FAMILY FIRMS AND INNOVATION: EXAMINING THE ROLE OF MANAGEMENT STRUCTURE ON R&D INVESTMENT AND OUTCOMES[1]

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ABSTRACT
This study investigates the effect of managerial structure—specifically, only-family-managed, mixed-managed (involving family members and external managers), and external-managed—on innovation inputs and outputs in family firms. Based on four years of panel data from the Mannheim Innovation Panel (MIP) and investigates how managerial structures influence innovation inputs, covering total innovation expenditure and R&D expenditure, as well as innovation outputs like revenue from new or improved products and market novelties. Decker and Günther (2017) have conducted research on the relationship between management and innovation in family firms. However, this study extends this work by integrating both Socio-Emotional Wealth (SEW) theory and Agency Theory. Moreover, it provides a comprehensive view of how different governance structures in family firms affect innovation in time. Results show that family firms with mixed management structures may utilize their external management abilities more effectively and increase their innovation potential. At the same time, this develops their innovation capacity when it balances their risk avoidance tendency and has a positive impact on their sustainable growth. Lastly, this study provides theoretical and empirical evidence not only in management structure but also in innovation performance in family firms.
Keywords: Family Firms, Innovation, Management Structure, Panel Data, Socio-emotional Wealth (SEW).
Jel Codes: D22, L26, M10, O31

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AİLE ŞİRKETLERİ VE İNOVASYON: YÖNETİM YAPISININ AR-GE YATIRIMLARI VE İNOVASYON SONUÇLARI ÜZERİNDEKI ROLÜNÜN İNCELENMESİ

ÖZ
Bu çalışma, yönetim yapısının -özellikle sadece aile tarafından yönetilen, karma yönetilen (aile üyeleri ve dış yöneticileri içeren) ve dışardan yönetilen- aile firmalarındaki inovasyon girdileri ve çıktıları üzerindeki etkisini araştırmaktadır. Mannheim İnovasyon Paneli'nden (MIP) elde edilen dört yıllık verilerine dayanmakta ve yönetim yapılarının toplam inovasyon harcamaları ve Ar-Ge harcamalarının yanı sıra inovasyon çıktılarınıda nasıl etkilediğini araştırmaktadır. Decker ve Günther (2017) aile şirketlerinde yönetim ve inovasyon arasındaki ilişki üzerine bir araştırma yürütmüştür. Ancak bu çalışma, Sosyo-Duygusal Zenginlik (SEW) teorisini ve Vekalet Teorisini entegre ederek bu çalışmayı genişletmektedir. Ayrıca, farklı yönetim yapılarının zaman içinde inovasyonu nasıl etkilediğine dair kapsamlı bir bakış açısı sunmaktadır. Bulgular, karma yönetim yapılarına sahip aile şirketlerinin dış uzmanlığı daha etkin bir şekilde kullanabildiğini ve inovasyon potansiyellerini artırdığını göstermektedir. Ayrıca, bu durum inovasyon kapasitelerini geliştirmekte ve riskten kaçınma eğilimlerini dengeleyerek sürdürülebilir büyümeyi desteklemektedir. Son

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olarak, bu çalışma yönetim yapıları ile inovasyon performansı arasındaki ilişkiye dair teorik ve ampirik kanıtlar sunmaktadır.
Anahtar Kelimeler: Aile İşletmeleri, İnovasyon, Yönetim Yapısı, Panel Veri, Sosyo-duygusal Zenginlik (SEW).
Jel Kodları: D22, L26, M10, O31

1. INTRODUCTION

Innovation is crucial for following and keeping sustain in today's business environment. Lastly, the literature highlights the paradox of family firms, which invest less in innovation inputs (De Massis et al., 2015) despite having more innovation potential (Duran et al., 2016). Studies have shown that despite having less innovation inputs, family firms often implement process innovations that improve productivity and product quality (Duran et al., 2016). The literature states that the concentration of socio-emotional wealth (SEW) in family firms may negatively affect economic development by increasing risk aversion (La Porta et al., 1999). One of the most characteristic features of family firms is socio-emotional wealth, may appear as an innovation paradox. According to a study by Decker & Günther (2017), family firm structures may minimize the possibility of conflict and simplify intergenerational decision-making processes by reducing the ownership of family ties. Family firms may prioritize the preservation of family control at the risk of deteriorating firm performance while at the same time adopting a more cautious approach by avoiding making risky decisions that may lead to performance fluctuations to avoid firm failure (Gómez-Mejía et al., 2007). The purpose of this study is to examine the impact of different governance structures in family firms (only family-managed, mixed, or externally managed firms) on innovation input and output.

