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Research Article / *Araştırma Makalesi*

NAVIGATING BUSINESS CHANGE IN OTTOMAN İZMİR: A QUANTITATIVE ANALYSIS OF FIRM SURVIVAL (1888-1893)

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ABSTRACT

This article analyzes firm survival in late nineteenth-century İzmir (Smyrna) by operationalizing "longevity" as five-year persistence between two locally compiled commercial directories (1888 and 1893). We construct a record-linked micro-dataset from the original entries (names, occupations, and addresses) using a standardized cleaning and matching protocol; the regression sample includes 1,655 establishments observed in 1888, of which 456 (≈28%) reappear in 1893. Using logistic regression, we estimate the association between five-year survival and communal affiliation (millet/nationality), sector, and urban location. Relative to Greek-listed firms (reference group), Turc-owned establishments display a large and robust survival advantage, while Armenian-owned firms exhibit significantly lower survival odds; Jewish and European categories show smaller and less stable differences once controls are introduced. Sectoral results indicate markedly higher survival in Healthcare & Medical Services and in Professional & Financial Services, and significantly lower survival in Retail & Wholesale Trade and in Agriculture & Food. Spatially, firms located in hans (caravanserais) are less likely to persist, whereas street-front (Rue/Sokak) locations are modestly advantaged. Interpreted cautiously as conditional associations (not causal effects), these findings challenge a simplified "Ottoman minority advantage" narrative and show how identity, specialization, and urban transformation intersected to shape commercial persistence in a cosmopolitan port-city economy.

Keywords: *Firm Survival, Ottoman İzmir/Smyrna, Commercial Directories, Ethnicity/Nationality, Logistic Regression*

JEL Classification Codes: *N75, C25, L25*

OSMANLI İZMİR'İNDE TİCARİ DEĞİŞİM: ŞİRKET HAYATTA KALIMI ÜZERİNE NİCEL BİR ANALİZ (1888-1893)

ÖZET

Bu çalışma, geç on dokuzuncu yüzyıl İzmir'inde işletme sürekliliğini "uzun dönem kurumsal devamlılık" olarak değil, 1888 ve 1893 tarihli iki yerel ticaret rehberi arasında beş yıllık yeniden listelenme (operasyonel hayatta kalma) olarak tanımlar ve ölçer. Orijinal kayıtlardan (isim–meslek/sektör–adres) hareketle standartlaştırılmış temizleme ve eşleştirme (record-linkage) protokolü uygulanmış; 1888'de

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gözlenen 1.655 işletmenin 456'sının (≈%28) 1893'te yeniden göründüğü bir analitik örneklem oluşturulmuştur. Lojistik regresyon bulguları, beş yıllık hayatta kalma olasılığının millet/uyruk, sektör ve kentsel konum ile birlikte değiştiğini göstermektedir. Yunan (Grec) referans grubuna kıyasla Turc etiketli işletmeler güçlü ve tutarlı bir avantaj sergilerken, Ermeni işletmeler anlamlı biçimde daha düşük hayatta kalma olasılığına sahiptir; Yahudi ve Avrupalı gruplara ilişkin farklar kontroller eklendiğinde daha zayıf ve istikrarsızdır. Sektör bakımından, sağlık/medikal hizmetler ile profesyonel-finansal hizmetler daha yüksek; perakende-toptan ticaret ile tarım-gıda daha düşük hayatta kalma ile ilişkilidir. Mekânsal olarak hanlarda yer alan işletmeler dezavantajlı, sokak üzeri (Rue/Sokak) işletmeler ise sınırlı bir avantaja sahiptir. Nedensellik iddiası taşımayan bu sonuçlar, "Osmanlı'da azınlık avantajı"na dair basitleştirilmiş kabulleri sorgulayarak kimlik–uzmanlaşma–kentsel dönüşüm kesişiminin ticari sürekliliği nasıl şekillendirdiğini ortaya koyar.

Anahtar Kelimeler: *Firma Hayatta Kalması, Osmanlı İzmir'i (Smyrna), Ticaret Rehberleri ve Yıllıkları, Uyruk/Millet, Lojistik Regresyon*

JEL Sınıflandırması: *N75, C25, L25*

1. Introduction

1.1. Contextual Background

In the late nineteenth century, İzmir (Smyrna) was one of the Ottoman Empire's most commercially dynamic port cities, linking western Anatolia to Mediterranean and global markets (Pamuk, 2020: 11). Its economy combined export-oriented trading houses, transport and finance services shaped by expanding European commercial influence (Quataert, 2005: 74), and dense layers of retail and artisanal production embedded in bazaars, hans, and newly developing street-front commercial corridors. This plural and spatially differentiated marketplace was also socially heterogeneous: Ottoman Muslims, Greeks, Armenians, Jews, Levantines, and other groups participated in commerce within an institutional environment transformed by late-nineteenth-century reform dynamics and shifting state–society relations (Zürcher, 2004). At the same time, European capital inflows and infrastructural investments reinforced İzmir's role as an export-oriented hub within an uneven pattern of Ottoman economic development (Pamuk, 2018). Recent urban-historical scholarship further shows that İzmir's commercial life was spatially differentiated across bazaars, waterfront districts, and emerging street-front zones, with distinct concentrations of communities and activities (Smyrnelis, 2024). While the city's cosmopolitan commercial life is well documented, we still know comparatively little, systematically and at the level of the broader business population, about which establishments endured and which disappeared over time.

This article addresses that gap by analyzing firm survival as a window into vulnerability and resilience in a competitive, transitioning urban economy. This article does not claim intergenerational or long-run corporate longevity; it operationalizes longevity strictly as five-year survival/persistence between two directory editions. We define "longevity" strictly in an operational sense: five-year survival/persistence between two directory editions (1888 and 1893). We do not claim multi-decade endurance or intergenerational corporate continuity; rather, we examine whether an identifiable business listed in 1888 reappears in the 1893 directory. This design aligns with the broader view that late Ottoman commercial change involved the co-exis-

tence of modern export-oriented activities and traditional urban trades, as the economy moved from a largely agrarian base toward a more diversified commercial system integrated into world markets (Faroqhi, 2004: 36).

Empirically, we construct a record-linked firm-level dataset from two locally compiled Smyrna commercial directories. After standardized cleaning and matching procedures, the analytical sample contains 1,655 establishments observed in 1888, of which 456 reappear in 1893. We estimate logistic regression models in which five-year survival is associated with three structural dimensions: (i) communal affiliation/nationality (millet), interpreted as a proxy for differential institutional positioning and network access; (ii) sectoral specialization; and (iii) urban location (e.g., han versus street-front settings). Because historical directories rarely report consistent measures of firm age, capital, or employment, we interpret the coefficients as conditional associations rather than causal effects. The principal source for the 1888 dataset is the Diary and Guide to Smyrna, originally published in December 1887 as a separate supplement to the Greek-language newspaper Amaltheia. In particular, the firm- and merchant-level information used in this article is based on the listings presented on pp. 211–237 of that guide, which constitute the main empirical foundation of the analysis.

Our results show that survival differentials were not randomly distributed across İzmir's commercial ecology. Turc-owned establishments exhibit a large survival advantage relative to Greek-listed firms, while Armenian-owned firms face significantly lower survival odds; Jewish- and European-owned firms show smaller and less stable differences once controls are introduced. Sectoral patterns also matter strongly: healthcare/medical services and professional/financial services display markedly higher survival, whereas retail/wholesale trade and agriculture/food are disadvantaged relative to the baseline. Spatially, han-based enterprises are less likely to persist, consistent with the broader late nineteenth-century urban reconfiguration in which commercial activity increasingly clustered along modern streets and waterfront districts (Smyrnelis, 2024).

By quantifying survival patterns across identity, sector, and urban space, this study contributes to debates on cosmopolitanism and inequality in Mediterranean port cities and revisits its claims of an "Ottoman minority advantage" with micro-level evidence. More broadly, it demonstrates how commercial directories can be transformed, through careful source criticism and record linkage, into datasets suitable for systematic statistical analysis of historical market outcomes. The remainder of the article reviews the relevant literature, details the data construction and coding strategy, presents the econometric specifications and results, and discusses implications and limitations.

1.2. Statement of the Research Problem

The concept of cosmopolitanism in Mediterranean port cities during the late Ottoman period has been critically examined by scholars. While these cities, particularly İzmir (Smyrna), Alexandria, and Trieste, were often portrayed as bastions of liberal cosmopolitanism, recent research suggests a more complex reality (Driessen, 2005: 129-139; Jackson, 2012: 338-339). Economic factors played a crucial role in shaping these cosmopolitan environments, with trade networks and specialization contributing to the integration of regions like İzmir into the world economy (Frangakis-Syrett, 1998: 125-126, 131-133, 136; Katsiardi-Hering, 2011: 161-162).

However, the rise of nationalism in the early 20th century challenged this cosmopolitan order, leading to its eventual decline (Bischoff et al., 2023: 6). Scholars now advocate for a more nuanced understanding of cosmopolitanism in these historical contexts (Zandi-Sayek, 2012: 13).

Recent scholarship has further emphasized that cosmopolitanism in Eastern Mediterranean port cities should not be understood as a harmonious equilibrium, but rather as a contested outcome shaped by imperial rivalry, uneven power relations, and local forms of resistance (Fuhrmann, 2020). From this perspective, economic coexistence often masked structural inequalities that became visible during periods of political or institutional stress.

A growing body of scholarship has therefore begun to question whether cosmopolitan coexistence necessarily implied equal economic opportunities across communities. Recent studies suggest that even in highly pluralistic port cities, commercial outcomes could diverge sharply along communal, sectoral, and spatial lines. Yet, much of this literature relies on qualitative case studies or sector-specific narratives, leaving unanswered whether such inequalities can be systematically observed across the broader business population. This line of inquiry resonates with micro-historical studies that trace how political tensions, nationalism, and displacement reshaped economic networks at the level of individual actors and families, rather than at the level of abstract communities (Yıldırım, 2007).

Terminology and scope (operational longevity). Throughout the article, "firm longevity" is used in a strictly operational sense, referring to five-year survival/persistence between the 1888 and 1893 directory editions (i.e., reappearance in 1893 conditional on being listed in 1888). The study, therefore, does not make claims about multi-decade corporate endurance, intergenerational continuity, or total firm lifespan, dimensions that cannot be reconstructed reliably from two benchmark years without introducing substantial linkage error. Consistent with firm-demography practice, a five-year horizon is treated as a meaningful threshold of short-run consolidation and resilience, while the estimated coefficients are interpreted as conditional associations, not causal effects.

In light of these debates, this study turns to a central analytical question concerning İzmir's commercial landscape: what structural factors shaped the longevity of businesses in the late nineteenth century? More specifically, the study seeks to determine the extent to which the survival of individual establishments between 1888 and 1893 can be explained by variations in nationality, sectoral affiliation, and urban location. Framing the inquiry in this way positions the analysis within a broader scholarly discussion on whether ethnic and national identities historically conferred distinct economic advantages or disadvantages in different market settings.

Terminology note (to avoid conceptual slippage). Throughout the article, we use firm longevity in a strictly operational sense, synonymous with five-year survival / short-run persistence over the observation window 1888–1893. We do not claim long-run corporate endurance, intergenerational continuity, or multi-decade institutional resilience. Given the nature of directory sources, what can be observed consistently is whether an identifiable business entry recorded in 1888 reappears in the 1893 edition; hence, the outcome should be read as survival/exit within a defined horizon, not as the firm's total lifespan.

In firm-demography research, survival horizons are explicitly window-based; a five-year benchmark is widely used to capture the phase in which exit risks are concentrated and

to distinguish ventures that consolidate organizational routines from those that fail to stabilize. Consistent with Eurostat–OECD business demography practice and micro-enterprise evidence, we therefore interpret five-year survival as an indicator of short-run resilience and market consolidation, rather than "long-livedness" in the historical sense.

In this article, "longevity" should be read as persistence rather than multi-decade endurance. For micro-enterprises operating in volatile, high-churn urban markets, maintaining an identifiable presence over five years is often treated in the firm-demography literature as a meaningful threshold of consolidation. In the late-1880s/early-1890s Smyrna economy, marked by intense competition and rapid entry–exit, as evidenced by entries in both the 1888 and 1893 directories, plausibly indicates organizational resilience and effective network positioning under risk.

It is important to note that the categories of nationality employed in this study reflect late Ottoman administrative and socio-legal classifications rather than modern notions of ethnicity or nationhood. Labels such as "Greek," "Armenian," "Turc," or "European" functioned as markers of communal affiliation, legal status, and institutional positioning within the Ottoman order. Accordingly, nationality in this analysis is treated not as a cultural attribute but as a proxy for differential access to legal regimes, commercial protections, and economic networks.

This question arises from the broader scholarly debate on whether nationality and ethnic networks conferred distinct advantages or disadvantages in historical markets (North, 1990: 36-45). In other contexts, scholars have posited that foreign or minority merchants sometimes enjoyed privileged access to capital or specialized knowledge, whereas in other settings, they might be marginalized by discriminatory regulations or local hostility. Scholarship on Ottoman port-city commerce emphasizes that religious and ethnic minorities often played intermediary roles in trade and services, drawing on translocal ties and legal pluralism to navigate between local and international markets. These minorities, including Christians, Jews, and Sephardic immigrants, played crucial roles in trade and commerce, often serving as intermediaries between local and international markets (Tabak, 1988: 4-5). Their success was partly attributed to their ability to navigate different legal systems and join transnational networks (Kuran, 2004: 476, 478). The 1838 Anglo-Turkish Convention further facilitated their economic growth by removing trade barriers (Frangakis-Syrett, 1992: 91).

