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Spinoffs and M&A as drivers of spatial clustering: The evolution of the Dutch banking sector in the Amsterdam region in the period 1850-1993

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Spinoffs and M&A as drivers of spatial clustering: the evolution of the Dutch banking sector in the Amsterdam region in the period 1850-1993

Ron Boschma and Rik Wenting

Abstract
There is little understanding of how clusters evolve, and where. While dynamic analyses of clusters hardly exist, this is especially true for spatial clustering of service industries. We take an evolutionary perspective to describe and explain why the Dutch banking cluster clustered in the Amsterdam region. This analysis is based on an unique database of all banks in the Netherlands that existed in the period 1850-1993, which were collected by the authors. We examine the extent to which spinoff dynamics, merger and acquisition activity and the location of Amsterdam had a significant effect on the survival rate of Dutch banks during the last 150 years. Doing so, we make a first step in providing an evolutionary explanation for why Amsterdam is the leading banking cluster of the Netherlands. Our analyses demonstrate, among other things, that Amsterdam banks were disproportionally active in acquiring other banks, leading to a further concentration of the banking sector in the Amsterdam region.

Key words: cluster, cluster life cycle, spinoffs, mergers and acquisitions, banking sector

JEL codes: o18, r00, r11

Introduction

Since Porter (1990), clusters have attracted widespread attention in economic geography. This literature is, however, not unproblematic (see e.g. Martin and Sunley 2003). One of the critiques is that clusters have been treated as static entities, as if clusters do not evolve, and as if their existence can be explained by looking at their current features. This issue of the dynamics of cluster evolution has been taken up by scholars recently (Audretsch and Feldman, 1996; Feldman and Schreuder, 1996; Staber, 1997, 2001; Maggioni, 2002; Brenner, 2004; Feldman et al., 2005; Iammarino and McCann, 2006; Staber, 2009; Menzel and Fornahl, 2009; Ter Wal and Boschma, 2010). Although this emerging literature on cluster life cycles has brought new and valuable insights, broadly speaking, it still suffers from a number of weaknesses: (1) this literature has remained rather conceptual; (2) it does not depart from a common theoretical framework; (3) case studies on life cycles of clusters have remained rather descriptive; and (4) when explaining the long-term evolution of clusters, they do not test for explanations other than Marshallian externalities. This paper aims to take up these issues when explaining the dynamics of the Amsterdam banking cluster since 1850.

This paper has two main objectives. The first objective is to develop a theoretical framework that is evolutionary of nature and allows for alternative explanations of spatial clustering. We build on the theoretical concept of the Window of Locational Opportunity developed in the late 1980s and early 1990s (Storper and Walker, 1989), and integrate that concept in the industrial dynamics literature, as developed by Klepper and others since the late 1990s (Klepper, 1997). Building on these insights, we come up with three (possibly alternative) explanations for the dynamics of spatial clustering: spinoff dynamics, merger and acquisition activity, and agglomeration effects. From an evolutionary perspective, all three

may act as potential vehicles through which knowledge and routines are created and diffused among a population of firms. Through the spinoff process, relevant pre-entry knowledge of the entrepreneur is transferred and diffused from incumbent firms to new firms (Helfat and Lieberman, 2002). Merger and acquisition activity may be considered a way of post-entry learning, in which acquiring firms get access to the knowledge of acquired firms (Ahuja and Katila, 2001). And once spatial clustering occurs, localization economies like knowledge spillovers and supportive institutions may become increasingly available, to the benefit of local firms (Boschma and Lambooy, 1999). All three mechanisms provide complementary but possibly alternative explanations for why an industry develops and concentrates in space.

The second objective of this paper is to test these ideas in the case of the Dutch banking sector. Since we analyze data on the headquarters of banks, we account for the most knowledge intensive part of this service industry where firm-specific routines are formed. More in particular, we investigate the clustering process in the Amsterdam region, and test whether this clustering process in the Amsterdam region has been caused by a high intensity of spinoff activity (e.g. did Amsterdam banks give birth to many and successful spinoffs in the Amsterdam region), a high intensity of M&A activity (e.g. were Amsterdam banks extremely active in taking over banks elsewhere in the Netherlands), and/or location-specific features of the Amsterdam region (e.g. did clustering bring benefits to Amsterdam banks over time). This analysis is based on an unique database of all entries and exits in the Dutch banking sector we collected for the period 1850-1993. We will conduct survival analysis, among other methodologies, to examine which factors contributed most to the survival rate of Dutch banks during the last 150 years. Doing so, we make a first tentative step in providing an evolutionary explanation for why Amsterdam is the leading banking cluster of the Netherlands.

The structure of the paper is as follows. Section 2 develops an evolutionary perspective on the spatial evolution of industries and clusters that incorporates three alternative but possibly complementary explanations. Section 3 introduces the data and present some descriptives. Section 4 devotes attention to the spatial evolution of the Dutch banking sector, and more in particular its concentration in the Amsterdam region. Section 5 examines which factors can be held responsible for the spatial clustering in the Amsterdam region. Section 6 goes more in detail concerning the M&A activity of Dutch banks, and of Amsterdam banks in particular. Section 7 concludes.

2. Spatial formation of industries from an evolutionary perspective

2.1 Localization economies and spatial clustering

In the 1980s, the spatial system in many leading economies was subject to fundamental change. New industries emerged and developed in new growth regions like the Sunbelt states in the US while avoiding places that were once the leading economic centres like the Rustbelt states. The Window of Locational Opportunity concept was proposed by the American geographers Allen Scott, Michael Storper and Richard Walker in the late 1980s to account for these regional dynamics (Scott and Storper, 1987; Scott, 1988; Storper and Walker, 1989). They criticized the a-historical and deterministic view of regional economists and economic geographers when explaining the geography of new industries. They rejected the view of regional economists like Norton and Rees (Norton, 1979; Norton and Rees, 1979) that new industries would select those places where they could minimize factor costs (like wage and land costs) and maximize profits, as if the rise of a new industry was a completely rational and allocative process. But they also took a critical stance towards economic geographers who

came up with endless lists of static location factors (like quality of life and good infrastructure) which, as Scott (1988) put it: "… usually degenerate into nothing more than the drawing up of bills of specifics that seem curiously tailored to fit each individual case" (p. 17).

Scott c.s. came up with a more dynamic explanation of the spatial formation of industries that was strongly rooted in evolutionary thinking. They propagated the view that new industries produce their own space. Following Myrdall (1957), they stated that, as soon as a new industry reaches a critical mass somewhere, self-reinforcing mechanisms come into being, because growing demands from the industry will transform the local environment in a supportive one: new institutions are created, new research institutes and educational facilities are established, a specialized labour market will arise, and specialized capital and other input suppliers will emerge. In other words, Marshallian localization externalities may come into being as an industry develops in space, sustaining its further development. And the more entrants locate locally, the stronger the impact of localization economies may become. Consequently, industries produce space, instead of the other way around, and after some time, localization economies can cause an industry to concentrate in a region over time.

This is not to say that new industries emerge out of the blue and develop everywhere (Boschma and Lambooy, 1999; Brenner, 2004). Staying close to an evolutionary perspective, Scott c.s. argued that location-specific features might still condition but do not determine the location of new industries. They suggested that an urban environment might be beneficial in this respect (Storper and Walker, 1989). However, the WLO-concept did not consider two alternative explanations (next to urbanization and localization economies) for the spatial clustering of an industry, that is, spinoff dynamics and merger and acquisition activity. We will turn to these two explanations in the next sections respectively.

2.2 Spinoff activity and spatial clustering

The spatial formation of an industry can be described in terms of spinoff dynamics (Arthur, 1994; Cantner et al., 2006; Klepper, 2007; Buenstorf and Klepper, 2009). With spinoffs we mean new firms that are founded by employees of incumbent firms in the same industry or in related industries. There is evidence that spinoffs play indeed a crucial role in the spatial concentration of industries (e.g. Dahl et al. 2003; Koster, 2006). There are two explanations for this. The first argues that regions that generate many spinoffs at the early stage of the life cycle of a new industry, will most likely dominate the industry. This is because the probability to give birth to a new spinoff is dependent on the number of firms already present in a region: the more spinoffs enter the region, the higher the probability to generate more spinoffs, as spinoffs tend to locate in the same region as their parent company (Arthur, 1994). The second explanation conceives the spinoff process as a mechanism through which tacit knowledge is transferred from parent to offspring, and which positively affects the performance of spinoffs. Klepper (2007) claims that entrepreneurs with previous experience in the same or in related industries will perform better than entrants without that type of experience. In addition to that, Klepper states that success breeds success. In a longitudinal study on the American car industry, Klepper demonstrated empirically that very successful parents did indeed generate many spinoffs, and also very successful spinoffs.

