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Corporate Investment in Hungary – Stylised Facts on Micro Data

(Vállalati beruházások Magyarországon – stilizált tények mikroadatok alapján)

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Contents

Abstract

This paper investigates corporate fixed investment in Hungary between 2001 and 2014 using firm-level data. We analyse the composition, heterogeneity and the drivers of corporate investment. Investments in Hungary are highly concentrated and dominated by large and foreign-owned companies. The period investigated can be split into three parts: the 2000s with moderate performance, the crisis period, and the period of weak recovery in 2013-2014. We find that structural problems were already seen before the crisis: the investment rate was stagnant and investment activity declined. However, the performance of firms was heterogeneous, as smaller and middle-aged firms became less active and dynamic. During the crisis, investment performance markedly deteriorated. Signs of recovery were seen in 2013 and 2014, but the investment rate remained subdued. We show that the ageing of the group of smaller firms played an important role in their weak investment performance, while the lack of new entrants contributed to the sluggishness of the recovery. We did not find any evidence that changes in individual sectors' weight in the economy contributed to the low corporate investment rate or the weakening activity.

JEL classification: D22, E22, G31
Keywords: corporate investment, micro data

Összefoglaló

A tanulmány a vállalati állóeszköz beruházásokat vizsgálja Magyarországon 2001 és 2014 között, vállalati szintű adatok alapján. A vállalati beruházások összetételét, heterogenitását és a beruházások meghatározó tényezőit elemezzük. A magyar beruházások erősen koncentráltak, jellemző a nagy ill. külföldi tulajdonú vállalatok dominanciája. A vizsgált időszak három részre bontható: a 2000-es évekre, amelyet mérsékelt beruházási teljesítmény jellemzett, a válság periódusra és a 2013-14-es gyenge kilábalás időszakára. Eredményeink szerint már a válságot megelőzően strukturális problémák jelentkeztek: a beruházási ráta stagnált és a beruházási aktivitás visszaesett. Ugyanakkor a vállalatok teljesítménye heterogén volt, elsősorban a kisebb és középkorú vállalatok lettek kevésbé aktívak és dinamikusak. A válság során a beruházási teljesítmény jelentősen romlott. 2013-ban és 2014-ben már láthatóak voltak a kilábalás jelei, de a beruházási ráta visszafogott maradt. Megmutatjuk, hogy a kisebb vállalatok csoportjának öregedése fontos szerepet játszott gyenge beruházási teljesítményükben, míg az új belépők hiánya hozzájárult a kilábalás lassúságához. Nem találtunk bizonyítékot arra, hogy az egyes szektorok gazdaságban betöltött súlyának változása hozzájárult volna az alacsony vállalati beruházási rátához vagy a beruházási aktivitás gyengüléséhez.

Executive summary

The paper investigates corporate fixed investment in Hungary between 2001 and 2014. The analysis is carried out on firm-level data, which allows an in-depth examination of the composition, the heterogeneity and certain drivers of corporate investment.

Historically, large companies account for about one half of total Hungarian corporate investment. Investments are concentrated: on average, the 20 largest investment projects account for one quarter of total annual investment. A similar concentration is observed in the distribution of investment by corporate ownership and export status: foreign-owned companies carry out one half of total investment, while exporting companies implement 40 per cent. These structural features of investment hardly changed during the period examined. Despite the boom in business creation observed in the 2000s, the increase in the share of smaller companies was small. During the crisis, large, and foreign-owned export companies gained share, mainly because of differences in the development of external and domestic demand, although liquidity constraints may have played a role as well. This started to reverse during the recovery.

The period examined can be divided into three distinct parts based on investment performance. The significant structural change characterising the Hungarian economy in the 1990s was mostly completed by the early 2000s. In parallel with this, the corporate investment rate also declined and for most of the 2000s it was stagnant at a level lower than that of the countries in the region. Structural problems were already seen in the pre-crisis period: the share of expansionary investments was declining, and the share of companies that did not invest at all was rising. During the crisis, between 2009 and 2012, investment performance deteriorated sharply. Investment rates fell, and more and more firms decided not to invest at all. Signs of recovery were seen in 2013 and 2014. The growth of the Hungarian economy and the loosening of financial constraints due to programmes of the central bank had also contributed to it. However the improvement of investment rate in aggregate terms was still small.

The performance of firms was heterogeneous in the pre-crisis period. The investment performance of smaller firms was weakening, while the investment rate of larger firms even increased. Not only did the investment performance of smaller (especially micro) companies decline, their growth rate of sales revenues also decelerated, and the ratio of firms moving into higher size categories decreased. Apparently during the pre-crisis period, the share of smaller companies that were unable to or did not want to grow and invest was rising.

The ageing of the sector played an important role in the weak investment performance of smaller firms. Irrespective of size, companies tend to invest more and grow faster in the first years of their life. However, while smaller firms invest less and less as they become older, ageing above a certain threshold results in no further deterioration in investment performance in the case of larger companies. This explains why ageing had a major negative effect on investment performance only in the case of smaller companies, although firms were growing older in every size categories.

Newly established companies are the most dynamic segment of the sector, and as such make a great contribution to investment. Changes in the number and share of entries can have a large impact on the investment performance, while at the same time they are strongly related to the ageing of the corporate sector as well. The impact of new entrants is felt not only in the year of the entry, as companies usually grow above average in the years following their entry as well. In the pre-crisis period, entrants and young firms significantly raised the investment rate. However, with the outbreak of the crisis their contribution to the investment rate fell. The share of new entrants decreased even during the years of recovery to reach historically low levels in 2014. The lack of new entrants contributed greatly to the sluggishness of the recovery.

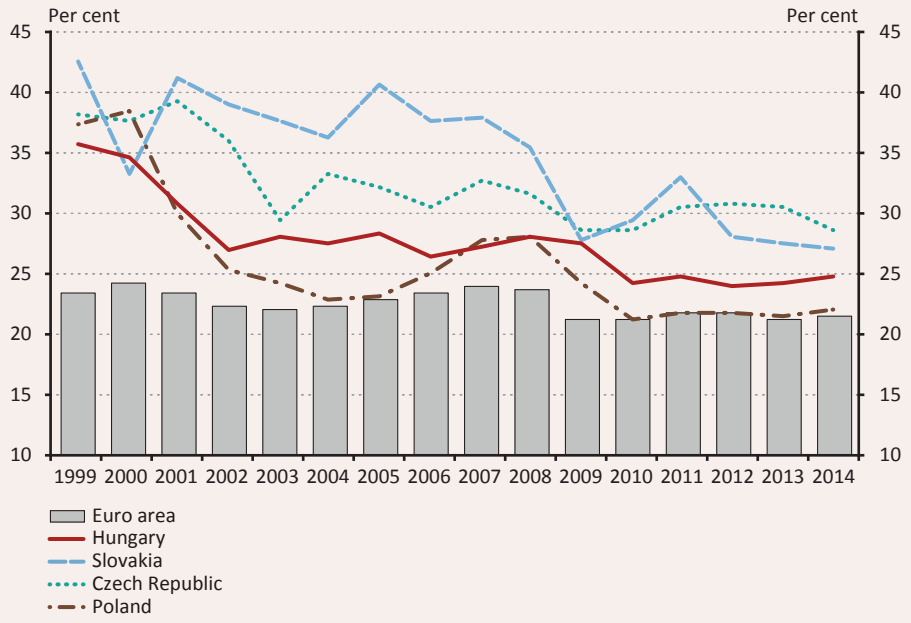
Changes in the sectoral structure can have an impact on investment performance indicators as the composition of capital vary across industries, and different types of capital goods have different useful life and depreciation pattern. According to our results, changes in the sectoral structure did not play a role in the development of investment performance. This holds for both smaller and bigger companies. We did not find any evidence that changes in individual sectors' weight in the economy contributed to the low corporate investment rate or the weakening activity.

The decomposition of the average investment rate underlines the findings based on the analysis of the impact of single-factor changes on aggregate performance: the negative role of ageing before the crisis and during the recovery is detected, while sectoral changes are found to have no impact. Other firm level variables on financial and real performance make a negligible contribution to explaining the changes in the investment rate over time. The decreasing average size of firms slightly increased the investment rate. The ESI index successfully captures some of the demand effects. The year fixed effects explain most of the variation over time, underscoring the importance of aggregate shocks and unobserved systemic factors, such as aggregate demand, credit supply and uncertainty.

1 Introduction

The significant structural change that characterised the Hungarian economy in the 1990s was mostly completed by the early 2000s. In line with that, investment activity weakened in the first years of the decade, before stagnating until the outset of the crisis. A higher investment rate means faster convergence to developed countries. The investment rate of converging countries usually exceeds that of developed economies. This is shown in Chart 1: over the past 15 years, the investment rate of the V4 countries was much higher than that of the euro area. Within the V4 countries, Hungary is a weak performer and Hungarian corporate investment is lower than the level seen in the Czech Republic or Slovakia, but higher than in Poland. It is also evident that the investment rate declined in all countries of the region in the 2000s, which is related to the completion of the transition period. It is also a common experience that the crisis entailed a decline in the investment rate of all countries in the region.

Chart 1
Investment rate of the non-financial corporate sector
(compared to GDP produced by the corporate sector, per cent)



Source: Eurostat.

