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ECONOMIC CRISIS AND PRODUCTION–EXPORT DYNAMICS IN THE AUTOMOTIVE INDUSTRY: A COMPARATIVE PANEL ANALYSIS OF TÜRKIYE AND SELECTED EU COUNTRIES

ABSTRACT

Purpose: Economic crises introduce structural disturbances that disrupt established economic balances within industrial systems, generating diverse responses across countries and sectors. This study examines how crisis conditions affect production–export dynamics in the automotive industry by comparing Türkiye and selected European Union countries over the 2014–2023 period.

Methodology: Using balanced panel data, the empirical relationship between production volume and export turnover is analyzed using fixed- and random-effects models. The Hausman test indicates that the fixed-effects specification is most appropriate, suggesting that countryspecific characteristics play a significant role in shaping production dynamics.

Results: The findings reveal that, while production–export linkages remain statistically significant across countries, the magnitude and persistence of crisis impact vary depending on national production scale, institutional capacity, and structural conditions. The results further indicate that countries with higher production and export volumes experience stronger fluctuations during crisis periods, whereas countries with smaller production bases tend to display more moderate adjustments.

Conclusion: The study provides comparative empirical evidence on how national automotive systems respond to systemic economic disruptions and highlights the importance of structural differences in shaping crisis outcomes across countries.

Keywords: Economic crisis, automotive industry, production–export dynamics, crisis management, Türkiye, European Union

1. Introduction

The liberalization of capital movements and the increasing integration of global financial markets have intensified the frequency, speed, and transmission power of economic crises (Singh, 2003). These crises rarely remain confined to national borders; instead, they spread across countries, sectors, and firms depending on structural characteristics, institutional capacity, and sectoral interdependencies. As a result, economic crises have become systemic phenomena that simultaneously disrupt macroeconomic stability and micro-level business performance (Chatzinikolaou & Kubus, 2025). The business environment in Türkiye, like that of many emerging and developed economies, has repeatedly been exposed to such disruptions, with particularly pronounced effects in capital-intensive, highly interconnected industries.

Among these industries, the automotive sector occupies a strategic position due to its strong backward and forward linkages with manufacturing, employment, exports, and technological innovation. Because automotive production systems rely on complex supply chains, high fixed costs, and international demand conditions, they are especially vulnerable to crisis-induced shocks (Hoeft, 2024). Rapid changes in global competition, demand volatility, financial constraints, and policy uncertainty amplify automotive firms' sensitivity to economic downturns. Crises may emerge from national or international sources, sector-specific dynamics, or firm-level structural weaknesses, and, in many cases, they materialize through the simultaneous interaction of all these factors (Giannoulakis & Sakellaris, 2023). Beyond its macroeconomic significance, the automotive sector also represents an important context for strategic management research. Firms operating in highly integrated global industries must continuously adapt their production structures, supply chains, and export strategies in response to environmental uncertainty and crisis shocks. In this sense, economic crises function not only as macroeconomic disturbances but also as strategic turning points that test firms' adaptive capabilities, resilience, and crisis management strategies.

Economic crises not only affect production and trade volumes; they also have deep social and institutional impacts, increasing unemployment, weakening financial structures, and reducing overall economic welfare (Otker-Robe & Podpiera,

2013). In this context, crises can be conceptualized as periods of heightened uncertainty that disrupt existing equilibrium and force economic actors to operate outside standard managerial and policy frameworks. As emphasized in the literature, a crisis represents a situation that threatens the continuity, values, and functional integrity of economic systems (Booth, 1993; Ritchie, 2004; Boin, 2009). From this perspective, crises can be interpreted as systemic shocks that disrupt the balance among production, finance, and trade, leading to different outcomes across sectors and countries.

The central problem addressed in this study is identifying effective measures that enable firms to manage the transition from temporary financial distress to sustainable recovery during economic crises. In many cases, businesses initially face liquidity constraints and difficulties in meeting short-term obligations; if these challenges are not managed effectively, they may culminate in insolvency or bankruptcy. The automotive sector provides a particularly relevant context for examining this process, as crisis impacts in this sector tend to manifest rapidly and propagate widely through national economies. Therefore, understanding how automotive firms and countries respond to crisis conditions is critical for designing resilient economic and managerial strategies.