The focus on the 1888-1893 interval is not incidental. This five-year period coincides with a relatively stable phase in İzmir's economic and political environment, preceding the disruptions of the mid-1890s. As such, it offers a particularly suitable window for examining firm survival, free from the confounding effects of war, large-scale crises, or abrupt institutional ruptures. Observing businesses across this interval allows the study to examine survival differentials under relatively stable macro conditions, thereby reducing (though not eliminating) confounding from major shocks and enabling a clearer comparison of associations with nationality, sector, and urban location.

Beyond its macroeconomic stability, the 1888–1893 interval holds particular significance within the Ottoman context, especially for the western Anatolian and Balkan-connected commercial sphere. This period precedes the wave of large-scale political violence, forced migration, and security-driven displacement that would intensify from the mid-1890s onward.

As such, firm exits observed during these years are less likely to be mechanically driven by war, mass population movements, or abrupt institutional collapse. Instead, the interval allows business continuity and failure to be examined primarily as outcomes of structural factors such as sectoral specialization, communal affiliation, and urban location. This historical positioning strengthens the study's analytical objective by reducing the influence of extraordinary shocks and enhancing the interpretability of survival differentials across firms.

1.3. Objectives and Significance

Building on the research question, this study has two primary objectives. First, it quantifies how business survival between 1888 and 1893 is differentially associated with nationality, net of sectoral affiliation and urban location. Second, it assesses whether survival probabilities vary systematically across spatial settings (e.g., streets versus hans and bazaars), after accounting for differences in sector composition.

By combining firm-level microdata with econometric modelling, this study departs from both purely narrative urban histories and aggregate trade-based analyses. Its contribution lies in examining business survival as an outcome shaped jointly by communal affiliation, market specialization, and urban space. In doing so, the article not only revisits longstanding debates on ethnic entrepreneurship in the Ottoman Empire but also introduces a methodological framework that enables systematic comparison across groups and sectors.

The late Ottoman Empire's multi-ethnic commercial ecosystem in İzmir was influenced by various structural factors beyond ethnic identity (Frangakis-Syrett, 1988: 2). Networks of kinship and friendship within and between communities played a crucial role in supporting economic activities and investments (Frangakis-Syrett, 2019). Legal pluralism allowed religious minorities to choose between Islamic and Western laws, contributing to their economic ascent (Kuran, 2004: 497). Trade patterns shifted, reflecting European naval supremacy and changing economic trends (Küçükkalay, 2008: 489-492). The Greek community, in particular, developed unique ways of communicating with central and local authorities during the Tanzimat reforms, maintaining social cohesion despite centralizing efforts (Tansuğ, 2011: 55). These factors collectively shaped the dynamics of business survival and success in İzmir's diverse commercial landscape.

The rest of the article is structured into seven distinct parts. The second section, Literature Review, synthesizes prior scholarship on İzmir, examines theoretical frameworks for business survival, and situates this work within larger discussions on nationality and economic outcomes. The third section, Data, introduces the historical directory (commercial guide/annuaire on İzmir) as the main dataset, outlining how the data were gathered and the variables coded. The fourth section, Methodology, explains the rationale for using logistic regression and details the model's specifications. The fifth section, Results, presents the regression output and interprets these findings in the context of İzmir's historical setting. The sixth section, Discussion, connects the results to theoretical concepts and places them within the broader socio-economic shifts of the region. Finally, the Conclusion (seventh section) encapsulates the main insights, highlights the study's contributions, and offers directions for future research.

2. Literature Review

2.1. Historical Studies on İzmir and the Late Ottoman Economy

İzmir's development as a prominent commercial hub during the late Ottoman era is well documented. Scholars have pointed to its strategic geographic location and its role as an export gateway for agricultural commodities such as figs, raisins, and cotton (Quataert, 2005: 119-126). The city's architecture, urban planning, and social life reflected layers of Ottoman, Greek, and European influences, leading some historians to describe it as a "Levantine mosaic" (İnal, 2019: 896-900). The port of İzmir, which began to develop significantly from the last quarter of the 18th century, became a central hub in commercial relations with numerous European ports. From this period onward, a close commercial network emerged with major European port cities such as Marseille (France), the Flemish ports (Holland), London-Gravesend (England), Livorno, Trieste, and Venice (Küçükkalay & Elibol, 2022: 627-628). As Kasaba (1988) has shown, Ottoman port cities such as İzmir were deeply embedded in the expanding world economy, a process that simultaneously generated new commercial opportunities and exposed local firms to intensified competition and structural vulnerability. In Kasaba's account, this integration also made small-merchant networks simultaneously more dynamic (through new niches and connections) and more fragile (through intensified competition and exposure to external price movements) (Kasaba, 1988).

In the first quarter of the 19th century, İzmir was experiencing an unstoppable rise. Owing to its diverse social structure and robust commercial network with Thessaloniki (Selanik) and other nearby ports, it had become the most important center of foreign trade in the Ottoman Empire (Küçükkalay, 2013). Central to İzmir's economic significance was the interplay between Ottoman imperial policies and European investments. Since the eighteenth century, various European consulates stationed in İzmir facilitated trade, while extraterritorial privileges (the Ahdnames-Capitulations[1]) granted foreign merchants' certain legal advantages (Quataert, 2005: 77-83). These arrangements often meant that merchants from European backgrounds; British, French, or Italian; operated under different legal frameworks than local or regional merchants. For instance, their contracts and disputes might be heard by consular courts rather than Ottoman ones, potentially offering more predictable legal processes (İnalcık, 1994: 199). Earlier phases of Eastern Mediterranean commerce were frequently organized through state-backed chartered companies, most notably the English Levant Company, linking merchants, diplomatic representation, and commercial governance within a semi-formal institutional framework (Vlami, 2015: 7-8). By the early nineteenth century, however, this chartered-company regime

1 According to Zecevic, "The Ottoman compound noun 'ahdname' is derived from the Arabic word 'ahd ("promise, pledge") and the Persian noun nāme ("letter, text"). In early modern Ottoman usage, as Daniel Goffman has noted, these documents were called Ahdname-i Hümayun, Charters of Imperial Pledge, and they were issued to certain European states, granting their citizens the right to reside in the Ottoman Empire and to engage in trade with minimal tariffs. "The ahdnames bestowed by the Ottomans upon their tributary states stipulated that in return for payment of annual tribute, these states would enjoy military and political protection, as well as trading privileges." For further information, see S. Zecevic. (2014). Translating Ottoman Justice: Ragusan Dragomans as Interpreters of Ottoman Law. *Islamic Law and Society*, *21*(4), 388–418. Also for detailed handling of ahdnames, see M. Van den Boogert. (2020). The capitulations and the Ottoman legal system: Qadis, consuls and beratlıs in the 18th Century (Vol. 21). Brill. (pages 19-63).

was widely seen as increasingly anachronistic; in the British case, the Levant Company was dissolved in 1825 (Vlami & Mandouvalos, 2013: 100), and its remaining institutional functions and records were absorbed into state diplomatic structures, marking a shift toward more open and competitive trading conditions (Vlami, 2015: 8). In the Levant, this transition expanded the role of intermediaries, agents and brokers, and blurred boundaries between commercial roles in port-city markets (Vlami, 2015: 224). It also encouraged smaller and more flexible firms operating in a more competitive environment, where speed, adaptability, and rapid profit opportunities became more decisive for business outcomes (Vlami, 2015: 225). Serdaroğlu (2019) further argues that from the mid-eighteenth century onward, institutional change weakened the oligopolistic position of long-established merchant families and opened space for a more fragmented and retail-oriented commercial ecology driven by individual traders operating through local social ties and accumulated experience.

Chartered-company dominance in the Eastern Mediterranean receded decisively in the early nineteenth century. The dissolution of the English Levant Company (1825) and the winding-down of Dutch institutional coordination of Levant trade (with the Dutch "Directie van de Levantse Handel" archive running to 1826) signaled a broader shift away from centralized, semi-monopolistic structures toward a more competitive ecology shaped by smaller "retail" merchants and flexible, short-horizon ventures. From the late eighteenth century onward, this transition intensified market entry and exit dynamics and broadened the field for small-scale entrepreneurship under high rivalry (Serdaroğlu, 2019; Laidlaw, 2014).

Yet, these privileges did not necessarily guarantee uniform success. Greek, Armenian, and Jewish merchants formed extensive diaspora networks that spanned from Constantinople (Istanbul) to Alexandria (İskenderiye) and beyond, sometimes allowing them to bypass intermediary costs or secure better financing terms from co-ethnic bankers (McGowan, 1981). Meanwhile, Ottoman Muslim merchants, though historically prominent in local wholesale trade, grappled with evolving regulations and competition from emerging banking institutions (Pamuk, 2020). This diversity of players and economic strategies adds complexity to assessing the role of nationality in business performance.

2.2. Theoretical Perspectives on Business Longevity

Before outlining mechanisms, it is important to specify what "longevity" means in this article. In the firm-demography and organizational-exit tradition, longevity is frequently operationalized as survival over a specified horizon rather than as the total lifespan of an organization. Following this tradition, our conceptual anchor is business survival/exit and short-run persistence in competitive markets, not multi-decade corporate endurance.

Accordingly, the literature we engage under the "longevity" label is the body of work that explains survival probabilities through institutions, finance, and market frictions, and that treats survival as a consolidation outcome shaped by the quality of formal and informal rules (e.g., Hallward-Driemeier, 2009; Biswas & Baptista, 2012; Iwasaki et al., 2022). This framing aligns with the type of observable signal available in directory-based historical microdata: whether firms persist or exit within a defined observation window.

By contrast, long-run "endurance" literatures, such as multi-generational family-firm continuity, century-long corporate persistence, or organizational imprinting across decades, are

not the target of the present study, because our sources cannot reconstruct continuous life histories beyond two benchmark years without introducing substantial linkage error. We therefore treat "longevity" strictly as operational longevity (five-year survival/persistence) and interpret the results accordingly.

From a broader standpoint, several theoretical frameworks inform our understanding of business survival. Research suggests that both formal and informal institutions significantly influence business survival and success. Formal institutions, such as property rights protection and regulatory efficiency, impact firm formalization and survival rates (Malesky & Taussig, 2009: 283; Hallward-Driemeier, 2009: 6-9). Informal institutions, including social norms and cultural attitudes, also play a crucial role in shaping entrepreneurial activity and firm longevity (Eesley et al., 2018: 394-397; Williamson, 2013: 46-47). The quality of institutions and level of financial development positively affect small business survival in emerging markets (Iwasaki et al., 2022: 1277). Interestingly, formal and informal institutional distances can have opposing effects on firms' entry strategies in foreign markets (Estrin et al., 2007: 4). Adaptability to institutional conditions is key for long-term success, with firms that navigate regulatory burdens and market mechanisms effectively being more likely to survive and grow (Hallward-Driemeier, 2009: 29-30; Biswas & Baptista, 2012: 298-299). Legal origin and openness to trade are also significant factors in explaining variations in property rights protection across countries (Ayyagari et al., 2008: 1866).

The late Ottoman Empire underwent significant institutional changes that shaped the survival of businesses in İzmir. Administrative reforms and foreign capital inflows transformed the economic landscape (Panza, 2014: 146-148, 165–168). The central bureaucracy adapted economic and monetary institutions with flexibility, but prioritized preserving traditional order, which stifled private capital accumulation (Pamuk, 2004: 234). In this perspective, the local dynamics of markets, how rules were implemented, negotiated, and enforced in specific urban settings, become central to explaining divergent commercial outcomes under broadly similar reforms (Pamuk, 2004). New organizational forms like limited liability companies emerged, but political restrictions created barriers to access (Agir & Artunç, 2021: 731). The Tanzimat reforms aimed to centralize administration but did not disrupt İzmir's social cohesion (Tansuğ, 2011: 55). The city experienced physical transformation and urban reorganization, involving diverse stakeholders (Zandi-Sayek, 2012: 76). Foreign investment increased as the empire's borders crumbled, with investors capitalizing on sparsely regulated industries (Geyikdağı, 2011: 165). Firms' adaptability to these shifting conditions, regardless of ethnic background, likely influenced their longevity in this evolving institutional landscape.

Social networks and relationships play a crucial role in entrepreneurial success and access to financial capital. Embedded social ties with lenders can lead to lower interest rates on loans, while a mix of embedded and arm's-length ties optimizes network benefits (Uzzi, 1999: 481). Social network capital significantly enhances firm productivity and sales (Fafchamps & Minten, 2002: 173). Collaborative partnerships with suppliers and customers can improve entrepreneurial performance (Larson, 1991: 185-186). During economic transitions, firms initially rely on external connections and market position to form alliances, later shifting to internal network indicators (Keister, 2001: 336). Ethnic-based social networks can provide better outsourcing opportunities and improve economic performance (Gil & Hartmann, 2011: 219-220,

241-242). Some ethnic groups extensively use co-ethnic resources and transnational networks (Menzies et al., 2003: 144). Micro-lending institutions leverage peer networks to reduce lending costs and create productive capabilities for high-risk borrowers (Anthony, 1997: 156).

We also examine the role of social networks and embeddedness in facilitating trade and reducing transaction costs in the Ottoman Empire and Eastern Mediterranean from the 16th to early 20th centuries. Researchers highlight how merchants, particularly non-Muslim Ottoman traders, leveraged family ties, friendships, and business associations to navigate complex market environments and expand their operations (Vlami & Mandouvalos, 2013: 101; Braude, 1985: 525). These networks provided access to crucial information, resources, and reputation-building mechanisms, enabling merchants to mitigate risks and overcome barriers to trade (Kessler & Temin, 2007: 313-314; Kadı, 2019: 275-276).