Corporate investment plays an important role in both the short-term and long-term development of an economy. This analysis aims to contribute to a better understanding of the reasons for Hungary's low investment performance. To date, mainly macro level analyses have been prepared on the investment performance of the Hungarian economy. The novelty of this paper is the use of firm-level data to examine investment from the early 2000s to the end of 2014.[1] The advantage of micro-level analysis is that it allows one to investigate the heterogeneity behind the aggregate performance as well as the role of firm characteristics. Section 2 discusses

[1] As far as we know, only two studies analyse firm-level investment using domestic data. Kátay – Wolf (2004) examine the impact of user cost. Using the same database, Reiff (2010) analyses the presence and role of non-convex costs. Both studies use data through 2002. This means that the micro-level analysis of investment in the past one and a half decades is completely missing.

the data and methodology, which is followed by a summary of the cross-sectional stylised facts on investment, such as concentration and composition by firm characteristics. The development of investment performance is examined in Section 4. Section 5 discusses some of the driving forces of aggregate investment performance, such as the age of the firm, industry composition, and the contribution of new entrants. The discussion on aggregate investment performance is supplemented by a decomposition of the average investment rate. Section 6 presents the conclusions.

2 Data and methodology

The financial statements of companies with double-entry accounting, i.e. the corporate tax database of the National Tax and Customs Administration (NAV), are used in the analysis. This database provides almost full coverage of the corporate sector. We exclude firm observations if both total assets and sales are zero. In some cases public firms are excluded, in other cases, when we do regression analysis, the availability or definition of certain variables narrow the sample, which will be noted there.

The analysis focuses on the period starting from 2001. By this time, the transition period was already over, and additionally a new Accounting Law was introduced from 2001. In some cases, longer time series are employed, when the performance during the 1990s provides a useful benchmark or helps to plot the longer-term trends.

The two major indicators used to evaluate investment performance are the investment rate and investment activity. The investment rate is calculated as usual, as the ratio of investment in the given year and the previous year's capital stock (I_t/K_{t-1})[2]. Depending on the size and the availability of the investment rate, a categorical variable – which we call investment activity – is defined. The latter allows us to analyse even firms for which the investment rate cannot be calculated – for example inactive firms (which have neither capital nor investment) or those, which become active (new entrants and firms which invest but previously their capital has been written off entirely).

The database does not contain direct information on capital stock and investment; therefore, estimates are provided for these using the information reported in the balance sheets and profit and loss statements. First, investment is determined as the sum of the change in tangible assets and accounting depreciation. This is a net category, capturing the difference of gross investment and disinvestment. In contrast to the study by Kátay – Wolf (2004), we disregard intangible assets. Although the share of these assets has increased gradually since the 2000s, we know very little about their behaviour. Therefore, we stuck with property, plant and equipment types of investment, which is the focus of investment theory. In addition, upon calculating the investment, we take into account not only planned but also accelerated depreciation. Real investment is calculated from nominal investment with the help of sector-level investment price indices. The PIM (Perpetual Inventory Method) is applied to calculate the real capital stock. When determining depreciation, the accounting depreciation rate is used. Accounting depreciation reflects the composition of a company's capital, which is important, because there are significant differences between the average useful lives and depreciation of different types of equipment or buildings and structures. However, its disadvantage is that – in line with the accounting rules – companies can write off their capital goods much faster than implied by their actual useful life. Consequently, investment rates will be higher compared to the case when economic depreciation is used.[3]

Having calculated the investment rate, we define categories and measures of investment activity. The following categories are introduced:

– Positive spike: investment rate > 0.35
– Positive investment: 0.02-0.35
– Zero investment/inactivity: (-0.02) – 0.02
– Negative investment: (-0.35) – (-0.02)

[2] This comes from the capital accumulation equation, as the difference of $I_t/K_{(t-1)}$ and the depreciation rate gives the percentage of increase in capital.

[3] Accounting rules may also cause systematic differences by company size. For example, according to the current rules, assets with a value below HUF 100,000 may be written off in one year, i.e. a 100% depreciation rate applies to them.

– Negative spike: < -0.35
– New entrants
– Others (K_{t-1}=0)

These categories are used to analyse the composition of firms by type of investment activity and to run estimations on the probability of individual events (spike, inactivity, etc.) occurring.

The empirical concept of a spike was introduced by Cooper et al. (1999) and Gourio and Kashyap (2007). The literature usually uses a rather arbitrary threshold (20%) to define a spike.[4] In this study, the threshold was raised substantially, since the use of accounting instead of economic depreciation rate resulted in much higher average investment rates. In our case, the 20% threshold would have identified about half of all investments as spikes. The 35% threshold yields a spike frequency similar to the ones found in the literature.

This measure of investment activity and its categories allows the analysis of new entrants and those who did not have capital in the previous years. In addition to the investment rate, changes in inactivity and new entries provide supplementary information on investment performance. Moreover, spikes are likely to capture expansionary investments, which contribute to the accumulation of productive capacities and as such deserve special attention. Examining the heterogeneity of the frequency of spikes or zeros also allows us to analyse the assumptions of investment theory on the existence of non-convex adjustment costs.

In the analysis, we faced a number of challenges related to the dataset. The investment we calculated at the company level is conceptually different from the aggregate investment recorded in macro statistics. In the latter case, only the purchase or creation of new assets is considered as investment, while at micro level, tangible assets change with the purchase/sale of used equipment as well; therefore, they are also accounted for as investment. At the same time, the buying and selling of used equipment offset each other at the aggregate level; the probability that used machines are sold abroad and not to domestic agents is likely to be low.

Our estimates for investment may be distorted and the deviations from macro data may be increased by corporate transformations. For example, if a firm outsources a part of its activity to another company, (not real) investment is recorded upon the appearance of the new firm and simultaneously a downsizing at the original one. This will have no impact on aggregate investment, but may influence firm-level analysis. Finally, aggregate data are also affected when a company is transformed by termination. In this case, a new firm is set up and an old one exits, distorting not only micro, but macro level analyses; there is new investment accounted for, but no disinvestment. Therefore, higher-than-actual aggregate investment is seen.

The heterogeneity of investment performance is analysed by looking at the differences by the size of the company (micro, small, medium, large), its ownership (foreign or domestic), its age (number of years elapsed since registration of the firm) and its export status (exporter or non-exporter). A firm is regarded as an exporter if its exports exceed 10% of its total sales revenue. A company is regarded to be foreign owned, if the share of foreign owners in paid-up capital is above 50%. As for the size categories, the standard EU thresholds are employed. For employment they are: 10, 50 and 250 people; for sales revenue: EUR 2, 10 and 50 million; for the balance sheet total: EUR 2, 10 and 43 million. In categorising, we deviate from the usual EU rules: if the company exceeds the threshold for at least one indicator, it is classified into the higher category. According to the EU definition, either employment or the balance sheet total and sales revenue together must be above the threshold for classifying the firm into the higher category. Our aim with the modification is to avoid the incorrect classification of new entries: e.g. upon launching their investment projects, several large firms would appear among the micro enterprises because, although their balance sheet total is high, their sales revenues or employment are low, as they have not started production yet in the period of the large investment.

[4] An alternative approach employs deviation from firm-specific medians. We rejected the median approach, as left and right censoring problems caused strong trends in the frequency of spikes.

We are primarily interested in the aggregate investment performance and its underlying drivers, including heterogeneity by firm characteristics. Given the heterogeneity and high concentration of corporate investments and capital, aggregate and average investment rates deviate from each other. Therefore, in the case of the investment rate most of the time we analyse aggregate instead of average behaviour, which has a bearing on the methodology: decompositions and playing with weights are used instead of regressions. At the same time, in the analysis of investment activity the performance measures are frequencies – e.g. the probability of investing or not investing at all. Therefore, regression analysis can be employed, which has the advantage of allowing for the investigation of the role of several factors at the same time.

3 Cross-sectional stylised facts

3.1 COMPOSITION AND CONCENTRATION OF CORPORATE INVESTMENT

Investments in the Hungarian corporate sector are highly concentrated and dominated by large, foreign-owned or exporter companies. These structural features have not changed much over the last 15 years, although the crisis caused temporary shifts.

Large companies dominated investment in the period under review. According to Chart 2, large firms implement about one half of investment. The weighting of groups by firm size hardly changed during the period. While smaller companies increased their share slightly in the 2000s, following the crisis this process reversed, and the share of large firms increased at the expense of all other size groups. This was partly attributable to cyclical and demand effects, as the demand of smaller companies producing for the domestic market declined persistently, while that of large companies producing for export markets picked up more rapidly. The tightening of liquidity constraints, which affected more domestic and smaller companies, may have also played a role. Following that, during the recovery, the shares returned to the levels typical of the 2000s. The Funding for Growth Scheme had also contributed to that. Although an increase in the segment of medium-sized companies would be important for a more balanced corporate structure, this is the only group that was not able to raise its share in any of the periods.

