Agglomeration Effects and Financial Performance

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Forthcoming in Urban Studies

This study empirically tests the tradeoff between the costs and benefits of agglomeration for a large sample of firms. In line with the existing literature, we find that population and employment density benefit productivity but increase labor and real estate costs. To test the tradeoff of benefits and drawbacks of agglomeration, we focus our analysis on the relation between agglomeration and profitability. For a sample of single-establishment Dutch firms, we find that on average the costs of settling in an area with a dense spatial distribution of employment outweigh the benefits; an effect that holds for both urbanization and localization measures. In general, doubling the employment density will decrease the average return on assets by more than one percentage point.

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1. Introduction

The impact of agglomeration on productivity is of central importance to the economy and has been extensively researched. Extant studies find, in general, that density has a positive influence on total factor productivity to compensate for an increase in costs.[1] However, while productivity is an important feature of agglomeration it is not the primary element firms in competitive industries aim at. A positive relation between productivity and density should not drive location choice if the drawbacks of agglomeration more than eliminate the advantages of higher total factor productivity. The elimination of this advantage is not imaginary, as density generally increases real estate costs and wages (Glaeser and Mare, 2001), which are the two main operating costs of companies (Brounen and Eichholtz, 2005). This paper empirically tests the tradeoff between the costs and benefits of agglomeration. Since these are not limited to land rent, wages, and productivity, we need a variable that measures the net effect of costs and benefits. This measure is a firm's profitability. Therefore, the focus of this study is on the relation between density and profitability.[2]

According to the well-known concept of spatial equilibrium there should be no positive or negative relation between density and profitability. Higher (lower) profitability in denser areas should attract (distract) companies to (from) these areas until equilibrium is restored. However, the presence of amenities that enrich the life of firms' decision makers is likely to result in decisions that are not solely focused on maximizing a firm's profits. Especially for firms where decision makers need to live close to their business, practical and behavioral reasons exist why firms locate in areas that are not financially optimal. For example, Glaeser (2007) argues that moving costs and spatial preferences of the CEOs result in non-perfect profit maximalization at the firm level. We therefore treat the relation between density and financial performance as an empirical question.

Ideally, a test of this relation exclusively incorporates single-establishment firms. In these firms, the decision makers are generally physically present at the firm's location. Also, examining single-establishment firms excludes the effect of firms that are located in various areas with different density levels: the performance of these firms cannot be attributed solely to the density of the headquarters location. By exploiting a database with information on firms' locations and their financial performance, we are the first to empirically test the tradeoff between the costs and benefits of agglomeration for single-establishment firms.

Our country of analysis is the Netherlands. Several reasons make this country an interesting basis for analysis. First, the Netherlands ranks high in population density when compared to other countries in the world. Bangladesh and Taiwan are the only countries with a population above ten million that show higher population density. Despite the high overall population density there is a large dispersion of urbanization across the Netherlands. Consequently, urbanization differences are an important factor in settlement choices for Dutch firms. A second factor that makes the Netherlands an interesting market for analysis is the availability of unique and very detailed information on both the company and the geographic level. The company data set comprises financial information of a large number of private companies, which facilitates a wide analysis of the potential effects. Detailed geographic information originates from the Dutch Central

Bureau of Statistics and includes employment, land use, and land area information on two levels of geographic aggregation.

Our sample consists of 13,161 privately owned firms for which financial information is available.[3] Regarding the relations between agglomeration and productivity, we corroborate results of other papers (e.g., Ciccone and Hall, 1996; Ciccone, 2002): density and productivity are positively related. Doubling the density increases the turnover per employee on average with 6.0% for firms included in our sample. We further find evidence that the labor costs per employee and land costs rise with density. More specifically, we find the labor costs per employee to rise with 6.3% when the population density doubles, while land costs increase with 42.0% for a doubling of the population density.

Productivity, wages, and land costs are not the only three factors that relate to density. Other benefits and costs include insurance costs, transportation costs, and labor availability. To examine the combined effect of these benefits and costs, we focus on a firm's profitability, as measured by the five-year average of a firm's return on assets. We make the distinction between effects related to urbanization (density of general economic activity) and localization (density of industry specific employment).

For urbanization, we find that density has a negative effect on firms' profitability. For Corop areas, which are equal to EuroStat's Nuts 3 regions, a doubling of the employment density will decrease the average return on assets by more than one percentage point. The same goes for density measures that focus on the number of inhabitants or addresses in an area. The negative relation between density and performance is also present in an analysis on the municipality level, although with lower coefficients and significance levels.

We test the effect of localization by examining industry-related effects. We find significantly negative effects between density and performance for firms in the 'construction' and 'wholesale and trade' industry. For other industries we also find negative signs, but the relations are not statistically significant at the 5% confidence level.

We further examine whether the presence of amenities that enrich the life of firms' decision makers is likely to result in decisions that are not solely focused on maximizing a firm's profits. If entrepreneurs balance their firms' profitability and the general quality of life, we expect that firms in municipalities with a high liveability score have a lower average profitability than firms in municipalities with a low score. We find that the relation between a liveability index and firm performance is indeed significantly negative, indicating that the living preferences of owners provides one potential explanation for our findings. The negative relation between liveability scores and performance also explains why our results can pertain over time.

Our paper contributes to the literature by combining empirical tests of the costs and benefits of agglomeration. Given that the majority of prior work deals with the relation between density and productivity – a relation which is generally found to be positive – the positive effects of agglomeration are overrepresented in the literature. By incorporating potential costs of agglomeration in our tests, we show that the net effect of settling in high density areas is on average negative. These findings potentially explain recent trends of deconcentration of employment (Carlino and Chatterjee, 2001). However, we stress that our test is based on an examination of single-establishment firms. For firms with multiple establishments, like virtually every public firm, and knowledge intensive industries the choice of (headquarter) location might strongly depend on prestige and skilled labor availability. Also, our results are based on one country, and this country has a high density, but is relatively small. Most firms in rural areas in the Netherlands are still within a one hour drive from a large city. Further research is necessary to examine the relation between agglomeration and firm performance in larger countries.

The remainder of this paper is organized as follows. We start with a description of the agglomeration literature in Section 2. Section 3 provides a description of our data. In Section 4 we examine the benefits and costs of agglomeration. Our analysis on agglomeration and profitability is presented in Section 5. Section 6 provides additional analyses regarding our measures of density and financial performance, and examines firms' cost of capital. In Section 7 we examine potential explanations for our results, and Section 8 concludes.

