equity capital (Bilińska-Reformat & Dewalska-Opitek, 2021). The formulas are shown in equations 3 and 4, respectively:

$$ROA_{i,t} = (NetProfit_{i,t} / TotalAssets_{i,t}) \times 100 \quad (3)$$

$$ROE_{i,t} = (NetProfit_{i,t} / Equity_{i,t}) \times 100 \quad (4)$$

In order to complement the tabular analysis and facilitate inter-firm comparison throughout the 2017–2023 cycle, two visualization tools were incorporated.

First, a profitability heatmap was created that shows the ROA and ROE values for each company and year. This matrix allows us to identify temporal patterns (persistence, episodes of deterioration and recovery) and heterogeneity among companies in terms of profitability.

Second, a growth – profitability strategy map in bubble scatter format was used. The horizontal axis corresponds to the compound annual growth rate (CAGR) of net income between 2017 and 2023, which was calculated using equation 5:

$$CAGR_i = [(Incomes_{i, 2023} / Incomes_{i, 2017})^{(1/6)} - 1] \times 100 \quad (5)$$

This allows us to define interpretive quadrants (high/low growth and high/low profitability). In order to test the hypotheses derived from RQ3, a difference-in-differences specification with firm and year fixed effects was chosen because it fits the structure of the data and the research objective. The dataset follows the same firms over 2017 - 2023, and the aim is to compare whether post-2020 trajectories differed according to firms' digital/omnichannel orientation rather than merely to contrast average outcomes before and after the pandemic. Firm fixed effects absorb time-invariant differences across companies, such as business model or positioning, while year fixed effects absorb shocks common to all firms, including the pandemic year, reopening, and the 2023 slowdown. Compared with a simple pre/post comparison, a cross-sectional analysis, or a pooled regression, this specification makes fuller use of the panel structure and provides a parsimonious way to estimate differential post-pandemic performance associated with digital orientation (Imai & Kim, 2020; de Chaisemartin & D'Haultfoeuille, 2022). The key explanatory variable captures digital/omnichannel intensification based on public disclosures (annual reports, corporate communications) and is operationalized in two complementary ways: first, a treatment indicator must be considered, i.e., a company that explicitly shows acceleration in e-commerce and omnichannel. Second, a continuous measure of digital intensity based on the percentage of online sales over total sales, and/or its year-on-year variation, must be considered. Given that the dataset contains two variants of the online % table (10 firms versus 6 with an online channel), the model is estimated both in the complete sample (coding the 4 mainly B2B firms as zero online intensity) and in the subsample of 6 firms with online sales (exploiting intensity gradients). The equation applicable to this case would be (equation 6):

$$y_{it} = \alpha_i + \delta t + \beta(Digital_i \times Post_t) + \varepsilon_{it} \quad (6)$$

where y_{it} represents performance/recovery metrics (e.g., net revenues, net profit, ROA, and ROE), controls for firm-invariant heterogeneity (business model, positioning), absorbs common shocks (2020 restrictions, 2021 – 2022 reopening, 2023 slowdown), and $Post_t$ identifies the recovery period (2021–2023). The parameter β assesses whether, following the pandemic, companies with greater digital momentum show differentially superior recovery trajectories in terms of accounting and profitability, which constitutes evidence of descriptive consistency with the narrative of digitization/omnichannel.

The inference is reported with robust standard errors grouped by company, and, given the low number of companies, conservative p-values are prioritized. Because digital/omnichannel orientation may be endogenous, the estimated coefficients are interpreted as descriptive associations rather than causal effects. Firm fixed effects absorb time-invariant differences across companies, and year fixed effects absorb common shocks, while the use of pre-pandemic online-sales intensity reduces

simultaneity with post-pandemic outcomes. However, these features do not eliminate the possibility that firms with stronger pre-existing capabilities were both more likely to invest in e-commerce and more likely to recover faster after 2020.

As a complementary verification to the above, we apply a Mann – Whitney U test comparing a synthetic indicator of recovery between groups of companies with different digital orientations. The outcome is defined as a measure of “rebound” relative to the pre-COVID level.

$$\Delta y = y_{2021-2022} - y_{2019} \text{ ratio } y_{2021-2022}/y_{2019}, \text{ for income and/or profitability} \quad (7)$$

The main partition follows the data structure: (a) firms with an online channel (6) vs. predominantly B2B firms (4), and (b) within the 6 online firms, comparison of high vs. low intensity using the percentage of online sales (or its increase during 2020–2021). The Mann–Whitney test contrasts whether the distribution of the “rebound” is stochastically greater in the group with greater digitization/omnichannel. This contrast does not impose normality or homogeneous variances and therefore serves as additional evidence that the observed trajectories are consistent (in descriptive terms) with a cushioning and recovery mechanism associated with the intensification of the digital channel during and after the pandemic shock.