Since the spinoff process is basically a local phenomenon, it may provide an alternative explanation for the spatial concentration of an industry. This means that in theory, we can explain the spatial clustering of an industry without referring to location-specific features. Accordingly, spinoff dynamics and localization economies provide different evolutionary explanations for the spatial clustering of an industry. However, both may also

play a role simultaneously (Boschma and Frenken, 2003). It seems quite plausible that a high rate of spinoff activity in a region strengthens agglomeration forces, which, in turn, enhance not only spinoff creation, but also increase the survival rate of spinoff companies. In other words, spinoff dynamics and localization economies provide alternative but possibly complementary explanations for spatial clustering.

Boschma and Wenting (2007) investigated both effects in a longitudinal study on the British car industry. They found evidence that spinoffs from related industries (founded by entrepreneurs with a background in related industries like cycle making) had a higher survival rate during the first stage of the industry life cycle, while spinoff companies that had their origin in the car industry performed better in a later stage of the industry life cycle. Boschma and Wenting did not, however, find a positive effect of localization economies on firm's survival. Localization economies did not matter at the first stage of the industry life cycle, although start-ups in regions with related industries performed better. However, it turned even into a negative effect on firm's survival at a later stage of the life cycle. In other words, the more the British car industry concentrated spatially, the harder it was for new entrants to survive in clusters. This may be due to the fact that cluster firms face more intense local competition and higher agglomeration costs after some time (see also Staber, 2001; Otto and Kohler, 2008).

2.3 M&A activity and spatial clustering

Another feature of the industry life cycle is that the number of firms goes down in later stages, due to a decrease in entry levels and a higher rate of exit levels (De Jong, 1981; Markusen, 1985; Chapman, 1991; Klepper, 1997). Exits of firms are mainly caused by selection (competition) and mergers and acquisitions (M&A). In the later stages of the industry life cycle, these become more prominent, due to the increasing importance of internal scale economies, among others. This causes a shake-out process which is likely to affect the spatial distribution of the industry, and we propose it may provide an additional explanation for why an industry clusters spatially.

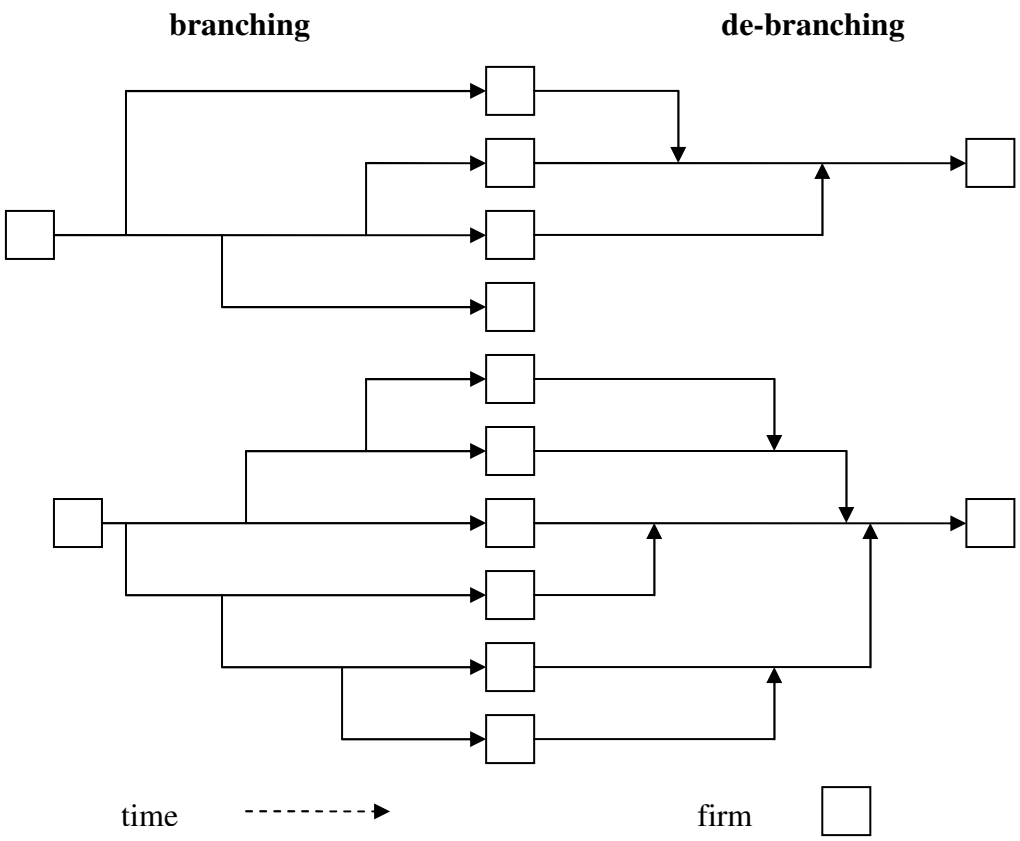
M&A activity is a way for firms to expand and grow. In clusters, firms have more opportunities to take over other (local) firms, because there are more candidates in the cluster from the same sector which they might know well. And when the acquiring and the acquired firm share the same location, this might increase the success of the M&A and reduce the number of M&A failure. There is indeed some evidence that geographical proximity is a driver of M&A even within countries (see e.g. Rodriguez-Pose and Zademach, 2003). The acquisition of cluster firms by other cluster firms will lead to a decrease of the number of firms in the cluster, but will increase the performance of the acquiring cluster firms, due to internal scale economies. But M&A activity might also be induced by strategies to enlarge the firm's market geographically, by taking over distant firms in markets the acquiring firm was not yet active. Despite the geographical distance, cluster firms might have an incentive to take over non-cluster firms, because they share their local market already with many local competitors. For these reasons, we expect that cluster firms are disproportionally more active in taking over other firms (both local and non-local firms), as compared to non-cluster firms.

Moreover, acquisition of other firms may be considered a form of post-entry learning in which acquiring firms get access to knowledge of acquired firms (Ahuja and Katila, 2001; Piscitello, 2004; Cassiman et al., 2005). In that respect, acquiring firms may increase their capabilities and get better routines over time. In addition to that, M&A activity is full of uncertainty and may lead to failure (Fein, 1998). Therefore, having experience in acquiring other firms might be crucial to ensure that the acquisition is well implemented and brings

value to the acquiring firm. Due to this cumulative aspect, we expect that a relatively low number of firms do most of the acquisitions in an industry. Most likely, these will be cluster firms, as these are already more active as acquiring firms, as explained above. For all these reasons, we expect that M&A activity is a driver of the spatial clustering of an industry over time, especially during the shake-out phase of the industry life cycle, when M&A activity is expected to be more intensive.

From such an industry life cycle perspective, M&A activity can be viewed as a de-branching process in which firm-specific routines merge, and the number of firm-specific routines in the industry decreases. This is depicted on the right side of Figure 1. Through M&A activity, a lineage structure between firm-specific routines across space is formed as time goes by, as knowledge and routines are transferred from acquired to acquiring firms. The spinoff process also contributes to the evolution of this lineage structure, as shown on the left side of Figure 1. However, the spinoff process sets into motion a branching process in which routines are transferred from parents to spinoff firms, and which makes the number of firm-specific routines increase over time. As explained above, both knowledge transfer mechanisms are likely to contribute to the spatial concentration of an industry. This is because the spinoff process is a self-reinforcing and path-dependent process that occurs at the regional level, in which a relatively small number of parent organizations give birth to a relatively large number of (successful) spinoffs. With respect to M&A activity, this is because intra-regional M&A's will primarily occur within clusters, while inter-regional M&A's will concern mainly cluster firms that acquire non-cluster firms. Spatial clustering is further reinforced by the fact that only a small number of cluster firms will do most of the acquisitions because of cumulative learning and internal scale economies.

Figure 1. Branching (through spinoff process) and de-branching (through M&A activity) of organizational routines



In other words, M&A activity may provide an alternative explanation for spatial clustering of an industry. However, this may not be completely independent of the two other mechanisms described earlier. There is a tendency of successful firms to be more active in taking over other firms, while acquired firms are not necessarily more successful (Fein, 1998). As spinoff firms are more likely to be successful, as argued earlier, we expect spinoffs to be disproportionally more active in taking over other firms. And since acquired firms are on average less successful than acquiring firms, we expect that spinoff companies are not acquired relatively more often than inexperienced firms. And as cluster firms may be more successful due to localization economies, cluster firms may be disproportionally more active in taking over other firms. This may be reinforced by that fact that clustering leads to the local emergence of specialized services like consultants and lawyers specialized in M&A, that may further boost M&A by cluster firms.