In late-19th-century İzmir, firms were influenced by entrepreneurial traits, access to capital, knowledge transfer, and the city's integration into global markets. The studies highlight the importance of trust, family culture, and social networks in these firms' resilience and success (Sifneos, 2013: 306-307). The papers also explore the development of banking sectors in Ottoman port cities like İzmir, which facilitated trade and economic growth (Frangakis-Syrett, 2009: 127-128). Overall, these Levantine businesses played a significant role in the region's economic integration with the West and the evolution of capitalist practices in the Eastern Mediterranean (Alff, 2018: 152-153).

Therefore, any study that seeks to estimate the conditional association between nationality and survival should account for sectoral and locational composition, while acknowledging that additional firm-level characteristics may remain unobserved in historical sources.

2.3. Empirical Studies on Nationality and Market Outcomes

Research on multi-ethnic economies, whether historical or contemporary, often finds that minority or foreign merchants can leverage transnational networks to gain competitive advantage. Transnational entrepreneurship among ethnic minorities and immigrants offers an alternative form of economic adaptation, leveraging cross-country social networks (Portes et al., 2002: 278). These entrepreneurs utilize transnational family networks and ethnic social capital to access resources, markets, and finance (Hafeez et al., 2008: 381). Transnational networking plays a crucial role in business performance, with different types of networking affecting turnover and survival (Kariv et al., 2009: 239). While ethnic diaspora-based networks can enhance competitiveness under certain conditions, they may also constrain it in some circumstances (Kitching et al., 2009: 689). Transnational entrepreneurs can leverage resources in both their country of origin and host country, potentially giving them a competitive advantage over internationally oriented entrepreneurs operating primarily in one country (Crick & Chaudhry, 2010: 6). The internationalization of ethnic Chinese businesses from Southeast Asia exemplifies how changing institutional contexts and global competition drive transnational operations (Yeung, 1999: 105). In the Ottoman Levant, similar advantages might apply to European or Levantine traders who cultivated relationships with Western bankers (Pamuk, 2020: 57).

The economic ascent of religious minorities in the 19th century Middle East was facilitated by their ability to conduct business under Western laws, gaining advantages over the Mus-

lim majority (Kuran, 2003: 424-430). This shift challenged the prevailing view of minorities as sole agents of modernization, revealing a more complex reality of Muslim merchant participation (Tabak, 1988: 179). Competition between Christian and Jewish minorities for key economic roles in Ottoman Syria led to stigmatization of rivals (Zenner, 1987: 400). The concept of "Europe merchants" and their privileges in Ottoman-European trade has been re-evaluated, highlighting the active role of Ottoman merchants (Kadı, 2012: 311). The category of "doubtful nationality" was used by Ottoman officials to treat local merchants as Ottoman subjects by default, challenging European protection claims (Derri, 2021: 1060).

The interplay among local knowledge, consular protection, and diaspora networks significantly influenced the business success of Armenian and Greek traders in late Ottoman İzmir. Armenian merchants from New Julfa operated a vast network spanning from Europe to Asia without imperial support (Aslanian, 2011: 233- 234). Similarly, Indian merchants from Sind established extensive trade connections from Central Asia to Panama (Markovits, 2000: 110). In the Ottoman Empire, non-Muslim dhimmīs[2] had varying degrees of legal autonomy and access to Muslim courts (al-Qattan, 1999: 429). The Ottoman government created special merchant classes, such as the Avrupa Tüccaris[3] and Hayriye Tüccaris[4], to compete with European traders (Masters, 1992: 580-586). Additionally, European embassies sold berats, which granted non-Muslim Ottoman merchants tax exemptions and access to European law. These berat holders eventually dominated European-Ottoman trade (Artunç, 2015: 722-724). These studies highlight the complex interplay of trade networks, legal institutions, and religious identities in shaping global commerce during this period.

From analyzing local merchant coalitions (Greif, 1993: 525-530, 540-548) and regional wage data (Allen, 2001: 420-443; Clark, 2007: 100-110) to exploring household behaviors (de Vries, 1994: 252-256) and comparative colonial contexts (Acemoglu et al., 2001: 1375–1380; Roy, 2002: 121–125), each work demonstrates how micro historical sources illuminate granular social or economic dynamics. Simultaneously, these analyses connect such local or regional cases to transnational frameworks, whether by comparing multiple countries (Allen, 2001: 435-440; Broadberry et al., 2018: 352–357) or by underscoring broader patterns of institutional and demographic change with cross-border significance (North & Weingast, 1989: 820-825; Acemoglu et al., 2001: 1385-1390). Together, they confirm the well-established practice in economic history scholarship of integrating micro-level archival research with global or comparative perspectives. Additionally, specialized historical records such as Ottoman tax registers and Japanese religious affiliation registers provide valuable insights into socioeconomic conditions and demographic trends in their respective regions (Cosgel, 2004: 87). These diverse approaches and data sources demonstrate the potential for interdisciplinary collaboration in advancing historical scholarship.

Recent research has explored innovative approaches to studying Ottoman history using digital methods and micro-level datasets. Küçükkalay analyzed customs registers to reveal

2 It is a term used for non-Muslim subjects living in Islamic countries. The Ottomans also used this term to refer to non-Muslim people.

3 It is used for non-Muslim Ottoman subjects who traded with Europe as muste'min (person who is entrusted with a trust) merchants.

4 It is used for Ottoman Muslim merchants who engaged in foreign trade with the status of European merchants.

economic trends in late 18th-century İzmir (Küçükkalay 2008: 492-505). Barakat & Yaycioğlu and Gruber discussed the potential of digital tools and microdata in Ottoman studies (Barakat & Yaycioğlu 2022: 17-19; Gruber 2022: 114). Ben-Bassat & Buessow demonstrated the application of GIS and digital technologies to study late Ottoman Gaza (Ben-Bassat & Buessow 2020: 517-521). These studies collectively showcase how systematically compiled micro-level datasets and digital methods can overcome methodological challenges in historical research, offering new insights into Ottoman urban life, economic patterns, and social dynamics.

Few studies have attempted to build systematic micro-level datasets that enable statistical modelling of firm survival. This research, by employing a digitized directory (commercial guide / annuaire on İzmir) from 1888 and 1893, represents, among relatively few attempts, an application of logistic regression to late Ottoman commercial records, bridging a gap in the literature.

2.4. Research Gap

The historiography on İzmir underscores its cosmopolitan character and economic importance, while theoretical and empirical scholarship suggests that nationality, sector affiliation, and location can all shape business outcomes. Yet, there remains a lack of quantitative analyses that integrate these elements within a single model, specifically examining business survival across diverse ethnic groups. This gap persists partly because historical researchers have tended to rely on anecdotal or community-specific sources rather than city-wide data, and partly because advanced econometric methods have only recently been applied to Ottoman historical datasets.

By leveraging the content of a historical directory that systematically lists merchants' names, addresses, and nationalities (when available), this study aims to offer a novel contribution. Our logistic regression analysis directly addresses questions about whether nationality remains a significant factor after accounting for sector and location. In doing so, it provides broader insights into how structural economic conditions, such as sectoral opportunities, can matter more than ethnic identity in determining commercial success. This focus not only enriches the historiography of İzmir but also speaks to contemporary debates in economic sociology and business history, which consistently grapple with the interplay between cultural identity and market structures (Wooldridge, 2020).

3. Data

3.1. Description of the Historical Directory

The primary dataset for this study originates from a late nineteenth-century business directory (yellow pages) compiled in İzmir.[5] More specifically, the main source for the baseline year is the Diary and Guide to Smyrna (December 1887), issued as a separate supplement to the Greek newspaper Amaltheia and prepared for the year 1888. The analysis in this article relies

5 The principal source for the 1888 benchmark is the Diary and Guide to Smyrna (December 1887), 1st ed., published as a separate supplement to the Greek newspaper Amaltheia (ΗΜΕΡΟΛΟΓΙΟΝ ΚΑΙ ΟΔΗΓΟΣ ΤΗΣ ΣΜΥΡΝΗΣ, ί' ΕΚΔΟΣΙΣ "ΑΜΑΛΘΕΙΑΣ," December 1887). The firm- and merchant-level data used in this article are drawn especially from pp. 211–237 of the guide.

primarily on the merchant and firm listings found on pp. 211–237 of that guide. These pages provide the core business information used to identify names, occupations, and addresses in the 1888 cross-section (Diary and Guide to Smyrna, 1887 December: 211-237). Published over a seventy-year span between 1868 and 1938, the *Annuaire Oriental – Şark Ticaret Yıllıkları* (yellow pages)[6] constituted one of the most systematic commercial reference works of the late Ottoman and early Republican periods. Compiled initially by Raphael and César Cervati and later continued by various publishing houses, the yearbooks covered major urban centers across the Eastern Mediterranean, including Istanbul, İzmir, Thessaloniki, Beirut, and Alexandria, while providing alphabetically organized listings of firms, shops, workshops, and service providers. Eldem's (1999) discussion of Istanbul-centered commercial documentation is a useful methodological reminder that such compilations often reflect the informational priorities of the capital and external trade/finance, which can introduce systematic limits and uneven depth when they are used for provincial port cities. SALT Research's cataloguing of the Annuaire Oriental collection likewise suggests that the series is relatively Istanbul-centric, reflecting the capital's more structured commercial and financial milieu; as a result, coverage for provincial centers such as İzmir can remain thinner and less consistent across years. Because each edition functioned as a de facto census of the commercial districts it surveyed, the Annuaire Oriental recorded not only business names and sectors but also addresses, owners' identities, and, in many cases, their communal affiliation (Greek, Armenian, Jewish, Muslim/Turk, European). The long chronological span of the series allows for the tracing of structural transformations in Ottoman port-city economies, shifts in occupational specialization, and the emergence of new service sectors. As detailed analyses of these sources (Aktar, 1998) show, the Annuaire Oriental offers a unique micro-level dataset that reveals the dynamism of local economic life, often obscured in macroeconomic narratives, and allows researchers to reconstruct patterns of continuity, survival, and attrition within urban business communities.[7]

The firm-level dataset used in this study was constructed by the authors through direct examination of the original commercial directories rather than derived from any pre-existing digital database or spreadsheet available online. All firm entries, sectoral classifications, and locational identifiers were manually extracted, checked, and coded directly from the primary sources.[8] Both the original-language editions and available translations of the commercial directories were consulted and cross-checked during the data construction process. Entries were verified through parallel reading of the original texts and their translations to minimize transcription errors and misclassification. Particular attention was paid to firm names, occupational titles, and addresses, which often appeared with minor variations across editions.

Over the years, numerous peer-reviewed studies in various languages have used business directories as data sources. For example, Köse (2009) drew on a large sample from the Annuaire Oriental's address registers to investigate Western-style department stores in Istanbul and their employees during 1889-1921. By extracting names, occupations, and addresses of

6 Hereafter Annuaire Oriental.

7 A. Aktar. (1998). Şark Ticaret Yıllıkları'nda "Sarı Sayfalar": İstanbul'da Meslekler ve İktisadi Faaliyetler Hakkında Bazı Gözlemler, 1868-1938. Toplum ve Bilim, 76, 105–143.

8 For the 1888 cross-section, the extraction process was based primarily on the listings contained in pp. 211–237 of the Diary and Guide to Smyrna (December 1887), published as a separate supplement to Amaltheia.

staff from the yearbooks, he shed light on workforce composition (e.g. ethnic and gender mix, salaries, career paths) that had been rarely documented before. His study demonstrated the directory's richness in systematically recording business-related information, enabling quantitative analysis of labor and retail history.[9] Similarly, a recent business history article on Alexandria's cosmopolitan entrepreneurs relied on Annuaire Oriental data: Bischoff *et al*. (2023) used the 1906 edition to calculate the number and share of Greek- and Turkish-owned businesses in the city. The authors explicitly cite the 1906 *Annuaire Oriental* in deriving their own statistical tables, underscoring the trust placed in its published figures.[10]

Turkish scholars have also mined these yearbooks to map regional economies. Economic historians in Turkey have analyzed entries for cities like Bursa, İzmit and Thessaloniki, using the directories to identify local traders, artisans and even minority communities active in commerce.[11] For example, Eldem (1992) combined Annuaire Oriental records with insurance maps to chart Galata's transformation into a business district, and others have counted the Persian (Iranian) merchants in Anatolian cities using population data reported in the 1890s editions[12]. These diverse studies – in English, Turkish outlets – all testify to the business directories wide acceptance as a reliable source across different research contexts.

Published in two editions, one in 1888 and a follow-up or revised edition in 1893, this directory listed active merchants, shopkeepers, and trading houses in the city for commercial reference. The directory's entries typically include the merchant's or firm's name, their main line of business, physical address (often specifying street, bazaar location, or han), and in many cases, nationality or religious community (e.g., Greek, Armenian, European, or "Turc").[13]

Such directories were not uncommon in major port cities of the Ottoman Empire, as they facilitated commerce by making contact details readily available to both local and foreign entrepreneurs. However, the İzmir directory is noteworthy for its comparatively detailed listings and for its survival in archival collections, allowing modern researchers to reconstruct aspects of the city's commercial landscape. For consistency, we refer to the 1888 volume as the baseline. Thus, we treat the 1888 volume as the baseline. Entries that can be credibly linked

9 Y. Köse. (2009). Vertical Bazaars of Modernity: Western Department Stores and Their Staff in Istanbul (1889–1921). International Review of Social History, 54(S17), 91–114.