2. Literature on the effects of agglomeration

Differences in total factor productivity as a result of unequal urbanization and localization across locations has been at the heart of urban economics at least since Marshall (1920) discussed technological spillovers between adjacent firms. Traditionally, cities emerged near natural transportation nodes and natural resources. With the advent of industrialization, firms started to benefit from communal presence and the benefits of face to face contact between firms and clients (see, for example, Archer and Smith, 2003; Clapp, 1980; Dunse and Jones, 2002; and Mills, 2004). However, the post-industrial era brings advancements in technology that might diminish the need for cities as a ground for knowledge spillovers (Bollinger et al., 1998).[4]

A simple model introduced by Roback (1982) shows how wages and land rents interact to allocate workers to locations with various quantities of amenities. In equilibrium, with both capital and labor completely mobile across cities, the combination of wages and land rents in each location satisfies two conditions. The first condition relates to workers and shows that locations with a high level of unproductive amenities have high rents to avoid overconcentration of workers. No arbitrage relations require that individuals must be indifferent across space if the flow of wages plus amenities minus housing costs and transportation costs is taken into account (Glaeser, 2007). The second, or firm condition, states that the presence of unproductive amenities requires low land rents to attract firms. Firms are indifferent over space when the spatial equilibrium condition holds that the unit cost equals product price and differences in wages are offset by differences in total factor productivity.

Existing studies that focus on the effect of agglomeration on productivity can be divided into a localization and urbanization strand. Localization typically relates to clusters. A cluster is a critical mass of companies in a particular field in a particular location, whether it is a country, state or even a city (Porter, 1998). According to Porter, productivity can be increased by improving factor inputs in efficiency and quality which should ultimately result in cluster areas with high levels of specialization.

The second strand of literature related to agglomeration economies focuses on urbanization. More specifically, it deals with the relation between the density of economic activity and productivity. Density of economic activity is a measure for the intensity of labor and human and physical capital within a confined geographic area. Early work in this field studies agglomeration economies by relating city size to technological spillovers (for a discussion of this literature, see Ciccone and Hall, 1996). Henderson (1974) shows that, in equilibrium, disamenities on the side of households because of agglomeration, such as for example congestion, pollution, and crime, are offset by productivity advances for competitive firms. These productivity advances can lead to high sustainable profits, which are partly redirected towards the employees in the form of higher wages. Ciccone and Hall (1996) and Ciccone (2002) study agglomeration effects by linking employment density to labor productivity for US states and European Nuts 3 regions, respectively. Ciccone and Hall (1996) measure productivity as the Gross State Output per acre for 46 states and the District of Columbia, while Ciccone (2002) uses value added at factor costs and salaried employment for 628 Nuts 3 regions in France, Germany, Italy, Spain, and the UK. These studies show that doubling of employment density raises average labor productivity approximately 6 percent in the US, while agglomeration effects in Europe are slightly smaller. Carlino et al. (2007) link urban density to the rate of invention, and find that doubling the employment density increases the patents per capita by 20%.

However, besides agglomeration benefits there are also diseconomies of agglomeration on the firm level. Typically, density is associated with higher wage and accommodation costs. Glaeser and Mare (2001) show for example that employees who live in cities earn a wage premium of 33% over workers that do not live in metropolitan areas. Accommodation costs, which are a function of land rents, rise with population density in line with ideas that date back to von Thünen (1862). Other negative effects of agglomeration are for example higher pollution and crime, and related insurance costs.

3. Data

In this section we introduce the data used in our empirical analysis. For the calculation of firm level performance we employ a sample of Dutch firms from Bureau van Dijk's REACH database. This database provides information on Dutch firms, and is survivor-bias free: the database still contains data on firms that do not exist anymore.[5] Our first selection comprises firms for which the REACH database reports profitability (ebitda), which are 32,553 organizations. We delete firms that do not report their location, and exclude financial institutions and utilities because of problems associated with measuring leverage and return on assets for these industries. We further exclude firms that are listed, firms that have multiple establishments, and firms that migrated to an area with a different density in the last eight years of their reporting. In addition, we exclude firms with names that include the words 'holding', 'group', 'international', 'Europe', or its Dutch equivalents. Our final sample, after truncating variables at the 1st and 99th percentile, comprises 13,161 firms. Fig. 1 shows the dispersion of these firms across the Netherlands based on the six digit postal code coordinates. Although the observations are widely spread across the country, the majority of observations are in the mid-west of the Netherlands.

[please insert Figure 1 here]

We define our profitability measure as the five-year average of the return on assets. The returns on assets are the earnings before interest, taxes and depreciation (ebitda) divided by the total assets at the end of the book-year. We compute the five-year average of the return on assets for the final year in which the firm is included in the REACH database. Hence, each firm only appears once in our sample. Industries are selected in line with the statistical Classification of Economic Activities in the European Community, Rev. 1.1 (2002), which is comparable to the SIC code in the US. We include various control variables in our regression estimation on density and profitability, like a firm's size, industry, leverage, age, and risk. We control for a firm's age as profitability is generally related to the life cycle of a firm. We also include a proxy for risk as risky firms are expected to obtain higher average return on assets. The risk profile of a company is calculated by taking the standard deviation of the reported profits (ebitda) over the last five years.

Besides firm information we also employ various sets of aggregated and disaggregated geographic and employment data. Physical space in our empirical analysis is defined as either municipalities or Corop areas. For each Corop area we gather the number of employees per industry per year since 1995 from the EuroStat database. Further geographic information used in our analysis includes the total land area of each municipality and Corop region. We employ these data to calculate employment density statistics.

We measure urbanization with three different variables which are employment, population, and address density. Employment and population density are respectively the number of employees or inhabitants per square kilometer of land area within a municipality or Corop region. Relative differences between these two measures of agglomeration exist if the population is ageing, when there is a high number of inhabitants below working age, residential areas are basically dormitory towns, or when the economic circumstances result in high local unemployment rates. Address density is a measure for the concentration of human activity. It measures the average number of addresses (including residential, commercial, and public properties) in a one kilometer radius area around each address within the defined agglomeration. We measure localization as the number of full time equivalent employees for each industry within Corop areas and municipalities per square kilometer of land.

Table 1 reports summary statistics of the variables in our study. We report individual sample statistics instead of common sample statistics as different combinations of variables appear in the various regression models of this paper.

[please insert Table 1 here]

The median size of the firms in our sample, measured as the value of total assets, is € 4.265 million. Given that these firms are privately owned, we observe a relatively high median leverage of 0.699. The median firm age is 19 years, and the median five-year return on assets is just over 10 percent. The median number of employees per km^2 is 368 in a Corop area and 606 in municipalities.

Fig. 2 shows the dispersion of population density across the country on a Corop and municipality level. A comparison of Fig. 1 and Fig. 2 shows that areas with high population density share high firm density.

[please insert Figure 2 here]

The dispersion of density measures across the country is high. Clearly visible is the high concentration of population in the west, an area known as the Randstad (including the cities Amsterdam, Rotterdam, The Hague, and Utrecht). Another densely populated area is the most southern part of the country. Low density areas appear in the more rural northern and eastern parts of the Netherlands.

4. Costs and benefits of agglomeration

In Section 2 we discussed prior work indicating that density positively influences total factor productivity. To test the relation between density and productivity for the firms in our sample, we regress the turnover per employee on the total number of employees within the firm. To examine a downside of agglomeration we test whether wages and land rent are higher in densely populated areas.

4.1 Testing the benefits of agglomeration

When testing the relation between employment density and turnover per employee for the firms in our sample, we control for firm size, firm age, and industry effects. We set the firm age variable to twenty for observations with firm age values above twenty, since firms are likely to have reached maturity by then. Throughout the paper, we will employ geographically clustered standard errors. This means that we cluster standard errors by Corop when we estimate an effect of density for Corop regions, and cluster standard errors by municipality when we estimate an effect of density for municipalities.