3. Data and some descriptives

Since localization economies, spinoff dynamics and M&A activity provide different explanations, it is up to empirical research to disentangle these and assess their importance. This will be done for the Dutch banking sector for the period 1850-1993. We collected data on the years of entry and exit, the location of the head office, merger and acquisition activity, and the pre-entry industrial background of the entrepreneur for every bank that entered the industry in the Netherlands during that period.

We collected data from a number of sources (for more details Boschma and Ledder, 2010). We have used the so-called *Nederlandse financiële instellingen in de twintigste eeuw: balansreeksen en naamlijst van handelsbanken* published by the Dutch Central Bank to compile a list of banks that were active in the period 1850 to 1993. This source claims to have listed every bank in the Netherlands for this period, the years they were in business, the location of their headquarters, and any reorganizations or ownership changes. Other sources we used were the *Nationale Vereniging van Banken* and the *Nederlandsch Economisch-Historisch Archief*. Information on the pre-entry industrial background of the entrepreneurs was acquired from *Geschiedenis van de Algemene Banken in Nederland 1860-1914* (Kymmell 1992, 1996), *Geschiedenis van de Nederlandsche Bank* (De Jong, 1967), the online databank on Dutch entrepreneurs of the *Internationaal Instituut voor Sociale Geschiedenis*, trade journals, regional and city archives, and chronicles on the history of particular banks.

Our database covers the period 1850-1993. This implies we cannot cover fully the life cycle of the banking sector, let alone the whole life cycle of the Amsterdam banking cluster. It is well known that Amsterdam was a leading international financial centre in the seventeenth century. Consequently, our study covers only part of the life cycle of the Amsterdam banking cluster but nevertheless a most interesting part. Before 1860, there did not exist a modern banking sector in the Netherlands, although there was a money and stock market. A structural change in the banking sector occurred in the early 1860s when the first banks with a juridical structure of a limited liability company emerged in the Netherlands. Having large sums of capital was new to the Dutch banking system. This became the dominant design in the bank industry in the following decades.

Another interesting aspect of the banking sector is that it is a knowledge-intensive service sector. We analyze headquarters of banks, which may be considered the most knowledge-intensive part of this service industry where firm-specific routines are formed. This enables us to investigate how (new) routines in a growing and declining population of firms diffuse in space over time. Most studies on the long-term evolution of an industry have focussed on manufacturing industries. Only a small number of studies have analyzed the long-term evolution of service industries (Fein, 1998; Carree, 2003; Consoli, 2005; Grote, 2008). To our knowledge, with the exceptions of Pratt (1998) and Wenting (2008), no study has investigated the long-term spatial evolution of a service sector.

In our database, we have information on 906 banks that entered the Dutch banking sector in the period 1850-1993. For 112 banks, the year of entry is unknown. Of these 906 banks, 779 banks had to exit the banking sector in the period 1850-1993, 119 banks were still active in 1993, and for 8 banks, the year of exit is unknown. A total of 394 exits were due to reasons like bankruptcy, closure, diversification into other activities than banking, et cetera. The remaining exits (385 banks, i.e. 49%) could be attributed to merger and acquisition activity.

Figure 2 describes the evolution of the Dutch banking sector in terms of number of entries, exits and firms in the period 1850-1993 (for details, see Boschma and Ledder, 2010). Except for a short intermezzo during the First World War, the total number of banks increased till 1929, when a maximum of 478 banks was reached. Entry levels remained low till the 1890s, because it was considered a sign of weakness to lend money from a bank in the second part of the nineteenth century (Nierop, 1972). Since then, however, there was a sharp and steady increase in the number of entrants, until the 1930s, when entry levels dropped sharply and remained low ever since. The number of exits was extremely low in the second half of the nineteenth century. After the turn of the century though, the number of exits started to increase, especially in the 1920s and early 1930s. At the turn of the century, the industry was dominated by five banks: Nederlandsche-Handelmaatschappij, Twentsche Bank, Rotterdamsche Bank, Amsterdamsche Bank and Incasso Bank. Their total market share was

35 per cent in 1900, rose further to 48 percent in 1918, but fell down again to 38 per cent in 1928. In 1930, the number of exits overtook the number of entrants and the shakeout of the industry started. In 1940, the market share of the big five was up to 52 per cent (Kymmell, 1996). The declining trend in the number of firms decelerates in the 1970s. In the 1970s, there is a short increase of exit levels, after which the number of exists stabilizes at a low level. In 1993, there were 119 banks left, still a considerable number. By that time, the Dutch banking sector had evolved into an oligopoly dominated by three banks (ABN-AMRO, ING Group and Rabobank), which had a market share of 80 per cent (Van der Lugt, 1999; Bos, 2004).

Figure 2. The number of firms, entrants and exits in the Dutch banking sector, 1850-1993

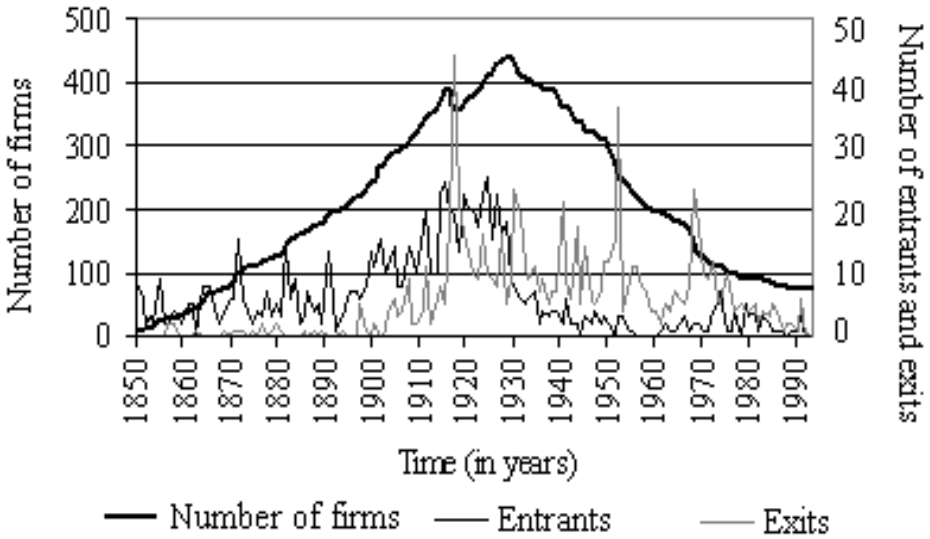
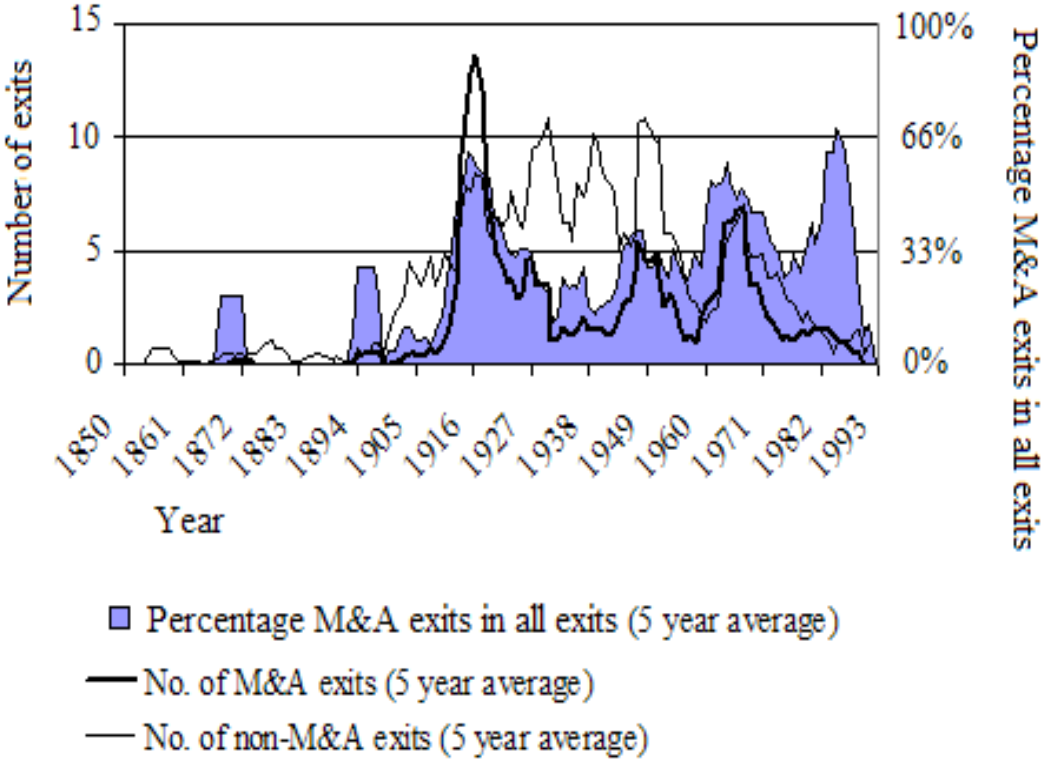


Figure 3 describes the number of exits due to M&A activity and their share in the total number of exits in the Dutch banking sector in the period 1850-1993. As explained earlier, about half of all exits were caused by mergers and acquisitions over the whole period, which is extremely high in comparison to other industries, like automobiles, where it is only 5 per cent. M&A activity was highest in the period 1914-1929, during which numerous small, mostly regional banks were taken over (Bosman, 1989). M&A activity slowed down after that, until a second wave of M&A occurred in the 1970s.