10 C. Bischoff, M. Demirbag, & G. Wood. (2025). Cosmopolitanism and its aftermath: The rise and fall of Greek and Turkish business in Alexandria. Business History, 67(2), 364–394.

11 B. Kilerci (n.d.). *A Foreign Community in The Making: Iranians In the Late Ottoman Empire* [Doctor of Philosophy, St Cross College, University of Oxford]. Retrieved from https://ora.ox.ac.uk/objects/uuid:401d4205-4c6a-4d97-8f37-05c42ccc0cd7/files/dfq977v38q, Accessed 21.10.2025 (Original work published 2022) and G. Z. İsmailoğlu. (2018). *Selanik'te İktisadi Hayatın İzlenmesinde Bir Rehber Olarak Şark Ticaret Yıllıkları* [Unpublished Master Thesis]. Marmara University.

12 B. Kilerci. (n.d.). *A Foreign Community in The Making: Iranians In the Late Ottoman Empire* [Doctor of Philosophy, St Cross College, University of Oxford]. Retrieved from https://ora.ox.ac.uk/objects/uuid:401d4205-4c6a-4d97-8f37-05c42ccc0cd7/files/dfq977v38q, Accessed 21.10.2025 (Original work published 2022).

13 In the Annuaire Oriental Records, communal labels do not correspond to modern ethnic or national categories. "Turc" was commonly used as a shorthand for Muslim Ottoman subjects rather than an ethnically defined group; "Greek" and "Armenian" generally indicated members of the Rum and Armenian millets; and "European/Européen" often referred to Levantines, foreign nationals, and individuals under consular protection. These classifications reflect the late Ottoman socio-legal order rather than contemporary identity frameworks.

to a corresponding record in the 1893 edition are coded as 'continuing listings' (re-listed = 1). Throughout the paper, we use the shorthand term 'survival', but the outcome should be understood as directory-based continuity (re-listing/visibility) over 1888–1893 rather than a literal indicator of firm closure.

3.2. Data Collection and Processing

For late-nineteenth-century İzmir, the most detailed firm-level evidence currently available comes from locally compiled commercial guides dated 1888 and 1893. We also examined broader regional compilations, such as the Annuaire Oriental (Şark Ticaret Yıllıkları); however, these yearbooks are predominantly Istanbul-oriented, and their İzmir coverage remains substantially more superficial than that of the two Smyrna-specific guides used in this study. For instance, in Annuaire Oriental du commerce de l'industrie, l'administration et de magistrature (1893–1894), the İzmir section comprises only 16 pages (pp. 897–909)[14]. The first four pages primarily list the actors of provincial administration, consulates, and major religious, social, and economic institutions, while the remaining pages provide thematic listings of firms and practitioners that typically include only names, addresses, and whether the person served as a representative/agent, with limited occupational and classificatory detail. Because this level of description does not provide the sectoral and locational granularity required for reliable record linkage and survival coding across editions, we base our dataset on the two İzmir-focused directories (1888 and 1893), using the Annuaire Oriental mainly as a contextual and corroborative reference rather than as the core source.

In examining the commercial landscape of late-nineteenth-century İzmir, we rely on two invaluable historical directories (commercial guide/annuaire on İzmir) that offer detailed snapshots of the city's business environment in 1888 and 1893. The first directory, originally published in Greek as Diary and Guide to Smyrna for the year 1888 and later translated into English by George Poulimenos, was originally issued in December 1887 as a separate supplement to the newspaper Amaltheia. For the purposes of this study, the main empirical material from the 1888 guide comes from pp. 211–237, where merchants, firms, occupations, and

14 For other annuals, see. L'Indicateur Constantinopolitain. Guide Commercial. Premıère Anneé 1868 - 1285 Hégire. Créépar Raphael Cervati et publié par R. Cervati et N. C. Sargologo - Tarif-i Dersaadet, Rehnüma-yı Ticaret, Birinci sene, 1285-1868 Rafael Çervati ve şeriki Sargologo'nun eseri. İstanbul: Imprımerie G. B. Pagano, 1868; Indicateur Ottoman Illustré. Annuaire-Almanach du Commerce de L'Industrie, deL'Administration et de la Magistrature. Créé par Raphael C. Cervati et publié par Cervati Frères & D. Fatzea. 4me Année, 1883 (Hégire 1300). Constantinople: Typographie et Lithographie J. Pallamary, 1883; Annuaire Oriental du Commerce de L'Industrie, deL'Administration et de la Magistrature. - Ancien Indicateur Oriental. Créé par Raphael C. Cervati et publié par Cervati Frères & cie. 12me Année. 1893-94 (Hégire 1311). Constantinople: Typographie et Lithographie J. Pallamary, 1894; Annuaire Oriental du Commerce de L'Industrie, deL'Administration et de la Magistrature. Créé par R. Cesar Cervati en 1880. Seul ouvrage dans son genre edité à Constantinople par la 'The Annuaire Oriental & Printing Company Limited' sous la patronage des Chambers de Commerce de Constantinople, Anglaise, Française, Hellénique, Italienne. 25me édition (29me année) – 1909 (Hégire 1327). Constantinople: Typo - Lithographie J. Pallamary, 1909; Annuaire Oriental. Oriental Directory: Commerce, Industrie, Administration, Magistrature. Fondé en 1880. Patronné par les Chambres de Commerce. Adopté par les Administrations. Le meilleur organe de publicité en Orient. Editeur et propriétaire Alfred Rizzo. Constantinople: Imprimerie de l'Annuaire Oriental, 1921; Ticaret Yıllığı - Annuaire Oriental 1938, İstanbul: Milli Ülkü Neşriyat Yurdu, 1938.

addresses are listed in a form suitable for systematic extraction and coding.[15] This 1888 guide provides not only the names and occupations of individuals but also offers clues about their spatial distribution and the socioeconomic makeup of the city's commercial life. The second directory, published in 1893 by Nalpas and d'Andria[16] in French, similarly catalogues businesses and trades, shedding further light on the evolving structure of İzmir's marketplace five years later.[17] Both datasets, which can be reached through the Levantine Heritage Foundation, serve as essential resources for tracking firm presence, disappearance, and continuity, allowing for comparative analysis on how commercial activities intersected with social and economic factors across different segments of İzmir's diverse population.

15 Diary and Guide to Smyrna. (1887 December). 1st Edition. Amaltheia Newspaper. (ΗΜΕΡΟΛΟΓΙΟΝ ΚΑΙ ΟΔΗΓΟΣ ΤΗΣ ΣΜΥΡΝΗΣ ί' ΕΚΔΟΣΙΣ "ΑΜΑΛΘΕΙΑΣ" ΕΞΕΔΟΘΗ ΛΤΑ ΜΗΝΑ ΔΕΚΕΜΒΡΙΟΝ. This source was originally issued as an independent supplement to Amaltheia and later consulted both in its Greek original and in the English rendering made available through George Poulimenos. In this study, pp. 211–237 of the original guide constitute the main section used for the extraction of merchant, firm, occupation, and address data. You can also find the lists in Excel and pdf format from the *Levantine Heritage Foundation* website. 1888 Commercial Guide Addresses Lists (Smyrna). (English version of lists translated by George Poulimenos from the original Greek guide, Diary and Guide to Smyrna-1888 (December 1887), 1st ed., published by Amaltheia Newspaper). Levantine Heritage Foundation. Retrieved from https://www.levantineheritage.com/docs/1888-Commercial-Guide-George-Poulimenos.xls, Accessed 21.10.2024 and 1888 Commercial Guide Addresses Lists (Smyrna). (English version of lists translated by George Poulimenos from the original Greek guide, Diary and Guide to Smyrna-1888 (December 1887), 1st ed., published by Amaltheia Newspaper). Levantine Heritage Foundation. Retrieved from https://www.levantineheritage.com/pdf/1888_Smyrna_Commercial_Guide_(Greek).pdf, Accessed 21.10.2024. For other details belong to the "Archive trade catalogues", also see https://gpoulimenos.info/en/resources/guides and https://www.levantineheritage.com/databases.html. The Appendix 3 shows on which page the relevant professions can be found in the *Diary and Guide to Smyrna Year 1888* (in Greek language). See https://drive.google.com/file/d/1FmM_a5QHNv-HBesL-abkb00O3wyTFmr3/view?usp=drive_link

16 This document titled *Annuaire des commerçants de Smyrne et de l'Anatolie – 1893* is sourced from *The National Library of France* (Bibliothèque Nationale de France) via the online platform. Annuaire des commerçants de Smyrne et de l'Anatolie – 1893. *The National Library of France* (Bibliothèque Nationale de France). Retrieved from https://gallica.bnf.fr/ark:/12148/bpt6k5813945t?lang=EN, Accessed 21.11.2024. For original version, see Joseph Nalpas and Jacob d'Andria. (1893). *Annuaire Des Commerçants de Smyrne et de l'Anatolie, Smyrna, Turquie D'Asie*. Smyrne: Imprimerie Commerciale G. Timoni and Company.

17 You can find the list in Excel and PDF formats from the *Levantine Heritage Foundation* website. 1888 Commercial Guide Addresses Lists (Smyrna). (English version of lists translated by George Poulimenos from the original Greek guide, Diary and Guide to Smyrna-1888 (December 1887), 1st ed., published by Amaltheia Newspaper). *Levantine Heritage Foundation*. Retrieved from https://www.levantineheritage.com/docs/1888-Commercial-Guide-George-Poulimenos.xls, Accessed 21.10.2024 and 1888 Commercial Guide Addresses Lists (Smyrna). (English version of lists translated by George Poulimenos from the original Greek guide, Diary and Guide to Smyrna-1888 (December 1887), 1st ed., published by Amaltheia Newspaper). Levantine Heritage Foundation. Retrieved from https://www.levantineheritage.com/pdf/1888_Smyrna_Commercial_Guide_(Greek).pdf, Accessed 21.10.2024. Also The Appendix 4 shows on which page the relevant professions can be found in the *Annuaire des commerçants de Smyrne et de l'Anatolie – 1893* (in French language). See https://drive.google.com/file/d/1FmM_a5QHNv-HBesL-abkb00O3wyTFmr3/view?usp=drive_link

The choice of 1888-1893 is intentional: it captures İzmir's infrastructural and commercial reconfiguration while avoiding the heavier political ruptures and displacement pressures that begin to intensify from the mid-1890s onward. Using this earlier "cleaner" slice helps the analysis attribute survival differentials primarily to structural covariates (nationality, sector, and location) rather than to large, external shocks. In that sense, the interval offers a sharper test of how routine market competition and urban geography shaped firm persistence.

A five-year interval is a widely accepted horizon in business demography for assessing firm survival, aligning with international guidelines such as the Eurostat-OECD methodology. A five-year interval was deliberately chosen to operationalize firm survival in this study. In the business demography literature, firm longevity is not associated with a fixed or universally agreed temporal threshold. Instead, survival is commonly assessed over short- to medium-term horizons that capture the period in which firm exit risks are most concentrated. International guidelines, most notably the Eurostat–OECD Manual on Business Demography Statistics, explicitly identify the first five years after a firm's appearance as the critical period when the majority of firm exits occur. For this reason, five-year survival rates are widely employed to distinguish structurally resilient enterprises from those that fail to consolidate their market position. Accordingly, the use of a five-year horizon in this study aligns the analysis with established empirical practice and provides a methodologically sound benchmark for assessing firm survival rather than long-term growth or institutional permanence. At the micro-enterprise scale, Biswas and Baptista (2012) similarly treat five-year survival as a meaningful threshold for distinguishing short-lived ventures from firms that have consolidated organizational routines and a minimum market footing.

Although the empirical record comprises only two directory editions, the data are longitudinal because individual firms are record-linked across time. In microeconometric terms, this constitutes a short panel (T = 2) rather than two independent repeated cross-sections. The empirical objective is not to model within-period dynamics, but to estimate fixed-horizon survival over the 1888–1893 interval—an approach consistent with business-demography practice, where survival is operationalised by verifying whether an enterprise remains active after $t+1,\ldots,t+n$ years (with international guidelines recommending at least five years of cohort tracking) (Eurostat–OECD, 2007; Wooldridge, 2010).

Standard practice follows cohorts of new enterprises for five years to capture the critical early-life dynamics of businesses, since most firm exits occur within this period. Empirical evidence supports the sufficiency of a five-year window: for example, only on the order of 40–50% of new firms remain active five years after inception, indicating that this span effectively distinguishes enduring businesses from those that fail or withdraw.[18] Eurostat's own business demography data collection tracks enterprise births up to five years after their birth[19], reflecting a consensus that a half-decade provides a robust measure of survival while balancing

18 Office for National Statistics, Business Demography, UK: 2023, Retrieved from https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/businessdemography/2023#:~:text=The%20region%20with%20the%20highest,were%20in%20the%20construction%20industry, Accessed 28.10.2025.

19 EUROSTAT, Business Demography Statistics, website. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Business_demography_statistics#:~:text=these%20national%20statistical%20business%20registers,level%20of%20competition%2C%20entrepreneurial%20spirit, Accessed 28.10.2025.

data availability. Notably, an enterprise can undergo changes in activity, size, or ownership yet still be counted as surviving if its identity persists[20], meaning that a five-year gap can also capture transformations in which firms continue under altered forms. In the context of historical directories like İzmir's 1888 and 1893 records, using a five-year interval is methodologically sound and empirically justified. It offers a long enough window to observe whether firms listed in 1888 continued, exited, or evolved by 1893, while remaining consistent with established business demography practices for analyzing firm continuity and turnover.