Chart 2
Distribution of investment by firm size

Source: Authors' calculations

The share of domestic and foreign companies in total investment is roughly fifty-fifty. Even the crisis did not change that (Chart 3). The breakdown by exporting status shows that the share of exporting companies started to increase following the outbreak of the crisis. The weight of exporting companies in investment increased from the earlier stable level of 25% to above 40% by the end of the period. This was partly driven by changes

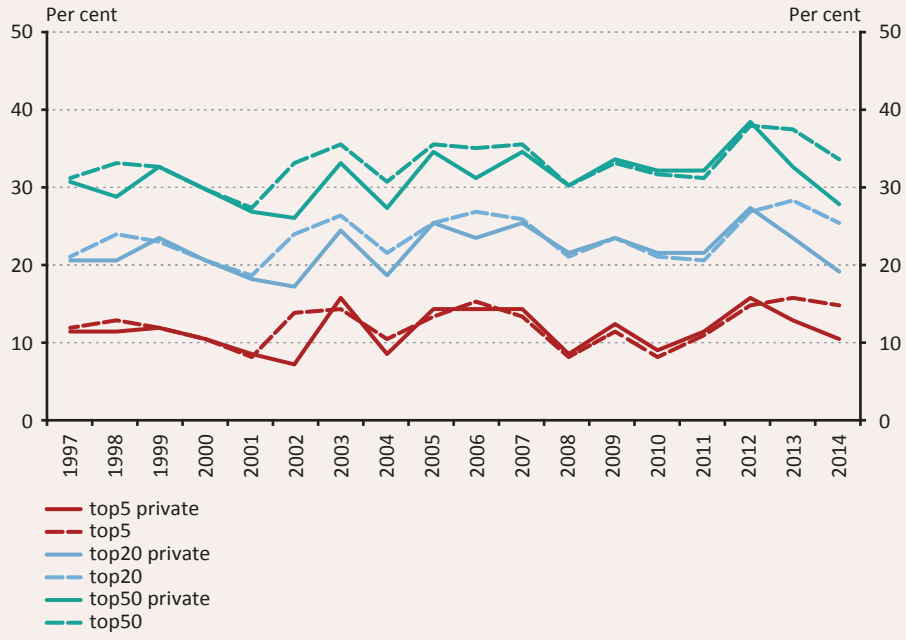
in demand, as demand started to recover much earlier and more strongly in the case of exporters than in case of firms producing for the domestic market.

Chart 3
Composition of investment by ownership and export status
(per cent)

Source: Authors' calculations.

Investments are highly concentrated. Not only is the weighting of large firms high, the largest investment projects related to these firms also show high concentration. Picking the largest investors each year, we found that the 5 largest investments account for 12% of total investment (average over the sample), while the top 20 projects account for nearly one quarter (Chart 4). Although these ratios are volatile, their average is stable throughout the entire period. The inclusion or exclusion of public firms does not change the assessment, although the gap between the two widens in certain periods. For example, at the end of the sample large investments financed from EU grants and implemented by state-owned companies contributed to the higher concentration.

Chart 4
Share of the largest investment projects



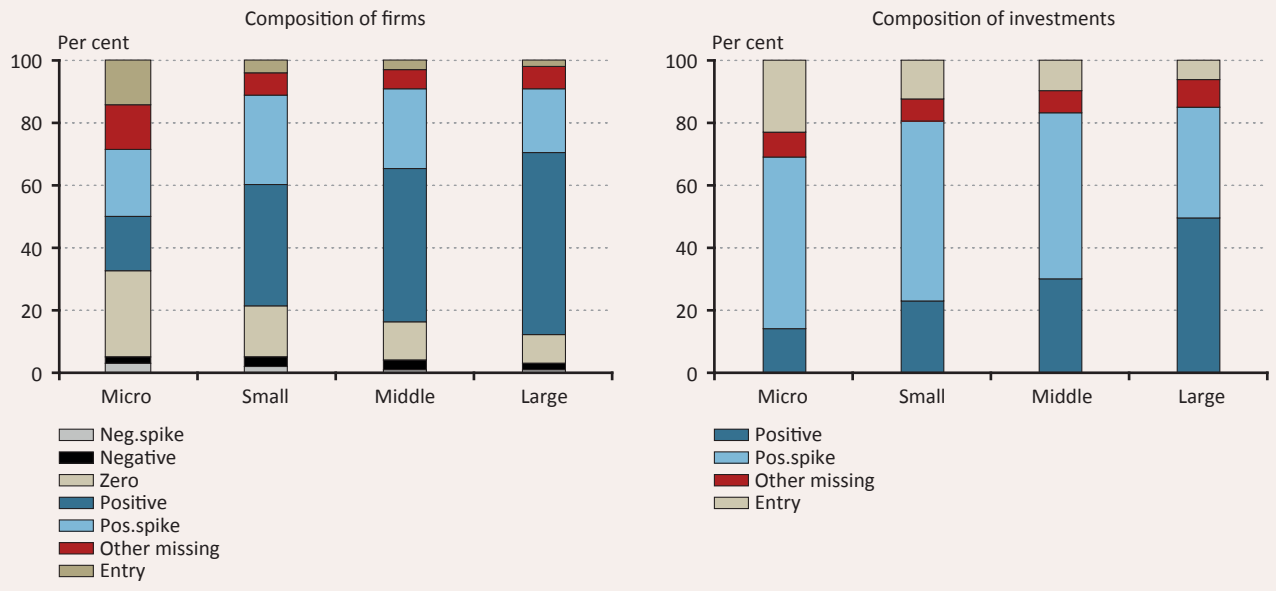
Source: Authors' calculations

3.2 HETEROGENEITY OF INVESTMENT ACTIVITY

Investment at the micro level is lumpy. Periods of inactivity – with no investment at all – are followed by occasional larger investments, and disinvestment is also rare. In addition, the bulk of investment comes from large investments (spikes). These regularities are observed in many countries and are in line with the assumptions of theoretical investment models – such as the presence of non-convex (fix) adjustment costs, indivisibility of capital goods, irreversibilities and large costs of disinvestment. The importance of these costs and frictions depends on the type of investment good (equipment versus structures), whether the investment is replacement or capacity-building (fixed adjustment costs are smaller in the case of replacement) and the size of the firm. Among these, firm size can be investigated in our sample. The larger a firm is, the more likely it outgrows fixed adjustments costs. Similarly, as large firms tend to have several plants, aggregation smooths their investment activity. Finally, indivisibility is also more likely to matter in the case of smaller firms. Consequently, we expect that with an increase in the size of the firm, inactivity (no investment) will be less frequent, while positive investment will be more frequent.

Evidences of the lumpy nature of investment and the heterogeneity by size or industry are documented among others by Cabalerro et al. (1995), Nilsen and Schiantarelli (2000), Gourio and Kashyap (2007), Bachman and Bayer (2014). The Hungarian data yield similar results. Inactivity is frequent, disinvestment is very rare, and the bulk of investment comes from spikes as shown in Chart 5. The frequency of these events depends on the size of the firm. Inactivity (and entry) is most frequent in the case of smaller firms, while the frequency of positive investment increases with size. The link between size and frequency of spikes is non-monotone, with the latter being the largest for small firms and then decreasing with the size of the firm. The right panel shows the importance of each event in terms of the contribution to total investment instead of in terms of frequencies, but the qualitative findings are the same.

Chart 5
Investment activity by size of firm



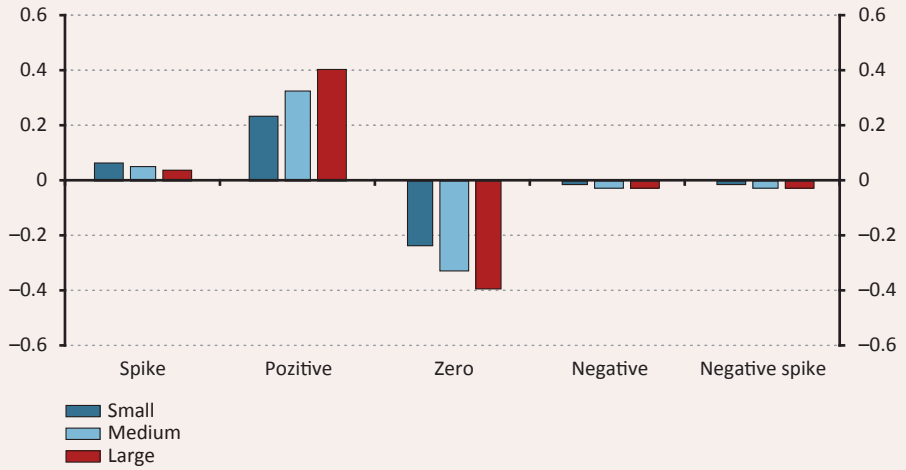
Source: Authors' calculations.

We test the heterogeneity of investment activity – in particular its dependence on the size of firm – by running regressions as well. The advantage of this approach is that we can control for many firm characteristics, such as age, sector, ownership, export status of the firm and the year fixed effect. The estimation results support the stylised facts observed above; the larger the firm, the less inactive and the more likely to have positive

investment (Chart 6). Regarding the probability of spike, micro firms are the least likely to experience a spike, otherwise its frequency is monotonous decreasing with size.[5]

As to the frequency of negative investments, a negative relationship to size is found, although the estimated model's performance is rather weak in terms of R^2.

Chart 6
Impact of firm size on indicators of activity
(estimation results, coefficients of size dummies; micro=0)



Source: Authors' calculations.

[5] If instead of size dummies we add capital (its cubic polynomial) to control for size, results change slightly: the impact becomes monotone in size and is the largest for micro firms. If capital and size dummies are both included, capital will absorb the impact of size, and the categorical variables capture the remaining variability, which actually show a decline with size. These results are not reported.