Figure 3. The number of M&A exits in the Dutch banking sector, 1850-1993



4. Spatial evolution of the Dutch banking sector

For all banks in the period 1850-1993, we have assigned their location (municipality) to one of the 40 labour markets (COROP regions) in the Netherlands. In the very exceptional case that a bank moved from one region to another, we assigned the bank to the region where it had been active for most of its time. In Figure 4, we have depicted the evolution of the number of Amsterdam-based banks and banks located outside the Amsterdam region for the period 1850-1993. In Figure 5, we show the share of the four most concentrated bank regions of the Netherlands (Amsterdam region, Rotterdam region, Utrecht region and The Hague region)[1] and the remaining part of the Netherlands in the national total for that same period.

Figure 4. Number of banks in and outside Amsterdam, 1850-1993

[1] Regions have been defined so-called COROP regions, which correspond to labour market areas in the Netherlands. For instance, COROP region Groot-Amsterdam includes the city of Amsterdam and surrounding municipalities like Aalsmeer, Amstelveen, Diemen, Edam-Volendam, Haarlemmermeer, Purmerend and Uithoorn.

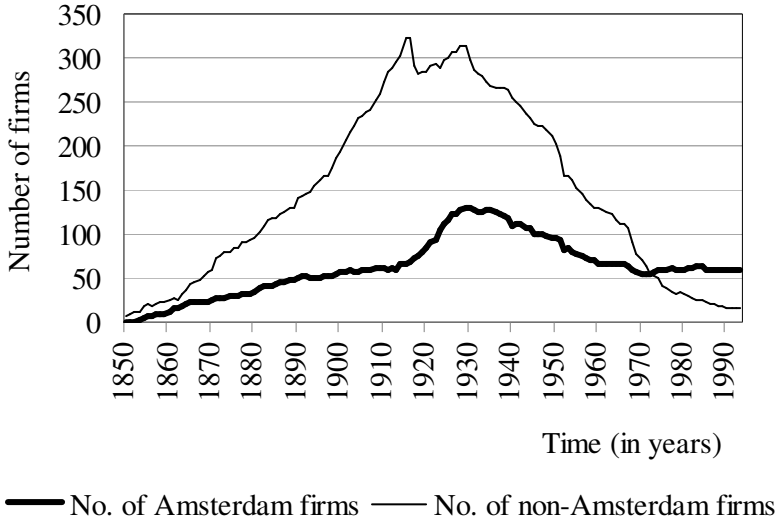
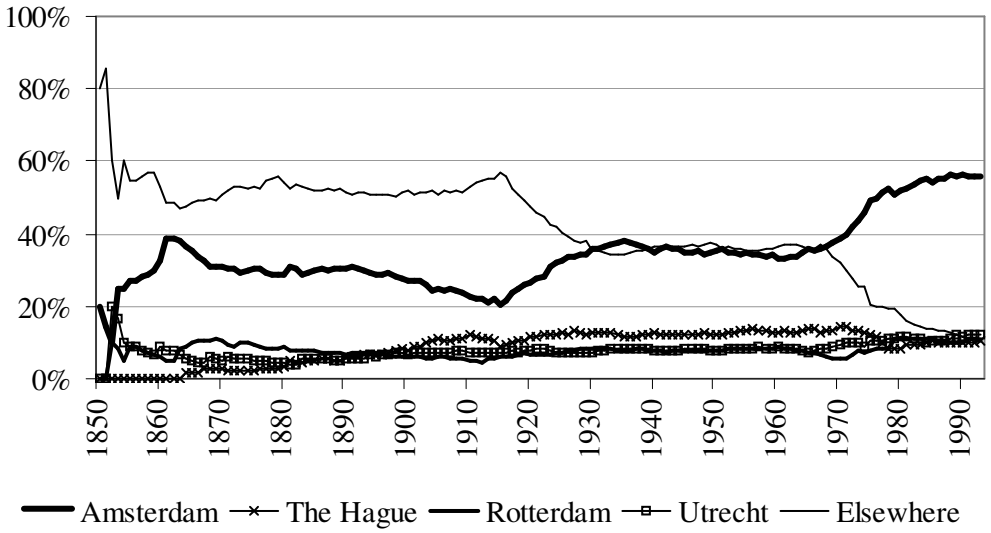


Figure 5. Shares of five regions in total number of Dutch banks, 1850-1993



As mentioned before, both figures include banks that entered only after 1850, so the findings in the first decade after 1850 should be treated with caution. Figure 4 shows a steady increase of the number of banks in the Amsterdam region. Around 1900, as mentioned before, the Dutch banking sector was dominated by five large banks, of which four were based in the Amsterdam region. The increase in the number of banks accelerated in the 1920s. After reaching a peak in 1930, a decline set in until the late 1950s, after which the number of banks stabilized at a level of about 60-80 banks till 1993. In relative terms, the share of the Amsterdam region in the total number of banks dropped from 38 per cent in the early 1860s to a mere 19,5 per cent in 1915. This was not so much caused by exits of banks located in Amsterdam, but by a relative increase of the shares of the Rotterdam region (in the late 1860s) and the Hague region (in the 1900s). This changed after 1915: 116 banks were founded in the Amsterdam region in a period of 15 years, which increased its share to almost 35 percent in 1930. This share stabilized for almost forty years, till foreign banks started to enter the Netherlands. In combination with exits that occurred mainly in the rest of the Netherlands, Amsterdam increased its share to around 56 percent in 1993. In terms of market share, the

concentration of bank activity around Amsterdam was much higher than that (Sluyterman et al., 1998).

5. Survival analysis

We employ a hazard model in order to determine which factors can explain the spatial evolution of the Dutch banking sector. More in particular, we will estimate survival time regressions to assess the effects of location (localization economies, being located in the Amsterdam cluster) and the pre-entry background of the entrepreneur (e.g. spinoffs) on the survival rates of banks, while controlling for other factors

Survival time regressions make use of the hazard function to estimate the relative risk of failure or hazard at each age of the firm (Klein and Moeschberg, 1997). In survival analysis, the dependent variable is the age of the firm. We would have preferred economic indicators like turnover or market shares, but these data are not available for each bank over such a long period. We could, however, determine the age of each bank based on the year of entry and the year of exit. Banks are treated as exits when they are taken over by another bank. Banks that continued to exist after 1993 have been handled as censored cases. In the hazard model, independent variables can be included to assess their effect on the hazard rate at each age of the bank. We have estimated regressions for 716 banks on which we had information on their year of entry and exit, their location, the pre-entry experience of the entrepreneur, and their M&A activity. The estimates are based on maximum likelihood. Since the proportional hazard assumption was not met, specifically for the variables Amsterdam and Locecon, we estimated the hazard model with the base-line hazard function following a Gompertz distribution, rather than using the standard semi-parametric Cox hazard model. Table 1 shows the results.

The first set of independent variables concerns the location of banks. The first variable takes up the effect of localization economies, which has been measured as the log of the number of banks in the region at the time of entry. The second variable estimates the cluster effect of the Amsterdam region. A dummy variable Amsterdam has been included to see whether being located in Amsterdam affects positively the survival of banks in the Amsterdam cluster. This is what we expect, since Amsterdam has not only a strong tradition in banking since the seventeenth century (Israel, 1995), but also increased its share in the Dutch banking sector in the twentieth century, as we showed before. In model 1, the estimations show that localization economies has a positive effect on the hazard rate, while the Amsterdam dummy has a negative effect. In other words, the more local banks are around in a region at the time of entry, the lower the survival rate of banks, but in the Amsterdam region, banks show a higher survival rate. So, the first results indicate that the Amsterdam region seems to matter, which is in line with claims made by large parts of the cluster literature[2].