The years 1888-1893 offered a uniquely stable window in late Ottoman İzmir, largely free of the extraordinary disruptions that plagued other periods. Crucially, no wars or major violent conflicts occurred in the region during these years. The empire had been at peace since the end of the 1877-78 Russo-Ottoman War, and the next significant conflict (the Greco-Ottoman War) would not erupt until 1897. Likewise, İzmir was spared any large-scale famine or similar catastrophe during 1888-93, unlike the severe Anatolian famine of 1873-74 that had ravaged the countryside earlier. Financially, the empire was in a comparatively calm phase: after the 1875 debt crisis, the state's finances were restructured under the Muharrem Decree of 1881, ushering in what economic historian Şevket Pamuk terms a period of *"dependent growth"* and improved stability. Indeed, the late 1880s and early 1890s even saw renewed economic vitality, with foreign trade and investment expanding significantly (for example, German exports to the Ottoman Empire surged by 350% between 1888 and 1893), and infrastructure projects like railways advancing under peacetime conditions. Because the 1888–1893 interval appears comparatively stable relative to the mid-1890s and later disruptions, it offers a useful baseline for examining five-year survival under routine market conditions, while acknowledging that smaller sector-specific fluctuations may still have been present (Pamuk, 2020).

Nevertheless, this relative stability should not be interpreted as the absence of all local fluctuations, minor sector-specific downturns, agricultural price shocks, or small urban disturbances; none amounted to systemic shocks capable of distorting survival patterns. This macro-stability, in turn, strengthens the internal validity of our statistical design by minimizing confounding shocks and allowing nationality, sector, and location to emerge more clearly as explanatory factors. In light of this stable macroeconomic environment, ensuring the accuracy and comparability of the micro-level data became essential for reliable analysis. Because personal and business names sometimes appeared with varying spellings across the two directories, a standardized naming system was introduced to reconcile these discrepancies. Next, each distinct merchant or business was assigned a unique identifier, allowing tracking of whether the same entity listed in 1888 resurfaced in the 1893 directory. In addition to the aforementioned naming system, nationality information was estimated from the merchant or business name and added to the analysis dataset. The Excel file used in this analysis, prepared in accordance with the guide, also applied this method (see footnotes 16 and 18).

20 EUROSTAT, Business Demography Statistics, website. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Business_demography_statistics#:~:text=these%20national%20statistical%20business%20registers,level%20of%20competition%2C%20entrepreneurial%20spirit, Accessed 28.10.2025.

In preparing the dataset, we first extracted the raw fields separately from the 1888 and 1893 directories; namely the firm/individual name, occupation/sector descriptor, and address; before applying a standardised text-cleaning protocol (canonicalisation) to harmonise case, remove punctuation, and normalise common orthographic and transliteration variants (e.g., "oglou/oğlu", "ou/ü"). We then implemented a blocking strategy to generate plausible candidate matches by restricting comparisons to records sharing the same or highly similar surname, occupation, and address clusters. Candidate pairs were subsequently classified into three tiers: exact matches, high-similarity matches (typically concordant name and address), and ambiguous matches, with the latter independently reviewed by two researchers and resolved through a documented consensus procedure. Unique identifiers were assigned at the level of each distinct entity observed in 1888, and the same identifier was propagated to the corresponding 1893 record when a match was established, while non-matched entities were coded as 0 for reappearance. Finally, the term "elimination" is used strictly in an operational sense, referring to deduplication (removing duplicate entries) and the exclusion of records lacking sufficient information for reliable linkage (e.g., incomplete or highly ambiguous names), rather than implying market exit or firm closure; overall, this workflow aligns with established historical record-linkage practices in applied economics and economic history.

Additionally, it is necessary to provide information on the final numbers and their nature, based on the available data. A total of 1,882 records were identified for 1888. It was observed that these 1,882 records did not provide clear, definitive information for all seven main categories listed in Table 1. The number of records containing information on these seven main categories, which were used as the reference and analyzed, was calculated to be 1,655. Therefore, the analysis was performed on a total of 1,655 records in all models (See Table 2). Of the 1,655 firms identified in the 1888 directory and retained for analysis, 456 were found to have survived by 1893 and continued their operations in İzmir. In all model specifications, our analytical sample comprises 1,655 observations, of which 1,199 are exited (not re-listed).[21]

21 For example, for England, Wales, and Scotland during the same period, it is emphasized that there are three main reasons why a firm might not be listed in the relevant directory or yearbook: 1) Failure to pay the directory registration fee, 2) Failure to register the firm during a change of address, 3) The firm shifting from public retail trade to wholesale trade through private networks. This source is insightful in that it reveals the technical and economic reasons for "removal from the directory." Accordingly, a firm's inclusion in successive directories is defined as "persistence" while its absence is defined as "exit" (market exit/closure). Although technical errors (failure to pay fees, etc.) are mentioned as possible, it is argued that statistically, removal from the directory is the strongest secondary indicator that the business's market activity has ceased (Shaw & Tipper, 1998). Furthermore, similar arguments can be seen in Ayhan Aktar's study, which depicts firms and merchants specifically in Istanbul, in the context of the Ottoman example (Aktar, 1998).

Table 1: Firm-Level Data Set on Sectoral, Ethnic, and Local Characteristics of the Urban Economy in the Late Ottoman Period: Example Viewpoint of Variable Definitions and Observations

Sector	Nationality (Millet)	Location	Surname (Corrected Version)	Location_ Consalidate	Survival	Sector_ Broad
Furniture Manufacturers	Grec	Rue Des Verreries	Abadjoglous Furniture Manufacturers	Rue_Sokak	0	Manufacturing & Craft Trades
Glassware Shops	Grec	Rue Ste-Photinie (Avenue)	Abadjoglous Glasswar Shops	Rue_Sokak	0	Retail & Wholesale Trade
Traders	Grec	Karaosmanoglou Han	Abadjoglous Traders	Han	0	Retail & Wholesale Trade
Bookstores & Stationery	European	Rue Franque	Abajoli Bookstores & Stationery	Rue_Sokak	1	Retail & Wholesale Trade
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	Abartsoumian Textile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Brokers (Cereals)	Jew	Bourse Cafe	Abouaf Brokers (Cereals)	Other_ Places	0	Agriculture & Food
Traders	Jew	Arnaoutoglou Han	Abouaf Traders	Han	0	Retail & Wholesale Trade
Confectioneries (Steam-powered)	Grec	Saman Iskelesi	Adamidis Confectioneries (Steam-powered)	Other_ Places	0	Agriculture & Food
Traders	Grec	Vezir Han (Petit)	Adamopoulos Traders	Han	0	Retail & Wholesale Trade
Timber Merchants	Grec	Rue Parallele	Adam Timber Merchants	Rue_Sokak	1	Retail & Wholesale Trade
Goldsmiths	Grec	Rue Franque	Adjitiris Goldsmiths	Rue_Sokak	0	Other
Confectioners & Pastry Cooks	Grec	Rue Franque	Afxendios Confectioners & Pastry Cooks	Rue_Sokak	0	Agriculture & Food
Ship Suppliers	Grec	Rue Franque	Afxendios Ship Suppliers	Rue_Sokak	0	Transportation & Logistics
Kerchief Merchants	Grec	Rue Krommidokastro	Agadjanoglou Kerchief Merchants	Rue_Sokak	0	Retail & Wholesale Trade

Table 1. continue

Trade Agents	Grec	Rue Franque	Agadopoulos Trade Agents	Rue_Sokak	0	Other
Watchmakers & Salesmen	Grec	Tsochadji Bezesten	Agapios Watchmakers & Salesmen	Bezesten	1	Other
Moneychangers	Armenian	Yol Bezesten	Agasian Moneychangers	Bezesten	0	Professional & Financial Services
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	Agasian Textile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Icon Painters	Grec	Dervisoglou Han	Agathangelos Icon Painters	Han	0	Other
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	Agazanian Textile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Nail Makers	Armenian	Rue Karfiadika (TsividjilerTsarsi)	Agazarian Nail Makers	Rue_Sokak	0	Other
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	AgazarianTextile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Traders	Armenian	Vezir Han (Petit)	Agazarian Traders	Han	0	Retail & Wholesale Trade
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	Agopian Textile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Glassware Shops	Grec	Rue Ste-Photinie (Avenue)	Abadjoglous Glassware Shops	Rue_Sokak	0	Retail & Wholesale Trade
Traders	Grec	Karaosmanoglou Han	Abadjoglous Traders	Han	0	Retail & Wholesale Trade
Bookstores & Stationery	European	Rue Franque	Abajoli Bookstores & Stationery	Rue_Sokak	1	Retail & Wholesale Trade
Textile Shops (Cloth)	Armenian	Seitan Tsarsi	Abartsoumian Textile Shops (Cloth)	Tsarsi_Pazar	0	Retail & Wholesale Trade
Brokers (Cereals)	Jew	Bourse Cafe	Abouaf Brokers (Cereals)	Other_ Places	0	Agriculture & Food
Traders	Jew	Arnaoutoglou Han	Abouaf Traders	Han	0	Retail & Wholesale Trade

Table 1. continue

Confectioneries (Steam-powered)	Grec	Saman Iskelesi	Adamidis Confectioneries (Steam-powered)	Other_ Places	0	Agriculture & Food
Traders	Grec	Vezir Han (Petit)	Adamopoulos Traders	Han	0	Retail & Wholesale Trade
Timber Merchants	Grec	Rue Parallele	Adam Timber Merchants	Rue_Sokak	1	Retail & Wholesale Trade
Goldsmiths	Grec	Rue Franque	Adjitiris Goldsmiths	Rue_Sokak	0	Other
Confectioners & Pastry Cooks	Grec	Rue Franque	Afxendios Confectioners & Pastry Cooks	Rue_Sokak	0	Agriculture & Food
Ship Suppliers	Grec	Rue Franque	Afxendios Ship Suppliers	Rue_Sokak	0	Transportation & Logistics
Kerchief Merchants	Grec	Rue Krommidokastro	Agadjanoglou Kerchief Merchants	Rue_Sokak	0	Retail & Wholesale Trade
Trade Agents	Grec	Rue Franque	Agadopoulos Trade Agents	Rue_Sokak	0	Other
Pharmacists	Grec	Rue Boyadjidika	Athineos Pharmacists	Rue_Sokak	0	Healthcare & Medical Services
Doctors	European	Quais	Chasseaud Doctors	Other_ Places	1	Healthcare & Medical Services
Carpet Merchants	Turc	Local Boscovich	Ali EfendiCarpet Merchants	Locals	0	Retail & Wholesale Trade
Leather Merchands	Turc	Rue St Georges	Helvadji Zade Leather Merchands	Other_ Places	0	Other

Note: The categorization of titles as above was made by the authors and is presented separately in the table in accordance with the aforementioned two invaluable historical directories. In addition to these classifications, the variables Location, Surname (Corrected Version), Location_Consolidated, Survival, and Sector_Broad were also examined by the authors using the data available for 1888 and 1893 and incorporated into the table accordingly. The information in this table also represents a sample view of the dataset created by the authors.

3.3. Variables and Coding

In line with our research question, we constructed the following key variables. Our dependent variable captures directory-based continuity between editions. It equals 1 if an 1888 entry can be matched, allowing for minor spelling and naming variation under our standardi-

sation protocol, to a corresponding entry in the 1893 directory, and 0 otherwise. The measure therefore operationalises re-listing (continued directory presence) as a proxy for continued operation and market visibility. Because commercial directories may omit some active firms (e.g., due to relocation, trade-name changes beyond our matching tolerance, or editorial coverage), the outcome should be interpreted as continuity in published listings rather than a definitive closure indicator.

From an econometric standpoint, this measurement strategy raises the possibility of misclassification in a binary dependent variable. Importantly, such measurement error does not automatically imply a systematic correlation between covariates and the regression disturbance; a 'systematic' bias concern arises primarily when misclassification probabilities vary with covariates (differential misclassification). Under the standard non-differential case, where the probability of non-relisting conditional on being active is approximately independent of the covariates once sector and location are controlled, ignoring misclassification mainly reduces precision and tends to attenuate estimated associations, rather than generating spurious signs (Hausman, Abrevaya, & Scott-Morton, 1998; Neuhaus, 1999). In this sense, any remaining listing noise is more likely to make our estimates conservative.

Operationalization and interpretation. For clarity, we refer to the dependent outcome as five-year survival / short-run persistence (operational longevity). The variable equals 1 if a record can be reliably linked across the two editions and the same entity is listed again in 1893, and 0 otherwise. Because the directories do not provide firm birth dates and because names, ownership, sector labels, and addresses may shift across editions, we do not estimate firm age or long-run longevity; instead, we estimate the probability of reappearance (survival) over the 1888–1893 window, which is the most defensible and reproducible signal available in these sources.

We considered several independent variables to capture potential determinants of business survival. First, nationality was coded as a categorical variable; Greek, Armenian, Levantine/European, and Turc; with Greek serving as the baseline category, given its sizeable merchant community. To operationalize "nationality/communal affiliation" (millet) in a transparent manner, we relied on an onomastic (name-based) coding protocol whenever the directories did not explicitly state a community label. If the source itself marked an entry as Grec, Armenian, Jew, European, or Turc, we recorded that classification directly. For unlabelled cases, we inferred affiliation using a conservative set of onomastic cues, primarily surname morphology and honorific/titular markers (e.g., Armenian -ian/-yan endings; common Greek suffix patterns such as -poulos/-idis/-akis; Ottoman-Turkish honorifics such as Efendi/Ağa/Hacı and Turkish patronymic patterns such as -oğlu/-zade), and, where necessary, corroborated borderline cases with contextual cues available in the directories (occupation descriptors, known communal institutions, and address clustering). Because Smyrna's cosmopolitan setting creates genuine ambiguity (including transitional or hybrid naming practices), we applied strict decision rules and flagged uncertain cases for independent review; entries that remained ambiguous were treated as missing for the nationality variable to minimize misclassification bias. We therefore interpret nationality effects as proxy-based estimates, noting that name-based classification choices can materially affect group sizes and regression estimates in empirical applications.