2. LITERATURE REVIEW

2.1. Understanding Family Firms

Family firms contribute significantly to local and global economies by providing employment and income. These companies were effective in meeting the needs of small markets. With the development of industrialization, some of these companies still exist today. According to McKinsey & Company (2023), family firms account for more than 70% of global GDP and 60% of employment. Economic cycles in this context have increased academic interest in family firms (Astrachan & Shanker, 2003; Morck & Yeung, 2004).

Family firms may vary from small to large, and therefore their definitions are not clear; however, the involvement of family members in the ownership or management process is recognized as one of the main characteristics of these firms (Handler, 1989; Chua et al., 1999). These firms are mostly managed by family members and maintain the family values and vision for gaining a competitive advantage by making emotional and financial contributions to the firm's resources (Miller & Rice, 1967; Dyer, 2006; Sirmon & Hitt, 2003). Family firms build trust-based relationships with customers and suppliers by focusing on family values, and this loyalty gives them a competitive advantage in the long run (Lyman, 1991). Family firms prioritize the long-term interests of their owners and focus on innovations that will

provide long-term competitive advantage (Miller & Le Breton-Miller, 2005; Ward 1987; Zahra et al., 2004). However, the long tenure of the same leader may slow down innovation and create inertia in the organization (Miller, 1991; Riefolo et al., 2024). On the other hand, capital constraints and fear of loss of control in family firms limit participation in innovative projects and reduce their incentives to accept outside investors (Morck & Yeung, 2003). Moreover, this approach to innovation, driven by the survival motive, reflects the "Janus-faced" character of innovation in family firms, which appears as paradoxical effects (Riefolo et al., 2024; Ahrens et al., 2018; Miller et al., 2015). According to La Porta et al. (1999), the long-term focus on the concentration of wealth and risk aversion of family firms may be a hindrance to economic development.

In family firms, ownership, management, leadership succession, and organizational structure directly influence the firm's goals, strategies, and organizational structure (Miller & Rice, 1967). Firms with only family-managed firms may be less likely to diversify because they rely less on external expert support but are more innovative and risk-averse (Górriz & Fumás, 1996; Classen et al., 2014). In the mixed management model, family members work with external professionals to bring different perspectives to the organization, which increases the potential for growth and innovation but can also weaken socio-emotional wealth (SEW) and family control (Gomez-Mejia et al., 2010; Schulze et al., 2003b). When management is fully handed over to external professionals, family members focus on more strategic decisions, and the impact of this structure on performance becomes more significant than controlling ownership.

Accordingly, changes in the management structure may have both positive and negative effects on a firm's strategic direction and innovation capacity. A mixed management model can increase a firm's potential for growth and innovation but comes with the risk of family members losing control. Conversely, an external management model may offer more professional management and a clearer focus on long-term strategic goals. However, this approach may make it difficult to preserve the family's traditional values and socio-emotional wealth (SEW) objectives. Hence, finding a balance between these structures is essential for the long-term success of family firms.

2.2. Definition Of Innovation

Today, in a rapidly changing and highly competitive environment, developing new products, services, and processes based on knowledge is critical for firms to gain competitive advantage (Zahra et al., 2007). The innovation process is generally based on two approaches: exploration and exploitation. Exploration focuses on finding new opportunities and providing flexibility, while exploitation focuses on increasing the efficiency of existing resources. Both approaches need to be balanced since over-reliance on exploration can lead to costly experimentation, and focusing only on exploitation can limit innovation and result in missed opportunities for growth (March, 1991). Product innovation aims to introduce new or improved products, process innovation to improve production and distribution, marketing innovation to

develop new promotional strategies, and organizational innovation to improve workplace structure (OECD, 2005; Abernathy & Clark, 1985).