[2] We also constructed a variable to assess the effect of urbanization economies, which captures all the effects of being located in an urban environment. We expected a positive effect on survival, since new banks may benefit from a big local market, among others. This has been measured as the log of the number of inhabitants per squared km. in the region at the time of entry. However, when including this variable into model 1, we run into multicollinearity problems, due to a high correlation with the variable localization economies. Therefore, we decided to leave out this variable in all estimations.

Table 1. Gompertz regression results (standard errors in parentheses).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Amsterdam	-0.570** (0.121)	-0.396** (0.122)	-0.122 (0.136)	0.006 (0.164)	0.152 (0.178)	0.262 (0.227)
Locecon	0.095* (0.045)	0. 126** (0.046)	0.018 (0.056)	0.012 (0.056)	0.010 (0.056)	0. 163* (0.080)
Spinoffs		-0. 606** (0.116)	-0.496** (0.117)	-0. 514** (0.118)	-0. 367** (0.136)	-0. 620** (0.202)
Experienced		-0. 827** (0.097)	-0.731** (0.097)	-0.734** (0.097)	-0.756** (0.098)	-0. 984** (0.139)
Foreign Banks		-1.501** (0.302)	-1.152** (0.310)	-1.106** (0.313)	-1.166** (0.313)	-1.792** (0.527)
Cohort 1			-0.512** (0.110)	-0.465** (0.120)	-0.462** (0.120)	-0. 727** (0.190)
Cohort 3			-0. 932** (0.149)	-0. 779** (0.196)	-0. 814** (0.197)	-0. 575* (0.267)
Amsterdam *Cohort1				-0.211 (0.203)	-0.266 (0.205)	-0.092 (0.283)
Amsterdam *Cohort 3				-0.351 (0.284)	-0.312 (0.284)	-0.327 (0.356)
Amsterdam *Spinoffs					-0. 395* (0.200)	-0.235 (0.266)
Constant	-3.705** (0.116)	-3. 306** (0.121)	-2. 892** (0.161)	-2.902** (0.162)	-2.916** (0.162)	-3. 799** (0.237)
Chi-square	25.17**	138.50**	194.09**	196.15**	200.04**	152.94**
-2LogLikelihood	2294.501	2181.16	2125.58	2123.52	2119.64	1535.92
No. observations	716	716	716	716	716	716
No. exits	609	609	609	609	609	320

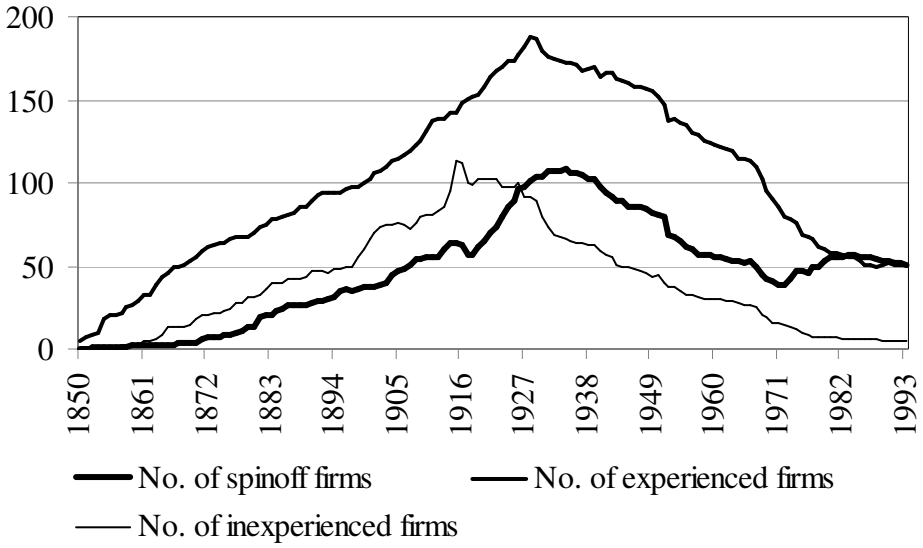
** Significant at the 0.01 level. * Significant at the 0.05 level.

-0.715**
(0.192)

The question is whether this cluster effect still holds when we include the effect of firm-specific features. Our second set of independent variables measures the effect of spinoff activity. Following other studies, this will be assessed by the pre-entry background of entrepreneurs. In Section 2, we explained that having a background in the same or related industries might increase the survival of new entrants. Following Klepper (2007), we distinguish between three types of banks. New entrants were classified as spinoffs when at least one of the founders had worked for or had founded a bank previously. When an entrepreneur had previous experience in several firms, the last firm he worked for was considered the parent of the spinoff. Some spinoffs had multiple founders that had worked for different firms. In that case, the parent of the spinoff was assigned to the founder that was described as the most influential in the new spinoff company. Of all 716 entrants that entered the banking sector in the period 1850-1993, 204 firms were defined as spinoff entrants. We

defined entrants as experienced firms when they had prior experience in related activities. Related activities have been defined as financial services in general. In the nineteenth century, these related activities concerned cashiers, bankers and stock-brokers (Kymmell, 1992). Cash could be obtained from a cashier, banker or stock-broker through the selling of not-due claims of bills of exchange and/or promissory notes, or through making a loan with securities or personal properties. None of these occupations had as their main activity the provision of credit (see for details, Boschma and Ledder, 2010). We counted a total of 288 experienced firms that entered banking activities in the period 1850-1993. These include both diversifiers and entrants that set up *de novo* banks founded by heads of firms in related activities. The third type of entrants concerns 224 inexperienced entrepreneurs with no prior experience in banking and related industries[3]. In Figure 6, the evolution of the number of the three types of banks are shown for the period 1850-1993.

Figure 6. Evolution of the accumulated number of the three types of banks, 1850-1993



Model 2 has included the dummy variables spinoffs and experienced firms, with inexperienced firms as the omitted reference category. Our hypotheses confirm our expectations: being a spinoff and an experienced bank has a negative and significant effect on the hazard rate. In other words, having a pre-entry entrepreneurial background in the same industry (banking) and related industries (financial services) increases the survival of banks. We also included a Foreign Bank dummy variable, because this might be considered a particular type of spinoff companies, whose survival (next to pre-entry learning) also depends on the strategy of the main headquarter located elsewhere. Our estimations show that foreign banks have lower hazards to exit: the coefficient for Foreign Bank is negative and significant. This may be due to the ability of foreign banks to rely on investment and experience from their home market. Interestingly, the findings concerning location have not changed in model

[3] For the 898 entrants with years of entry and exit known, we could find information on the pre-entry background of the founder for 736 banks. So, the group of entrants with an unknown entrepreneurial background (162 banks) is relatively small, in comparison to other survival studies. This group of entrants has been excluded from the analyses. We found that these had a shorter life span than the entrants with a known background. This makes sense, because one expects little information is available for banks that existed only a few years. On 3 of these 736 banks with a known entrepreneurial background, data on the year of exit were missing.

2. For instance, being located in the Amsterdam cluster still increases the survival of banks, even when controlling for the pre-entry background of entrepreneurs. So, the positive Amsterdam cluster effect remains, despite the fact that 53 per cent of all spinoffs located in the Amsterdam region (Table 2) and spinoffs perform better (as compared to inexperienced firms), and despite the fact that 80 per cent of all foreign banks located in the Amsterdam region and foreign banks performed better (as compared to domestic banks).

Table 2.Type of pre-entry background in Amsterdam and elsewhere

Type of background	No. of firms		Share of firms	
Spinoff	204		28.5%	
- in Amsterdam		108		52.9%
- elsewhere		96		47.1%
Experienced firm	288		40.2%	
- in Amsterdam		95		33.0%
- elsewhere		193		67.0%
Inexperienced firm	224		31.3%	
- in Amsterdam		34		15.2%
- elsewhere		190		84.8%
Total		716		100.0%

The third set of independent variables concerns time of entry which is included as control variable. According to Klepper (2007), early entrants in a new industry outperform late entrants because of weaker selection and lower entry barriers. Although we do not cover the whole industry life cycle, we also expect early entrants to have a lower hazard rate at every, because the banking sector was characterized by many small banks and low entry barriers in the second half of the nineteenth century. We have constructed three entry cohorts. The first cohort concerns 220 banks that have been assigned to the period 1850-1900. The second cohort concerns 377 banks that entered in the expansion period 1901-1929, during which scale economies grew in importance and entry barriers rose. The third cohort includes 136 firms that entered Dutch banking in the period 1930-1993.