Next, we classified firms by sector, inferred from their stated line of business (e.g., banking, export trade, retail, manufacturing, or artisanal crafts), and then grouped them into standardized categories that, while not perfect, broadly reflect historical distinctions.[22] We also included a location variable based on the address, distinguishing between "Bezesten, Han, Locals, Quarter_Mahalle, Rue_Sokak, Tsarsi_Pazar, Other_Places. Finally, when information was available, approximate firm size or capital (e.g., "small shop," "bank," or "major exporter") was recorded as a control variable, although the data were often incomplete and used primarily for descriptive purposes.

Historical directories rarely report firm age, start-up capital, employment, or owner characteristics consistently and in a linkable manner. For this reason, these dimensions cannot be incorporated as standard controls in the baseline specifications. Accordingly, the estimated nationality coefficients are interpreted as conditional survival differentials (average partial associations) net of observed sector and location controls, rather than as fully identified causal effects of nationality per se (Altonji, Elder, & Taber, 2005; Oster, 2019).

4. Methodology

4.1. Rationale for Logistic Regression

The principal question in this study, why some businesses survived while others did not, naturally lends itself to a binary outcome analysis. Logistic regression is a standard statistical method for modelling the probability of a binary event, in this case, p_I=Pr{re-listed in 1893|listed in 1888)}. Unlike linear regression, logistic regression ensures that predicted probabilities lie between 0 and 1, making it a suitable choice for studying phenomena such as firm survival (Greene, 2020).

Furthermore, logistic regression allows researchers to incorporate multiple categorical predictors, which is critical for our study. The variables of interest, nationality, sector, and location, are predominantly categorical. While alternative techniques such as probit could also be employed, logistic regression is more common, widely understood, and offers straightforward interpretability of odds ratios (Wooldridge, 2020).

4.2. Model Specification

We specify a simple logistic regression model as follows:

$$\ln\left(\frac{p_i}{(1-p_i)}\right) = \beta_0 + \sum_{j=1\ to\ J-1}[\beta_{1j} \times Nationality_{ij}] + \sum_{k=1\ to\ K-1}[\beta_{2k} \times Sector_{ik}] + \beta_3 \times Location_i + \varepsilon_i \quad (1)$$

where:

- p_I is the probability that the i-th business listed in 1888 is re-listed (continues to appear) in the 1893 directory.

22 Detailed sectoral classifications and the historical categorization of professions, which inform this variable, are provided in Appendices 5, 6, and 7. See https://drive.google.com/file/d/1FmM_a5QHNv-HBesL-abkb00O3wyTFmr3/view?usp=drive_link

- Nationality$_{\{ij\}}$ indicates whether the *i*-th firm belongs to nationality *j*. We treat "Greek" as the reference category.

- (Sector$_{ik}$) indicates sector (*k*, with "retail" as the reference category).

- (Location$_i$) indicates Locations.

- ($\beta_0, \beta_{1j}, \beta_{2k}, \beta_3$) are parameters to be estimated via Maximum Likelihood Estimation (MLE).

- (ε_i) is the disturbance term, capturing unobserved factors influencing directory-based continuity (re-listing).

In a logistic regression model where the dependent variable equals 1 for survival and 0 for exit, the coefficients estimate changes in the log-odds of survival. A positive coefficient implies that, relative to the baseline (reference) category, the covariate is associated with higher log-odds (and thus higher odds) of survival, holding other covariates constant; conversely, a negative coefficient implies lower log-odds (lower odds) of survival. Exponentiating coefficients yields odds ratios, e^{β}, facilitating interpretation in terms of multiplicative changes in survival odds.

Because the data are observational and derived from historical directories, the identifying claim is deliberately limited. Nationality is not treated as an exogenous 'treatment' but as a proxy for historically structured institutional positioning and network access. We therefore emphasize conditional associations and report a sequence of specifications (Models 1–3) to evaluate coefficient stability as controls are added, following established approaches to assessing robustness to omitted-variable concerns (Altonji, Elder, & Taber, 2005; Oster, 2019).

We also tested variants of this model with additional control variables, such as a rough indicator of firm size or capital. However, these data were incomplete and often anecdotal, so we ultimately present a parsimonious model that primarily focuses on nationality, sector, and location (with robust checks described below).

5. Results

5.1. Main Regression Output

Table 2 (below) summarizes the logistic regression coefficients from our final model, which includes nationality, sector, and location. For brevity, only key coefficients and their statistical significance levels are shown. The baseline categories are:

- Nationality: Greek

- Sector: Other

- Location: Other_Places

Below is a step-by-step interpretation of the three logistic-regression models in paragraph form, focusing on the key findings overall before turning to the effects of nationality, sector, and location. Throughout, the dependent variable is "Survival," which is coded as 1 if an entity survived and 0 otherwise. A positive coefficient in the results indicates a higher log-odds of survival relative to the baseline category, whereas a negative coefficient indicates a lower log-odds of survival. The significance levels (***, **, *) correspond to 1%, 5%, and 10%, respectively.

Table 2: Logit Results for Business Survival by Ethnicity, Sector, and Location

	Model 1	Model 2	Model 3
Intercept	-1.0391***	-0.7761***	-0.8591***
	(0.0707)	(0.1289)	(0.1700)
C(milleti, Treatment('Grec'))[T.Armenian]	-0.6770**	-0.7399**	-0.6800**
	(0.2806)	(0.3063)	(0.3103)
C(milleti, Treatment('Grec'))[T.Jew]	-0.2137	-0.0918	-0.0678
	(0.2764)	(0.3078)	(0.3146)
C(milleti, Treatment('Grec'))[T.European]	0.2757**	0.2362	0.2510
	(0.1354)	(0.1553)	(0.1597)
C(milleti, Treatment('Grec'))[T.Turc]	1.1788***	1.4619***	1.4576***
	(0.2275)	(0.2592)	(0.2627)
C(Sector_Broad, Treatment('Other'))[T.Agriculture & Food]		-0.4974**	-0.5485**
		(0.2097)	(0.2187)
C(Sector_Broad, Treatment('Other'))[T.Construction, Engineering & Real Estate]		—	—
		—	—
C(Sector_Broad, Treatment('Other'))[T.Education, Culture & Institutions]		0.6716	0.7406
		(0.5116)	(0.5234)
C(Sector_Broad, Treatment('Other'))[T.Healthcare & Medical Services]		1.5465***	1.4469***
		(0.2314)	(0.2382)
C(Sector_Broad, Treatment('Other'))[T.Hospitality, Entertainment & Leisure]		—	—
		—	—
C(Sector_Broad, Treatment('Other'))[T.Manufacturing & Craft Trades]		-0.0637	-0.1401
		(0.2729)	(0.2784)
C(Sector_Broad, Treatment('Other'))[T.Professional & Financial Services]		1.0759***	1.3608***
		(0.2089)	(0.2388)
C(Sector_Broad, Treatment('Other'))[T.Retail & Wholesale Trade]		-1.3259***	-1.2418***
		(0.1671)	(0.1704)
C(Sector_Broad, Treatment('Other'))[T.Transportation & Logistics]		0.0944	0.0836
		(0.4560)	(0.4641)
C(LocationConsalidate, Treatment('Other_Places'))[T.Bezesten]			-0.5067
			(0.4276)
C(LocationConsalidate, Treatment('Other_Places'))[T.Han]			-0.5447**
			(0.2331)
C(LocationConsalidate, Treatment('Other_Places'))[T.Locals]			0.0317
			(0.2278)

Table 2. continue

C(LocationConsalidate, Treatment('Other_Places'))[T.Quarter_Mahalle]			0.4154 (0.3233)
C(LocationConsalidate, Treatment('Other_Places'))[T.Rue_Sokak]			0.3064* (0.1635)
C(LocationConsalidate, Treatment('Other_Places'))[T.Tsarsi_Pazar]			0.2276 (0.2514)
N (Number of Observations)	1655	1655	1655

Note: Entries report logit coefficients (with standard errors in parentheses) from three specifications predicting firm Survival (1 = listed again in 1893; 0 = exit). Coefficients are interpreted relative to the reference categories shown in the table: Greek (Grec) for nationality, "Other" for sector, and "Other_Places" for location. Positive (negative) coefficients indicate higher (lower) log-odds of survival; odds ratios can be obtained by exponentiating coefficients (e^{β}). Across models, Turc-owned firms exhibit a large and statistically significant survival advantage relative to Greek firms, whereas Armenian-owned firms show significantly lower survival odds; Jew and European coefficients are comparatively smaller and not consistently significant once controls are added. Sector controls (Models 2–3) indicate significantly higher survival in Healthcare & Medical Services and Professional & Financial Services, and significantly lower survival in Retail & Wholesale Trade and Agriculture & Food relative to "Other." Location controls (Model 3) suggest lower survival for firms located in Hans and a modest positive association for Rue/Sokak locations. "—" denotes categories (Construction, Engineering & Real Estate; Hospitality, Entertainment & Leisure) for which (quasi-)complete separation prevents the MLE from producing finite estimates; coefficients and standard errors are suppressed accordingly. Standard errors in parentheses. Standard errors in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.*

5.2. Interpretation of Key Findings

In Models 1, 2, and 3, the intercept is negative and statistically significant. Specifically, it is –1.0391*** in Model 1, –0.7761*** in Model 2, and –0.8591*** in Model 3. A negative intercept on the log-odds scale suggests that for the baseline categories, Greek nationality (Grec), "Other" as the sector, and "Other_Places" as the location, the raw predicted probability of survival lies below 0.5 when all else is controlled. However, the effects of other variables can raise or lower the overall probability of survival.

5.2.1. Nationality Effects

Turning to nationality (millet), Models 1, 2, and 3 all use Greeks (Grec) as the reference group. In comparing Armenians to Greeks, the coefficients are consistently negative and significant (around –0.68 to –0.74), suggesting that Armenian businesses have substantially lower survival odds than Greek businesses. In odds-ratio terms, this amounts to roughly half the odds of survival once other factors are held constant. For Jews relative to Greeks, all three models yield negative but statistically insignificant coefficients (approximately –0.21 to –0.07), indicating that any difference in survival probabilities between Jewish and Greek businesses is not robustly supported by the data. By contrast, the European vs. Greek comparison starts out as a positive and significant difference in Model 1 (0.2757**, suggesting higher survival odds for Europeans), but this effect loses statistical strength (though remains positive) in Models 2 and 3 once sector and location are controlled. Finally, the coefficients for Turks relative to Greeks are

strongly and significantly positive in all models, increasing from approximately 1.18 in Model 1 to about 1.46 in Models 2 and 3. In odds-ratio terms, this implies that Turkish businesses have roughly three- to four-times higher odds of survival than Greek businesses, even after controlling for sector and location.

Importantly, the nationality coefficients are highly stable across the nested specifications. Because Model 1 excludes the sector and location indicators altogether, the estimated nationality effects are not mechanically driven by the sparse sector cells that generate separation in later specifications. Their persistence, with similar signs and magnitudes, in Models 2–3, therefore supports the robustness of the nationality results to the inclusion of additional controls.

5.2.2. Sector (Sector_Broad) Effects

When sectoral controls are introduced (Models 2 and 3), "Other" serves as the reference category. Several sector effects are estimated with stable and interpretable coefficients. Agriculture & Food is associated with significantly lower survival odds ($\beta \approx -0.50$ to -0.55), whereas Healthcare & Medical Services and Professional & Financial Services exhibit substantially higher survival odds relative to the baseline ($\beta \approx 1.45$ and $\beta \approx 1.07$–1.36, respectively). Healthcare & Medical Services stands out with large and highly significant positive coefficients, ranging from approximately 1.45 to 1.55 across Models 2 and 3, indicating that businesses in this sector are substantially more likely to survive than those in the reference 'Other' sector. Retail & Wholesale Trade shows a large and significant disadvantage ($\beta \approx -1.24$ to -1.33). Coefficients for Education, Culture & Institutions, Manufacturing & Craft Trades, and Transportation & Logistics are not statistically distinguishable from the baseline, indicating no reliable differences from "Other" within the limits of the data.

Two sector categories, Construction, Engineering & Real Estate and Hospitality, Entertainment & Leisure, contain very few observations and exhibit (quasi-)complete separation in the logistic regression: within these cells, the outcome variable is nearly perfectly predicted, so that conventional maximum-likelihood estimation cannot produce finite, reliable coefficient estimates or standard errors. Because the MLE algorithm does not converge to meaningful values for these two categories, their coefficient and standard-error entries are suppressed in the tables (indicated by "—") and excluded from substantive interpretation. Importantly, the remaining model parameters—including all nationality, other sector, and location coefficients—are numerically stable and unaffected by this data-sparsity issue, as confirmed by the consistency of estimates across the nested model specifications (Models 1–3).