[please insert Table 2 here]

In general, the results point towards a positive relation between productivity and industry specific employment density: the coefficient of the effect of urbanization on productivity is positive on both the Corop and the municipality level. The influence on the municipality level is however not statistically significant. In a Corop area, doubling the location density – in terms of employees per km^2 – increases the productivity by 6.0%.[6] The influence of neighboring areas is larger on the municipality level which could be the reason for noise in our findings for municipalities. Larger firms have a higher productivity, ceteris paribus, whereas the age of the firm has a negative impact on the turnover per employee.

4.2 Testing the costs of agglomeration

To examine potential downsides of agglomeration we test whether the employment costs per employee and the land price per square meter are higher in dense areas for the firms in our sample. Although employment and land costs are only two of the downsides, they are potentially the most influential as they constitute some of the main costs of companies.[7] Table 3 shows the effect of density on the average payment per employee and on land costs per square meter.

[please insert Table 3 here]

The wage per employee is calculated by dividing the total salary costs by the number of employees present at the last year of reporting. The land price variable is the average price paid per square meter of land with a residential zoning plan within the Corop regions in 2006. The data stem from the Dutch Land Registry, which files all property and land transactions in the Netherlands.

We control for size, age, and industry effects. It can be seen that salaries are higher in dense areas, ceteris paribus. Increasing the density by 100% will increase the average pay per employee with 6.3% for Corop areas. On a municipality level, this percentage is 2.1%. Land costs also rise with population density. More specifically, doubling the density increases the cost of land by 42.0%. We only report land costs in Corop areas as the price per square meter of land is not available at municipality levels.

5. Agglomeration and financial performance

In this section we will empirically test the impact of location density on a firm's profitability.

5.1 Urbanization in a Corop region and financial performance

We will first test the relation between density and financial performance on Corop levels. We measure density in three ways: the number of employees per km^2, the number of inhabitants per km^2, and the address density. Table 4 shows the results.

[please insert Table 4 here]

The density variables have a significant negative influence on the average five-year profitability. The statistical significance holds for all of the density measures employed in Table 4. An increase of the density (employees per km^2) with 100% will decrease the average return on assets by 0.012. For instance settling in Rotterdam (488 employees/km^2) instead of Almere (258 employees/km^2) increases the density measure with 89%. For a firm that has an average return on assets of 10% in Almere, a similar firm in Rotterdam has an expected average return of 8.9% (0.1 – 0.012 * 0.89). The coefficients for inhabitants per km^2 and address density are -0.013 and -0.020, respectively.

Table 4 further shows that larger firms are on average more profitable. It has to be taken into account that our sample comprises single-establishment firms, which are on average relatively small compared to multiple-location firms, but have a stronger link with their place of business. Leverage decreases the average earnings before interest, taxes, and depreciation as a percentage of total assets. In accordance with a risk-return tradeoff, firms with higher earnings volatility have on average higher return on assets.

5.2 Urbanization in a municipality region and financial performance

In the Netherlands there are multiple areas in which relatively dense municipalities are surrounded by regions with lower density. Examples are cities in the rural North of the country. In a Corop, the resulting density variable will balance the high and low density regions. To examine whether the mitigation of high density cities has an impact on the results of Table 4, we analyze the influence of density on municipality level in Table 5.

[please insert Table 5 here]

Table 5 shows that the significantly negative relation between the employees per km^2 and profitability is also present on the municipality level. The other two measures for urbanization are not significant. Also, the economical impact of density is smaller on the municipality level than on the Corop level: the coefficient decreases from -0.012 in Table 4 to -0.004 in Table 5 for the variable employees per km^2.

Our finding that the impact of density is stronger on Corop levels can be explained by the fact that density on a Corop level is more moderate. On the municipality level the density measure often differs substantially among adjoining regions, as could be seen in

Fig. 1. Firms that settle in relatively low-density municipalities may still be influenced by adjoining high-density regions. These interaction problems are lower for Corop areas, due to their size and moderation.

5.3 Localization and performance

There have been various studies on the effects of clusters. A typical example of a cluster is Silicon Valley. Although Silicon Valley would not correspond to the highest density levels in terms of employees or inhabitants per km^2, it does correspond to a high value for industry related employment per km^2. The clustering of technological companies in Silicon Valley is not likely to largely influence the profitability of for example, an agricultural company in this area. It could however largely benefit other technological firms. In the Netherlands, areas like Silicon Valley are scarce and certainly less pronounced. Still, clustering is a worldwide phenomenon and therefore also exists in the Netherlands (Kloosterman and Lambregts, 2001). In this section we will test the influence of industry related density on firm performance.

We only estimate our model for industries with more than 150 observations. These industries are ‘manufacturing’, ‘construction’, ‘wholesale and trade’, ‘transport, storage and communication’, and ‘real estate, renting, and business services’. Fig. 3 shows the dispersion of industry specific employment on a Corop level across the country and displays comparable patterns across industries.

[please insert Figure 3 here]

Testing localization effects is not based on relative specialization but on absolute levels of industry specific employment density. Although industry specific employment resembles urbanization patterns to a large extent, some industry specialization differences are visible. All industries show density peaks in the west of the country and in the densely populated southern tip of the Netherlands. The construction industry is most evenly spread across Corop regions while 'real estate, renting and business activities' is the industry with the highest dispersion across the country. Table 6 shows the results of our regression analysis.

[please insert Table 6 here]

It can be seen that the relation between industry related density and performance for firms in the 'manufacturing' industry is negative with a coefficient of -0.017, but this effect is not significant at the 5% level (it is significant at the 10% level). For the 'construction' and 'wholesale and trade' sectors the coefficients are -0.018 and -0.014, respectively, and these effects are significant at the 5% level. The sector 'real estate, renting, and business services' has a negative effect which is only significant at the 10% level. The effect of industry related density on performance is insignificant for the industry of 'transport, storage and communication'. The results are similar on a municipality level (not reported). In general, we can conclude that the negative relation between density and financial performance is apparent for both localization and urbanization issues.

6. Additional analyses

In this section, we will test the robustness of our findings for our measure of agglomeration and our measure of profitability. We also examine real options, the cost of capital, endogeneity issues, and potential effects of the business cycle.

6.1 Measures of agglomeration: Unequal density of production

Throughout this paper we have used measures of agglomeration that are scaled by the land area of the Corop or municipality. One potential problem raised by Ciccone (2002), is the assumption of constant production density throughout the geographic areas. This assumption is unrealistic as some areas have large portions of agricultural land combined with dense agglomerations. If the companies in our sample operate in the denser parts of the area, the low average employment density of the overall region could be misleading. To test this effect we estimate the relation between firm performance and agglomeration by using the non-agricultural employment per non-agricultural square kilometer of land area. We only perform the analysis on a Corop level as the impact of agricultural land use on the results would be largest for this level of geographic aggregation. Non-agricultural employment is the total employment in the Corop minus the number of employees in farming, forestry, and fishery industries. The measure for non-agricultural land area is the total land area of the Corop region minus land used by companies that earn at least 2/3 of their revenue from agricultural or commercial forestry activities and is provided by the

Dutch Central Bureau of Statistics. Our analysis indicates that the proportion of agricultural land varies between 13% and 78% with an average of 54%. The weight of agricultural employment has a range from 0.2% to 8.8% and is on average 1.8%. In untabulated analysis, we replicate our analysis on density and firm performance for non-agricultural land and employment, and find the results to be relatively similar: a doubling in non-agricultural employment density decreases the average return on assets by 1.5%, which is slightly more than the 1.2% for general urbanization.