In model 3 in Table 1, we have included dummy variables for cohort 1 and 3, with cohort 2 as the reference category. As expected, entrants in cohort 1 show lower hazards: its coefficient is highly significant with a negative sign. What is unexpected though is that the same result is found for entrants in cohort 3. Apparently, also late entrants show a higher survival rate, which is not in line with Klepper's model. What is also interesting is that the location variables are not significant anymore: the time of entry variables have taken over the effects of the Amsterdam cluster and localization economies. This is probably due to the effect of cohort 3, which correlates positively with the Amsterdam dummy (0.26), while cohort 1 has a negative (insignificant) correlation with Amsterdam of -0.06, as shown in the correlation matrix in the appendix.

In order to explore further the effects of time of entry particular to banks located in Amsterdam, we have included in model 4 of Table 1 two interaction variables between Amsterdam and time of entry. The coefficient of Amsterdam*Cohort1 is insignificant, while coefficient of Cohort1 remains significant and negative, which implies that Amsterdam firms did not experience different survival chances due to early entry. The same results apply to the variables Amsterdam*Cohort3 (insignificant effect) and Cohort 3 (negative significant

effect)[4]. In other words, the Amsterdam region attracted many late entrants (59 per cent of all entrants in cohort 3)[5] which showed higher survival rates in general, but late entrants in the Amsterdam region did not perform better, as compared to late entrants elsewhere in the Netherlands. The estimates for previously added variables in model 4 remain comparable to model 3. Time of entry and pre-entry entrepreneurial background remain important for survival, while localization economies and location in the Amsterdam region have no significant effect.

In model 5 of Table 1, we included another interaction variable between Amsterdam and spinoff background. The coefficient for Amsterdam*Spinoffs is significant and negative, while the variable Spinoffs remains significant and negative. These results indicate that not only do spinoffs outperform other types of entrants, but also that spinoffs in the Amsterdam cluster outperform other spinoffs located outside the Amsterdam region. Since spinoffs locate near their parent firm, these findings suggest that firms in Amsterdam generated better performing spinoffs, as compared to firms located elsewhere. Thus, the Amsterdam cluster did not only generate more spinoffs than any other region in the Netherlands, spinoffs in the Amsterdam cluster also performed better.

In our analysis thus far we considered firms to exit when acquired by a competitor. However, it may very well be that acquired firms are not necessarily acquired out of failure but out of success: better performing firms might be more attractive candidates for takeovers. To see whether considering acquisition as an exit event influenced our results, we estimated a new model in which we considered acquisition events as right-censored cases rather than failure events. As a result, the number of exit events is greatly diminished, from 609 to 320 events. Put differently, 55.3 per cent of our firms are now defined as right-censored cases, compared to 14.9 per cent in our earlier models. Model 6 in Table 1 presents the results. All previous findings remain the same, with two exceptions. First, the positive coefficient for Locecon turns significant again, similar to Model 1 and 2. It seems when we only include real failures as exits (excluding M&A exits), localization economies has a positive effect on the hazard to exit. Second, the interaction variable Amsterdam*Spinoffs is no longer significant. This implies that Amsterdam spinoffs only perform better when M&A is considered an exit event.

6. Merger and Acquisition Activity

In Section 2.3, we mentioned that M&A activity may contribute to the further spatial concentration of the Dutch banking industry. As we noticed before, M&A activity has been extremely intense in the banking sector, accounting for about half of all exits. We have not included this factor as an independent variable in the survival analysis, because M&A activity might be considered a post-entry event. If we would have included it, one runs into endogeneity problems, because it would remain unclear whether an acquisition increased the performance of a bank, or the other way around. Instead, we will test some hypotheses, in order to examine whether M&A activity might have contributed to the increasing concentration of banks in the Amsterdam region.

To begin with, we tested whether Amsterdam banks were disproportionally more active in taking over other banks in Amsterdam and elsewhere. Table 3 shows there is

[4] This latter result may also be due to the low variance on this interaction variable given the fact that 59 per cent of all entrants in cohort 3 located in the Amsterdam region.

[5] This figure was much lower for cohort 1 and cohort 2, of which the Amsterdam region attracted 29 and 26 per cent of all entrants respectively.

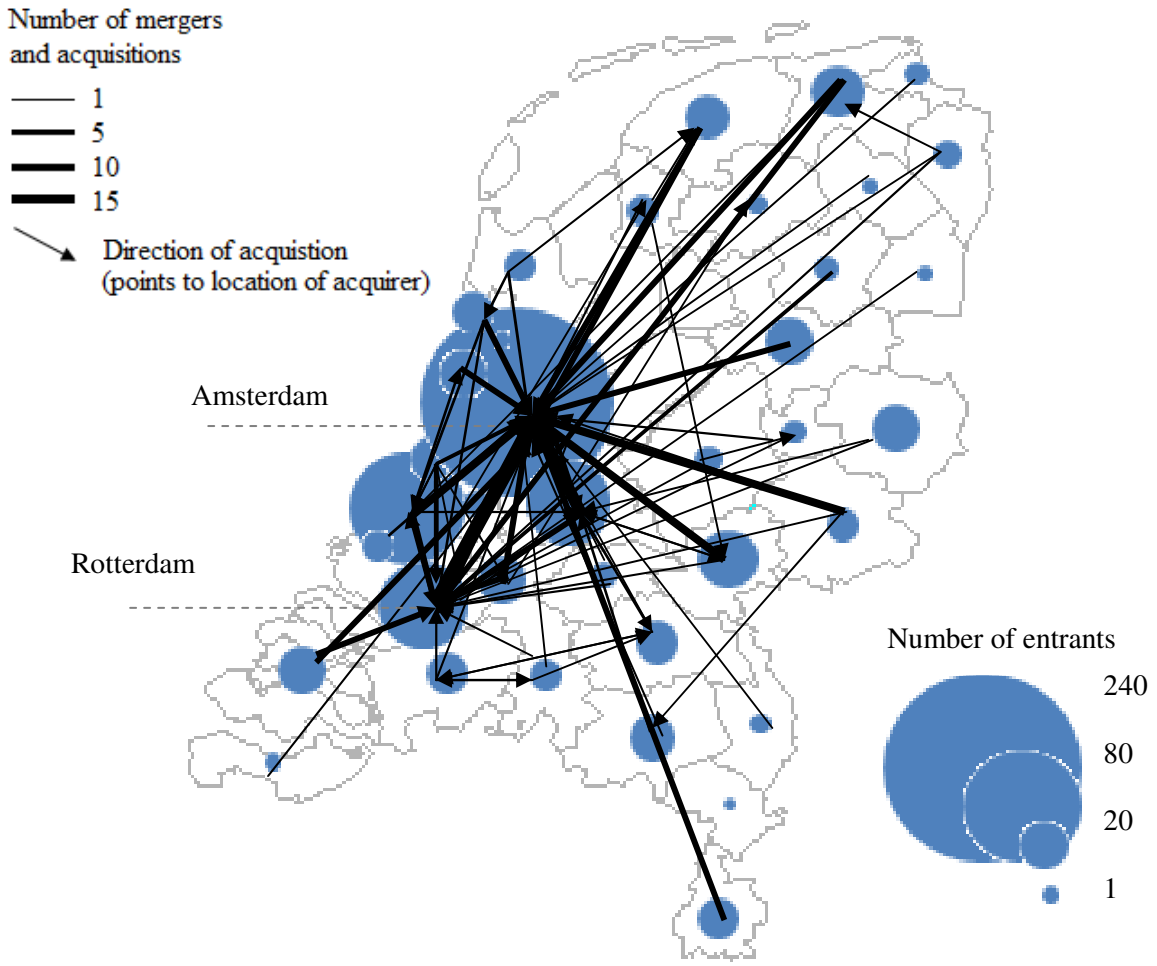
overwhelming evidence for this. First, we found that 59 per cent of all M&A's has been initiated by Amsterdam banks in the period 1850-1993, while only 33 per cent of all entrants located in the Amsterdam region during that period. Second, of all acquisitions done within a COROP-region in Dutch banking (that is, the acquired and the acquiring bank belonged to the same region), 65 per cent of those were done within the Amsterdam region. This finding confirms our expectation that cluster firms will have more opportunities to take over other local firms than non-cluster firms. However, having said that, most of the acquisitions by Amsterdam-firms (i.e. 76%) are acquisitions of other banks outside the Amsterdam region. Of all acquisitions crossing borders of COROP regions (i.e. the acquiring bank takes over a bank in another region), Amsterdam-based banks were again especially active: 55 per cent of those acquisitions had been initiated by Amsterdam banks during the period 1850-1993.