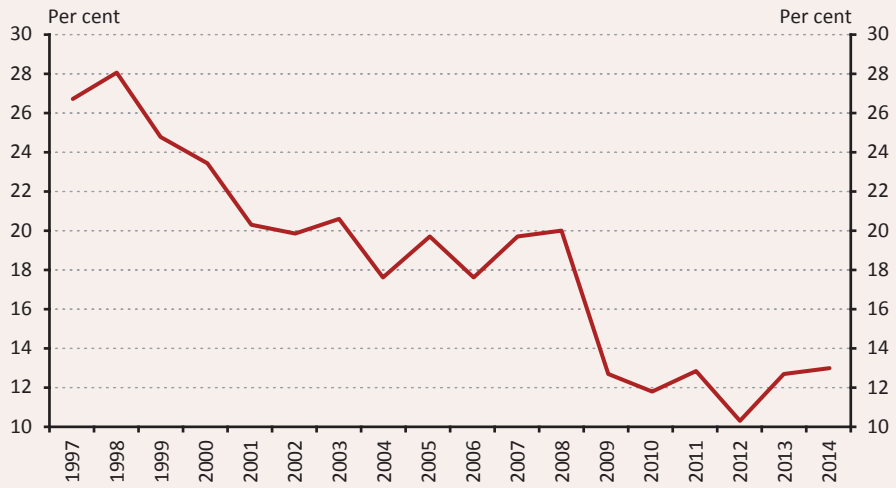
4 Changes in investment performance

The change in investment performance of firms is described by their aggregate investment rate and their investment activity. Analysing the latter is of interest, because it covers newly established companies as well as ones that are becoming otherwise active or inactive, but for which we cannot calculate an investment rate. Investment performance is evaluated first for the entire corporate sector, and then by size, ownership and export status.

4.1 ENTIRE CORPORATE SECTOR

The aggregate investment rate as a proportion of the previous year's capital is depicted in Chart 7, which shows a steep fall in the investment rate at the end of the 1990s, followed by a slight decline and stagnation in the investment rate in the 2000s, until the outbreak of the crisis. The impact of the crisis on the investment rate is first seen in 2009, when a significant decline occurred. A slow recovery is observed following the crisis: a modest rise began in 2013 and 2014, following the trough in 2012.[6] The growth of the Hungarian economy and the loosening of financial constraints due to programmes of the central bank had also contributed to this improvement.

Chart 7
Aggregate investment rate
(as a percentage of capital in the previous year)



Source: Authors' calculations.

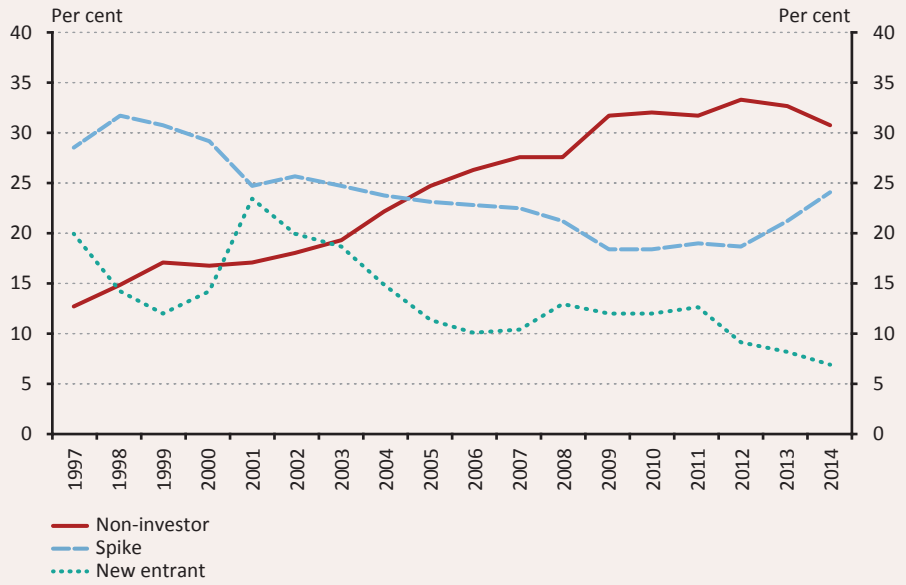
Accordingly, starting from the early 2000s, the developments in the investment rate divide the period under review into three well distinguishable phases: a pre-crisis period of stagnation between 2001 and 2008, the crisis between 2009 and 2012, and the phase of recovery in 2013–2014. The rest of this analysis focuses on these three phases.

Looking at the developments in investment activity over time, significant rearrangements are observed (Chart 8). Although – as seen in the previous chart – the aggregate investment rate was relatively static in the 2000s,

[6] This behaviour of the investment rate is similar to the investment ratio defined as the investment as a percentage of GDP. See Chart 1.

a declining trend was already observed in investment activity from the early 2000s on: the ratio of spikes declined steadily, while the ratio of inactive companies which did not invest at all increased, and the ratio of new entries also decreased. The different developments in the two performance indicators (investment rate and activity) in this period are partly explained by the fact that the investment rate is dominated by large companies due to the concentration of investment, while investment activity is dominated by smaller firms because of their high number.

Chart 8
Trends in investment activity
(ratio of companies belonging to individual categories)



Note: Single-entry bookkeeping ceased in 2004; therefore, a large number of old companies appeared in the sample. In order to avoid breaks, the values for 2004 were substituted with the average of the years 2003 and 2005.

Source: Authors' calculations.

During the crisis, these negative trends continued or even deepened in certain cases. Thus, for example, one third of the companies did not invest at all in this period. However, signs of a recovery were already seen in 2013–2014, and the previous negative trends reversed: the ratio of companies which do not invest at all declined, and the ratio of spikes increased. The share of new entrants took a different path and tended to stagnate between 2008 and 2011, before declining again. The temporary rise in new entries in 2011 followed by a decline in 2012 may be attributable to changes in legislation (raising the minimum paid-up capital and other tightening measures). However, the subsequent further decline reflects a deterioration in the willingness to establish companies. By 2014, the share of entries fell to a historically low level.

4.2 GROUPS BY FIRM SIZE

The aggregate developments mask the heterogeneous performance of group of firms. Here we examine the developments in the investment rate and investment activity by size. For the classification (micro, small, medium-sized and large companies), we use the methodology outlined in the data section.

The aggregate investment rate broken down by company size is shown in Chart 9. Various lessons can be drawn. Firstly, prior to the crisis, the investment rate was higher in the smaller size categories. This is partly explained by smaller companies' different asset composition (they typically have assets which exhibit faster depreciation and higher replacement needs) and by the fact that on average they are younger and more rapidly growing companies. A similar observation is made in the literature, for example in Hall (1987) where it is shown that smaller firms grow faster. Accounting rules, which allow companies to use 100% depreciation in the case of

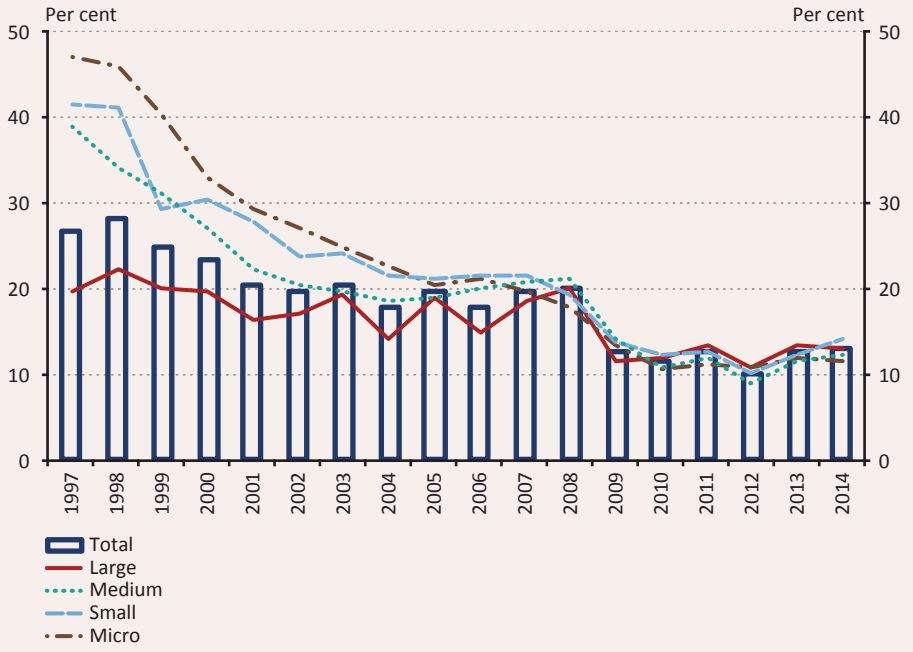
capital goods with a value below a threshold, might also contribute to the size dependence of investment rate through the faster depreciation of capital.

Secondly, in the 2000s it was primarily the investment rate of micro and small enterprises that declined, while the investment rate of medium-sized firms was stagnant, and that of large companies even increased to some extent between 2004 and 2008. Accordingly, the decline/stagnation observed in the full sample is mainly the consequence of smaller companies' decreasing investment rate. We should note that the overall impact of smaller companies on the aggregate investment rate is limited and fades over time. Although their investment rate is much higher in the first half of the sample, their share in total capital remains small for the entire period.

As smaller firms usually have a higher investment rate, it is a negative development that in 2007–2008 the investment rate of smaller-size companies declined to a level similar to that of large companies.