In family firms, successful innovation requires effective knowledge-sharing between family members and external stakeholders (Zahra, 2012). However, factors such as risk aversion, intra-family competition, and different entrepreneurial spirits can complicate this process (Block, 2012; Chrisman et al. 2015; Gomez-Mejia et al. 2001). These dynamics can limit the family firm's capacity to develop technological competencies and hinder innovation efforts, especially in high-risk, high-reward strategies (Block et al., 2023). However, despite investing less in innovation, family firms can achieve similar or higher innovation outcomes through factors such as wealth concentration and socio-emotional wealth (SEW); family identity and social ties play a supportive role in this process by encouraging informal knowledge sharing (Duran et al., 2016; Gomez-Mejia et al., 2007).

2.3. Management Structure and R&D Investments in Family Firms

R&D investments increase the capacity of firms to develop innovative products and technologies, but uncertainty in this area can lead to agency problems between owners and managers (Block, 2012). Family and founder-owned firms behave differently from other firms in terms of R&D expenditures; family ownership may reduce R&D intensity, while founder-owned firms may increase R&D intensity and productivity (Block, 2012).

Family- and founder-owned firms provide effective managerial control due to their broad ownership structure, which reduces information asymmetry and lowers agency costs (Chrisman et al., 2004; Miller & Le Breton-Miller, 2005). However, in family firms, issues such as sibling rivalry and different goals may restrict information sharing, and the tendency of family members to primarily control and dividend the firm may reduce R&D efficiency (Dyer, 1994; Eddleston & Kellermanns, 2007; Chandler, 1990). Socio-emotional wealth (SEW) may cause family firms to focus on non-financial goals, encouraging long-term investment, but may lead them to avoid R&D projects that threaten family control (Chrisman et al., 2012).

2.4. Theoretical Framework

2.4.1. Socio-Emotional Wealth (SEW) Theory

Gómez-Mejía et al. (2007) argues that socio-emotional wealth (SEW) includes non-financial goals that fulfill the emotional needs of family members, such as identity, continuation of family influence, and maintenance of family legacy. Family firms are sensitive to maintaining family control, prioritizing the preservation of SEW even over financial goals. Therefore, they may avoid risky R&D projects that could jeopardize SEW, especially under the direction of founding family members. However, this protection motive may also reduce the willingness to engage in innovative projects that could improve the firm's performance (Gómez-Mejía et al., 2007). Threats such as loss of family control may lead to acceptance of high risks in the name of protecting SEW.

2.4.2. Agency Theory

Agency theory suggests that conflicts of interest may arise between firm owners and the manager; this is known as the “principal-agent problem” (Ross, 1973). Meckling and Jensen (1976) argued that agency costs arise from managers' efforts to align their activities with the interests of owners. In family firms, agency costs can have both positive and negative impacts on financial performance. On the positive side, family altruism may reduce certain agency costs by fostering trust and alignment of interests. However, it can also lead to challenges such as free-riding and the retention of incompetent managers due to family ties (Schulze et al., 2001, 2003a). This may lead to competency deficiencies, especially in personnel selection processes where preferences are given to family members and may make it difficult to punish poor performance due to family ties.

3. METHODOLOGY

3.1. Research Model and Research Question

This study investigates how different management structures in family firms—only managed, mixed-managed, and external managed—impact innovation input and output. Using panel data from the Mannheim Innovation Panel (MIP) for 2015 and 2021, the study aims to explore the relationship between management structure and innovation behavior through descriptive and comparative analyses. Key variables include total innovation expenditure (ias), R&D expenditure (fues), turnover from new or improved products (umneu), and market novelties (mneup). To answer the research question, ‘What is the influence of management structures on innovation input and output in family firms according to comparative analyses the study employs the Mann-Whitney U Test for structural comparisons. Therefore, the study outlines four distinct hypotheses, which are as follows:

H1: Family firms, where only family members are in management (management structure = 1), show a statistically significant difference in total innovation expenditure compared to those with mixed or external management structures (management structure = 2).

