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# **Divergent resilience: the employment growth paths of Amsterdam and Rotterdam, 2000-2014**

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## **Abstract**

Amsterdam and Rotterdam have followed rather different trajectories after 1970 when deindustrialisation set in. Amsterdam benefited strongly from the growth in financial services, creative and cultural industries (CCIs) and tourism after 1990. Moreover, it has been quite successful in attracting highly skilled workers. Rotterdam, meanwhile, has fared less well. This has also become apparent after 2008, when employment growth in Amsterdam bounced back while that in Rotterdam stagnated. The Amsterdam economy, in other words, appears to be more resilient than that of Rotterdam.

Resilience is a complex concept and many potential explanations are on offer. In this paper, we focus on the role of the sectoral composition in explaining the divergent growth paths of Amsterdam and Rotterdam using a shift-share analysis of employment data over the period 2000-2014 as a strategic window. This is a first explorative step to a more comprehensive understanding of these cities' growth paths.

*Keywords: resilience; sectoral composition; employment; shift-share analysis; growth path*

## **1 Introduction**

According to Mark D'Eramo [1: 85] “[t]he contrast between the two port cities of Amsterdam and Rotterdam, less than half an hour apart, could hardly be more dramatic”. He focuses on the strikingly different urban landscapes of both cities – Amsterdam with its dense and functionally mixed urban environment and

Rotterdam characterised by high-rise towers and broad avenues – and points at how they were shaped by port activities. Pre-industrial marine technology in the case of Amsterdam and industrial/container technology in the case of Rotterdam. It is not just the built environment that sets these two cities, with more or less comparable numbers of inhabitants (in 2014, Amsterdam had 811,000 and Rotterdam 618,000 inhabitants [2]), within commuting distance, and part of the same national institutional framework, apart. Amsterdam and Rotterdam also have followed rather different trajectories of development, notably after 1970 when deindustrialisation set in. Amsterdam, historically the financial and cultural capital of the Netherlands, benefited strongly from the growth in financial services, creative and cultural industries (CCIs) and tourism after 1990 [3, 4]. Rotterdam, has, on the whole, fared less well and still seems to struggle with the aftermath of industrial decline and the large-scale automation of ship-handling (based on containers) which has resulted in significant job losses. Amsterdam has been much more successful in attracting and retaining highly educated workers than Rotterdam [5: 41] thereby creating a virtuous circle with urban amenities (such as shops, restaurants, cafés, and galleries) making the city even more attractive.

Below, we will explore how the two cities have fared with respect to their employment growth paths. We will compare the overall and the sectoral development of the number of jobs both before and after the outbreak of the credit crisis in 2008. We will examine the responses to the external shock of the credit crisis thereby assessing the resilience of the two urban economies. Resilience in our view refers “to the ability of a region to accommodate shocks” but also to “the ability of regions to reconfigure their socio-economic and institutional structures to develop new growth paths” [6: 734]. The concept of resilience is useful when analysing how the shock of the credit crisis has influenced the developmental trajectories of both cities [7].

*Diversity* figures prominently among the factors which have been proposed to explain differences in resilience [6–9]. We address the question if and to which extent the sectoral composition can explain differences in economic resilience between Amsterdam and Rotterdam. To do so, we use a shift-share analysis which enables us to distinguish the impact on the urban employment growth paths of (1) factors related to the national developments; (2) those related to the sectoral composition or industrial mix; and (3) those that are first and foremost local.

We first discuss the methodology and the data (Section 2). After that, we present the pre-shock and post-shock employment growth paths of both cities as well as a breakdown of the sectoral composition (Section 3). We then go into the results of the shift-share analysis (Section 4). We conclude by pointing at potential explanations for the observed patterns (Section 5).

## 2 Methodology and data

We apply a twofold approach to analyse the development of employment and sectoral composition in Amsterdam and Rotterdam. First, we analyse sectoral composition in terms of the employment shares of different sectors as well as location quotients. This will show for each of the two cities which are the main economic sectors, but also which sectors are overrepresented or underrepresented. Second, we use a shift-share analysis [10]. This allows us to disentangle the growth or decline of employment into three components:

- 1) national growth (NG) or national share: the growth that can be attributed to the national factors such as interest rates and national demographics and policies;
- 2) industrial mix (IM): the growth that may be attributed to a city's specific economic composition and specialisation; and
- 3) regional share (RS) or competitive effect: the growth that may be attributed to region-specific factors, such as accessibility, agglomeration economies and quality of life.