Following the outbreak of the crisis, in 2009 a similar decline in the investment rate took place across companies of various sizes. Until 2012, the investment rate stayed at this low level in all size categories. A slight improvement is seen in 2013–2014.[7]

Chart 9
Aggregate investment rate by firm size
(as a percentage of capital of the previous year)



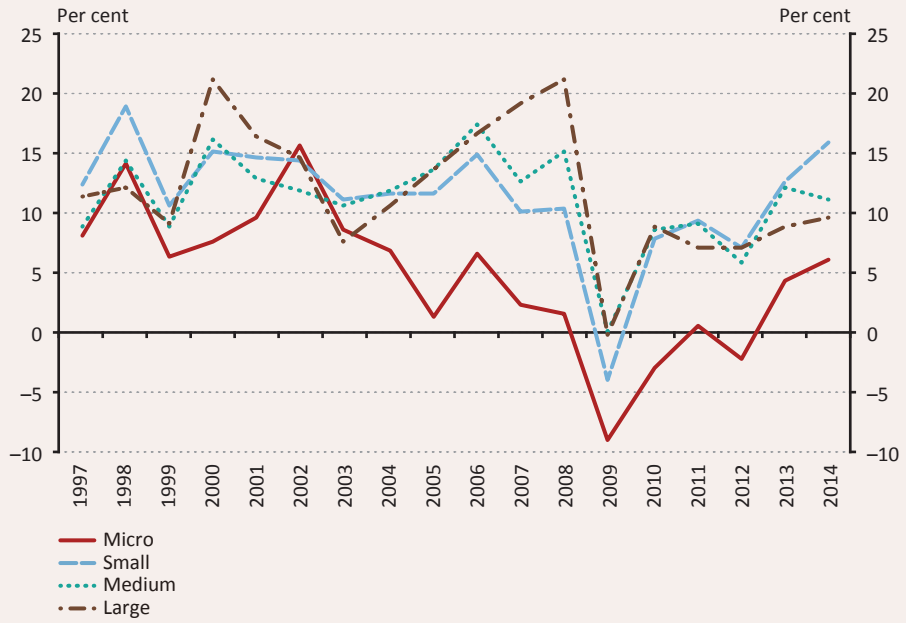
Source: Authors' calculations.

Box 1
Other performance measures of micro enterprises

The declining investment performance of micro enterprises in the 2000s suggests that these companies were less willing or able to grow. This is corroborated by other indicators as well. For example, the dynamics of sales also weakened in the period between 2001 and 2008. According to Chart 10, a declining trend in the average growth rate of sales revenue is observed only among micro enterprises.

[7] One might argue that the movement of the most dynamic micro firms into larger size groups may have also contributed to the decline in micro firms' investment rate. However, that is not the case, as the decline is observed even if we control for movements between size groups.

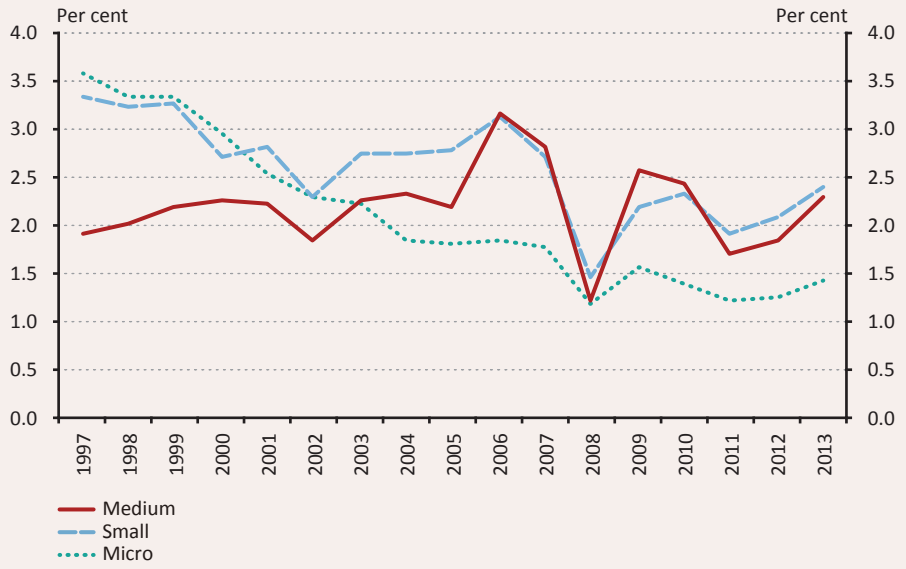
Chart 10
Average real growth rate of sales
(calculated from firm-level growth rates of sales deflated by producer prices, per cent)



Source: Authors' calculations.

The declining dynamism and weaker growth performance of micro enterprises is also indicated by the fact that the frequency of transition to a higher size-category declined strongly and steadily. This is also a micro enterprise phenomenon; no similar unfavourable trend is observed in other size categories (Chart 11).[8]

Chart 11
Frequency of transition to a higher size category by firm size
(number of transitions in the following year/number of firms, per cent)



Source: Authors' calculations.

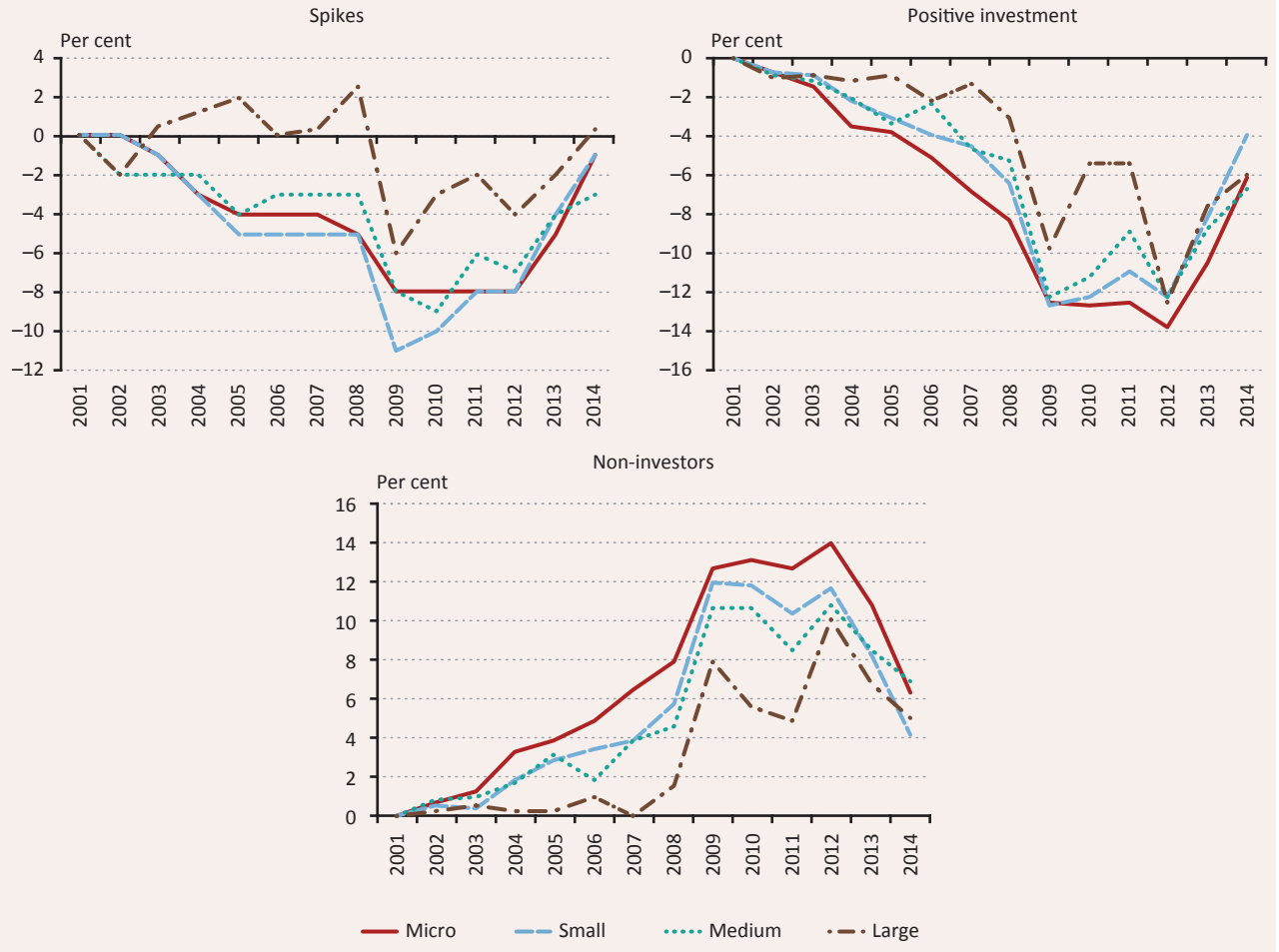
[8] The frequency of transition to smaller size categories does not show a trend in any size categories.

The developments in investment activity reveal similar heterogeneity by size. Given our interest in aggregate investment performance and the large deviation between the aggregate and average investment rates, the unconditional investment ratios were analysed in the foregoing. In the case of investment activity however, instead of reporting unconditional frequencies, we opted to calculate time trends, while controlling for several firm characteristics (ownership, age, sector, financial performance, etc.). Accordingly, Chart 12 does not show the actual frequencies, but – using 2001 as a base year – it depicts the remaining year fixed effects after controlling for changes in firm characteristics.

The results show that even after controlling for changes in the composition of firms in terms of observable characteristics, investment activity was declining in the pre-crisis period. However, the rise in the ratio of non-investors and the decline in the frequency of spikes, was typical of smaller companies, but not of large ones.

The crisis affected the activities of all size categories in a similar manner. The frequency of expansion-type investment declined significantly, while the frequency of companies which did not invest at all surged. Signs of recovery can also be observed irrespective of size: the probability of spikes rose strongly, and the frequency of non-investing companies declined to the pre-crisis level. Presumably, at that time companies started to make up for a part of the investment postponed during the crisis. This may have contributed both to the decline in the ratio of companies which do not invest at all and to the increase in the ratio of spikes.