6.2 Measures of profitability

Our measure of profitability in Section 5 is the five-year average of the return on assets. The returns on assets are the earnings before interest, taxes and depreciation (ebitda) divided by the total assets at the end of the book-year. We focus on ebitda because this measure is expected to be strongly related to firms' cash flows (more than for example net earnings). In untabulated analyses, we have tested whether our results would be different if we use ebit as a percentage of total assets for our dependent variable. We find very similar results.

Scaling by total assets is in line with a large literature on firms' profitability. Still, in robustness tests, we employ alternative scaling variables. First, we scale by total assets minus fixed assets like buildings and land. This additional test is important as the value of fixed assets is likely to relate to the density of the location (due to for example a substitution of labor for capital when labor is more expensive). Columns (1)-(3) of Table 7 show the results for the Corop areas.

[please insert Table 7 here]

It can be seen that the relation between density and financial performance is again significantly negative for all three measures of density. Hence, our findings are robust for scaling by non-fixed assets. Note though that the *t*-statistics are lower than if we scale by total assets. Also, the R^2s are reduced when we scale by non-fixed assets. Firm risk, which is measured as the standard deviation of return on assets, and firm leverage do not have a statistically significant effect on financial performance when we scale this performance by non-fixed assets.

Second, we have scaled ebitda by total sales (not reported for parsimony). We have 1,715 observations for this analysis. In all of the three density measures the effect of density on profit over sales is negative (coefficients of -0.908, -0.906, and -0.949, respectively), and this effect is statistically significant at the 5% level in two of the three estimations. Only the effect of inhabitants per km^2 on profit over sales is not significant at the 5% level (but it is significant at the 10% level).

6.3 Real options and the cost of capital

A potential issue with looking at financial performance is that it does not necessarily take into account that a location provides real options. It could be argued that locating in dense areas provides real options for firms by facilitating connections to for example capital suppliers and law-experts. If these real options do not show up in the five-year average return on assets, then we are likely to underestimate the benefits of locating in dense areas. We therefore examine whether our results change when we increase the time period for which we measure average return on assets. To reduce losing too many observations, we increase our time period to eight years. We expect that for the single-establishment firms in our sample most of the real options that a location provides will have shown up in the financial performance in these eight years. Columns (4)-(6) of Table 7 show the results for the Corop areas.

We find that the negative effect of density on firm performance remains present when we calculate financial performance over an eight year period. Since real options materialize into cash flows over the years and hence increase the profitability for firms with more real options, this finding indicates that locating in dense areas reduces financial performance, even when real options are likely to have materialized. The results in Table 7 also show that the economic significance remains very similar for our five-year and eight-year measure. Given that we expect different firms to exercise their real options at different times, it is very likely that at least some of the firms' real options have materialized in the period between five and eight years. Our finding that the results of our five- and eight-year measures are similar therefore indicates that the real options are not likely to differ strongly between firms in low and high density areas in the Netherlands.

We also examine the interest that firms pay on their debt, to analyze whether firms in high density areas have lower or higher costs of capital than firms in low density areas. This analysis relates to Degryse and Ongena (2005), who find that for Belgian firms the loan rates decrease with distance between the firm and the lending bank, while it increases with the distance between the firm and competing banks.

We have 780 observations for this analysis. We estimate the regression specification $Interest\ cost = \gamma_0 + \gamma_1 Density + \gamma_2 Size + \gamma_3 Leverage + \gamma_4 Firm\ age + \gamma_5 Risk + \gamma_6 Tangibility + \gamma_7 Industry + \varepsilon$, in which density is the number of employees per km^2 in a Corop area, and tangibility is fixed assets divided by total assets. We scale total interest by total debt for our first interest variable, and by long-term debt for our second interest variable. We find that the coefficient is negative for both our interest variables (coefficients of -0.001 and -0.002), but not statistically significant (*t*-statistics of -0.95 and -0.09). Our results are similar for our other density measures. We do therefore not find evidence that the cost of capital differs for firms in low and high density areas in the Netherlands.

We have to stress that the Netherlands is a relatively small country. Even for the most rural areas in the Netherlands a potential capital supplier will not be very far away. In larger countries, density perhaps has stronger effects on firms' cost of capital and real options, which could provide benefits for locating in dense areas.

6.4 Endogeneity

The choice whether to start a company in a high or a low density area might be endogenous. That is, whether or not a firm is founded in a high density area can depend on various characteristics, like the firm's industry. We will estimate a two-stage model in which we control for two effects on whether or not to start-up a firm in a high density area. The first effect we take into account is the firm's industry. The type of industry and location are related, as for some industries specific natural resources have to be present (e.g., mining companies). The second effect is start-up cohorts: over time, the popularity of certain cities, areas, or density levels may have fluctuated. We let a start-up cohort consist of twenty years.

Our model will control for selection bias, based on Heckman's (1979) treatment effect. This self-selection model deals with the possibility that the dependent variable is endogenous beyond the impact of observable characteristics. Firms may self-select into their preferred choice: there can be unobserved characteristics, like the place of residence of a company's founder, that have an effect on where to locate a firm.

We convert our density measure to a binary variable: the dummy 'high density' will equal one for firms in which the Corop's or municipality's number of employees per km^2 is above the median, and zero for locations with below-median employees per km^2. We first estimate a probit model on the choice to start a firm in a high or low density area and then calculate the inverse Mills ratio. This ratio is added to the regression as an additional variable to correct for possible selection bias.

[please insert Table 8 here]

The density dummies in Table 8 have a negative sign. Apparently, density and performance are also negatively related when controlling for selection bias. The impact of the density dummy on the Corop level is significant at the 5% level, while at the municipality level it is not. The inverse Mills ratio provides information on self-selection. It can be seen that we do not find strong self-selection bias for our estimations.

The difference between the dummies on a Corop and municipality level is partially due to the construction of the dummies: the municipality dummy equals one when the number of employees per km^2 exceeds 606 (which is the median). In a Corop area the median is only 368. Furthermore, the explanatory power of the density dummies is less than the explanatory power of the density variables in our previous analyses, as converting a variable into a dummy automatically implies a loss of information.