3. Research results

As can be seen in the dataset included in the data availability section, these tables jointly document how the Polish textile–clothing (T-C) sector’s listed firms adjusted to the COVID-19 shock through their income statements and balance sheets. Across the sample, the pandemic year (2020) marks the main structural break, followed by a fast, but uneven, normalization in 2021–2022 and a clear deceleration in 2023. As shown in Figure 1, net revenues indexed to 2017 reveal a pronounced divergence across firms, with Answear’s structural expansion contrasting with the pandemic shock and subsequent rebound observed in retail-oriented companies (see dataset in availability section).

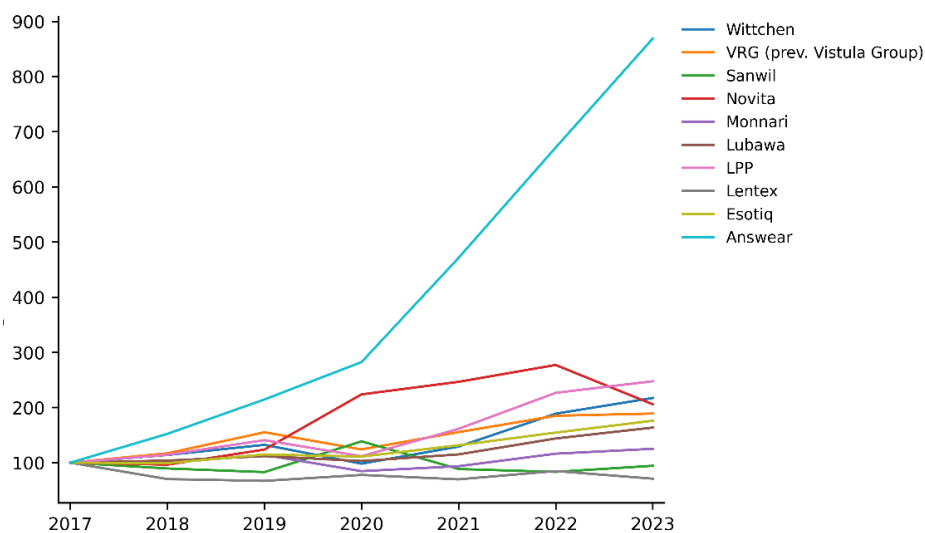


Figure 1. Indexed net income trajectories (2017 = 100).

Source: own elaboration based on the data from the indicated financial portals or the companies’ yearly reports.

Figure 1 shows the variation in indexed net income (2017=100), revealing significant diversity among companies in the sector. Answear stands out, with exceptional and sustained growth through 2023 (index close to 870, consistent with a cumulative increase well above the rest), indicating structural expansion rather than a temporary rebound. In contrast, several companies in the retail and fashion sector reflect the impact of 2020 and a subsequent recovery. LPP and Wittchen show a downward trend until the pandemic year, then experience an increase in 2021–2022, stabilizing in

2023 at levels significantly higher than those recorded in 2017. Novita, for its part, shows a more cyclical pattern, characterized by a significant increase during the pandemic (probably due to healthcare demand), followed by a normalization in 2023. Ultimately, Lentex is the most fragile case of the period, with an index below 100 in recent years and a relative contraction compared to 2017. Analysis of the data set reveals that the sector's recovery after 2020 was genuine, albeit asymmetrical and dependent on the specific business model. In Table A.2 (net revenues), 2020 stands out as a sector-wide contraction: total net revenues for the examined firms fell by >17% year-on-year. The largest drops were concentrated among clothing/retail-oriented companies: Wittchen and Monnari (each >25% decline), as well as VRG and LPP (each >20% decline); consistent with demand compression and disruptions in physical retail. At the same time, the shock created “winners” linked to medical/protective materials: Novita increased revenues by >80% and Sanwil by >67%. The post-pandemic rebound was strong in aggregate (total revenue growth of ~39% in 2021 and >37% in 2022), but firm trajectories diverged: LPP illustrates a classic collapse-and-recovery profile (about +44% in 2021 and +40% in 2022 after the 2020 fall), while Answer shows persistent scaling (+67% in 2021 and >42% in 2022). By contrast, some pandemic-era gains proved transitory: Sanwil and Lentex later recorded marked revenue declines (approximately >36% and >10%, respectively). In 2023, sector momentum weakened (total growth only ~9%), with Answer still expanding, but Novita and LPP contracting (by >25% and >16%, respectively). Over the full horizon (2017–2023), total net revenues rose by >135% (for the companies comparable across the period), driven disproportionately by Answer (+768%), with strong long-run increases also for LPP (>147%) and Wittchen (>117%).