H2: Family firms, where only family members are in management (management structure = 1), exhibit a statistically significant difference in total R&D expenditure relative to those with mixed or external management structures (management structure = 2).

H3: Family firms, where only family members are in management (management structure = 1), display a significant difference in the proportion of total turnover from new or clearly improved products compared to those with mixed or external management structures (management structure = 2).

H4: Family firms, where only family members are in management (management structure = 1), show a statistically significant difference in the share of turnover from market novelties compared to those with

mixed or external management structures (management structure = 2).

3.2. Data Collection

This study uses secondary data from the Mannheim Innovation Panel (MIP), which provides annual insights into the innovation activities of German enterprises across various sectors (ZEW, n.d.). The MIP dataset includes information on product introductions, innovation expenditures, and returns from innovation activities, making it an invaluable source for research and policy analysis (Classen et al., 2014). For this study, data from 2015, 2017, 2019, and 2021 were selected, focusing on family firms in the Research-Intensive Industry, Other Industries, and Knowledge Intensive Services sectors. After screening for missing data and categorizing firms by management structure, the final sample examines the IDs of 105 firms over 4 years.

3.3. Sample Selection

To ensure the relevance of the sample, we first identified family firms based on 2015 MIP data, when family firm status was last surveyed. Out of the initial dataset, a final sample of 105 family firms was obtained after excluding firms with extensive missing data and those in non-target sectors. The panel structure was then refined by categorizing firms according to their management structure as defined in 2015: family-only management or mixed management (including both family and external managers). Following this categorization, missing data on essential variables were addressed to ensure consistency across the selected years, allowing a focused analysis of the relationship between management structure and innovation outcomes over time. Table 1 below shows information about the research sample.

Table 1. Distribution of Family and Mixed Management Structures in Sample

Management Structure	Frequency	Percent (%)	Cumulative (%)	Knowledge-Intensive Services	Other Industry	Research-Intensive Industry	Total (Sector)
Family Firms (1)	268	63.81	63.81	44	146	78	268
Mixed Firms (2)	152	36.19	100.00	20	64	68	152
Total	420	100.00		64	210	146	420

3.4. Findings

The data for this research was analyzed using Stata software, beginning with an initial examination of the management structure and sectoral classifications of the selected family firms. In addition, hypotheses were tested using the Mann-Whitney U test.

3.4.1. Shapiro-Wilk Test

The Shapiro-Wilk test was applied to evaluate whether the data showed a normal distribution, and the results are presented in Table 2.

Table 2. Result of Shapiro-Wilk Test

Variable	Obs	W	V	z	Prob > z
Share of Turnover from Market Novelties	368	0.91761	21.053	7.222	0.00000
Total Turnover from New or Clearly Improved Products	376	0.98310	4.401	3.516	0.00022
Total Innovation Expenditure	374	0.66471	86.920	10.591	0.00000
Total R&D Expenditure	383	0.69059	81.933	10.463	0.00000

Table 2 showed that the p-values of the variables total turnover from new or clearly improved products (umneu_final), share of turnover from market novelties (mneup_final), total R&D expenditure (fues), and total innovation expenditure (ias) were well under 0.05, indicating that these variables do not meet the assumption of normal distribution. These results limit the use of parametric tests in the analyses and suggest that nonparametric tests should be preferred.

3.4.2. Mann Whitney U Test

Hypothesis 1

The Mann-Whitney U Test is suited for analyzing the differences between two groups in nonparametric data. In this study, it was used to test Hypothesis 1 and Hypothesis 2. Table 3 shows the result of hypothesis 1.