6.5 The effect of the business cycle and cross-sectional differences

We measure the five-year average of the return on assets for the firms in our sample for the final year in which that firm is included in our database. In Section 5, we do not require this year to be 2006 (the last year in our sample), to reduce the impact of survivorship bias. Potentially, this method results in a new bias, as we compare firms in different time periods. A firm in a bull period is expected to have higher returns on assets than a firm in a bear period, even if the firm in the bull market underperforms compared to other firms in that period. To examine whether differences in the economic cycle drive our results, Column (1) of Table 9 reports the results for only our observations in 2006 (i.e. the return on assets for all of these firms is measured over the period 2002-2006).

[please insert Table 9 here]

It can be seen that the effect of density on financial performance is still significantly negative, with a coefficient of -0.019 and a *t*-statistic of -2.56. In Column (2), we examine the period 1999-2003, in which economic growth was relatively low. We again find a significantly negative effect of density on financial performance, and the economic effect has doubled (coefficient of -0.039).

We also test whether the observed negative relation between density and financial performance is present in both young and old firms. That is, the relation might only be present in the early stages in a firm's life cycle, and not in later stages. Columns (3) and (4) report the results for young firms (existing for 1-10 years) and older firms (existing for over 10 years). It can be seen that the negative relation is present in both sub-samples. As a final robustness test we only look at the sub-sample of firms with an above-median size. The reason is that the profitability measures for small firms could be affected by the wages that entrepreneurs pay themselves. For larger firms, the profitability measure is less likely to be strongly affected by the wage of the entrepreneur. Column (5) of Table 9 shows that the negative relation is also present for our sub-sample of relatively large firms. Hence, we conclude that the negative effect of density on firm performance is robust for effects of the business cycle and the wages of the entrepreneur.

7. Potential explanations for our results and directions for future research

The focus of this paper is on empirically testing the relation between agglomeration and financial performance. Our findings are particularly interesting in light of a spatial equilibrium. The no arbitrage relationship of firms states that firms must be indifferent over space (Glaeser, 2007). Why would firms still settle in dense cities, given that these locations are negatively related with return on assets? One would expect each firm to settle in an area that provides the most favorable conditions, which creates a spatial equilibrium.

A potential explanation for our results is that circumstances change over time, thereby temporarily shifting settlement conditions over time and space. In a changing society the optimal location twenty years ago may not be the optimal location today, while moving costs of firms are certainly not zero as assumed by standard equilibrium models. The cost of living in the largest cities rose sharply with an increase in house prices over the last decades. These changes in house prices push up wage demands in the cities and subsequently increase labor costs for companies in these areas. Given that relocating is costly, temporal disequilibria can exist.

Also, others factors, like prestige, might drive location choices. Especially for the relatively small firms in our sample, the preferences of the owners will have an effect on the location choice. An entrepreneur is likely to start his business in a region he is familiar with. In line with Glaeser (2007), it is also likely that entrepreneurs choose their firm's location close to a region in which they would like to live, balancing profitability and the general quality of life.

Although these potential explanations are difficult to test in practice, we can provide some insight in whether entrepreneurs choose their firm's location close to a region in which they want to live by including a liveability index in our analysis. We obtain this liveability index for the Netherlands from the "Atlas voor Gemeenten 2005," which reports a liveability score that is calculated for the 50 largest municipalities in the

Netherlands, based on eight different factors. These factors are safety (based on an index consisting of reported crimes), the ratio of residences that are owned compared to rented, the proximity to nature, the proximity to jobs, a cultural score, quality of the restaurants, the existence of a university, and a score for the historical look of the municipality.

If entrepreneurs balance their firms' profitability and the general quality of life, we expect that firms in municipalities with a high liveability score have a lower average profitability than firms in municipalities with a low score. That is, entrepreneurs would require a premium to locate their firm in a municipality in which they would rather not live. Column (6) of Table 9 shows the effect of liveability on the five-year average return on assets for the 50 largest municipalities. It can be observed that the relation between the liveability index and firm performance is significantly negative, which is in line with our expectations. Panel B of Table 9 reports the average and median five-year average ROA for quartiles based on the liveability score. Firms in the lowest liveability quartile have an average return on assets of 11.4% (median of 10.1%). In the highest quartile, the profitability is the lowest: the mean is 8.6% and the median 6.6%.

This analysis provides evidence in line with the conjunction that the owners of the single-establishment firms in our sample balance profitability and the general quality of life. These findings do however need to be interpreted with caution. We only have data on liveability for 50 municipalities, which are all relatively dense. Further research is necessary to disentangle the exact relations between density, liveability, and financial performance. Also, a direction for further research is to examine other factors that may lead to disequilibria.

Our findings might be a general characteristic of relatively small countries. It would be interesting to examine the effects in larger countries. For example, industry-related density in the Netherlands cannot be compared to various clusters around the world, like Silicon Valley in the US. We do not question the positive effects of these clusters. Furthermore, since our study focuses on firms with a single location, it would be interesting to examine the relation between location density and financial performance for somewhat larger, public firms. As these firms are substantially different in terms of size, scope, and networks, the choice of location encounters many new facets.

8. Conclusion

Although the benefits and costs of agglomeration have been widely documented, the tradeoff between these factors is a relatively uncultivated area. In this paper we study agglomeration effects in the Netherlands. With a detailed database of single-establishment companies, we are able to capture the productivity benefits of agglomeration density: firms that settle in dense areas portrait a higher turnover per employee. We also find the costs of agglomeration to be present in our sample: labor costs per employee and land rents are considerably higher in dense areas.

Our study focuses on combining the costs and benefits into a single measure, which is financial performance. In case the benefits of density overshadow the costs, firms in denser areas should outperform their equivalents in areas with lower density. When the costs of agglomeration are higher than the benefits, we expect firms in regions with lower density to perform better.

We find that the density of an area has a negative effect on firm performance. This effect is more present in Corop regions than in municipalities. We measure urbanization in various ways: employees per km^2, inhabitants per km^2, and address density. The existence of the negative effect turns out to be irrespective of our measurement of density.

[1] For an extensive review of this literature see Holmes and Stevens (2004).

[2] Papers that examine the relation between location and profitability include Boassen and MacPherson (2001), and Vaessen and Keeble (1995). Boassen and MacPherson study listed US firms in the pharmaceutical industry and find the returns to be higher for clustered firms than for non-clustered firms. Vaessen and Keeble (1995) use survey results to study growth-oriented firms in the UK and find the profits of firms in various regional environments to be relatively similar. Pirinsky and Wang (2006) study the effect of corporate headquarter location on stock returns. They find strong co-movement in the stock returns of firms headquartered in the same geographic area.

[3] The sample size differs across specifications in our empirical analysis due to incomplete reporting of variables. As we base our analysis on privately owned firms, disclosure of information is not subject to the same regulations as for public firms. We have 3,597 firms with all the necessary information to be included in our estimations of the effects of density on a firm's profitability.

[4] Glaeser (1998) provides an extensive discussion of whether cities are dying and concludes that information spillovers will continue to be important, even in an age of cheap and fast communication.

[5] In robustness tests, we have tested whether our results would change if we only include firms that still exist. We find that both the signs and significance of our main results remain unaltered.

[6] Note that the increase of observed productivity is not necessarily completely due to employees being more productive: part of the effect could be explained by employees being substituted for machines in areas in which labor costs are high.