The profit dynamics in Table A.3 (net profit) reinforce this interpretation. In 2020, most firms experienced profit compression, yet the depth of the decline depended on business model and product exposure. Wittchen, for example, saw a sharp drop but remained profitable; suggesting partial buffering through channel diversification (including e-commerce). In contrast, firms connected to medical/material demand (e.g., Novita, Sanwil, Lentex) displayed comparatively better outcomes during the shock. The subsequent year (2021) brought a broad profit rebound, with particularly strong improvements among retail-focused firms (Wittchen, VRG, Monnari, LPP, Esotiq, Answer), consistent with reopening effects and operating leverage after a depressed base. Balance-sheet aggregates adjusted more gradually. Table A.4 (assets) indicates a pandemic-era slowdown rather than a collapse; notably, the year-on-year change in 2022/2021 appears weaker in percentage terms than in 2020/2019, suggesting that normalization did not eliminate investment and valuation headwinds. The most pronounced asset expansion is associated with growth strategies (especially Answer and LPP); whereas Lentex is the sole firm with a sizeable asset contraction (about –28%). Finally, Table A.5 (equity/own capital) mirrors these patterns: Answer records the largest cumulative increase (>750% from 2017 to 2023), while Lentex is again the only firm with a material decline (about –25%). Importantly, at the aggregate level, the only negative equity change occurs in 2020, followed by a rebound in 2021, when almost all companies rebuild capital relative to 2019 (with Monnari and Lentex as exceptions). These developments in revenues, profits, assets, and equity set the empirical foundation for the next step of the analysis, where profitability and capital efficiency will be examined using ROA and ROE for the same set of companies.

To complement the tables above, which show the annual evolution of accounting figures and ratios and analyze ROA-ROE tables (see tables of dataset include in data availability section), two figures have been added that allow us to: (i) visualize profitability patterns throughout the pandemic cycle, and (ii) rank companies according to the growth-profitability binomial, taking size into account.

Figure 2 provides a compact, firm-by-firm view of profitability dynamics by combining ROA and ROE in a two-panel heat map. Two patterns stand out immediately. First, profitability is highly heterogeneous across companies and years, indicating that sector-wide shocks translated into asymmetric firm-level outcomes.

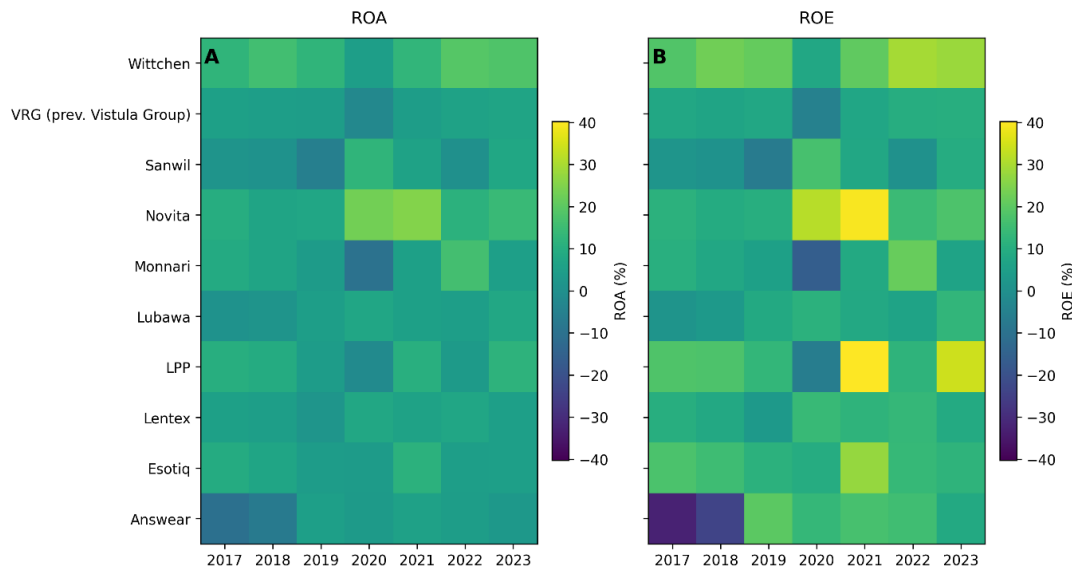


Figure 2. Heat map of profitability by company and year (ROA and ROE).

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

Second, dispersion is visibly larger for ROE than for ROA, which is consistent with the amplifying role of capital structure (and changes in equity base) in the return to shareholders. This difference is also evident in the underlying values: across 2017 - 2023, ROA ranges from -10.4% to 25.4%; while ROE ranges from -32.5% to 40.3%, i.e., a substantially wider amplitude on the equity side. The heat map therefore supports an interpretation in which operating profitability (ROA) is comparatively "bounded," whereas shareholder returns (ROE) swing more strongly with leverage and equity dynamics; particularly in years of disruption and rapid recovery. Several companies illustrate these mechanisms particularly well. LPP is the clearest example of leverage-driven asymmetry: in 2020, it records negative profitability (ROA -1.8%, ROE -6.2%), followed by an exceptional rebound in 2021 where ROE peaks at about 40.3% while ROA is only 10.6%. The large wedge between ROE and ROA (roughly 30 p.p.) is indicative of a strong equity multiplier effect and/or equity base adjustments during the recovery phase. In contrast, Wittchen displays a more "stable high performer" profile, keeping ROA positive throughout and reaching 19.1% (ROA) and 29.3% (ROE) in 2022, suggesting robust operational profitability with less extreme equity amplification. At the other end of the spectrum, Answear shows pronounced early weakness and subsequent normalization: it begins with negative ROA (-10.4% in 2017) and very negative ROE (-32.5% in 2017), then turns consistently positive from 2019 onward. Notably, however, its ROA remains in low single digits in later years despite positive ROE (e.g., ROA 2.6% vs. ROE 8.7% in 2023), pointing to comparatively modest asset profitability even as shareholder returns improve. Finally, pandemic-related "beneficiaries" are visible in the concentration of high values for Novita, where ROA peaks at 25.4% (2021) and ROE reaches 39.5% (2021), followed by lower (though still positive); returns as conditions normalize, consistent with a temporary demand shock rather than a permanent profitability shift.