Chart 12
Development of the frequency of spikes and non-investors by firm size
(percentage points)

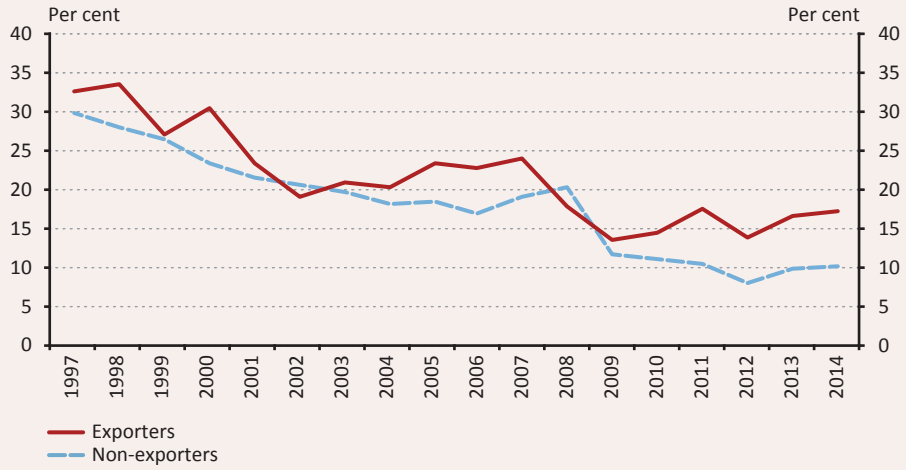


Note: Estimation results on year dummies, after filtering out the effect of firm-level variables; 2001 is the base year.
Source: Authors' calculations.

4.3 DEVELOPMENTS IN INVESTMENT BY OWNERSHIP AND EXPORTING STATUS

In this section, we examine heterogeneity by ownership and exporting status. Examining the investment rate of exporters and non-exporters, it is observed that in the 2000s the investment rate of those producing for the domestic market declined (Chart 13), while that of exporters rather increased. In the case of exporters, the effect of the crisis is already seen in 2008 in the decline in the investment rate, while in the case of non-exporters the rate falls only in 2009. This is in line with the fact that external demand started to deteriorate sooner than domestic economic activity as a result of the crisis. Moreover, in line with developments in economic activity, the recovery after the crisis started earlier and was stronger in the case of exporters.

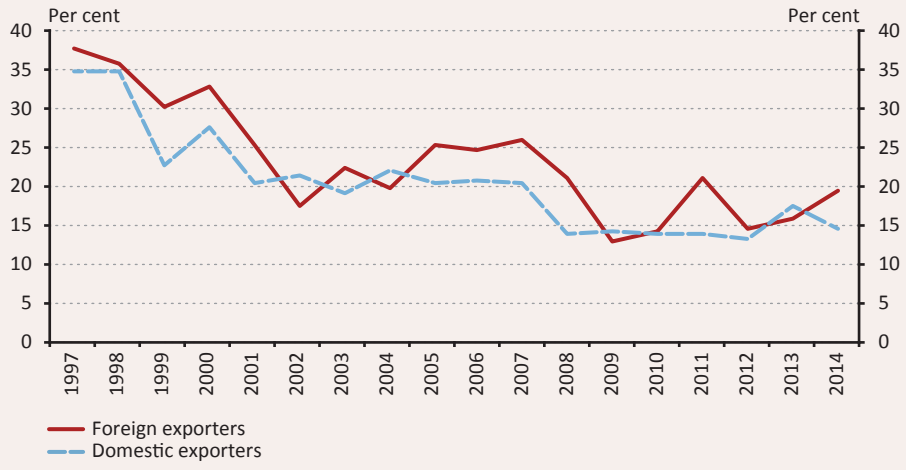
Chart 13
Aggregate investment rate of exporters and non-exporters
(investment/capital of previous year, per cent)



Source: Authors' calculations.

There is a strong overlap between exporting and foreign ownership; therefore, a further breakdown of exporters is applied according to ownership (Chart 14). After the crisis, the investment rates of foreign-owned exporters show a faster and stronger recovery compared to domestic-owned firms.

Chart 14
Aggregate investment rate, foreign and domestic exporters
(investment/capital in previous year, per cent)



Source: Authors' calculations

5 What factors contributed to investment performance?

The size of the investment rate is affected by various factors. Companies' performance changes over their life-cycle. They grow most dynamically in their first years, and therefore, we expect that the investment rate depends on the age of the company. In addition, the composition of tangible assets also affects the investment rate. While a machine is used by a company for 5–10 years on average (the useful life of a computer is even shorter), the lifespan of buildings and structures is many times that. Accordingly, companies and sectors that need machines more than structures typically have higher investment rates. To investigate the changing composition of capital goods we analyse industries, as information at firm level is not available.

In a similar vein, investment activity is also likely to depend on age and sector. In this case, the impact of age or sector can be extracted by running regressions and including the factors of interest as control variables.

The changes in the investment rate over time may be significantly affected if the composition of companies changes either according to age or sector. Therefore, in this section we examine whether the sectoral structure and the age distribution influenced the investment performance, and if so, in what direction and to what extent. The contribution of entry is examined in a separate sub-section, which is followed by a decomposition of the average investment rate.

5.1 ROLE OF SECTORAL COMPOSITION

5.1.1 Investment rate

To show the impact of changing sectoral composition, as a first step we fix the sectoral distribution of capital corresponding to the first year in our sample (2000). Then, these weights are used to recalculate the aggregate investment rate from the actually observed industry-level[9] investment rates for each year. Any gap between the original investment rate and the one excluding sectoral effects informs us about the impact of changes in industry composition. Based on Chart 15, **changes in sectoral structure did not have a substantial impact on the aggregate investment rate;** consequently, it is not the change in the sectoral composition of the economy that causes the decline in the investment rate. The chart shows results for micro enterprises, because the investment rate declined the most in their case, but the result is similar for small, medium-sized and large companies as well.

[9] The sectoral breakdown was prepared using national economy sections (i.e. identified by alphabetical letters A to U).

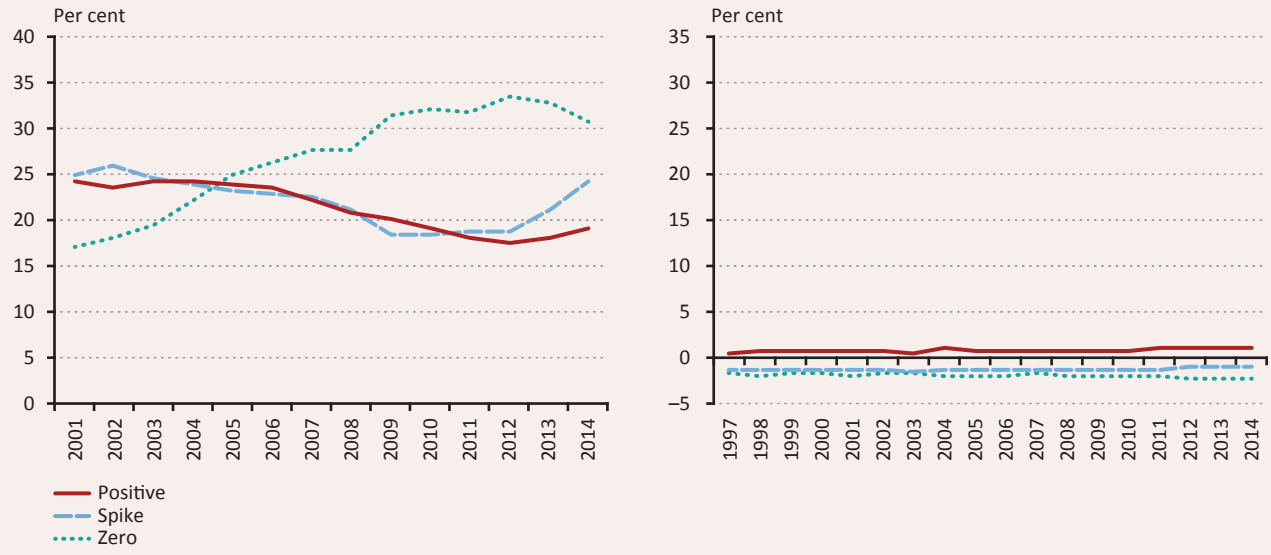
Chart 15
Aggregate investment rate including and excluding the effect of sectoral composition, only for micro enterprises
(average of letter-level sectoral investment rates weighted by capital of previous year and 2000)

Source: Authors' calculations.

5.1.2 Investment activity

The impact of changes in sectoral composition on the frequency of certain investment events (inactivity, positive investment, spikes) is calculated by using the estimated sector fixed effects and the composition of firms by industry to generate a weighted average industry impact. Then, its evolution over time is examined (Chart 16). The change in industry effect is very small. We use the same scale to render the two figures comparable – the one showing the actual frequencies and the one capturing the impact of sectoral composition.