[7] Note that location costs could be partly mitigated by tenure possibilities. That is, companies in denser urban areas generally have a much wider array of tenure possibilities than companies in more rural areas. For example, real estate leasing possibilities are more abundant in more densely populated areas, and this is also the case for sale and leaseback (S&L) transaction possibilities: investors that form the counterpart in S&L transactions are more likely to find a replacement tenant in more densely populated areas, which limits their risk and increases the likelihood of engaging in an S&L transaction.

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Figure 1. Firm location and population density on Corop level

This figure shows the location of each firm in our sample based on a six digit postal code. The geographic areas represent the 40 Corop regions in the Netherlands.

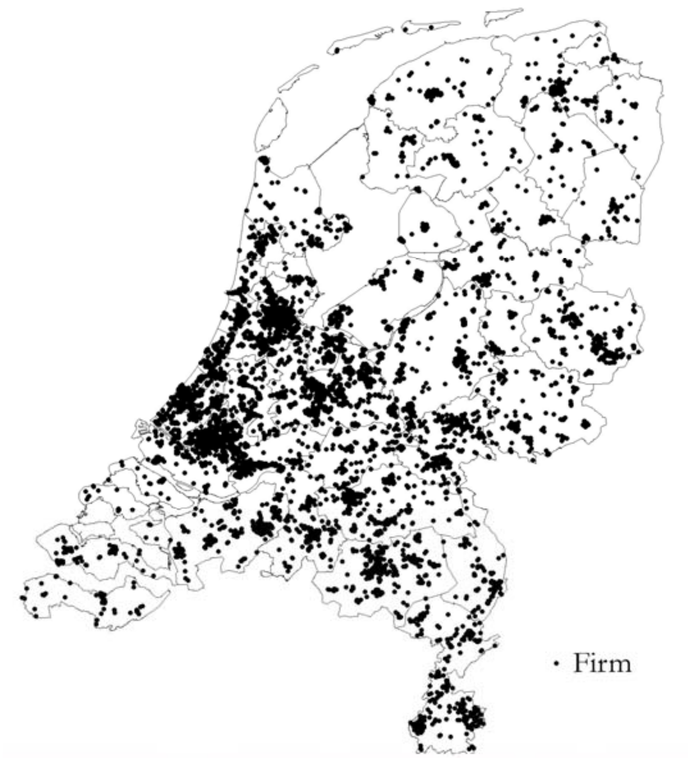

Figure 2. Population density on Corop and municipality level

This figure shows the population density, measured as the number of inhabitants per square kilometer of land area. Panel (a) shows population density for 40 Corop areas and Panel (b) for 443 municipalities in the Netherlands.

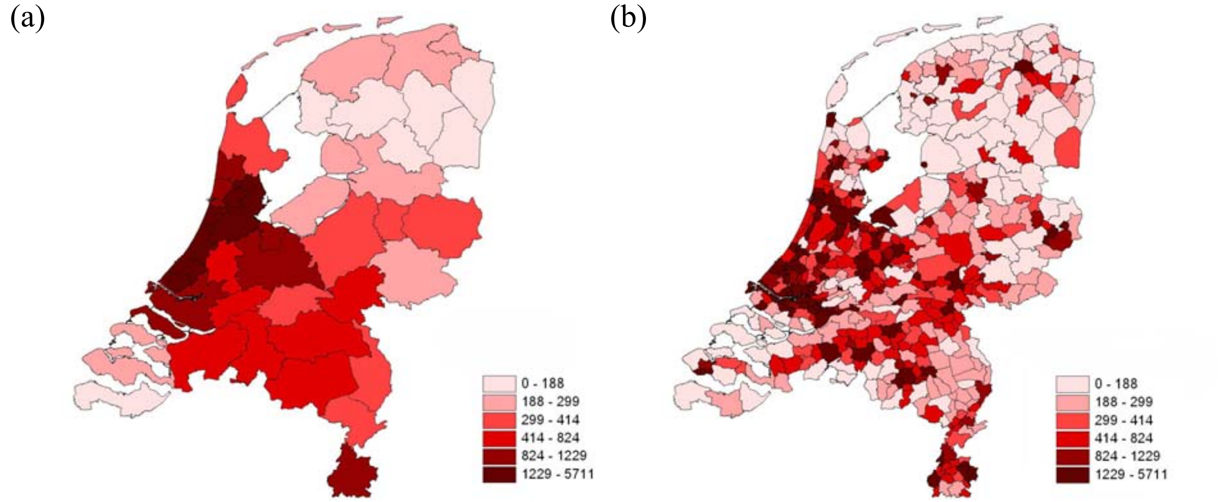

Figure 3. Employment density for specific industries

This figure shows the density of employment for industry classifications in accordance with the statistical Classification of Economic Activities in the European Community, Rev. 1.1 (2002). Employment density is measured as the number of employees per square kilometer, for 40 Corop areas in the Netherlands for different industries. Panel (a) shows information for the 'manufacturing' industry. Panel (b) represents the 'wholesale and trade' industry and Panel (c), (d) and (e) represent the 'transport, storage and communication', 'construction' and 'real estate, renting and business activities' industries respectively. Scales are based on quantiles.