Table 3. Number and share of M&A according to different types of M&A

Type of M&A	No. of M&A cases		Share of M&A cases	
M&A within the region	62		21.4%	
- by Amsterdam firms		40		**64.5%**
- by other firms		22		35.5%
M&A between regions	228		78.6%	
- by Amsterdam firms		126		**55.3%**
- by other firms		102		44.7%
Total	290		100.0%	

These results are further illustrated in Figure 7 which shows the number of entrants in the 40 Dutch COROP regions and the number of M&A (as depicted by the thickness of acquisition links) between these regions in the period 1850 and 1993. We can see that M&A's were mainly executed by banks from the Amsterdam cluster. Also, it is clear that banks in more peripheral areas of the Netherlands were more likely to be victim, rather than initiator of acquisitions. Because of this disproportional amount of acquisitions by Amsterdam-based firms, it is plausible that M&A activity contributed to the further concentration of the banking sector in the Amsterdam cluster.

Figure 7. Spatial distribution mergers and acquisitions Dutch banking sector, 1850-1993.

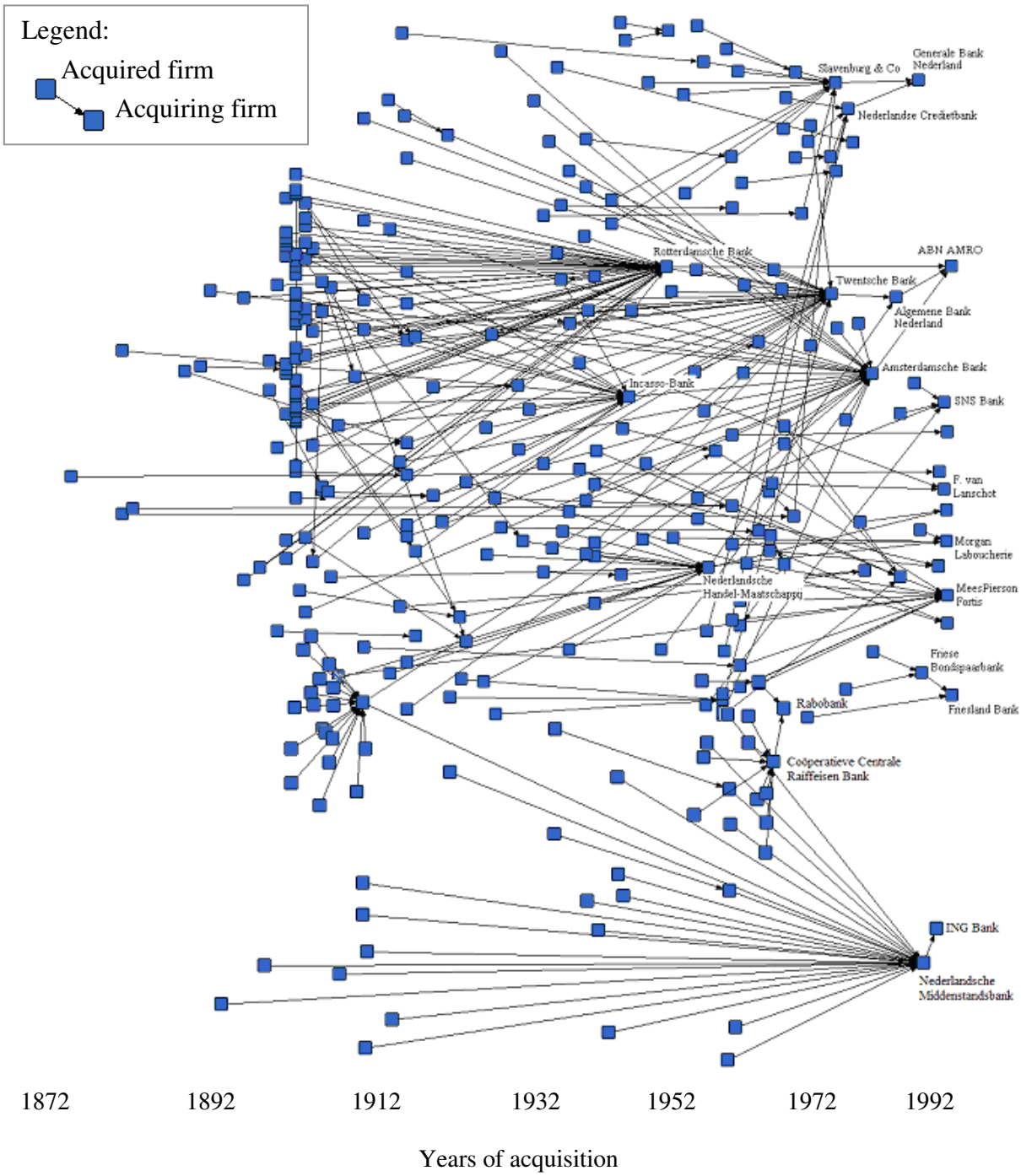


In addition to that, we tested the hypothesis whether a relatively low number of firms do most of the acquisitions in an industry, and whether that further contributed to the spatial clustering of that industry. This is expected because doing acquisitions makes banks stronger over time because they can exploit internal scale economies and gain access to knowledge of acquired banks, but also because they acquire experience in taking over other banks and how to handle that complex process. We found strong support for this hypothesis. When we rank each Dutch bank by the number of acquisitions in the period 1850-1993, the top seven was responsible for 57 per cent of all acquisitions in the Dutch banking sector, and six of these banks were located in the Amsterdam region. In Table 4, we have ranked the top five of Dutch banks that have been involved both directly (i.e. the number of banks a bank acquired) and indirectly (i.e. the number of banks that had been acquired by another bank before this latter bank was taken over) in the period 1850-1993. As Table 4 shows, the top three banks are all located in the Amsterdam region and have been responsible for 87 per cent of all M&A activities in our research period. This is illustrated more in detail in Figure 8.

Table 4. Top 5 banks in number of (direct and indirect) takeovers and their location

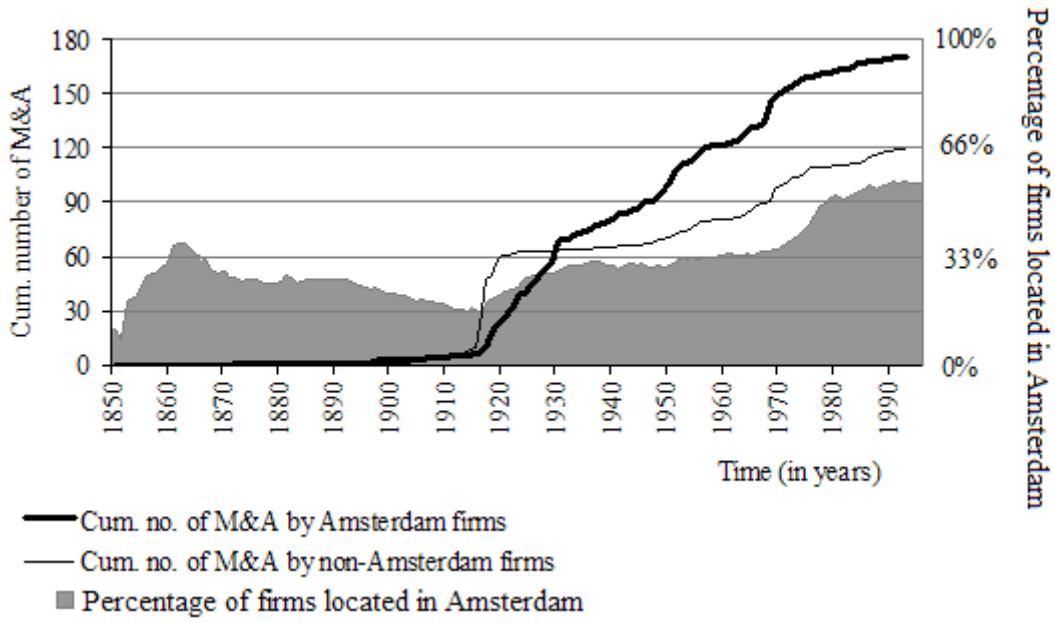
Rank	Name of bank	Share of M&A	Location
1	ABN AMRO	58.5%	Amsterdam
2	Fortis Nederland	15.7%	Amsterdam
3	ING Bank	12.5%	Amsterdam
4	Rabobank	3.0%	Utrecht
5	SNS Bank	1.2%	Utrecht

Figure 8. Mergers and acquisitions as a de-branching process in the Dutch banking sector



Last but not least, Figure 9 shows that the share of the Amsterdam cluster in the total number of Dutch banks increased rapidly since the 1970s, from 35 per cent to 56 per cent in the 1990s. This coincided with the increase of M&A activity undertaken by Amsterdam banks. Even though Amsterdam firms dominated M&A activity since the 1950s, they were especially active in the 1970s, as compared to banks located elsewhere. For all these reasons, it is plausible to state that M&A activity contributed to the further concentration of the banking sector in the Amsterdam region.