Chart 16
Indicators of investment activity (left) and the impact of sectoral composition (right)



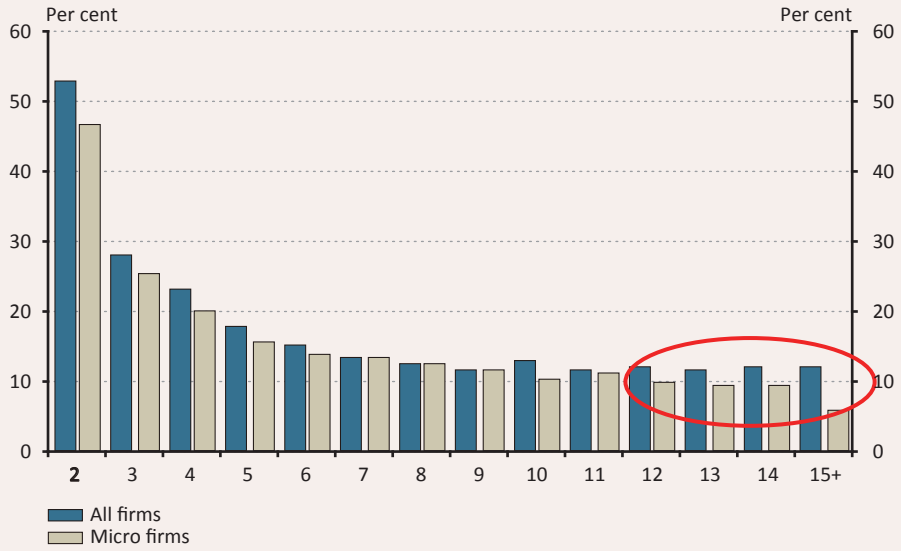
Source: Authors' calculations.

5.2 ROLE OF AGE

5.2.1 Investment rate

To examine the role of age we calculate the aggregate investment rates by the age of the firm. A strong relationship is found between the age and the investment rate of companies: the investment rate of young companies 2-4 years old is much higher than that of older ones. However, age dependence varies by the size of firm. Micro enterprises tend to invest more when they are young, and their investment rate declines steadily with age. At the same time, for the entire corporate sector, which also contains larger enterprises, no decline is observed above a certain age (Chart 17). Hence, small and old firms are less active than their larger peers.

Chart 17
Investment rate by age, in the case of all firms and micro firms
(investment/capital in the same year, per cent)



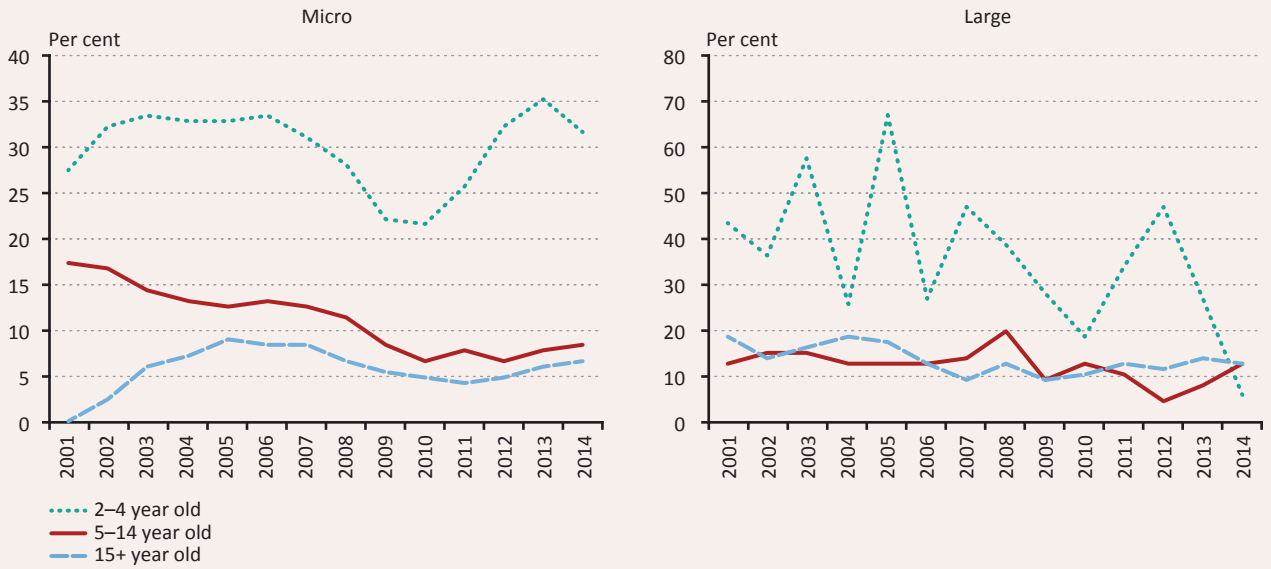
Source: Authors' calculations.

The changing performance of different age (and size) groups reveals some interesting findings. According to Chart 18, the declining investment rate of micro firms before the crisis is mainly explained by the decreasing investment rate of middle-aged, 5-14-year old firms. Young, 2-4-year old firms do not decrease their investment rate essentially until the crisis. That is, small and old firms underperformed not just relative to their young counterparts, but their relative performance even deteriorated over time. By contrast, similar data on large firms show no time trend in the 2000s in any of the age groups, although the series are more volatile due to the small number of firms, especially in the group of 2-4-year old companies.

The chart reveals some interesting stories during the crisis and the recovery as well. The young age group seems to be the most sensitive to the crisis (a similar observation is made by Haltiwanger 2013) and their investment rate fell the most. Moreover, the recovery from the crisis is strong among young micro firms,[10] whereas it is weak in case of other micro firms.

[10] Although the recovery of 2-4-year old firms is strong after the crisis, as will be shown later, their contribution to the aggregate investment rate does not recover and remains very low. That is because of the fall in the number and share of new entrants and young firms.

Chart 18
Changes in the investment rate by age, in the case of micro and large firms[11]
(investment/capital in the same year, per cent)



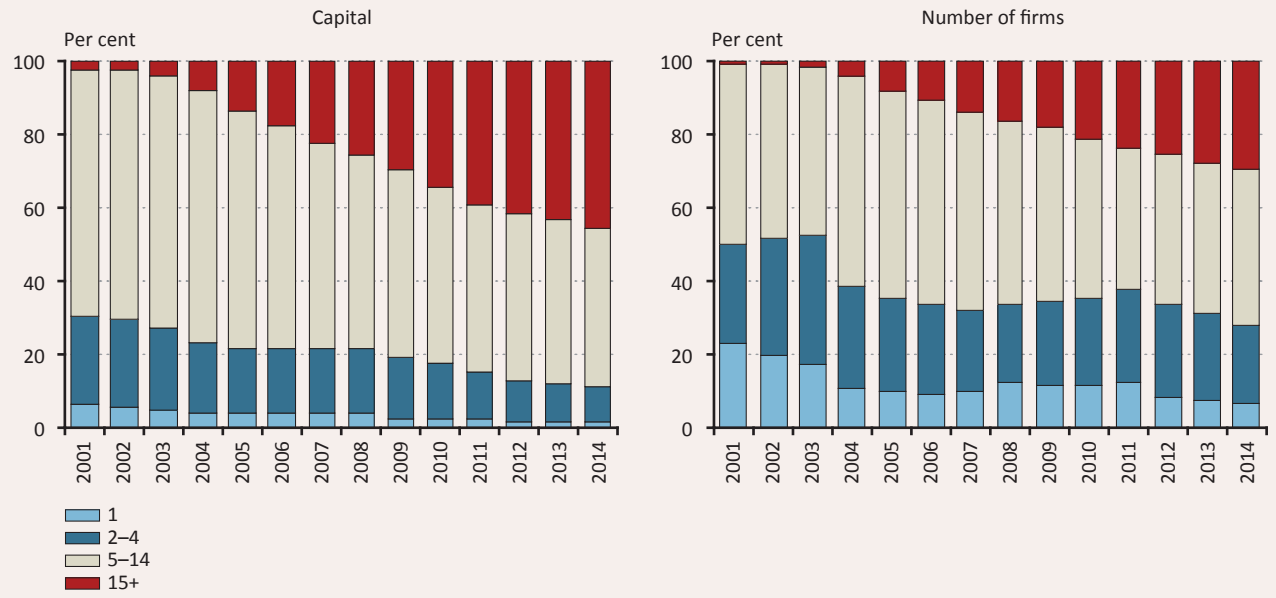
Source: Authors' calculations.

According to the findings on the relationship between age and investment, the decline in the investment rate of micro enterprises and of smaller companies in general in the 2000s may also be attributable to changes in the composition of companies by age. The average age of firms is actually increasing in the sample. Chart 19 shows ageing in the case of micro enterprises, although it is observed in each size category.[12] Similar ageing is reported for the USA in Hathaway and Litan (2014), although they did not investigate the relationship of ageing and investment performance. The sharp increase in the share of 15+ year old firms started around 2005, which probably reflects the impact of the firm creation boom at the beginning of 1990s. As a result of the transition crisis and the introduction of the new Bankruptcy Law in 1991, many old firms were dissolved and new ones were established.

Since Hungarian firms are gradually growing older, and ageing is shown to lower investment rates, we next calculate how large the effect of ageing was on the investment rate. We use the methodology already introduced to analyse the effect of changes in the sectoral structure. Here the weights correspond to the distribution of capital among age groups in the year 2001, which are used to recalculate the aggregate investment rates for each year.[13] Chart 20 depicts the investment rate weighted by 2001 capital and the actual aggregate investment rate.[14] According to the results, the ageing of companies partly – but not completely – explains the pre-crisis decline in the investment rate of micro enterprises. Ageing also hinders the recovery following the crisis. The impact of ageing is huge, by the end of the sample the difference is two-fold. To a lesser extent, ageing contributes to the declining investment rate of small companies as well. In the case of medium-sized companies, the effect is small and volatile, while the investment performance of large companies was not affected by ageing at all. These results are consistent with the findings of Chart 17, i.e. that the investment rate does not decline above a certain age in the case of larger firms.