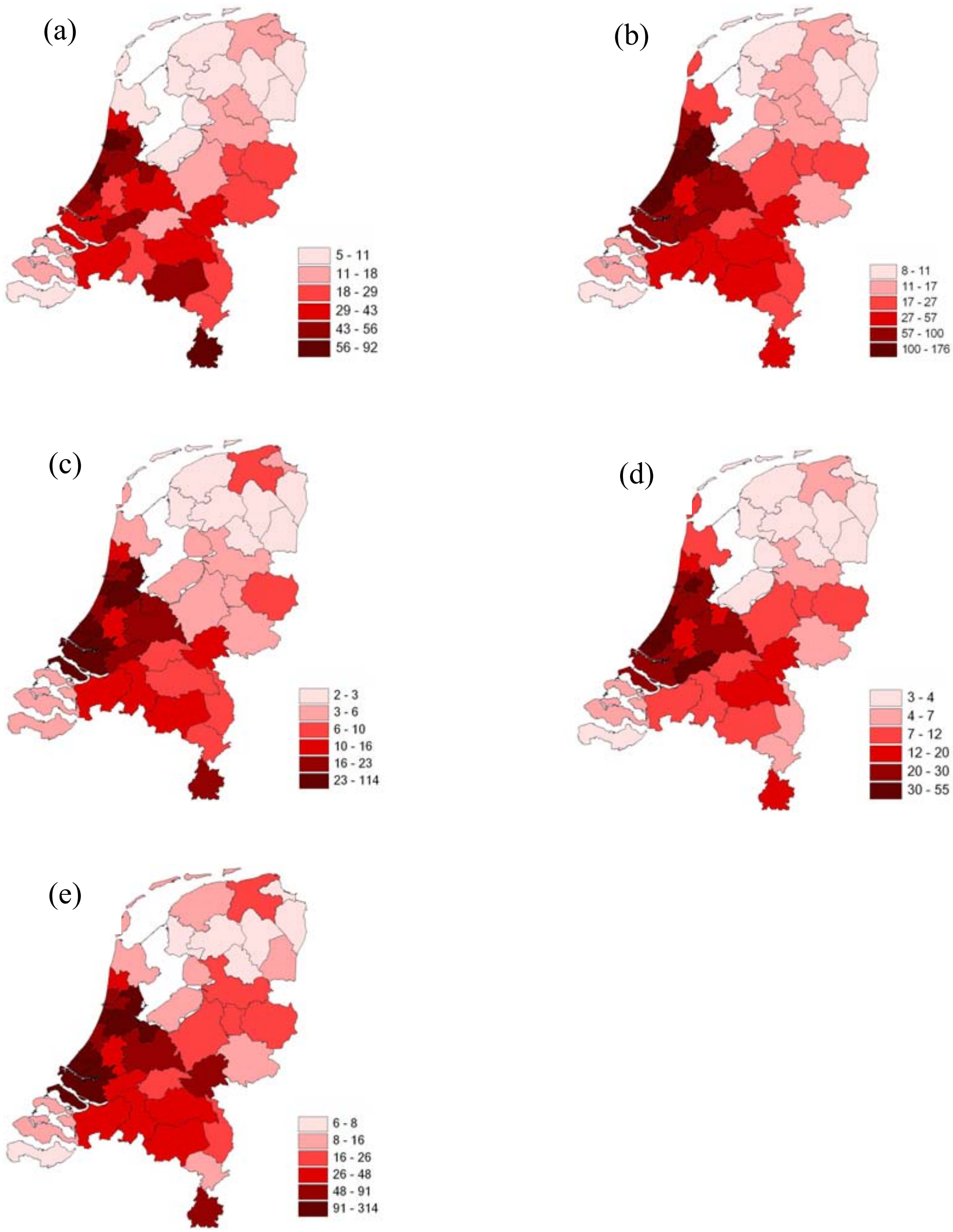

Table 1. Summary statistics

This table reports summary statistics for our total sample. Total assets are in millions of Euros. Leverage is total debt divided by total assets. Firm age is the year of reporting minus the year the firm was founded. ROA stands for return on assets and is calculated by dividing the earnings before interest, taxes, and depreciation by the total assets. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. Total assets and leverage are reported for the firm's last year of reporting. Turnover per employee and payment per employee are total turnover and total salary costs divided by the total number of employees. Land costs reflect the price of residential land per square meter. Employment and population density is measured as respectively the number of employees or inhabitants per square kilometer of land area within a Corop region or municipality. Address density is a measure for the concentration of human activity. It measures the average number of addresses (including residential, commercial, and public properties) in a one kilometer radius area around each address within the defined agglomeration.

Firm characteristics	**N**	**Mean**	**Median**
Total assets	13,161	29.557	4.265
Leverage	10,893	0.618	0.669
Firm age	13,161	36.512	19.000
Five-year mean ROA	4,085	0.116	0.101
Risk	4,085	0.093	0.063
Turnover per employee	6,743	519	167
Payment per employee	1,429	42	39
Land costs	13,161	451	433
Density measures (Corop)			
Employees per km^2	13,161	457	368
Inhabitants per km^2	13,161	963	845
Address density	13,161	2,087	1,649
Density measures (Municipality)			
Employees per km^2	13,161	4,931	606
Inhabitants per km^2	13,161	1,374	709
Address density	13,161	1,562	1,150

Table 2. Density and the revenues per employee

This table reports the influence of density on firms' productivity, and tests the model Productivity = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Firm age + γ_4Industry + ε. Productivity is measured as the total turnover divided by the total number of employees. Density is the number of employees per km^2. Firm size is measured as total assets. We take the natural logarithm of the productivity, density, and size variable. The variable firm age has a maximum of 20. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Turnover per employee	
	Corop	Municipality
Employees per km^2	0.060**	0.004
	(3.03)	(0.46)
Size	0.777**	0.775**
	(43.73)	(39.77)
Firm age	-0.034**	-0.035**
	(-13.88)	(-10.98)
Industry dummies	Yes	Yes
N	6,743	6,743
R^2	0.332	0.328

Table 3. Density, employment costs, and land costs

This table reports the influence of density on firms' direct employment costs, i.e. wages. We test the model Employment costs = γ_0 + γ_1Density + γ_2Size + γ_3Firm age + γ_4Industry + ε. Employment costs are measured as the total salary costs divided by the total number of employees. Land costs reflect the price of residential land per square meter. Density is the number of employees per km^2. Firm size is measured as total assets. We take the natural logarithm of the employment cost, land cost, density, and size variable. The variable firm age has a maximum of 20. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Payment per employee		**Land costs**
	Corop	Municipality	Corop
Employees per km^2	0.063**	0.021**	0.420**
	(6.59)	(4.66)	(8.67)
Size	0.056**	0.057**	-0.001
	(4.99)	(3.53)	(-0.06)
Firm age	-0.011	-0.007	0.001**
	(-0.57)	(-0.33)	(2.79)
Industry dummies	Yes	Yes	Yes
N	1,429	1,429	13,161
R^2	0.086	0.073	0.755

Table 4. Density of Corop and firm performance

This table reports the influence of Corop density on firm performance, and tests the model Profitability = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + γ_6Industry + ε. Profitability is measured as the five-year average return on assets. Density is the number of employees per km^2, the number of inhabitants per km^2, or the address density. We take the natural logarithm of the density variables. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Five-year mean ROA		
Employees per km^2	-0.012*		
	(-2.65)		
Inhabitants per km^2		-0.013*	
		(-2.50)	
Address density			-0.020**
			(-3.68)
Size	0.019**	0.018**	0.019**
	(4.63)	(4.56)	(4.67)
Leverage	-0.079**	-0.079**	-0.079**
	(-6.65)	(-6.63)	(-6.63)
Firm age	0.001	0.001	0.001
	(1.01)	(1.02)	(0.98)
Risk	0.266**	0.266**	0.266**
	(4.70)	(4.70)	(4.72)
Industry dummies	Yes	Yes	Yes
N	3,597	3,597	3,597
R^2	0.065	0.065	0.066

Table 5. Density of municipality and firm performance

This table reports the influence of municipality density on firm performance, and tests the model Profitability = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + γ_6Industry + ε. Profitability is measured as the average five-year return on assets. Density is the number of employees per km^2, the number of inhabitants per km^2, or the address density. We take the natural logarithm of the density variables. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Five-year mean ROA		
Employees per km^2	-0.004**		
	(-2.69)		
Inhabitants per km^2		-0.004	
		(-1.21)	
Address density			-0.005
			(-1.24)
Size	0.018**	0.017**	0.017**
	(4.28)	(4.20)	(4.21)
Leverage	-0.080**	-0.080**	-0.080**
	(-7.82)	(-7.71)	(-7.72)
Firm age	0.001	0.001	0.001
	(0.70)	(0.72)	(0.74)
Risk	0.236**	0.237**	0.238**
	(3.55)	(3.56)	(3.59)
Industry dummies	Yes	Yes	Yes
N	3,597	3,597	3,597
R^2	0.060	0.058	0.059