For each city, these factors can be distinguished on a city level as well as for specific sectors. The sum of the three components equals the shift, i.e. the total employment growth in a city or sector. Together, these methods provide more detailed insights in the underlying trends shaping the employment growth paths of the two cities. However, it must be stressed that a shift-share analysis in itself does not offer explanations.

For the analyses we used data on the employment ("All jobs of employees in the Netherlands, in practice all jobs that fall under the Dutch wage tax legislation. Jobs of Dutch people working abroad are excluded, jobs of foreigners working in the Netherlands are included. There are no restrictions based on age or weekly working hours. Jobs of self-employed workers are excluded" [2]) for each sector in Amsterdam and Rotterdam, as well as for the Netherlands as a whole. Data is classified according to the Dutch Standaard Bedrijfsindeling (SBI), which follows the international SIC and NACE classifications. Data covered the period from 2000 to 2014 [2].

Two issues should be noted regarding these data. First, due to discontinuities in the way data have been collected, it is virtually impossible to construct consistent time series broken down by sector for the entire period:

- 1) a change in the method of data collection. Before 2006 data were collected by means of the yearly questionnaire on employment and payment (EWL), but starting from 2006 they were obtained from the social security registration (UWV), which was based on a slightly different definition. This leads to overall somewhat higher employment figures; and
- 2) a change in classification. In 2008, the SBI 2008 classification replaced the SBI'93 classification used until then. This reflected a similar change in the international NACE classification.

Given only slight differences, it is safe to assume that the 2006 change in data collection method did not significantly affect the relative economic composition in terms of sectors' shares. This implies that calculations based on individual

years (e.g. location quotient) were only affected by the 2008 change in SBI classification. Fortunately from the perspective of our analysis, this change coincides with the economic crisis, making it still possible to analyse 'before' and 'after' the crisis, which would also correspond to the maximum interval advised for shift-share analysis [11]. Due to the changes in 2006, however, three periods had to be distinguished regarding the shift and share analysis: 2000-2005, 2006-2008 and 2008-2014.

Second, data on several specific sectors was classified as 'confidential'. The total employment in these sectors is known, just not the size of the individual sectors. As this concerned only sectors which are quite small in both cities (e.g. agriculture, mining and energy production), we decided to group these sectors; this entails sectors A-C and E for SBI'93 and A, B, D and E for SBI 2008.

### **3 Analysis**

#### **3.1 Employment**

Between 2000 and 2014, employment in Amsterdam grew from around 470,000 jobs to nearly 570,000 or with about 21 per cent. The growth path of Rotterdam is less steep with 330,000 in 2000 to nearly 370,000 in 2014 or some 12 per cent (Figure 1). These percentages are around 8 to 10 per cent point less if we account for the aforementioned change in definitions, but the difference remains the same. Resilience is about the ability of a city or a region to bounce back and return to its former growth path after a shock. Figure 2 shows the employment growth paths in both cities and the Netherlands (base year 2008). The pre-shock growth paths of Amsterdam and Rotterdam (and the nation as whole) are quite similar with a slightly steeper increase of employment in Rotterdam compared to Amsterdam. After the financial crisis broke out in 2008, however, a striking divergence occurred: Amsterdam displayed a strong growth of employment whereas Rotterdam showed a stagnation. The growth paths of the two cities, then, embody empirically the two contrasting cases theoretically distinguished by Martin and Sunley [7: 22] of a city which "did not return to its previous growth path, emerges from the shock on a lower growth trajectory" and a city where the shock had the effect of "propelling the region on a recovery trajectory that is much more favourable than the region's pre-shock growth trend: its economic base emerges from the shock with a greater growth potential." Below, we will attempt to disentangle the effects of the sectoral composition from more city-specific factors on these diverging growth paths.