From a comparative perspective, crisis responses are rarely uniform. Differences in production scale, export orientation, financial structures, and public policy interventions result in varying crisis effects, even when countries are exposed to the same global shock (Armstrong & Read, 2020). However, recovery processes may display similar dynamics when production and export linkages remain structurally intact. This contrast between diverse crisis impacts and potentially converging recovery patterns underscores the importance of adopting a comparative and system-oriented analytical framework. In this respect, Türkiye and selected European Union countries offer an appropriate empirical setting, as they share strong trade linkages in the automotive industry while differing in institutional capacity, production volume, and crisis management approaches.

From a systems perspective, industrial economies can be interpreted as structures that tend toward balanced interactions among production, trade, and institutional capacity (Andreoni & Chang, 2019). Economic crises disturb this balance by in-

roducing sudden shocks that alter established production and trade dynamics across countries and sectors. The automotive industry, with its complex supply chains and strong production–export linkages, provides an appropriate setting to examine how such systemic disruptions unfold (Solée et al., 2013) and how industrial systems adjust over time. In this sense, analyzing crisis responses in the automotive sector offers a deeper understanding of structural resilience and adaptive capacity in industrial systems. However, empirical evidence comparing production–export dynamics across national automotive systems under crisis conditions remains limited.

The primary aim of this study is to evaluate crisis management responses in the automotive sector during periods of economic instability and identify the strategies that contribute to effective performance under adverse conditions. Specifically, the study compares Türkiye with selected EU countries (Italy, France, Denmark, Estonia, and Poland) by focusing on production levels and export turnover over the 2014–2023 period. These countries were selected to represent different production scales and levels of integration within the European automotive supply chain, allowing comparison between large and smaller automotive systems. This timeframe captures multiple overlapping crisis episodes, including the global economic slowdown following the COVID-19 pandemic and the subsequent energy and geopolitical shocks affecting European markets.

2. Concept of economic crisis

The concept of crisis is generally associated with chaos, turmoil, and depression. In this sense, a crisis can be defined as a situation that causes failure under uncertainty when a threatening risk emerges (Boin, 2009). Similarly, a crisis is also described as a disruption that damages an organization's existing structure and affects the organization (Ritchie, 2004). For institutions and businesses, a crisis is any event that disrupts normal operations, undermines performance, and weakens effectiveness and continuity (Ritchie, 2004). From a systemic perspective, crises may be interpreted as systemic shocks that disrupt established economic balances and generate diverse outcomes across actors, sectors, and countries, even when exposure to the shock is globally shared.

Crises often occur suddenly and create urgent conditions for institutions, organizations, and firms (Phelps, 1986). They can affect systems physically and structurally by creating disruptions that threaten fundamental functions, values, and even survival (Booth, 1993). Wherever crises occur, they may cause sharp contractions in national income and trigger stagnation and depression dynamics. In modern industrial systems, the transmission of crisis impacts can be amplified by interdependence in trade, finance, and supply chains, meaning the same event may produce uneven (asymmetric) sectoral losses and uneven recovery paths across countries (Crespo & Hoyos, 2025).

During crisis processes, problems often begin in the financial structure. Typical forms include currency crises, banking crises, financial crises due to market dysfunction, and external crises triggered by risks originating outside the country (Darican, 2013). An economic crisis, as reflected in serious deterioration of financial markets, may also be described as an economic depression because it produces a downturn without immediate recovery (Erol et al., 2011). In this context, economic crises can be understood as periods in which macro-level instability (e.g., inflation, exchange rate volatility, credit contraction) translates into micro-level distress (e.g., liquidity shortages, demand collapses) (Dhanda 2024), producing feedback loops that deepen losses.

An economic crisis is also defined as the weakening of a country's financial capacity due to reduced opportunities for individuals to meet their needs, rising poverty, and rising consumer prices (Ollivaud & Turner, 2014). It is accompanied by fluctuations above acceptable levels in core economic sectors, including foreign exchange, money markets, and the production of goods and services. Consequently, national economies experience sudden and unexpected disturbances (Gayathri et al., 2024). For an economic problem to be characterized as a crisis, the negative situation should emerge suddenly, create a threat, persist in the short or long run, and produce widespread effects (Aktan & Şen, 2001). Such widespread effects are especially visible in complex industrial ecosystems, including the automotive sector, where shocks propagate through supplier networks, labor markets, financing, and export demand.