Figure 3 maps firms' long-run strategic positioning by jointly displaying net revenue growth (CAGR 2017–2023) on the horizontal axis and average ROE (2017–2023) on the vertical axis, while bubble size captures scale through average assets. The crosshair reference lines (sample means) partition the space into four quadrants, enabling a compact interpretation of the trade-off between expansion and shareholder profitability over the full period, rather than in single-year snapshots.

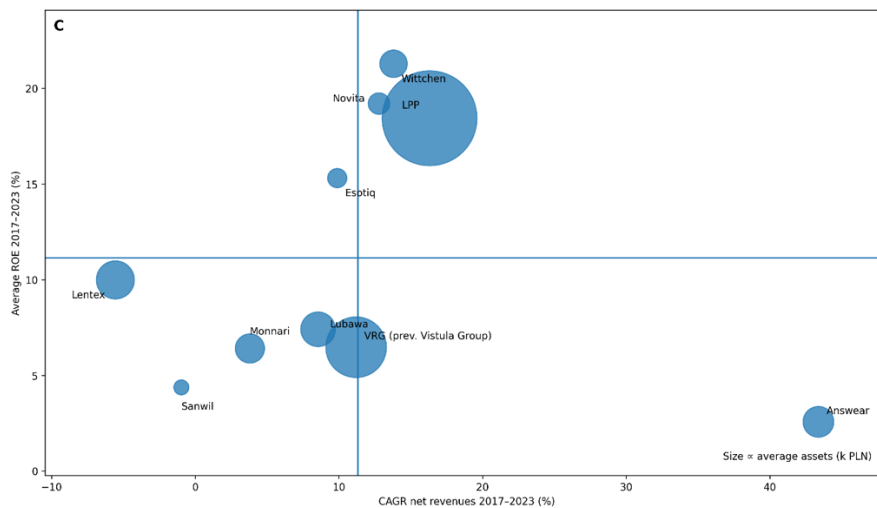


Figure 3. Strategic growth–profitability map with bubbles (size-average assets).

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

Two contrasting profiles are particularly informative. Answer is an extreme “high-growth/low-profitability” case: it records by far the highest revenue CAGR (around the mid-40% range), yet its average ROE remains clearly below the sample mean (low single digits). This configuration suggests that growth was achieved with limited conversion into shareholder returns over the period, consistent with a strategy centered on rapid scaling and reinvestment rather than ROE maximization.

In contrast, Wittchen combines above-average growth with the highest average ROE in the sample (above 20%), positioning it as a “high-growth/high-profitability” performer, i.e., a firm able to expand while sustaining strong returns to equity. Scale adds an essential layer to these interpretations. LPP, the largest bubble by a wide margin, lies in the high-growth/high-ROE area (both above the averages), meaning that the firm's performance is not only strong in relative terms but also disproportionately relevant for sector aggregates due to its asset base. Conversely, firms such as Sanwil and Monnari fall below the average ROE line and exhibit modest-to-low growth, indicating weaker overall positioning across the two dimensions, albeit with much smaller asset weights. The figure therefore helps separate “economically dominant” drivers of sector performance (notably LPP) from smaller firms whose trajectories, while informative, are less influential for aggregate outcomes.

The findings of the fixed-effects panel contrast by company and by year provide evidence consistent with RQ3, in the sense that the recovery trajectories observed are compatible with better relative performance by firms that, according to their public communications, strengthened their digital channel and omnichannel approach during the pandemic. The aforementioned points are shown in Table 1.

Table 1. Post-pandemic recovery and digital orientation: effect sizes and significance (DiD/fixed effects-cluster SE).

Sample	Specification	Outcome	Estimate (cluster SE)	p-value	N (obs)	N (firms)
Online sellers only (N=6)	HighDigital × Post (median split)	ROA	0.013 (0.021)	0.543	42	6
Online sellers only (N=6)	HighDigital × Post (median split)	ROE	-0.001 (0.063)	0.982	42	6
Online sellers only (N=6)	HighDigital × Post (median split)	asinh(Net Profit)	1.315 (3.771)	0.727	42	6
Online sellers only (N=6)	HighDigital × Post (median split)	ln(Net Revenues)	0.356 (0.354)	0.314	42	6
All firms (N=10)	OnlineSeller × Post (dummy)	ROA	0.014 (0.013)	0.298	70	10
All firms (N=10)	OnlineSeller × Post (dummy)	ROE	0.067 (0.033)	0.0404	70	10
All firms (N=10)	OnlineSeller × Post (dummy)	asinh(Net Profit)	3.706 (2.028)	0.0676	70	10