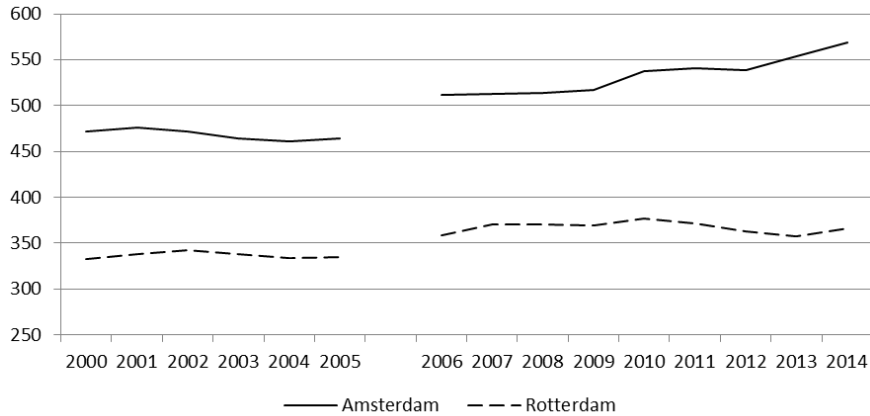


Figure 1: Employment trends, Amsterdam and Rotterdam, 2000-2014 (break due to definition change in 2006).

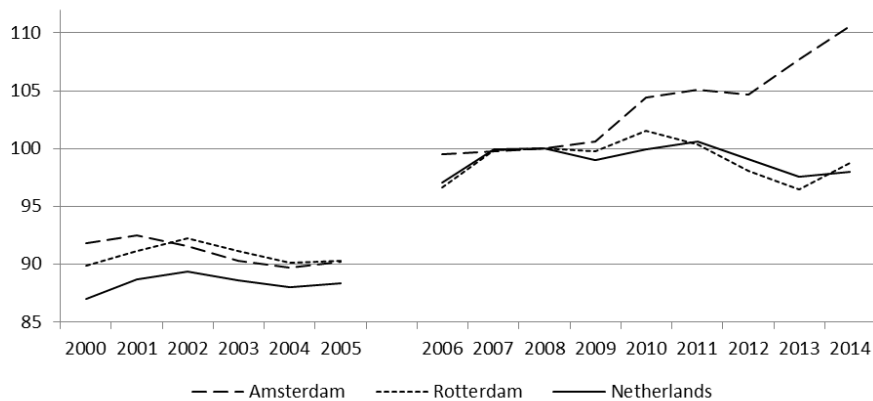


Figure 2: Development of employment (index: 2008=100. Break due to definition change in 2006).

### 3.2 Sectoral composition

Figure 3 shows the sectoral composition of Amsterdam and Rotterdam in 2008. Both cities are dominated by service activities, but Rotterdam shows a relative specialization in manufacturing and transport, due to its seaport which is largely included within its municipality boundaries (in contrast to Schiphol Airport, which is located outside Amsterdam). It also has a slightly larger employment share for healthcare. In contrast, Amsterdam has higher shares of tourism, IT and financial and business services.

The picture becomes somewhat more nuanced, but not very different, if we consider location quotients (Table 1 and Table 2). These show the overrepresentation or underrepresentation of sectors compared to the national average. Financial services are particularly strong, relatively, in Amsterdam, but they are overrepresented in Rotterdam as well. The same is true to a lesser extent for business services and culture, sports and recreation, reflecting the fact that while Amsterdam has a stronger service, cultural and knowledge economy than Rotterdam, the latter still has service dominated large-city economy.

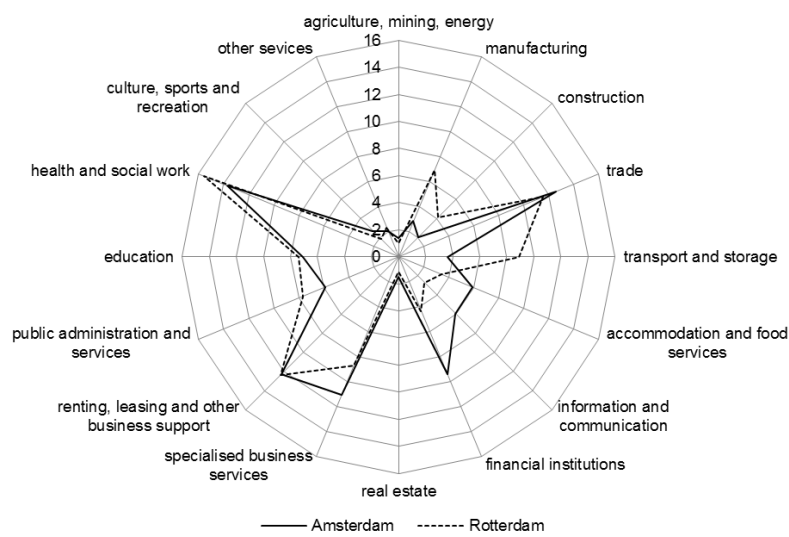


Figure 3: Sectoral composition (percentage of total employment) in 2008.