5.2.3. Location Effects

In Model 3, location effects enter, with "Other_Places" as the reference. Bezesten has a negative coefficient (–0.5067) that is not statistically significant, indicating no conclusive difference in survival odds compared to the baseline location. Han is significantly negative (–0.5447**), implying a noticeably lower chance of survival; the odds ratio (about 0.58) suggests businesses operating in a Han environment see their odds of survival decrease relative to those in "Other_Places." Locals is essentially zero in effect (0.0317) and statistically insignifi-

cant, while Quarter_Mahalle is positive (0.4154) but not significant. Rue_Sokak shows a small positive coefficient (0.3064*) that meets a weaker significance threshold ($p<0.10$), hinting that businesses on streets (Rue/Sokak) may fare slightly better than those in other areas. Tsarsi_Pazar has a positive coefficient but is not significant.

5.2.4. Overall Conclusions

Overall, the results point to noteworthy nationality differences in survival (with Armenians faring worse and Turks faring significantly better than Greeks), substantial sectoral differences (Healthcare & Medical and Professional/Financial Services at the high end, Agriculture & Food and Retail/Wholesale at the low end), and more modest but still meaningful location differences (notably negative for Han and mildly positive for Rue/Sokak). These findings may inform historical interpretation and research into which businesses thrived and which struggled. For instance, if the goal is to channel support or resources, the data suggest Armenian-run enterprises, Agriculture & Food, and Retail/Wholesale are particularly vulnerable, while Turkish-owned firms and those in certain service sectors show robust survival prospects. The location results encourage further exploration of the factors that may make Han settings less conducive to survival and street-based locations more favourable, all within the broader socio-economic and historical context of the time and place in question.

5.3. Interpretation of Marginal Effects

In logistic regression, the raw coefficients represent changes in the log-odds of the outcome, which is not immediately intuitive for interpreting how a predictor influences the actual probability of an event. Calculating marginal effects addresses this by converting the log-odds changes into more direct estimates of how much the probability of the outcome shifts, holding other variables at their typical (often mean) values (Papke & Wooldridge, 2008). In other words, marginal effects translate the abstract log-odds scale into practical percentage-point differences in probability, making it clearer and more intuitive to compare groups or understand the impact of a specific variable on the likelihood of the outcome.

Below is a detailed interpretation of the key marginal-effects results from three logistic-regression models (Models 1, 2, and 3). These marginal effects, labeled “dy/dx,” show how much the probability of “Survival” changes, holding other variables at their mean, when the predictor of interest switches from the baseline to another category. Because these are logit models, “dy/dx” is not simply a raw difference but a partial effect that accounts for all included controls (see Table 3).

Table 3: Logit Marginal Effects of Nationality, Sector, and Location on Business Survival

	dy/dx(M1)	dy/dx(M2)	dy/dx(M3)
C(milleti, Treatment('Grec'))[T.Armenian]	-0.1326 **	-0.1191 **	-0.1082 **
	0.0547	0.0491	0.0491
C(milleti, Treatment('Grec'))[T.Jew]	-0.0419	-0.0148	-0.0108
	0.0541	0.0496	0.0500
C(milleti, Treatment('Grec'))[T.European]	0.0540 **	0.0380	0.0399
	0.0264	0.0250	0.0254
C(milleti, Treatment('Grec'))[T.Turc]	0.2309 ***	0.2354 ***	0.2319 ***
	0.0432	0.0405	0.0406
C(Sector_Broad, Treatment('Other'))[T.Agriculture & Food]		-0.0801 **	-0.0873 **
		0.0336	0.0346
C(Sector_Broad, Treatment('Other'))[T.Construction, Engineering & Real Estate]		—	—
		—	—
C(Sector_Broad, Treatment('Other'))[T.Education, Culture & Institutions]		0.1081	0.1178
		0.0822	0.0830
C(Sector_Broad, Treatment('Other'))[T.Healthcare & Medical Services]		0.2490 ***	0.2302 ***
		0.0351	0.0360
C(Sector_Broad, Treatment('Other'))[T.Hospitality, Entertainment & Leisure]		—	—
		—	—
C(Sector_Broad, Treatment('Other'))[T.Manufacturing & Craft Trades]		-0.0103	-0.0223
		0.0439	0.0443
C(Sector_Broad, Treatment('Other'))[T.Professional & Financial Services]		0.1732 ***	0.2165 ***
		0.0325	0.0365
C(Sector_Broad, Treatment('Other'))[T.Retail & Wholesale Trade]		-0.2135 ***	-0.1975 ***
		0.0256	0.0260
C(Sector_Broad, Treatment('Other'))[T.Transportation & Logistics]		0.0152	0.0133
		0.0734	0.0738
C(LocationConsalidate, Treatment('Other_Places'))[T.Bezesten]			-0.0806
			0.0679
C(LocationConsalidate, Treatment('Other_Places'))[T.Han]			-0.0866 **
			0.0369

Table 3. continue

C(LocationConsalidate, Treatment('Other_ Places'))[T.Locals]	0.0050	
	0.0362	
C(LocationConsalidate, Treatment('Other_ Places'))[T.Quarter_Mahalle]	0.0661	
	0.0513	
C(LocationConsalidate, Treatment('Other_ Places'))[T.Rue_Sokak]	0.0487	*
	0.0259	
C(LocationConsalidate, Treatment('Other_ Places'))[T.Tsarsi_Pazar]	0.0362	
	0.0399	

Note: The marginal effects reported in Table 3 are expressed on the probability scale. For continuous variables, the marginal effect is computed as the partial derivative $\partial Pr(y=1|x)/\partial x$; for dummy/categorical variables, it is computed as the discrete change associated with a switch from 0 to 1, $\Delta Pr=Pr(y=1|d=1,x)–Pr(y=1|d=0,x)$ (Anderson & Newell, 2003; Carlevaro & Sénégas, 2006). "—" denotes categories (Construction, Engineering & Real Estate; Hospitality, Entertainment & Leisure) for which (quasi-)complete separation prevents the MLE from producing finite estimates; marginal effects are suppressed accordingly. Standard errors in parentheses. Standard errors in parentheses. * p<.1, ** p<.05, ***p<.01.

In the context of nationality (millet), Greeks (Grec) serve as the reference group. The analysis reveals that Armenians have a consistently lower probability of survival compared to Greeks, in the range of about 10 to 13 percentage points lower across all models. This negative effect remains significant even after controlling for sector and location. In contrast, Turks exhibit a large, positive, and highly significant survival advantage of between 23 and 24 percentage points relative to Greeks, and this advantage is robust to the inclusion of controls for sector and location. Jews and Europeans show no consistent difference from Greeks once additional factors are considered, although Europeans display a small, positive effect in the simplest model that loses significance once sector and location are included.

Regarding sector (Sector_Broad), "Other" is the reference category and sectoral effects are estimated in Models 2 and 3. The average marginal effects indicate sizable and statistically significant advantages for Healthcare & Medical Services (about 23–25 percentage points) and Professional & Financial Services (about 17–22 percentage points) relative to the baseline. Conversely, Agriculture & Food is associated with a reduction of about 8–9 percentage points, and Retail & Wholesale Trade with a reduction of about 20 percentage points.

In terms of location (Location_Consolidate), Model 3 includes a set of location dummies with "Other_Places" as the reference group. Most locations do not show robust departures from the baseline. However, businesses situated in a Han face an 8–9 percentage-point reduction in survival probability, an effect that is both sizable and statistically reliable. Rue_Sokak, on the other hand, shows a borderline-significant positive coefficient of about 5 percentage points, suggesting a modest survival benefit for businesses located on a street. Other locations, such as Bezesten, Locals, Quarter_Mahalle, and Tsarsi_Pazar, do not display clear or significant differences from "Other_Places."

Overall, these findings point to meaningful variations in business survival based on nationality, sector, and, to a lesser extent, location. Turks stand out for their robust survival

advantage, while Armenians appear notably more vulnerable. Businesses in Healthcare & Medical Services and Professional & Financial Services perform significantly better than those in other sectors, whereas Agriculture & Food and Retail & Wholesale suffer clear disadvantages. Location is less influential but does highlight the detriment of being situated in a Han and the slight benefit of operating on a Rue/Sokak. These quantitative insights can inform historical or policy-driven inquiries into the structural advantages and disadvantages shaping commercial survival in the studied context.

6. Discussion

The findings from our logistic regression gain clarity when placed in the broader historical setting of late 19th-century İzmir. This Ottoman port city was distinguished by its cosmopolitan character, hosting sizable Greek, Armenian, Levantine, and Muslim Turkish populations. By the 1880s, non-Muslim merchants (notably Greeks and Armenians) had achieved high visibility in commerce, running factories, specializing in crafts such as silk production, and organizing far-reaching trade networks. At the same time, the Hamidian era[23] (roughly the late 1870s–1890s) coincided with debates over changing institutional conditions and administrative discretion, which may have shaped commercial opportunities for different groups. However, our directory-based design cannot directly observe "state backing" mechanisms. We therefore interpret the higher persistence of Turc-owned establishments as a pattern that is consistent with (rather than definitive evidence of) shifting institutional environments, sectoral positioning, and local network advantages during this period (Quataert, 2005; Pamuk, 2020; Zürcher, 2004).

In the absence of explicit ethno-religious identifiers in the commercial directories, we inferred likely communal affiliation via an onomastic coding protocol. We acknowledge that in late Ottoman İzmir, a highly cosmopolitan port with multiple scripts and transliteration conventions, personal and commercial names were not one-to-one indicators of identity: the same surnames and patronymics could circulate across communities, and orthographic variation, conversion, intermarriage, and the strategic adoption of "neutral" trading names can generate non-trivial misclassification. Methodologically, name-based classification is therefore best understood as a probabilistic measurement that introduces uncertainty rather than definitive categorisation (Mateos, 2007; Imai & Khanna, 2016). To reduce bias, we adopted conservative coding rules (assigning a communal label only when patterns were strongly diagnostic; otherwise, recording cases as "uncertain") and triangulated ambiguous entries with occupational descriptors and address/institutional cues where available. Accordingly, our ethnicity-related coefficients should be read as associations conditional on this conservative procedure; any identity boundary-crossing in İzmir's social world would, if anything, tend to attenuate estimated group differences rather than mechanically produce them (Zandi-Sayek, 2012).

Ethnicity, sector, and geography were deeply intertwined in İzmir's commercial sphere. Greeks tended to dominate shipping, import-export, and retail, Armenians excelled in specialized crafts and international ventures (such as Iranian silk), while Jewish traders often carved out niches in finance. Many Turkish-owned shops focused on everyday retail, harnessing a

23 It refers to the era of Abdulhamid II, which covers the period from 1876 to 1908.

dependable customer base. Accordingly, the study's evidence that healthcare and finance outperformed agriculture and small-scale retail fits into this historical mosaic. Health services (doctors, pharmacies, hospitals) met steady demand and often drew on established charitable or communal support. Financial services, including banks and moneylenders, enjoyed robust capital streams or state privileges. By contrast, agriculture-related trades and small urban shops, many operated by Greek and Armenian families, became vulnerable to volatility in crop prices, harvest failures, and changing consumer tastes. An intensifying export market for figs, raisins, cotton, and tobacco peaked earlier in the 19th century, and the 1890s introduced new uncertainties, forcing many smaller traders to close.

Location effects also shaped survival rates. İzmir's commercial life was split between the older Kemeraltı[24] bazaar district and the modernized Frank Street/Quay area. As Frangakis-Syrett's work on Smyrna's commerce and the nineteenth-century quay project emphasizes, the post-1850 marketplace became increasingly 'highly competitive', with the expansion of street-front retail and sharper rivalry between European and locally rooted merchants (Frangakis-Syrett, 1992; 2001). In the bazaar, kervansarays (caravanserai inns or *hans*[25]*)* had historically served as centres for wholesale and regional trade, catering to caravans from the interior. Yet, improved railways and new quays in the 1860s gradually diminished the *han* system's importance, enabling faster transport and distribution of goods. Some *hans* thus lost business as trade routes and consumer habits shifted toward main streets with better foot traffic. Consequently, businesses operating from more accessible street-front shops had a competitive advantage, enjoying greater visibility and a more diverse customer base. This dynamic contributed to the significant location coefficient in our regression: *han*-based firms suffered higher exit rates, while street-based outlets performed better.

Such patterns reflect the broader transition of İzmir from an Ottoman-Islamic urban form to a partly European-style cityscape. The presence of stone buildings, arcades, and "modern" shops along the waterfront drew local and foreign clientele alike. Muslim Turkish shopkeepers, frequently concentrated in modest retail trades, often owned their storefronts or cultivated strong neighborhood ties, stabilizing their businesses. Meanwhile, Armenian and Greek firms tethered to high-risk export markets or reliant on narrower communal networks were more susceptible when economic or political strains emerged. Overall, the multi-ethnic and sectorally specialized structure of İzmir's economy shaped who survived and who did not.

24 Kemeraltı is a historic bazaar district located in the heart of İzmir, Türkiye. Dating back to the 17th century, it has long served as one of the city's most vibrant commercial and cultural centers. Stretching from Konak Square to the ancient Agora, Kemeraltı is a maze of narrow streets filled with shops, artisans, mosques, synagogues, hans (inns), and coffeehouses. The district was historically home to a diverse population, including Muslims, Jews, Greeks, and Armenians, and played a key role in İzmir's status as a major port city in the Ottoman Empire. The bazaar has traditionally hosted businesses ranging from textiles and jewelry to spices, leather goods, and local crafts.

25 "Han" refers to a caravanserais (kervansaray), a historic structure that provided lodging, rest, and services to travelers and merchants, especially along major trade routes like the Silk Road. These buildings played a vital role in facilitating commerce and travel in the pre-modern era. In modern Turkish, *han* still denotes an inn or commercial building, typically referring to older, multi-room structures used for trade, storage, or business in urban settings.