Sample	Specification	Outcome	Estimate (cluster SE)	p-value	N (obs)	N (firms)
All firms (N=10)	OnlineSeller $\times$ Post (dummy)	ln(Net Revenues)	0.345 (0.259)	0.183	70	10
All firms (N=10)	PreAvgOnlineShare/10 $\times$ Post (continuous)	ROA	0.004 (0.001)	2.63e-05	70	10
All firms (N=10)	PreAvgOnlineShare/10 $\times$ Post (continuous)	ROE	0.014 (0.002)	3.8e-13	70	10
All firms (N=10)	PreAvgOnlineShare/10 $\times$ Post (continuous)	asinh(Net Profit)	0.799 (0.120)	2.42e-11	70	10
All firms (N=10)	PreAvgOnlineShare/10 $\times$ Post (continuous)	ln(Net Revenues)	0.111 (0.014)	1.33e-14	70	10

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

Firstly, a comparison of companies with online sales and predominantly B2B companies reveals a statistically significant positive difference in return on equity (ROE) during the 2021–2023 period, with an approximate difference of +6.7 percentage points. With regard to revenue and profit, the estimated difference is also positive, although it does not reach statistical significance with this dichotomous partition. This suggests that heterogeneity within the "online" group may be relevant. Secondly, when digitization is measured continuously by the intensity of the online channel prior to the pandemic (percentage of online sales over total sales), the results are clearer: a 10 percentage point increase in this intensity is associated, in 2021–2023, with an additional increase of around 11.7% in revenue (in logarithmic terms), along with significant improvements in profit and profitability indicators (ROA and ROE). This pattern is consistent with the hypothesis that accumulated digital capabilities and online channel traction contributed to accelerating the recovery after the 2020 shock.

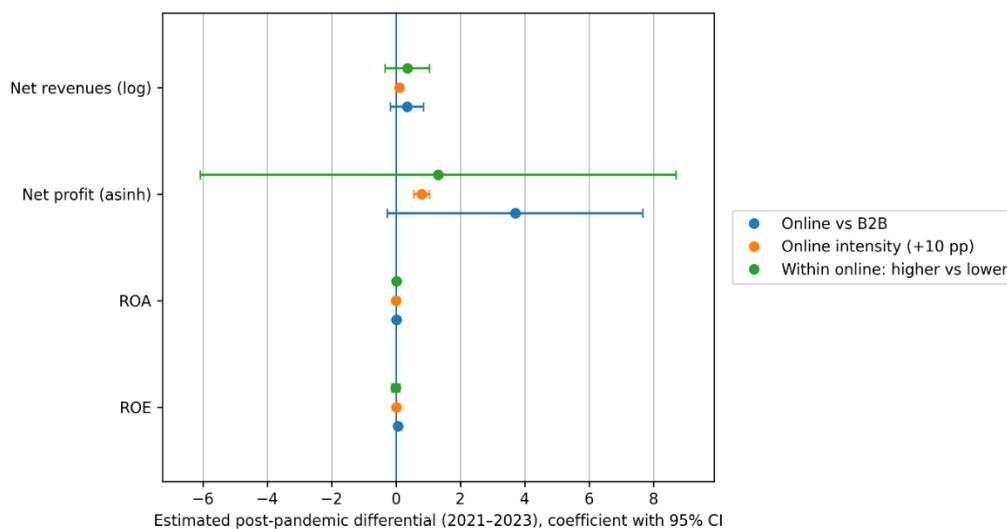


Figure 4. Recovery associated with digitization and omnichannel retailing (DiD with fixed effects, 2021–2023).

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

The findings of the fixed-effects panel comparison by company and by year are consistent with RQ3, insofar as the observed recovery trajectories (2021–2023) are compatible with the relatively superior performance of firms that intensified their digital and omnichannel orientation during the pandemic, as suggested by their public communications. This assertion is corroborated by the data presented on tables of dataset included in data availability section. A comparison was made between companies with online sales and predominantly B2B companies. This comparison revealed a positive and statistically significant differential in return on equity (ROE) for the years 2021–2023, amounting to approximately +6.7 percentage points. With regard to revenue and profit, the sign is equally positive, but the evidence is less conclusive with this dichotomous classification, suggesting that

channel intensity (and not just its presence) may be the decisive factor. It is evident that the operationalization of digitization on a continuous basis, as evidenced by pre-pandemic online channel intensity (percentage of online sales over total sales), yields more robust results. Specifically, a 10-percentage point increase in that intensity is associated, in 2021–2023, with an additional increase of approximately 11.7% in revenue (measured in logarithms), and with statistically significant improvements in profit and profitability indicators (ROA and ROE). This pattern is consistent with a mechanism of resilience and demand capture derived from accumulated digital capabilities, as well as greater commercial flexibility (e.g. reallocation of sales to e-commerce and online-store coordination) following the shock of 2020.

As illustrated in Figure 5, the results of the non-parametric Mann-Whitney test were applied to "rebound" indicators.