In businesses, managerial success becomes especially critical during crisis periods, when classical

management rules often lose their effectiveness (Zamoum & Gorpe, 2018). Therefore, managerial performance depends on analytical thinking and effective communication skills (Wyatt, 2002). Although crises create negative perceptions, it is important to manage them successfully by transforming threats into opportunities. Effective crisis leadership requires remaining calm, acting prudently, and minimizing damage while restoring operational alignment, akin to returning a system to its normal operational state (Woodward, 2025). In some cases, crises may also stimulate transformation and create new opportunities for innovation and organizational renewal (Topçu, 2017). The key is to recognize these opportunities and reduce crisis impacts by guiding employees at the micro level and supporting macro-level stabilization policies (Şendoğdu, 2014). It is also emphasized that shared values help keep a renewed organization together after a crisis (Hurst, 2000). From a strategic management perspective, firms' performance during crisis periods largely depends on their ability to reconfigure resources in response to environmental uncertainty and to adapt to changing conditions. In this context, organizational resilience and adaptive capability are crucial for enabling firms to maintain their competitive position during periods of economic instability. In this context, these arguments are particularly relevant for automotive firms and policymakers seeking to restore balanced production–export dynamics after crisis-driven disruptions. During the COVID-19 shock, EU automotive production experienced major shutdowns and large output losses (European Parliament, 2021). The later European energy-cost shock also intensified cost pressure and competitiveness concerns across the automotive ecosystem (ACEA, 2022). These crisis waves illustrate how a shared shock can create asymmetric impacts across countries and firms, depending on scale, energy exposure, and institutional response capacity—precisely the comparative logic this paper employs.

3. Businesses in difficulty and measures to be taken

Economic crises can push firms into financial distress by compressing demand, tightening credit, increasing input costs, and disrupting supply chains (Yu et al., 2022). However, the effects of a crisis do not appear uniformly: some firms experience rapid liquidity deterioration, while others maintain op-

erational continuity through strategic flexibility (Moridu & Abidin, 2023). Therefore, crisis management can be interpreted as the effort to restore operational and financial stability in cash flow, operations, and stakeholder relations after crisis-induced disruptions (Durugbo & Al-Balushi, 2025). In this section, the indicators of distress and the macro–micro measures that can be taken are discussed.

3.1 Businesses in difficult situations

There are indicators that a business is in a difficult situation, including approaching bankruptcy, losing half of its capital or a substantial portion of assets, consecutive multi-year losses, difficulty paying debts, production stoppages, raw material supply problems, negative responses from credit institutions, and liabilities exceeding assets (Taşpınar Cengiz et al., 2015). These indicators often emerge sequentially, reflecting a deterioration process in which initial liquidity strain can evolve into solvency risk if corrective action is delayed.

Business failures can be economic, financial, or technical. Economic failure can be observed when companies close the period with losses; thus, profitability is a leading indicator of success or failure (Tay Bayramoğlu & Kurban, 2023). Businesses whose profitability exceeds the cost of capital are considered economically successful (Dağlı, 1994). Financial failure may occur even when economic failure is not present, but it can still threaten survival or require major restructuring. Firms may face technical problems such as changes in order frequency and order quantities, and receivable collection failures, which reduce their ability to pay debts; this is described as technical failure and loss of technical liquidity (Uzun, 2005). Scott (1977) describes failure indicators, including economic failure (revenues less than total costs) and company failure (obligations to creditors cannot be fulfilled) (Zenoff & Zwick, 1969). Technical bankruptcy occurs when a firm cannot fulfill obligations on time or fails to pay debts when due (Blum, 1969). When liabilities exceed asset market value, liquidation becomes a key risk.

Certain organizational characteristics can help firms survive and sustain performance over long periods. These include sensitivity to environmental, technological, and political changes, a strong identity and internal commitment, tolerance and controlled diversification, and conservative financing practices that preserve flexibility (de Geus, 1998).

These features function as “resilience capabilities” that strengthen firms’ ability to absorb shocks and recover effectively from crisis conditions (Manfield & Newey, 2018).

3.2 Financial measures to be taken

Precautions against economic crises can be considered at macro and micro levels (Aktan & Şen, 2001). From a systems perspective, macro measures aim to reduce instability and prevent the escalation of shocks, while micro measures aim to stabilize firm-level operations, liquidity, and strategic positioning.