Table 1: Sectoral composition location quotients for Amsterdam and Rotterdam, 2000-2008.

SBI'93	Sector description	Amsterdam		Rotterdam	
		2000	2008	2000	2008
A-C; E	Agriculture, mining, electricity, gas and water supply	0.32	0.21	0.53	0.42
D	Manufacturing	0.39	0.44	0.65	0.69
F	Construction	0.45	0.39	0.75	0.81
G	Trade	0.80	0.76	0.76	0.70
H	Hotels and restaurants	1.55	1.48	0.91	0.86
I	Transport and communication	1.13	0.89	1.76	1.70
J	Financial intermediation	2.70	2.35	1.44	1.18
K	Business activities	1.41	1.34	1.25	1.17
L	Public administration	1.04	0.92	0.99	1.21
M	Education	1.01	1.07	1.12	1.12
N	Health and welfare	0.90	0.89	1.03	1.00
O	Culture and other services	1.45	1.55	0.99	1.12
Total		1.00	1.00	1.00	1.00

Table 2: Sectoral composition location quotients for Amsterdam and Rotterdam, 2008-2014.

SBI 2008	Sector description	Amsterdam		Rotterdam	
		2008	2014	2008	2014
A-B, E-D	Agriculture, mining, energy and water supply, waste management	0.66	0.53	0.50	0.79
C	Manufacturing	0.28	0.23	0.68	0.63
F	Construction	0.41	0.40	0.82	0.97
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	0.76	0.74	0.70	0.73
H	Transportation and storage	0.74	0.62	1.81	1.93
I	Accommodation and food service activities	1.48	1.53	0.86	0.90
J	Information and communication	1.94	2.21	0.88	0.76
K	Financial institutions	2.73	2.67	1.26	1.12
L	Renting, buying and selling of real estate	1.56	1.55	1.11	1.15
M	Consultancy, research and other specialised business services	1.64	1.71	1.29	1.17
N	Renting and leasing of tangible goods and other business support services	1.12	1.35	1.12	1.18
O	Public administration, public services and compulsory social security	0.93	0.85	1.22	1.21
P	Education	1.06	0.95	1.11	1.08
Q	Human health and social work activities	0.89	0.82	1.01	1.01
R	Culture, sports and recreation	1.64	1.50	1.11	1.22
S	Other service activities	1.08	1.10	1.24	0.69
Total		1.00	1.00	1.00	1.00

### 3.3 Shift-share analysis

We have calculated the contributions of the different components to the employment growth paths using shift-share analysis for each city as a whole and their individual sectors for a pre-shock (2000-2005) and a post-shock period (2008-2014).

The National Growth (NG) component was positive for both cities in the pre-shock period. In Amsterdam this component contributed 7,176 and in Rotterdam 5,060 to the overall employment trend between 2000 and 2005 (see Table 3). The contribution of the sectoral composition or Industrial Mix (IM) was also positive, respectively 7,753 for Amsterdam and 3,552 for Rotterdam. The contribution of the specific urban factors, the Regional Share (RS), however, was for both cities negative, with -23,070 for Amsterdam and -6,962 for Rotterdam. The overall result was a slight decline of employment in Amsterdam (-8,140), whereas the national and industrial mix factors more than compensated for the negative local impact in Rotterdam with a net growth of 1,650. Broken down by sectors, Amsterdam shows almost across the board negative Regional Shares. In Rotterdam, manufacturing, construction and public administration show positive Regional Shares (see Table 3). This confirms the earlier observation that



Rotterdam was doing slightly better in terms of its pre-shock employment growth path than Amsterdam.

Table 4 shows a break-down of the growth paths of the two cities into three components for the post-shock period 2008-2014. In marked contrast to the pre-shock period, we find negative National Growth components regarding the overall employment trend for both cities, respectively -10,224 for Amsterdam and -7,364 for Rotterdam thus reflecting the deep and prolonged recession on a national level after 2008. The impact of the Industrial Mix (IM) is positive in Amsterdam with 2,227 and slightly negative in Rotterdam with -175. The big surprise can be found in the contribution of local factors. The calculated effect of the Regional Shares (RS) in Amsterdam stands at a staggering 62,526, amply compensating for the negative impact of the national factors and resulting in a net growth of 54,530. The picture for Rotterdam is rather different with a much smaller Regional Share of 3,059 which falls short of the loss due to national factors and resulting in a net loss of employment of 4,480.