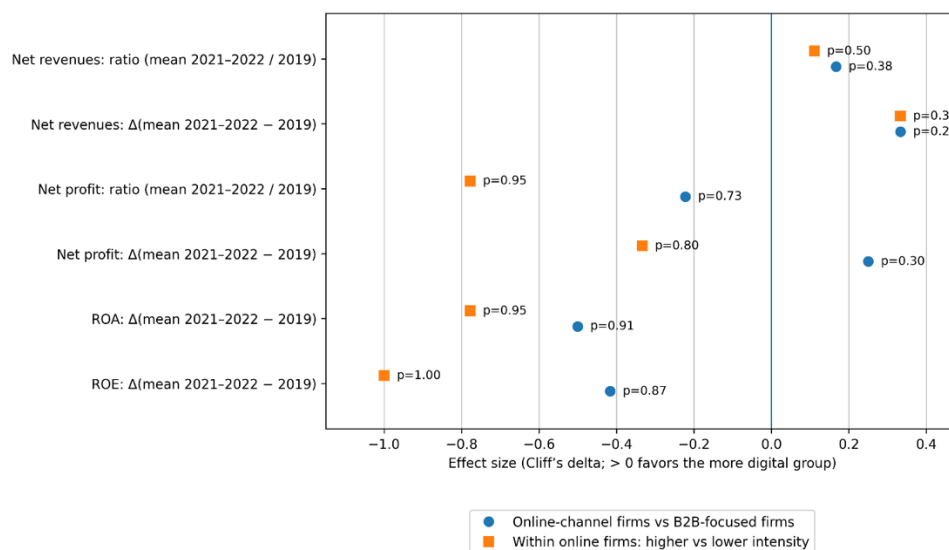


Figure 5. Post-pandemic recovery and digital orientation: effect sizes and significance (Mann-Whitney Test).

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

These indicators were defined as the difference between the 2021–2022 and 2019 averages, and as 2021–2022/2019 ratios for revenue and profits. The horizontal axis indicates the effect size (Cliff delta), with positive values denoting a significantly greater recovery in the group with greater digital orientation. Furthermore, the significance value of the one-tailed test is indicated adjacent to each point. The significance values are elevated for virtually all indicators and partitions, indicating that the "rebound" distributions do not differ significantly between groups. However, a moderately favorable pattern emerges in relation to revenue, associated with digital orientation (positive effect sizes). Nevertheless, in terms of profitability (ROA and ROE), effect sizes tend to be negative when comparing intensity between firms with online channels. The recovery is consistent with the commercial benefits associated with the digital channel in some cases.

4. Discussion

This study examined the financial resilience of ten companies in the textile and clothing sector listed on the Warsaw Stock Exchange (GPW) throughout the pre-pandemic cycle (2017–2019), shock (2020), and recovery (2021–2023). The objective has been to analyse, through annual and cumulative comparisons, the evolution of net income, net profit, assets, equity, and profitability ratios (ROA and ROE), as well as to describe the heterogeneity between business models. Additionally, we analyse whether post-COVID trajectories are descriptively consistent with a greater digital/omnichannel orientation, operationalized with public disclosures and online sales intensity.

Regarding RQ1, the results confirm that 2020 constitutes the main structural break in the cycle analysed: at the aggregate level, net sales for the group of companies fell by more than 17% year-on-year, accompanied by a generalized compression of profits (albeit with varying intensity) and signs of tension in capital dynamics. This pattern fits with sectoral evidence describing a sharp contraction in the European textile and apparel industry in 2020, particularly acute in segments exposed to discretionary consumption and physical retail, and with greater relative resilience in branches linked to nonwovens/medical applications (Euratex, 2020, 2021). The aggregate recovery in 2021 - 2022 is intense (total revenue growth of close to 39% in 2021 and >37% in 2022), but it does not eliminate heterogeneity, and a clear slowdown is observed in 2023 (total revenue growth of 9%). Interpretatively, this sequence is consistent with a post-lockdown and reopening “rebound” phase, followed by a less expansive normalization; this profile is consistent with the literature that emphasizes that financial resilience is not only defined by “returning” to previous levels, but by the ability to absorb, maintain operations, and stabilize in highly uncertain environments (Salignac et al., 2019; Zahedi et al., 2021). The profitability analysis reinforces this reading: the observed range is narrower in ROA (from -10.4% to 25.4%) than in ROE (from -32.5% to 40.3%), suggesting an amplification via capital structure (return to shareholders fluctuates more than return on assets). Emblematic cases illustrate the mechanics: LPP recorded negative returns in 2020 (ROA -1.8%; ROE -6.2%) and an extraordinary rebound in 2021 (ROE 40.3% vs. ROA 10.6%), while Wittchen approaches a relatively stable high-performance profile with peaks in 2022 (ROA ~19.1%; ROE ~29.3%). These contrasts are consistent with approaches that interpret resilience as a result of resources and management decisions (e.g., operational and financial adjustment), rather than as a uniform property of the sector (Salignac et al., 2019).