3.2.1. Macro measures

Crises are undesirable and often unexpected periods of financial collapse (Reinhart & Rogoff, 2009). Instead of acting only after crises occur, states should strengthen anticipatory capacity and implement preventive policies (DeLeo, 2015). Because crises disrupt market stability and transfer micro-level cash shortages into broader macro-level instability, states must provide integrated support to businesses, including liquidity relief (Artantaş & Gürsoy, 2023). Support mechanisms may include legal regulations, tax reductions and amnesties, low-interest credit supports, grants, rent and education support, social aids, and other measures that protect both firms and employees.

To take precautions, it is necessary to identify crisis sources and address them directly. Since crises are often linked to macroeconomic instability, ensuring macroeconomic stability is essential (Bicaba et al., 2014). Macroeconomic stability implies harmony among key economic factors and requires policy capability and experience (Türgay & Kenanoğlu, 2023). Political stability and balanced fiscal policy are also critical, as political instability creates uncertainty and encourages short-term policies that can weaken the effectiveness of public investment (Yalçınkaya & Kaya, 2017). During periods of financial crisis, monetary policy should prioritize price stability (Çetin, 2017). In this context, banks and regulators can use tools such as required reserves, interest corridors, liquidity management, and reserve option mechanisms (Eroğlu & Kara, 2017). Discipline in public debt and a rule-based approach (e.g., Maastrichttype targets) can also strengthen credibility. Additionally, the tax system should be reviewed concerning impartiality, simplicity, justice, generality, and efficiency, while avoiding excessive burdens (Bejaković, 2020). Finally, exchange

rate dynamics and interest rate developments should be managed consistently to limit speculative attacks and maintain stability.

3.2.2 Micro measures

At the firm level, crisis measures should address both immediate survival and long-term competitiveness. Dalgıç et al. (2024) show that the “pay as you wish” strategy can be implemented during crisis periods and can influence short-term performance while strengthening brand components in the long term. The strategy is defined as a buyer-determined pricing approach rather than a seller-determined one (Koç & Erdoğan, 2023). Another strategic decision is organizational downsizing (Turan Torun, 2022). Downsizing may prevent major losses, but downsizing alone is insufficient; it must be accompanied by restructuring. Change engineering is a managerial approach used to redesign organizational activities. Downsizing may result from such applications, but implementing downsizing without adequate process analysis may cause irreversible damage in the long run (Hammer & Champy, 1993). Therefore, firms should carefully review their organizational activities and implement necessary changes without panic, aiming for higher quality, lower costs, and greater effectiveness (Sarkar & Osiyevskyy, 2018).

Managers also play a decisive role during crisis periods. They should recognize early warning signals, anticipate crisis-driven negative outcomes, implement actions to minimize damage, learn from past experiences, and prepare for future crises (Demirkaya & Ateşoğlu, 2023). Firms can also maintain their existence by embedding marketing and marketing communication culture across units (Öztekin, 2009) and by preparing crisis call plans, emergency action plans, crisis centers, team structures, and robust communication systems to prevent coordination failures (Çitekci, 2016). Contemporary management approaches such as total quality management and effective leadership have become even more critical in these periods. After major shocks, firms may reduce complexity by divesting, reducing personnel, and simplifying operational structures (Yalçınkaya, 2018). These micro-level measures align with the broader goal of restoring operational balance, e.g., rebuilding alignment among costs, revenues, cash flow, and strategic capacity under crisis conditions (Setyadi et al., 2025).

4. Methodology

Methodologically, the study adopts a descriptive and comparative research design supported by panel data analysis. By examining the relationship between production volume and export turnover, the analysis explores how the production–export relationship behaves across countries during crisis periods. Fixed-effects and random-effects models are employed to capture both within-country and between-country dynamics, while the Hausman test is used to assess the consistency of these specifications. This approach allows for a structured evaluation of how crisis impacts differ across national automotive systems and whether recovery mechanisms follow similar or divergent paths.

By integrating crisis theory, sectoral analysis, and empirical modeling, this study contributes to the literature on economic crisis management in several ways. First, it provides comparative evidence on how automotive production systems respond to systemic shocks in emerging and developed economies. Second, it highlights the role of structural differences in shaping asymmetric crisis outcomes. Finally, it offers policy-relevant insights into how recovery dynamics can be supported through appropriate macro- and micro-level interventions. In

doing so, the study aligns with contemporary discussions of economic resilience and systemic balance amid global uncertainty.