We can observe a negative IM component for sectors that have been especially hard hit by the crisis, such as construction, finance and other business services (which include e.g. advertisement and consultancy, but also sectors directly related to construction and finance, such as architecture and legal services). The IM component is positive for healthcare and, in Amsterdam, accommodation and food services, i.e. tourism. Remarkably, however, is the strong regional share RS in Amsterdam, which adds to positive IM components and mitigates the effect of negative ones in the above sectors. This is in sharp contrast to Rotterdam, where RS components are all relatively small (even taking into account the smaller size of the local economy) and partly negative. For several sectors they are in fact more negative than IM components.

Table 3: Shift-share analysis 2000-2005.

	Amsterdam				Rotterdam			
	NG	IM	RS	Shift	NG	IM	RS	Shift
SBI'93								
A-C; E	50	-382	113	-220	57	-439	-1,098	-1,480
D	387	-3,627	-2,210	-5,450	458	-4,292	1,164	-2,670
F	189	-1,222	-837	-1,870	225	-1,456	1,171	-60
G	993	-3,327	-3,215	-5,550	669	-2,242	-3,377	-4,950
H	411	-294	-587	-470	171	-122	-389	-340
I	532	-2,600	-4,643	-6,710	586	-2,860	154	-2,120
J	748	-2,048	21	-1,280	281	-771	-1,160	-1,650
K	1,640	5,215	-4,455	2,400	1,029	3,273	-3,642	660
L	527	561	-2,908	-1,820	353	375	1,612	2,340
M	449	2,656	-1,405	1,700	351	2,076	-417	2,010
N	854	11,824	-1,698	10,980	688	9,527	-55	10,160
O	398	998	-1,245	150	192	482	-924	-250
Total	7,176	7,753	-23,070	-8,140	5,060	3,552	-6,962	1,650

Table 4: Shift-share analysis 2008-2014.

SBI 2008	Amsterdam				Rotterdam			
	NG	IM	RS	Shift	NG	IM	RS	Shift
A-B, E-D	-140	281	-721	-580	-76	151	2,384	2,460
C	-292	-1,054	-773	-2,120	-513	-1,851	-1,446	-3,810
F	-210	-2,275	755	-1,730	-303	-3,279	2,292	-1,290
G	-1,289	925	6,463	6,100	-852	612	2,100	1,860
H	-372	-702	-986	-2,060	-654	-1,237	2,281	390
I	-603	4,425	5,768	9,590	-254	1,866	648	2,260
J	-606	-26	8,572	7,940	-199	-8	-1,312	-1,520
K	-964	-4,282	4,425	-820	-321	-1,426	-1,503	-3,250
L	-154	-846	819	-180	-79	-435	134	-380
M	-1,131	-3,261	9,182	4,790	-640	-1,846	-2,375	-4,860
N	-1,258	1,927	23,120	23,790	-910	1,394	2,626	3,110
O	-598	1,206	1,262	1,870	-565	1,140	-5	570
P	-723	-421	424	-720	-546	-318	-496	-1,360
Q	-1,404	7,142	2,432	8,170	-1,146	5,831	335	5,020
R	-274	284	440	450	-134	139	705	710
S	-207	-1,096	1,343	40	-172	-908	-3,311	-4,390
Total	-10,224	2,227	62,526	54,530	-7,364	-175	3,059	-4,480

A closer look at the different sectors reveals marked differences between Amsterdam and Rotterdam with respect to the IM and RG components, i.e. between the growth based on sectoral economic composition and that based on regional competitiveness. In the period 2000-2005 the overall regional share is negative in both cities, especially in Amsterdam. The IM component is positive, but whereas Amsterdam has an advantage here it is not sufficient to compensate for the negative RS component. After the shock of the outbreak of the credit crisis, we observe a negative IM component for sectors that have been especially hard hit by the crisis, such as construction, finance and other business services (which include e.g. advertisement and consultancy, but also sectors directly related to construction and finance, such as architecture and legal services). The IM component is quite positive for healthcare and, in Amsterdam, accommodation and food services, i.e. tourism. Amsterdam clearly outperforms Rotterdam in almost every single sector when it comes to the contribution of local factors (see Figure 4).