With regard to RQ2, the results show that sector aggregates mask radically different trajectories. In 2020, the largest declines in revenue are concentrated in retail/fashion-oriented companies: Wittchen and Monnari exceed -25%, while VRG and LPP fall more than -20%. In contrast, there are temporary “winners” linked to materials/protection and healthcare demand: Novita increased its revenues by >80% and Sanwil by >67% during 2020. This asymmetry is consistent with the literature documenting simultaneous but uneven effects across subsectors (fashion vs. nonwovens/healthcare) and the need for rapid reconfiguration of production and logistics in disrupted textile chains (Seidu et al., 2024; Zhao & Kim, 2021). In the recovery phase, heterogeneity in persistence is also observed: some expansions during the pandemic period are reversed (subsequent declines in Sanwil and Lentex), while other companies consolidate levels above 2017 after the rebound (e.g., LPP and Wittchen). Answer's trajectory stands out for its structural expansion: on the 2017=100 index, it reaches a level close to 870 in 2023 (cumulative growth of +768%), suggesting sustained scaling rather than a temporary rebound. Over the entire 2017 - 2023 horizon, total revenues increase by >135% (for comparable firms), driven disproportionately by Answer, with also high increases in LPP (>147%) and Wittchen (>117%). This pattern is consistent with studies that emphasize that performance during shocks depends on firm characteristics (profile, exposure to retail, etc.) and that differences can be substantial even within the same sector (Cho & Saki, 2021; Santos & Castanho, 2022). The growth-profitability “strategy” sums up this heterogeneity well: Answer appears as a case of high growth and low average profitability (average ROE below average), while Wittchen combines above-average growth with the highest average ROE (>20%). LPP also has the largest weighting by assets, so its positioning (high growth and above-average ROE) has disproportionate relevance for any aggregate reading. In interpretive terms, these results are consistent with the idea that resilience and recovery do not depend solely on the rebound in demand, but also on adjustment capabilities and strategic/financial decisions that shape the conversion of growth into returns (Salignac et al., 2019; Ozdemir et al., 2022).

Finally, with regard to RQ3, the evidence supports a nuanced interpretation: there are signs consistent with a positive association between digital orientation and recovery, but this is not uniform depending on the digitization metric and the contrast applied. In the “online vs. predominantly B2B”

comparison, a positive and statistically significant difference in ROE of approximately +6.7 p.p. is identified for 2021–2023, while in revenue and profit the differences remain positive but do not reach significance with this dichotomous partition. This is consistent with an interpretation in which the presence of the online channel is not sufficient to guarantee broad improvements in all metrics, and where heterogeneity within the “online” group is decisive. When digitization is operationalized as the continuous intensity of the online channel prior to the pandemic, the results are clearer: a 10 p.p. increase in this intensity is associated with an additional increase of 11.7% in revenue (in logarithms) in 2021–2023 and with significant improvements in profit, ROA, and ROE. This pattern is consistent with the literature linking greater digital capabilities/investments with smaller declines and greater adjustment capacity during COVID-19, albeit with heterogeneity depending on the degree of adoption (Abidi et al., 2023; Li et al., 2022), and with evidence in fashion/retail on the acceleration of channel integration and digital transformation in response to mobility restrictions (Acquila-Natale et al., 2022; Wulff, 2022). However, the nonparametric (Mann–Whitney) contrast on synthetic “rebound” indicators suggests caution: for most outcomes and partitions, the p-values are high (no statistically clear differences), with a moderately favourable pattern observed in revenue (positive effect sizes), but not necessarily in profitability when comparing intensity within the online subgroup (effect sizes tending to be negative in ROA/ROE in that partition). Overall, the most parsimonious reading is that the evidence is descriptively compatible with a role for the digital channel in sustaining/recovering sales, but that the translation into profitability depends on additional conditions (costs, financial structure, competitive dynamics), which is consistent with approaches that understand digitalization as a potential, but not automatic, mechanism of resilience (Akhtar et al., 2022; Xia et al., 2022) and with the methodological caution noted by the design itself.

In line with the central contribution of the article, this study provides an overall assessment of the financial resilience and post-pandemic recovery of GPW-listed Polish textile and clothing firms throughout the 2017 - 2023 period. The study details the asymmetry of impacts and the relevance of the business model and adds an explicit approach to the digital/omnichannel dimension using a DiD approach with fixed effects and non-parametric contrasts, positioning its findings with consistency. However, the study has a number of limitations that should be noted. (i) The small sample size (10 firms) and its bias toward listed companies; (ii) the possible presence of survival bias; (iii) the possibility of residual endogeneity in the digital-orientation measures, since firms with stronger pre-existing capabilities may have been more likely both to invest in e-commerce and to recover faster; (iv) the measurement of digitization based on online sales intensity, which is susceptible to error and not equivalent to a broad digital transformation; and (v) the sensitivity of ROE to changes in equity and financial structure in years of high volatility. Accordingly, the findings should be interpreted as applying primarily to the population studied: Polish textile and clothing firms listed on the Warsaw Stock Exchange. They should not be generalized automatically to unlisted SMEs, which are not represented in the sample, or to firms in other industries, where business models, exposure to physical retail, and crisis-response mechanisms may differ. The results may offer useful indications for understanding resilience in related settings, but their external validity beyond listed textile and clothing firms requires further empirical testing.