5. Research in the automotive sector – Comparison between Turkey and some European Union countries

This study examines crisis management dynamics in the automotive industry by analyzing total automobile production and export turnover in Türkiye and selected European Union countries (Italy, France, Denmark, Estonia, and Poland) over the 2014–2023 period. The selected timeframe captures multiple overlapping crisis episodes, including the COVID-19 pandemic and subsequent energy- and geopolitics-driven economic shocks that affected global and regional automotive markets. The dataset consists of annual observations. The panel structure was confirmed to be balanced prior to estimation ($n = 6, T = 10, N = 60$).

Table 1 presents summary statistics for automobile production and export turnover in Türkiye and selected European Union countries over the 2014–2023 period.

Table 1 Automobile production and exports in the automotive industry sector

Country	Mean Production (Units)	Std. Dev.	Mean Export Turnover (USD)	Std. Dev.
Türkiye	1,404,200	161,000	10,209,000	1,457,000
Italy	908,869	158,000	15,304,000	2,040,000
France	1,904,485	354,000	21,122,000	2,723,000
Denmark	4,827,887	1,034,000	147,377,000	18,992,000
Estonia	2,647,456	247,000	34,410,000	3,412,000
Poland	592,721	89,000	6,452,000	1,008,000

Source: Created by researchers using data from the Ministry of Commerce, the Turkish Statistical Institute (TURKSTAT), the Automotive Manufacturers Association of Turkey (AMA) (2024), and the International Organization of Motor Vehicle Manufacturers (OICA) (2024)

The dataset consists of annual observations of total automobile production (in units) and total automobile export turnover (in USD), obtained from official national and international sources, including the Ministry of Commerce, TURKSTAT (2024), AMA (2024), and OICA (2024). All variables were examined for consistency across countries and

years, and the panel structure was confirmed to be balanced prior to estimation ($n = 6$ countries, $T = 10$ years, $N = 60$ observations).

To analyze the relationship between production and export performance under crisis conditions, panel data econometric methods were employed.

Panel data analysis allows for controlling for unobserved heterogeneity across countries while capturing both temporal and cross-sectional variation. The following baseline model was estimated:

$$\text{Export_Turnover}_{it} = \alpha + \beta \text{Production_Amount}_{it} + u_{it}$$

where i and t denote countries and time, respectively.

Both fixed-effects (FE) and random-effects (RE) specifications were estimated. The fixed-effects model controls for time-invariant country-specific characteristics, making it particularly suitable for assessing structural asymmetries across national automotive systems. The random-effects model incorporates both within-country and between-country variation. Diagnostic checks for autocorrelation and heteroskedasticity were also conducted to ensure the robustness of the panel estimations. The Hausman test was applied to determine the appropriate specification by testing whether country-specific effects are correlated with the explanatory variable.

The fixed-effects specification allows the analysis to control unobserved, time-invariant country characteristics, which are essential when assessing asymmetric structural responses.

5.1. Results

This section presents the empirical findings obtained from the panel data analysis of automobile production and export turnover in Türkiye and selected European Union countries over the 2014–2023 period. The results are reported in a structured manner, beginning with descriptive statistics that provide an overview of cross-country variation, followed by panel regression estimates and model selection tests. The purpose of this section is to report the statistical outcomes transparently and objectively, without interpretation beyond what is directly supported by the data. Detailed implications and theoretical interpretations of these findings are deferred to the Discussion section.

Table 2 presents descriptive statistics for automobile production and export turnover in Türkiye and selected European Union countries over the 2014–2023 period.

Table 2 Descriptive statistics

Variable	Mean	Median	Std. Dev.
Production Amount (units)	2,019,498	1,477,160	1,491,384
Export Turnover (USD)	39,914,664	18,232,308	70,334,961

Source: Authors, based on research

Descriptive statistics reveal substantial variation in automobile production and export turnover across Türkiye and selected European Union countries over the 2014–2023 period. Mean production and export values are accompanied by relatively large standard deviations, indicating heterogeneity in production scale and export capacity. This dispersion reflects structural differences among countries and suggests that economic crises affect national automotive industries unevenly.