Table 3. Results for Hypothesis 1 on Total Innovation Expenditure (ias)

Two-sample Wilcoxon rank-sum (Mann,Whitney) test			
famgf_2gro~s	Obs	Rank sum	Expected
1	232	40499.500	43500
2	142	29625.500	26625
Combined	374	70125	70125
Unadjusted variance	1029500.00		
Adjustment for ties	-10081.66		
Adjusted variance	1019418.34		
H0: ias(famgf_~s==1) = ias(famgf_~s==2)			
z = -2.972			
Prob > z		=	0.0030

These findings show that family firms with only-family-managed firms invest less in total innovation expenditures than those with a mixed management structure. The Z value of -4.430 and the p-value of 0.0000 show the significance of this difference, providing significant support to Hypothesis 1.

Hypothesis 2

Table 4 shows the result of hypothesis 2.

Table 4. Results for Hypothesis 2 on Total R&D Expenditure (fues)

Two-sample Wilcoxon rank-sum (Mann,Whitney) test			
famgf_2gro~s	Obs	Rank sum	Expected
1	239	41307.500	45888
2	144	32228.500	27648
Combined	383	73536	73536
Unadjusted variance	1101312.00		
Adjustment for ties	-32302.08		
Adjusted variance	1069009.92		
H0: fues(famgf_~s==1) = fues(famgf_~s==2)			
z = -4.430			
Prob > z		=	0.0000

These findings suggest that family firms with only family members in management tend to invest less in total innovation expenditure compared to those with a mixed management structure. The Z value of -4.430 and a p-value of 0.0000 confirm the significance of this difference, providing robust support for Hypothesis 2.

Hypothesis 3

Table 5 shows the result of hypothesis 3.

Table 5. Results for Hypothesis 3 on Total Turnover from New or Clearly Improved Products (umneu)

Two-sample Wilcoxon rank-sum (Mann,Whitney) test

famgf_2gro~s	Obs	Rank sum	Expected
1	236	43638	44486
2	140	27238	26390
Combined	376	70876	70876
Unadjusted variance	1038006.67		
Adjustment for ties	-19725.58		
Adjusted variance	1018281.08		
H0: umneu_~l(famgf_~s==1) = umneu_~l(famgf_~s==2)			
z = -0.840			
Prob > |z|		=	0.4007

According to Table 5, the p-value of 0.4007 indicates that there is no statistically significant difference in terms of innovation outputs (umneu) between firms managed only by family members and firms with mixed management structures.

Hypothesis 4

Table 6 shows the result of hypothesis 4.

Table 6. Results for Hypothesis 4 on Share of Turnover from Market Novelties (mneup)

Two-sample Wilcoxon rank-sum (Mann,Whitney) test

famgf_2gro~s	Obs	Rank sum	Expected
1	236	41356.500	43542
2	132	26539.500	24354
Combined	368	67896	67896
Unadjusted variance	957924.00		
Adjustment for ties	-186430.38		
Adjusted variance	771493.62		
H0: mneup_~l(famgf_~s==1) = mneup_~l(famgf_~s==2)			
z = -2.488			
Prob > |z|		=	0.0128

The null hypothesis is rejected based on the Z value of -2.488 and the p-value of 0.0128. This shows that mneup values change significantly only between firms only-family-managed and those with mixed or externally managed ones. Results confirm hypothesis 4, indicating that the turnover rate from market innovations is lower in only managed family firms than in firms with mixed or external management. Table 7 summarizes the results of the hypothesis tests.

Table 7. Results of Hypothesis Testing

Hypotheses	z-value	p-value	Supported	Key Insight
H1	-2.972	0.003	Yes	Family-only management invests less in innovation expenditure.
H2	-4.430	0.000	Yes	Family-only management invests less in R&D expenditure.
H3	-0.840	0.4007	No	No difference in turnover from new products.
H4	2.488	0.0128	Yes	Market novelties turnover lower in family-only firms.

4. DISCUSSION

This research examines how management structure influences innovation activities within family firms, utilizing non-parametric methods like the Mann-Whitney U test. The dataset includes firms identified as family firms in 2015, categorized into two groups: firms only managed by family members and those with a mixed management structure that incorporates both family members and external managers. Since the Shapiro-Wilk test indicated that parametric assumptions were not satisfied, non-parametric methods were applied throughout the analysis.