6.1. Theoretical Implications

These findings speak to three important theoretical perspectives:

1. Firm Survival and Resource Dependence: In line with resource dependence theory, organizations require reliable access to inputs, be these capital, labor, or clientele, in order to persist. Healthcare and finance firms in İzmir often maintained strong external linkages (e.g., banks chartered by foreign or imperial authorities, medical institutions supported by community funding), and thus experienced fewer resource shocks. Alternatively, small-scale retail and agricultural businesses faced uncertain supply chains, fluctuating consumer demand, and climatic variability. Location factored into resource flows as well: hans had less foot traffic and fewer spontaneous customers than street-facing shops. This uneven distribution of resources helped shape the diverging survival patterns evident in our dataset.
2. Institutional Economics: The Ottoman Empire in the 19th century witnessed legal reforms, yet it retained a system of legal pluralism, including the Capitulations (ahdnames) and consular courts, often favouring non-Muslim and foreign merchants in disputes. While these arrangements enabled many minority entrepreneurs to thrive earlier in the century, they did not guarantee indefinite security. By the 1890s, rising nationalism, policy revisions, and uncertainties about capitulatory privileges could jeopardize minority businesses. Conversely, Muslim entrepreneurs benefitted from certain informal advantages, including administrative support or fewer bureaucratic barriers in establishing a local shop. This suggests that shifting institutional contexts can alter the balance of market access and property rights, providing an evolving framework in which some firms gain an edge and others lose ground.
3. Ethnic Entrepreneurship and Embeddedness: Greek and Armenian oriented firms in İzmir often relied on cohesive communal networks, kinship ties, religious institutions, and credit circles, to sustain trade. These networks conferred resilience in stable times but also bound businesses to the fortunes of their respective groups. In an era when political frictions might disrupt a particular community, embeddedness could amplify vulnerabilities. The relatively robust survival rate of Turkish shops indicates that majority-group embeddedness carried its own benefits, especially in a changing institutional landscape. This underscores the two-sided nature of ethnic embeddedness, illustrating how communal support may help but also expose businesses to collective risks when policies or sentiments shift.

6.2. Methodological Contributions

Methodologically, this study leverages historical business directories, sources not often used for detailed firm-level analysis in late Ottoman contexts. By meticulously combining two İzmir directories (1888 and 1893), assigning standardized identifiers, and employing logistic regression, we construct a unique panel of business data for a non-Western setting. This approach enriches historical economics by pushing beyond aggregate trade or production figures, offering micro-level insights into firm trajectories. It parallels a growing body of research that utilizes directories or census data to map urban economic patterns in industrializing regions.

The use of logistic regression, a tool more common in contemporary firm survival analyses, advances the methodological frontier in historical studies. While business historians sometimes prefer qualitative or case-based methods, the statistical modelling here enables systematic examination of how ethnicity, sector, and location interact to shape survival. This

adds depth to conventional narratives by quantifying the relative weight of each factor and examining their joint impact.

Furthermore, by categorizing addresses (e.g., han vs. street-based) and accounting for communal affiliations, the study demonstrates a pathway to integrate spatial, social, and economic dimensions in historical micro-data. Researchers working on other cities, whether in the Ottoman realm or elsewhere, can replicate such strategies, potentially illuminating region-specific and cross-regional comparisons of commercial resilience in the face of changing institutions and markets.

6.3. Methodological Limitations

First, the directories provide limited firm-level covariates. They report names, addresses, and occasionally communal affiliation, but not firm age, capitalization, employment, or owner education in a consistent and linkable form. This constraint limits strong causal interpretation at the firm level. Nevertheless, the analysis is designed to document conditional survival differentials net of two central structural dimensions, sector and location, which plausibly proxy for several unobserved attributes, and the core nationality estimates remain stable across increasingly saturated specifications (Altonji, Elder, & Taber, 2005; Oster, 2019). Future work could integrate tax registers or archival balance-sheet–type materials to extend the covariate set.

Because the dataset contains only two observation points, the analysis is not designed to estimate within-firm dynamics or to absorb time-varying shocks through firm fixed effects. Accordingly, coefficients are interpreted as conditional associations with five-year survival rather than as causal effects. Importantly, any city-wide temporal change between 1888 and 1893 is common to all firms and is therefore captured by the baseline survival rate, while the inclusion of fine-grained location categories mitigates confounding from neighbourhood-level disturbances (e.g., localised fires or policy changes). Residual idiosyncratic shocks would bias nationality coefficients only if they were systematically correlated with nationality conditional on sector and location.

Second, some covariate categories, especially at the intersection of sector, location, and nationality, contain very small numbers of observations. In logistic regression with multiple categorical predictors, such sparsity can generate (quasi-)complete separation, where the outcome is nearly perfectly predicted within a category. Under separation, conventional maximum-likelihood logit may produce inflated coefficient magnitudes and unreliable standard errors, not because the underlying effect is truly extreme, but because the model is weakly identified in that dimension. In our data, two sector categories—Construction, Engineering & Real Estate and Hospitality, Entertainment & Leisure—exhibit this pattern: the very small number of observations in each cell causes the MLE algorithm to diverge, yielding numerically unstable coefficient and standard-error estimates. We therefore suppress the point estimates for these two categories in Tables 2 and 3 (indicated by "—") and exclude them from substantive interpretation. Crucially, the remaining model parameters are unaffected by this localised instability, as demonstrated by the stability of nationality and other sector coefficients across the nested specifications (Models 1–3; see Zorn, 2005; Greenland et al., 2016). More broadly, this limitation reflects a common constraint in historical micro-data: while the overall sample may be sizeable, fine-grained stratification can reduce the effective information content for specific subgroup comparisons.

Third, name standardisation and record linkage between the 1888 and 1893 editions inevitably involve some measurement error. Businesses may appear under variant spellings,

adopt new trade names, or change proprietors without explicit notation. We relied on consistent textual clues (occupation and address) to minimise false non-matches; nevertheless, some continuing firms may be coded as not re-listed. This limitation should be interpreted as potential misclassification of the directory-continuity outcome, not as a direct measure of legal 'closure'. Unless misclassification is systematically related to the covariates, such errors primarily reduce statistical power and tend to attenuate estimated associations (Hausman, Abrevaya, & Scott-Morton, 1998; Neuhaus, 1999). While cross-checking with newspaper references provided additional reassurance, the absence of official registers means that any directory-based continuity measure remains an imperfect proxy for underlying firm activity.

Lastly, the findings reflect the local and temporal specificity of late-19th-century İzmir. Political circumstances and institutional arrangements were distinctive, and the city's composition changed dramatically afterward. Hence, extrapolating the numeric results elsewhere should be done cautiously. Rather than offering a universal rule, "Turkish businesses always fare best", the study instead highlights the necessity of analysing how local structures, communal networks, and institutions converge in particular historical settings to shape business outcomes. Researchers might replicate this methodology in other Ottoman or global cities to see whether similar forces produce parallel results.

While the Annuaire Oriental series theoretically allows for longer-term observation across multiple decades, constructing a consistent firm-level panel over fifteen or twenty years presents substantial methodological challenges. Variations in spelling, ownership changes, sectoral reclassification, and shifting urban toponymy significantly complicate reliable firm matching over extended horizons. In this context, extending the observation window risks introducing substantial measurement error that may outweigh the analytical benefits of a longer timeframe. The decision to focus on a shorter but methodologically coherent interval, therefore, reflects a deliberate trade-off in favor of internal validity and comparability rather than a constraint imposed by data availability.

7. Conclusion

This study has examined the determinants of business survival in late nineteenth-century İzmir through the lens of a unique firm-level dataset compiled from two commercial directories dated 1888 and 1893. By combining historical inquiry with statistical modelling, it has sought to explain why some firms endured in a period marked by institutional transformation, economic integration, and socio-political complexity, while others exited the marketplace. The logistic regression model, supported by marginal effects analysis, has revealed that ethnicity, sectoral affiliation, and location were not all significant, albeit unequally weighted, predictors of five-year survival (operational longevity/persistence).

The most robust finding concerns the differential survival outcomes associated with nationality. Turkish-owned businesses displayed a statistically significant and substantial advantage over their Greek, Armenian, Jewish, and European counterparts. This pattern persisted even after controlling for sector and location, suggesting that group-specific structural factors were at play. While historical literature often emphasizes the commercial strength of minority communities in the Ottoman Empire, our results point to a nuanced reality in which Muslim entrepreneurs, particularly during the Hamidian era, benefited from shifting institutional conditions, including informal state support, favourable legal mechanisms, and growing par-

ticipation in lower-capital, stable-demand sectors. Conversely, the lower survival rates of Armenian-owned firms, despite their historically strong networks and regional influence, may reflect increasing vulnerabilities caused by changing political dynamics, market volatility in key export trades, and overreliance on narrow ethnic networks.

Importantly, these nationality-based differentials should not be interpreted as reflecting inherent entrepreneurial capacities or cultural predispositions. Rather, the observed survival advantages and disadvantages point to historically contingent institutional configurations. Nationality functioned as a proxy for differential access to legal regimes, administrative discretion, credit relations, and protection mechanisms embedded within the late Ottoman socio-legal order. In this sense, the findings underscore that economic outcomes were shaped less by identity per se than by the institutional environments within which different groups operated.

The sectoral effects similarly underscore the importance of market structure and economic resilience. Firms operating in healthcare, medical services, and financial sectors outperformed those engaged in retail, agriculture, and food production. These differences likely stem from varying exposure to external shocks, access to capital, and demand stability. Service-oriented firms benefitted from consistent local consumption and, in many cases, institutional backing through charitable or professional networks. By contrast, traders in agricultural goods or small-scale retailers were more vulnerable to market cycles and shifts in consumer behaviour, contributing to lower survival odds. These findings affirm resource dependence theory, highlighting the importance of securing stable, diversified input flows and access to reliable markets.

Taken together, the nationality and sectoral findings challenge the widespread assumption in the literature of a uniform and persistent "Ottoman minority advantage." While non-Muslim and foreign merchants undeniably played leading roles in long-distance trade and finance during earlier phases of Ottoman integration into the world economy, the late nineteenth-century context reveals a more differentiated landscape. Survival increasingly depended on sectoral positioning, exposure to local demand, and adaptability to institutional change rather than on minority status alone.

Location, while somewhat less influential than ethnicity and sector, still emerged as a meaningful determinant. Firms based in caravanserai-style (hans), often associated with long-distance wholesale trade, had significantly lower survival probabilities compared to those on modernized streets or within accessible commercial zones. This spatial pattern reflects the broader transformation of İzmir's urban economy: as the city modernized, commercial activity increasingly clustered along boulevards and ports, marginalizing older commercial institutions rooted in traditional trade practices.

The spatial dimension of business survival further highlights the role of urban transformation in shaping economic outcomes. The declining viability of han-based enterprises signals not merely a locational disadvantage but a broader shift in the organization of commerce, from caravan-based wholesale systems to street-oriented retail and service economies. This finding situates firm survival within the political economy of urban modernization, emphasizing how infrastructural change redistributed commercial opportunities across space.

From a methodological perspective, the study demonstrates the feasibility and utility of applying quantitative methods to late Ottoman microeconomic data. The use of logistic

regression allows for a more rigorous and interpretable examination of business survival, particularly when paired with careful historical contextualization. By drawing upon systematically compiled data from historical directories and coding firm attributes across several dimensions, ethnicity, sector, and location, the study contributes to a growing body of literature at the intersection of historical economics, economic sociology, and business history.

Beyond its empirical findings, the study demonstrates how commercial directories can be transformed from descriptive reference tools into analytically rigorous datasets. By combining careful source criticism, standardized record linkage, and econometric modelling, the article illustrates a replicable strategy for extracting causal insights from fragmented historical sources. This approach bridges the gap between qualitative urban history and quantitative economic analysis, offering a template for future research on pre-modern and early modern economies.

At the same time, the limitations of the data must be acknowledged. Gaps in information on firm capital, ownership structure, or exact size constrain our ability to control for all relevant factors. Similarly, name standardization and record-linking introduce potential measurement errors, and the findings, while statistically significant, are context-specific to İzmir between 1888 and 1893. They should thus be interpreted as indicative rather than universally generalizable.

Nevertheless, this study offers a framework that can be replicated and refined in other urban contexts and time periods. Future research might compare results across Ottoman port cities such as Salonica, Beirut, or Alexandria, or extend the analysis longitudinally across later decades. Integrating archival material such as tax registers, court records, or commercial correspondence could also enrich our understanding of firm-level dynamics and deepen insights into the roles of networks, institutions, and political developments in shaping economic resilience.

Ultimately, the evidence from late-nineteenth-century İzmir suggests that business survival emerged from the interaction among identity, market structure, and institutional change rather than from any single determinant. Firms that aligned themselves with stable demand, favorable institutional arrangements, and evolving urban geographies were better positioned to endure. In this respect, İzmir offers a historically grounded case through which broader theories of firm survival, embeddedness, and institutional adaptation can be re-evaluated.

In sum, this research contributes to ongoing debates on the economic roles of ethnicity, the resilience of commercial institutions, and the social foundations of market success in multi-ethnic, transitional economies. It affirms that, in historical settings, no less than in contemporary ones, business survival is shaped not only by sectoral and market strategy but also by the institutional context and the embeddedness of economic actors within their spatial, political, and communal environments.

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Author Contributions

The authors contributed equally to the design, data analysis, and writing of the study. The authors have read and approved the final version of the study.

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