Future research could test the external validity of these findings by expanding the universe to unlisted SMEs, integrating direct and multidimensional measures of digitization, and examining whether similar recovery patterns emerge in other industries. It would also be relevant to contrast mechanisms with stronger causal identification strategies and extend the time window to assess the persistence (or reversal) of the effects observed after 2023.

For companies in the sector, the results suggest that resilience to systemic shocks is not a homogeneous attribute, but rather the product of positioning, channel, and reconfiguration capacity. First, the magnitude of the decline in 2020 is concentrated in profiles exposed to physical retail, reinforcing the value of strategies that enable sales to be sustained under restrictions (e-commerce and omnichannel coordination). Second, quantitative evidence associates greater pre-COVID online

intensity with a stronger commercial recovery in 2021–2023, pointing to the importance of building digital traction before the crisis, not just reacting during it. Third, the greater dispersion in ROE than in ROA underscores that shareholder recovery depends critically on capital structure: decisions on leverage, equity preservation, and cost discipline condition the conversion of the rebound into profitability. Finally, the existence of temporary beneficiaries linked to healthcare demand suggests that portfolio diversification and production flexibility can act as partial hedges against demand disruptions.

Conclusions

An analysis of ten textile and apparel companies listed on the Warsaw Stock Exchange from 2017 to 2023 reveals that 2020 marked a critical juncture in the examined period. This year witnessed an aggregate contraction in net sales exceeding 17%, accompanied by a pervasive decline in profits, albeit with notable variations in intensity among individual companies. In 2021 and 2022, there was a marked aggregate rebound in revenues. However, in 2023, the recovery lost momentum, suggesting a less uniform subsequent normalization. Profitability demonstrates heightened volatility in return on equity relative to return on assets, suggesting that the financial structure amplifies fluctuations in shareholder performance. The findings indicate significant heterogeneity across business profiles. Companies with a strong presence in consumption and physical stores experienced substantial declines, while those engaged in the healthcare sector demonstrated remarkable growth in 2020, often of a temporary nature. In the long term, aggregate growth is strongly influenced by cases of structural expansion, notably the trajectory of Answear and, to a lesser extent, LPP and Wittchen. In the context of digital transformation, the observed disparities indicate a favourable correlation with the recovery phase. Specifically, enterprises that have established an online sales channel demonstrate higher returns on equity (ROE) during the 2021–2023 period. Furthermore, upon examining the extent of their prior digital engagement, substantial enhancements in revenue, profit, and profitability are evident. However, it is imperative to exercise caution when employing non-parametric tests, as they underscore the notion that the correlation between digitization and financial gain is not inevitable. Instead, this relationship is contingent upon factors such as costs, competitive pressures, and financial decisions. The sector's resilience is not uniform; it is contingent upon the business model, the capacity to adapt the offering, and prior preparation in digital channels and financial management.

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Data availability statement: The data that support the findings of this study are openly available in Portal de la Investigación UCAV Repository at <https://portalcientifico.ucavila.es/datos/69903fb41459d551bca5d37c>.

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Appendix A

Table A.1 Profile of the companies analyzed.

Company	Description of business/main activity	Products/markets	History/presence
Wittchen	Family-owned manufacturing and retail company.	Leather and textile products: jackets, footwear, bags, wallets, and accessories.	Family company profile with a presence in retail.
Vistula Group (VRG)	Multi-brand corporation.	It includes Polish fashion brands: Vistula, Wólczanka, Bytom, Deni Cler; and a jewelry brand (W. Kruk).	Group with a portfolio of established brands.
Sanwil	Manufacturer of specialized textile materials.	Textiles for upholstery, medical applications, PPE, technical materials, and the footwear sector.	Focus on technical materials and industrial uses.
Novita	Nonwoven fabric manufacturer.	Spunlace and needle-punched nonwovens for personal hygiene, medical, household, and technical applications.	Specialization in nonwovens for multiple uses.
Monnari	Polish women's fashion brand.	Wide range of products for women.	Focus on apparel/retail (brand).
Lubawa	Manufacturer of textile products for uniformed services.	PPE, tents, airsheds, fabrics, specialized vehicle equipment, and camouflage.	Focus on institutional clients/defense-security.
LPP	Large Polish company (listed on the WIG20 index).	Clothing and accessories under five brands: Reserved, Cropp, House, Mohito, Sinsay.	Large-scale group with multiple brands.
Lentex	Polish manufacturer of nonwoven fabrics.	Nonwovens (spunlace, thermobond, needle-punched) for automotive, sanitary, furniture, clothing, and filtration.	Company with over 100 years of activity.
Esotiq & Henderson	Producer/marketer with physical stores and online channel.	Lingerie, swimwear, and clothing.	Mixed brick-and-mortar + e-commerce model.
Answear	International e-commerce (online store).	Online sales of multiple brands of clothing, footwear, accessories, and home furnishings.	Presence in 12 countries.

Source: own elaboration based on the data from the indicated financial portals or the companies' yearly reports.

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