Figure 9. The number of M&A by Amsterdam and non-Amsterdam firms and the share of banks located in the Amsterdam region.



We also tested whether spinoffs and experienced banks were disproportionally more active in taking over other banks than inexperienced banks, since we expect, as explained in Section 2.3, that more successful firms do so. Table 5 shows the results. Our expectations are confirmed for experienced banks (but not for spinoffs): 67 per cent of all acquisitions is initiated by experienced firms which is high above their share of 40% in the total population of Dutch banks. Inexperienced banks are responsible for only 12 per cent of all acquisitions, while they comprise 31% of the total number of banks. In Section 2.3, we also stated that spinoffs and experienced banks are not acquired more often than inexperienced banks, because acquired firms are on average less successful than acquiring firms This is confirmed in the last column of Table 5.

Table 5. Share of firms by pre-entry background as acquiring or acquired firm of all 290 M&A

	Share in total number of firms	Share in total number of acquisitions as acquiring firm	Share in total number of acquisitions as acquired firm
Spinoff	28.5%	20.7%	23.5%
Experienced	40.2%	**67.0%**	42.8%
Inexperienced	31.3%	**12.3%**	33.7%
Total	100.0%	100.0%	100.0%

Interestingly, Table 5 shows that spinoffs are neither particularly active nor inactive in terms of number of acquisitions. Rather, spinoffs seem to aim for particular types of acquisitions. Table 6 shows the share in acquisitions in proportion to the share in total number of firms for each pre-entry background type. Figures larger than 1 indicate a disproproportionally high amount of M&A between firms with particular pre-entry backgrounds. Table 6 shows that spinoffs tend to favour disproportionally acquisitions of other spinoffs or experienced firms. By and large, M&A between banks with similar pre-entry backgrounds happened more often than could be expected from their relative shares. Indeed, experienced firms disproportionally acquire other experienced firms, and this is even more true for inexperienced banks acquiring other inexperienced banks. Not unexpectedly, Table 6 shows that inexperienced banks rarely take over spinoffs and experienced firms.

Table 6. M&A by background of acquiring and acquired firm.*

		Acquired firm		
		Spinoff	Experienced	Inexperienced
Acquirer	Spinoff	**1.25**	**1.31**	0.38
	Experienced	0.81	**1.13**	1.00
	Inexperienced	0.20	0.28	**2.65**

* This table shows the share of acquisitions of firms with particular backgrounds, divided by the share of the particular background in the total population of firms.

Finally, we tested whether cluster firms are acquired more often than non-cluster firms. Model 1 in Table 7 shows the results of a logistic regression that assesses the probability of a bank to be acquired. The coefficient of the dummy variable Amsterdam is significant and negative. This implies Amsterdam banks had a lower probability to be acquired by another bank. This confirms our earlier results that M&A played its part in shaping the geography of Dutch banking. In Model 2, we included variables relating to the pre-entry background of the entrepreneur, to see whether spinoffs, experienced firms and spinoffs from Amsterdam are significantly more targeted in M&A's. The results show no significant effects of these variables on the probability to be acquired by another firm.

Table 7. Logistic regression estimates
Dependent variable: probability of being acquired

Independent variable	Model 1	Model 2
Amsterdam	-1.159**	-0. 953**
	(0.179)	(0.222)
Spinoffs		0.185
		(0.255)
Experienced		0.150
		(0.186)
Foreign Banks		-0.585
		(0.455)
Amsterdam*Spinoffs		-0.562
		(0.393)
Constant	-0.038	-0.120
	(0.091)	(0.139)
LR Chi-square	45.94**	51.31**
-2 Log Likelihood	920.66	915.29

N	716	716

** Significant at the 0.01 level. * Significant at the 0.05 level.

5. Final remarks

This paper has made an attempt to describe and explain the spatial evolution of the banking industry in the Netherlands, and more in particular, the spatial clustering of Dutch banking in the Amsterdam region, for a period of almost 150 years. We found strong evidence that spinoff companies and experienced firms had a higher survival rate. This is in line with previous studies that attach importance to the pre-entry experience of entrepreneurs in the same industry (banking) and related industries (financial services). In addition, we found evidence that the clustering process in the Amsterdam region might have been caused by a high intensity of spinoff activity: Amsterdam banks did not only give birth to a disproportionally high number of spinoffs in the Amsterdam region, but these Amsterdam-based spinoff companies also performed better in the long run. And the Amsterdam region also attracted a disproportionally high number of foreign banks, which, in general, had higher survival rates than domestic banks.

We also found evidence that the banking sector showed an unprecedented high number of exits caused by M&A activity. This may provide an additional explanation for the spatial clustering of an industry that has not been taken up in existing studies. Our study could indeed demonstrate that Amsterdam banks were extremely active (disproportionally so) in taking over banks elsewhere in the Netherlands. More in particular, we could show that only a small number of banks were responsible for the lion share of all acquisitions, and these banks were almost without exception Amsterdam-based. This was especially true in the later part of the industry life cycle when the Amsterdam region rapidly increased its share in the Dutch banking industry. Based on these findings, it seems plausible that M&A activity contributed to the further spatial clustering of banking in the Amsterdam region in the twentieth century. In that respect, M&A activity delineates a lineage structure between firms that cross regional boundaries and lowers the number of firms in an industry over time. This is opposite to the lineage structure caused by the spinoff process which is mainly intra-regional and leads to an increasing number of firms over time, but which also adds to spatial clustering.

Our first estimates were in line with large parts of the cluster literature that would expect a positive effect of the Amsterdam cluster on survival. However, when including time of entry variables in the survival analysis, this cluster effect disappeared. Overall, these results tend to show that entry levels are affected positively in the Amsterdam cluster, but exits levels as well. In other words, the Amsterdam cluster attracted high numbers of entrants, but simultaneously, it was also a harsh environment for banks in general to survive. A key finding was that the Amsterdam region was able to attract a disproportionate number of spinoff companies and late entrants that performed relatively well in general. But we found weak evidence that Amsterdam-based spinoffs performed better than spinoffs located elsewhere, and no evidence that Amsterdam-based late entrants performed better than late entrants located elsewhere. Above all, Amsterdam-based banks were very successful in taking over other banks, both locally and non-locally. It is not unlikely that the Amsterdam location may have contributed to this disproportionate M&A activity, due to the local presence of services specialized in M&A and other financial organizations like the Dutch Central Bank.

This project opens up many research challenges. First of all, there is a need to replicate this study in other countries where banking is spatially concentrated, like the US (New York), the UK (London) and Germany (Frankfurt). In this context, one should also account for the internationalization of the banking sector, and how that has affected the evolution of the

Amsterdam banking cluster (see e.g. Engelen and Grote, 2009). Given the overall importance of M&A activity as driver of spatial clustering, future research should concentrate more on how routines are transferred from acquired to acquiring firm, because this has remained a black box in our study, due to a lack of data. This is likely to differ between firms, depending on their M&A strategy. For instance, it might be the case that M&A in banking is much less driven by getting access to successful routines of other firms, as in high-tech sectors, for instance, and much more by conquering market shares from competitors. And last but not least, it would also be interesting to include network effects on the performance of banks. Such a study could look at the evolution of interlocks between banks over time, and determine what are the main drivers (like geographical proximity) behind the network dynamics concerning interlocks. Interlocks between banks are also probably good predictors of which banks will be acquired by which bank, and therefore may affect the long-term survival of banks. Such an approach would include network dynamics in the study of the life cycle of clusters, which is a challenging topic by itself, and which would add to the explanatory framework that analyzes the spatial evolution of industries and the life cycle of clusters from an evolutionary perspective (Ter Wal and Boschma, 2010).

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Appendix

Table A1. Correlation Matrix of independent variables used in regression analysis

	Spinoff	Experienced	Foreign Banks	Amsterdam	Locecon	Cohort 1	Cohort 3
Spinoff	1,00						
Experienced	-0,52	1,00					
Foreign Banks	0,36	-0,19	1,00				
Amsterdam	0,27	0,00	0,15	1,00			
Locecon	0,26	-0,05	0,12	0,72	1,00		
Cohort 1	-0,15	0,12	-0,10	-0,06	-0,43	1,00	
Cohort 3	0,27	-0,02	0,29	0,26	0,29	-0,31	1,00