The findings revealed significant differences in innovation input between the two groups. Family-managed firms showed notably lower investments in total innovation expenditure ($z = -2.972$, $p = 0.0030$) and R&D expenditure ($z = -4.430$, $p = 0.0000$) when compared to mixed-management firms. These results suggest that mixed management may encourage greater innovation investment, potentially due to the diverse expertise and perspectives that external managers bring.

Regarding innovation output, the analysis found no significant differences in turnover from new or improved products (umneu) between the two management structures ($z = -0.840$, $p = 0.4007$). This suggests that external factors, such as industry-specific conditions or market dynamics, could play a more influential role in driving this particular outcome. However, family-managed firms generated significantly less revenue from market novelties (mneup) compared to mixed-management firms ($z = -2.488$, $p = 0.0128$). This finding points to potential weaknesses in family-only management when it comes to market-oriented innovation strategies.

Overall, the results indicate that external managers contribute to improved innovation inputs and stronger market performance in family firms. Mixed management appears to strike a balance by combining the traditional strengths of family firms with the professional expertise of external managers, thereby enhancing innovation-related outcomes.

5. CONCLUSION

This study analyzes the effects of different management structures in family firms—only family-managed family firms and those with a mixed management structure—on innovation inputs and outputs, using data from the Mannheim Innovation Panel (MIP). The paper contributes to the understanding of the 'innovation paradox', where family firms exhibit lower levels of innovation input despite having innovation potential. This paradox was first identified by De Massis et al. (2015) and further confirmed by Duran et al. (2016). It has been suggested that family firms tend to privilege socio-emotional wealth (SEW), often focusing on risk aversion and family control, which can limit economic growth and innovation (Gómez-Mejía et al., 2007; La Porta et al., 1999).

The findings show that mixed management structures in family firms support innovation by balancing the protection of family values and the inclusion of external expertise. While firms with only managed family members tend to face limitations in their innovation activities, family firms with mixed governance structures are better able to utilize external knowledge and strategic vision and effectively unlock their innovation potential. Therefore, combining family values with external expertise enables family firms to strengthen their competitive advantage by fostering an innovative culture. While these findings provide theoretical contributions to the literature, they also provide a practical side to strategically shape management structures to enhance the long-term competitiveness of family firms. In sum, adopting a management approach that includes external expertise allows family firms to balance their risk aversion tendencies, enhancing their innovation capacity and supporting sustainable growth. The innovative capacity afforded by mixed management plays a crucial role in empowering family firms to make strategic future-oriented investments and achieve a more sustainable position in the market.

6. LIMITATION

The research using MIP data has several limitations that affect the analysis and results. The main limitation is the unbalanced structure of the dataset; firms enter and leave the data each year, limiting the number of consistent observations for panel data analysis. The study focuses on comparing innovation inputs and outputs between family and non-family firms, limited to those classified as family firms between 2015 and 2021. In 2015, the research continued with 105 firm IDs identified as either family or non-family firms, using 420 data points for 4 years, assuming that the firms maintained the same management structure during this time. Over this period, family-managed firms (management structure = 1) totaled 268, and mixed or externally managed firms (management structure = 2) totaled 152.

Additionally, not all questions in the MIP survey were asked every year, which limited the ability to use all questions for panel data analysis. Only the questions that were asked consistently across the years were used. The survey asked about firms' total innovation expenditure as a proportion of their turnover, and the study focused on differences in innovation spending among firms. However, due to data limitations, we could not determine each firm's total budget or the exact budget allocated to innovation. These limitations should be considered when interpreting results on family firms' innovation behavior. Also, patent citations were excluded as an innovation measure because they are infrequent and unsuitable for panel data analysis.

7. FUTURE RESEARCH

In future research, addressing the limitations of this study could provide deeper insights into innovation in family versus non-family firms. Using a balanced panel dataset, clearly defining budgets allocated to innovation, and extending the time frame would allow for clearer comparisons. Alternative measures of innovation output, such as patent citations, along with a closer examination of different family management structures (e.g., family-only, mixed), could also offer a more detailed perspective on the impact of management structure on innovation.

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