Table 6. Industry-related density and firm performance

This table reports the influence of industry-related density in a Corop area on firm performance, and tests the model Profitability = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + ε. Profitability is computed as the five-year average return on assets. Density is the number of industry-specific employees per km^2. We take the natural logarithm of the density variable. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Five-year mean ROA				
	Manufacturing	Construction	Trade	Transportation	Real estate, renting, and business services
Constant	0.192**	0.153*	0.103**	0.012	0.093**
	(3.55)	(2.12)	(2.80)	(0.18)	(2.92)
Employees per km^2	-0.017	-0.018*	-0.014*	-0.008	-0.008
	(-1.98)	(-2.07)	(-2.03)	(-0.73)	(-1.85)
Size	0.003	0.033*	0.021**	0.025*	0.022**
	(0.24)	(2.36)	(3.69)	(2.38)	(3.13)
Leverage	-0.122**	-0.099**	-0.081**	-0.091*	-0.043
	(-4.99)	(-2.74)	(-4.80)	(-2.54)	(-1.71)
Firm age	0.002	-0.003	0.001	0.003	-0.001
	(1.45)	(-1.35)	(0.99)	(1.25)	(-0.43)
Risk	0.225	0.207*	0.619**	0.781**	0.145
	(1.18)	(2.05)	(7.74)	(2.86)	(1.34)
N	874	395	1,186	184	628
R^2	0.065	0.060	0.153	0.153	0.028

Table 7. Alternative performance measures

This table reports the influence of Corop density on firm performance, and tests the model Profitability = γ_0 + γ_1Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + γ_6Industry + ε. Profitability is measured in two different ways. In columns (1)-(3), it is measured as the average five-year return on non-fixed assets. In columns (4)-(6), profitability is measured as the average eight-year return on total assets. Returns relate to firms' reported ebitda. Density is the number of employees per km^2, the number of inhabitants per km^2, or the address density. We take the natural logarithm of the density variables. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. T-test statistics are based on geographically clustered standard errors and appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Five-year mean returns scaled by non-fixed assets			**Eight-year mean ROA**		
	(1)	(2)	(3)	(4)	(5)	(6)
Employees per km^2	-0.066*			-0.012*		
	(-2.12)			(-2.48)		
Inhabitants per km^2		-0.071*			-0.012*	
		(-2.13)			(2.42)	
Address density			-0.066*			-0.022**
			(-2.13)			(-3.45)
Size	0.042*	0.042*	0.040*	0.015**	0.015**	0.015**
	(2.29)	(2.26)	(2.11)	(3.39)	(3.41)	(3.39)
Leverage	-0.096	-0.095	-0.091	-0.076**	-0.075**	-0.076**
	(-1.21)	(-1.20)	(-1.12)	(-7.22)	(-7.22)	(-7.16)
Firm age	-0.005	-0.005	-0.005	0.004	0.004	0.004
	(-0.58)	(-0.57)	(-0.58)	(1.68)	(1.67)	(1.65)
Risk	0.005	-0.001	0.001	0.240*	0.240*	0.240*
	(0.02)	(-0.01)	(0.01)	(2.69)	(2.68)	(2.69)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	3,273	3,273	3,273	2,245	2,245	2,245
R^2	0.025	0.024	0.023	0.071	0.071	0.074

Table 8. Self-selection test

This table reports the influence of density on firm performance while controlling for self-selection issues. We first estimate a probit model on the choice of settling in a low or high density area. The explanatory variables in this model are industry dummies and start-up cohorts. We calculate the inverse Mills ratio and add this ratio to our basic estimation model Profitability = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + γ_6Industry + ε, to control for possible selection bias. Profitability is measured as the average five-year return on assets. 'High density' equals one when the Corop's or municipality's density score for the number of employees per km^2 is above the median, and is zero otherwise. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. T-test statistics appear in parentheses. **, * indicate significance at the 1% and 5% level, respectively.

	Five-year mean ROA	
	Corop	Municipality
High density	-0.247*	-0.053
	(-2.02)	(-0.46)
Size	0.017**	0.018**
	(4.78)	(5.00)
Leverage	-0.077**	-0.079**
	(-8.48)	(-8.30)
Firm age	0.001	0.001
	(1.36)	(0.95)
Risk	0.265**	0.237**
	(10.63)	(9.19)
Inverse Mills ratio	0.141	0.026
	(1.87)	(0.36)
Industry dummies	Yes	Yes
N	3,597	3,597

Table 9. The business cycle, cross-sectional differences, and liveability

This table reports the influence of the employees per km^2 of the Corop on firm performance for various sub-samples. The table also shows the effect of the liveability of municipalities. Columns (1)-(5) of Panel A test the model Profitability = $\gamma_0 + \gamma_1$Density + γ_2Size + γ_3Leverage + γ_4Firm age + γ_5Risk + γ_6Industry + ε. Profitability is measured as the five-year average return on assets. Density is the number of employees per km^2. We take the natural logarithm of the density variables. Size is the logarithm of total assets. Leverage is total debt divided by total assets. The variable firm age has a maximum of 20. Risk is measured as the standard deviation of the return on assets over the last five years of the firm's reporting. For Column (6) of Panel A, we focus on municipalities, and we replace our density variable with a score for the liveability of a municipality. This score is based on a report by "Atlas voor Gemeenten" in 2005. T-test statistics are based on geographically clustered standard errors and appear in parentheses. Panel B reports the average and median five-year mean ROA for different quartiles based on the liveability score. The difference of means t-statistic relates to the difference between the lowest and highest quartile, and assumes unequal variances. **, * indicate significance at the 1% and 5% level, respectively.

Panel A

	Five-year mean ROA					
	2002-2006	1999-2003	Young firms	Old firms	Large firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Employees per km^2	-0.019*	-0.039**	-0.023**	-0.011*	-0.009*	
	(-2.56)	(-3.77)	(-2.78)	(-2.44)	(-2.07)	
Liveability score						-0.006*
						(-2.36)
Size	0.021**	0.014*	0.023	0.019**	0.026**	0.010*
	(2.90)	(2.07)	(1.85)	(4.65)	(4.30)	(2.14)
Leverage	-0.066*	-0.020	-0.089*	-0.079**	-0.051**	-0.068**
	(-2.69)	(-0.70)	(-2.68)	(-6.49)	(-5.13)	(-5.13)
Firm age	0.001	0.005	-0.006	0.001	0.004	0.002
	(0.72)	(1.66)	(-1.88)	(0.35)	(1.93)	(1.77)
Risk	0.229	0.500**	0.171	0.286*	0.487**	0.212**
	(1.37)	(5.31)	(1.15)	(2.17)	(3.94)	(5.88)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	622	818	278	3,319	1,798	1,729
R^2	0.071	0.089	0.160	0.066	0.136	0.054

Panel B

	Lowest liveability score	Somewhat low liveability score	Somewhat high liveability score	Highest liveability score	Difference of means t-statistic
Mean ROA	0.114	0.121	0.107	0.086	-2.54**
Median ROA	0.101	0.099	0.095	0.066	
N	434	433	427	435	