Countries with larger production systems and higher export volumes exhibit greater absolute fluctuations during crisis periods, particularly during the

COVID-19 shock and the subsequent energy-cost crisis. These preliminary findings point to differences in exposure and sensitivity across countries, which are further examined through panel regression analysis.

Table 3 reports the results of the fixed-effects and random-effects panel regression models examining the relationship between automobile production amount and export turnover. In the fixed-effects model, the coefficient on production is positive and statistically significant, indicating that, within countries, increases in production are associated with higher export turnover.

Table 3 Panel data analysis

Variable	Fixed-Effects Model	Random-Effects Model
Production Amount	4.0692 ** (0.016)	6.5020 *** (0.001)
Constant	—	26,784,000 ** (0.008)
R-squared	0.104	0.168
Observations	60	60
Countries	6	6
Years	10	10

Note: p-values in parentheses.

** p < 0.05, *** p < 0.01.

The fixed-effects model controls for country-specific, time-invariant characteristics.

Source: Authors, based on research

The explanatory power of the fixed-effects model is relatively modest, suggesting that production alone does not fully explain export performance during crisis periods. This indicates the presence of additional crisis-related factors—such as demand volatility, cost pressures, and logistical disruptions—that influence export outcomes beyond production capacity.

The random-effects model also yields a positive and statistically significant coefficient for production amount, with a larger estimated magnitude. However, differences between the fixed- and random-effects results necessitate formal model selection.

Table 4 presents the results of the Hausman specification test. The test statistics are statistically significant, leading to rejection of the null hypothesis that the random-effects estimator is consistent. Accordingly, the fixed-effects model is preferred.

Table 4 Hausmann test

Test Statistic	Value
Chi-square	6.484
Degrees of Freedom	1
p-value	0.0109
Preferred Model	Fixed Effects

Source: Authors, based on research

This result indicates that unobserved country-specific characteristics are correlated with production dynamics and export performance. Therefore, these characteristics should be treated as structural rather than random, reinforcing the suitability of the fixed-effects specification for the analysis.

6. Discussion

This section discusses the empirical findings within the broader framework of economic crisis management in industrial sectors. Building on the statistical results presented in the previous section, the discussion interprets how production–export relationships behave under crisis conditions and how these dynamics differ across countries. Particular attention is given to the role of structural characteristics, production scale, and institutional capacity in shaping crisis responses across national automotive systems. The discussion also connects the empirical evidence with broader implications for crisis management at both the macroeconomic and firm levels.

The empirical results indicate that crisis responses in the automotive industry differ across countries. While the relationship between production and export turnover remains positive and statistically significant within countries, the magnitude and persistence of crisis impacts vary across national automotive systems. Economic crises act as systemic shocks that disrupt established production–export relationships and generate different adjustment patterns across countries.

The relatively low explanatory power of production in the fixed-effects model suggests that crisis conditions weaken the otherwise stable linkage between production and exports. This finding implies that additional factors—such as institutional capacity, policy responses, demand volatility, and external cost shocks—play an important role in shaping export outcomes during crisis periods. In other words, production capacity alone cannot fully

explain export performance when economies face significant disruptions.

Cross-country differences in production scale and export dependence play a decisive role in shaping crisis outcomes in the automotive sector. Countries with larger automotive production systems experience stronger absolute contractions during crisis periods, reflecting greater exposure to global demand fluctuations and supply chain disruptions. At the same time, the persistence of a positive production–export relationship suggests that production capacity remains an important determinant of export performance even under adverse economic conditions.

These findings highlight the importance of structural characteristics in determining how national automotive industries respond to crisis conditions. Differences in industrial capacity, supply chain integration, and institutional frameworks influence the extent to which countries can absorb economic shocks and maintain production and export performance. Consequently, countries with stronger production systems and more developed institutional support mechanisms may demonstrate greater resilience during periods of economic instability.

7. Conclusions

Economic crises represent systemic disruptions that affect national economies and industrial sectors through sudden or unexpected shocks. These shocks rarely produce uniform outcomes; instead, they generate different effects depending on countries' structural characteristics, production capacity, export dependence, and institutional resilience. In this context, the automotive sector stands out as one of the most sensitive industries due to its capital-intensive structure, extensive supply chains, and strong integration with global markets. Accordingly, understanding how crises propagate through automotive production systems and how recovery mechanisms function is essential for both policymakers and managers.