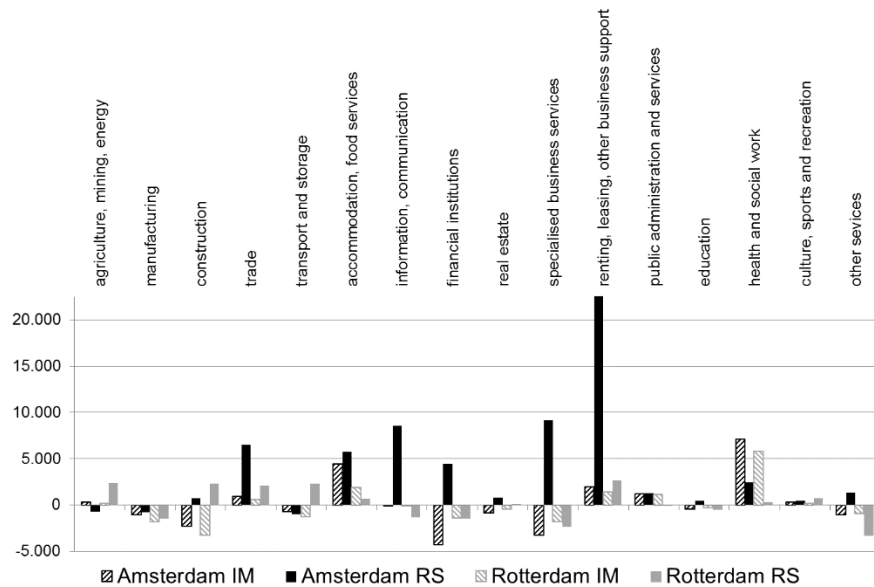


Figure 4: Industrial mix (IM) and regional share (RS) components, 2008-2014.

#### 4 Divergent growth paths

Our findings indicate that, in terms of employment, the Amsterdam economy is recovering much faster than that of Rotterdam after the 2008 crisis, and has bounced back far beyond its pre-crisis level. Our results also suggest that this divergence cannot be primarily explained by the differences in sectoral composition. Whereas Amsterdam indeed has a slight advantage over Rotterdam in terms of its industry mix or sectoral composition, this effect is smaller than before 2008, and is dwarfed by the much larger contribution of specific local factors to employment growth. It appears, as our shift-share analysis shows, that particularly city-specific factors play a decisive role in the strong recovery of the city after 2008. This is in line with recent findings of Martin *et al* [13] for the UK.

Shift-share analysis has its limitations. It considers employment change over one specific time interval, and focuses on the city as a self-sufficient system that does not depend on the development of other regions [12]. In addition, the analysis is dependent on the delineation of its principal building blocks, the sectors, and cannot provide insights in intra-sectoral trends within subsectors (or within the firms). Nonetheless, the employment trends we have identified seem very clear with Amsterdam and Rotterdam more or less displaying similar growth paths before the credit crisis and strongly different trajectories after that with Amsterdam showing a much stronger performance both when compared to its own pre-shock path and to Rotterdam's post-shock growth path.

However, another limitation of the method applied is that while we can quantify the various components of employment growth, our analysis does not provide an explanation of what they actually entail. To explain why Amsterdam has been able to enter a post-shock new growth path, displaying thereby a more fundamental type of resilience, we have to look beyond the shift-share analysis. According to Boschma [6: 735], a new growth path is based on the “ability to adapt and reconfigure their industrial, technological and institutional structures in an economic system that is restless and evolving” At this stage, we can only speculate on what might constitute these emerging structures. We offer a few suggestions which are analytically distinct but which in reality may be interrelated and/or overlap. Urban economies do not change overnight but tend to move along path-dependent trajectories, so we have to look first at the existing strengths of Amsterdam and how they might be recombined to create new structures.

First, it may be that significant shifts have occurred within the sectors. It might be, for instance, that the broader delineation of the sectoral composition hides rapidly expanding subsectors. Secondly, it may be that on a firm level, new strategies with respect to markets, products and ways of production have been developed. Third, Amsterdam may offer a very suitable environment for foreign firms given its quality of place [5, 14] and its combination of amenities and a large pool of highly educated workers with a cosmopolitan outlook.

Our findings are only the starting point for further research that should reveal the factors behind the observed patterns. A more extensive analysis of the factors behind the divergent trajectories of the two largest Dutch cities and, more specifically, of the underlying drivers of Amsterdam’s new growth path is high on our agenda.

## Acknowledgements

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