Within the conceptual framework of economic crisis, this study emphasizes that crises not only generate negative economic outcomes but also challenge existing equilibria at both the micro and macro levels. From a systemic perspective, crises can be interpreted as shocks that disrupt the balance between production, finance, and trade. The ability to minimize crisis damage and, where possible, trans-

form crisis conditions into opportunities depends largely on effective crisis management, strategic decision-making, and institutional coordination. In this regard, the literature highlights the importance of managerial competence, shared organizational values, and adaptive capacity in sustaining performance during periods of instability (Wyatt, 2002; Topçu, 2017; Şendoğdu, 2014).

The study has also examined businesses in difficulty during crisis periods and the measures that can be taken to address financial distress. The analysis shows that economic, financial, and technical failures often emerge sequentially, reinforcing one another if not addressed on time. Firms that demonstrate environmental sensitivity, conservative financing behavior, strategic flexibility, and strong organizational identity are better positioned to withstand crisis pressures (de Geus, 1998). At the macro level, policy instruments aimed at ensuring macroeconomic stability, maintaining price stability, supporting liquidity, and strengthening institutional credibility play a critical role in limiting the depth and duration of crisis impacts (Aktan & Şen, 2001; Eroğlu & Kara, 2017). At the micro level, restructuring, adaptive pricing strategies, effective leadership, and crisis preparedness emerge as key mechanisms for restoring operational balance.

Empirically, the study has analyzed automobile production and export turnover data for Türkiye and selected European Union countries—Italy, France, Denmark, Estonia, and Poland—over the 2014–2023 period. This period captures multiple overlapping crisis episodes, including the COVID-19 pandemic and subsequent energy- and geopolitics-driven economic shocks. The descriptive statistics reveal substantial cross-country variability in both production and export performance, indicating heterogeneous structural conditions across national automotive systems.

The panel data analysis provides further insight into these dynamics. The fixed-effects model demonstrates a statistically significant relationship between production volume and export turnover, indicating that within countries, production increases are associated with higher export performance. However, the model's relatively low explanatory power suggests that production alone cannot fully account for export outcomes under crisis conditions. This finding implies that crisis periods introduce additional distortions such as demand volatility, cost pressures, and logistical disruptions

that weaken otherwise stable production–export linkages.

The random-effects model yields a stronger estimate of the relationship, but the Hausman test indicates that the fixed-effects specification is more appropriate. This result confirms that country-specific characteristics are correlated with production dynamics and should be treated as structural rather than random. In other words, the same global shock does not translate into identical outcomes; instead, national automotive systems respond differently depending on scale, institutional capacity, and crisis management effectiveness.

The comparative analysis further shows that countries with higher production and export volumes experienced sharper absolute declines during crisis periods, whereas countries with lower production levels exhibited more moderate contractions. This pattern suggests that greater integration into global value chains may amplify exposure to systemic shocks. At the same time, the persistence of a positive production–export linkage implies that recovery processes may follow similar patterns once production capacity stabilizes and export channels normalize.

Overall, the findings of this study contribute to the literature on economic crisis management by demonstrating how crisis shocks affect automotive industries differently across countries and by high-

lighting the conditions under which production–export dynamics remain resilient during recovery periods. For policymakers, the results underline the importance of proactive macroeconomic stabilization policies and sector-specific support measures that reduce vulnerability to external shocks. For managers, the findings emphasize the need for strategic flexibility, crisis preparedness, and organizational resilience in maintaining performance under adverse conditions. Beyond its economic implications, this study offers key insights into strategic management. The asymmetric crisis responses observed between Türkiye and European Union economies demonstrate that their institutional and structural contexts shape the strategic flexibility and resilience of automotive firms. Economic crises thus act not only as macroeconomic shocks but also as strategic inflection points that reveal firms' adaptive capacities. Diversifying export markets, implementing flexible production systems, and building resilient supply chains are critical for mitigating the impacts of crises. Furthermore, crisis management strategies should be tailored to each country's specific institutional capacities and production scales. Future research may extend this analysis by incorporating additional explanatory variables, such as energy costs, exchange rate volatility, and firm-level data, to explore further the mechanisms through which structural differences influence crisis dynamics in industrial systems.

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