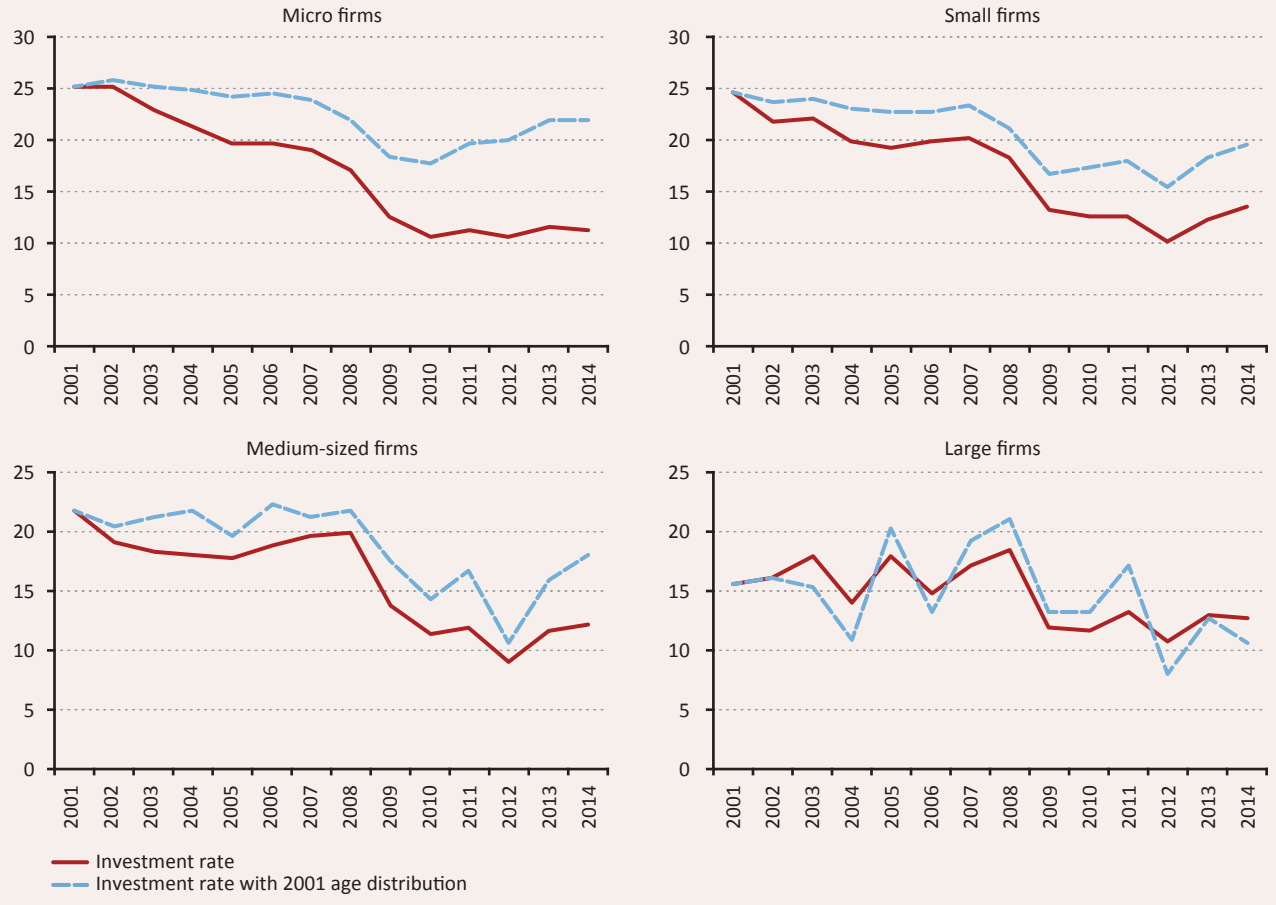
[11] There is only a small number of old micro firms in 2001, so the slightly negative investment rate is the consequence of idiosyncratic events.
[12] It is important to note that not only the decline in the ratio of new entries can contribute to the increase in average age, it may have a similar impact if there are many young ones among the companies that cease to exist.
[13] In this case, the aggregate investment rates are calculated by dividing the investment by simultaneous capital, because dividing by the capital of the same firms in the previous period would exclude 1-year old firms from the analysis.
[14] We also performed a calculation with 2008 weights, and the results did not change.

Chart 19
Changes in the age distribution of firms, micro firms
(according to number of firms and capital)



Source: Authors' calculations.

Chart 20
Aggregate investment rate, including and excluding the composition effect of age, by firm size
(average of investment rates by age, weighted by capital according to age distribution of the actual year and of 2001)

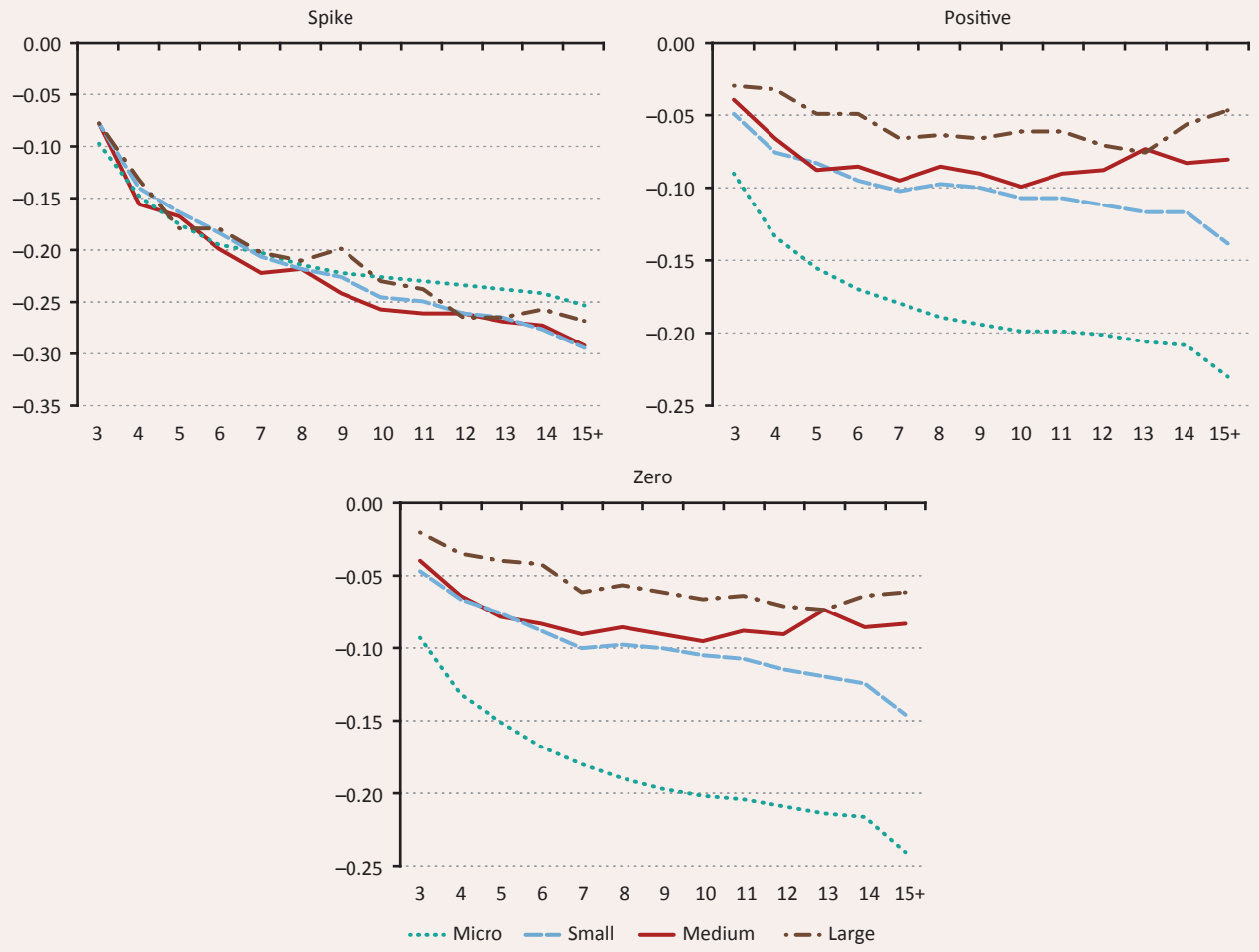


Source: Authors' calculations.

5.2.2 Investment activity

According to our estimation results, not only does the investment rate fall, inactivity also increases with age. Results by firm size are summarised in Chart 21. In the estimation, the usual controls are included: sector, firm controls (financial and real performance), year fixed effects. The frequency of spikes declines by age, and the pattern is very similar in all size categories. As to the likelihood of positive investment,[15] the decline by age is steady and steeper for smaller firms. By contrast, for the middle and large category the frequency of positive investment declines mainly in the first few years of the firm's life and stagnates after that. A similar conclusion can be drawn with regard to inactivity, the frequency of zero investment. Apparently, the activity of firms displays similar age-dependence by size of firm, as we have seen in the case of the investment rate. The activity of smaller firms keep declining by age, while larger firms exhibit decline only up to a certain age.

Chart 21
Investment activity and age of firm
(estimated coefficients of age dummies)



Source: Authors' calculations.

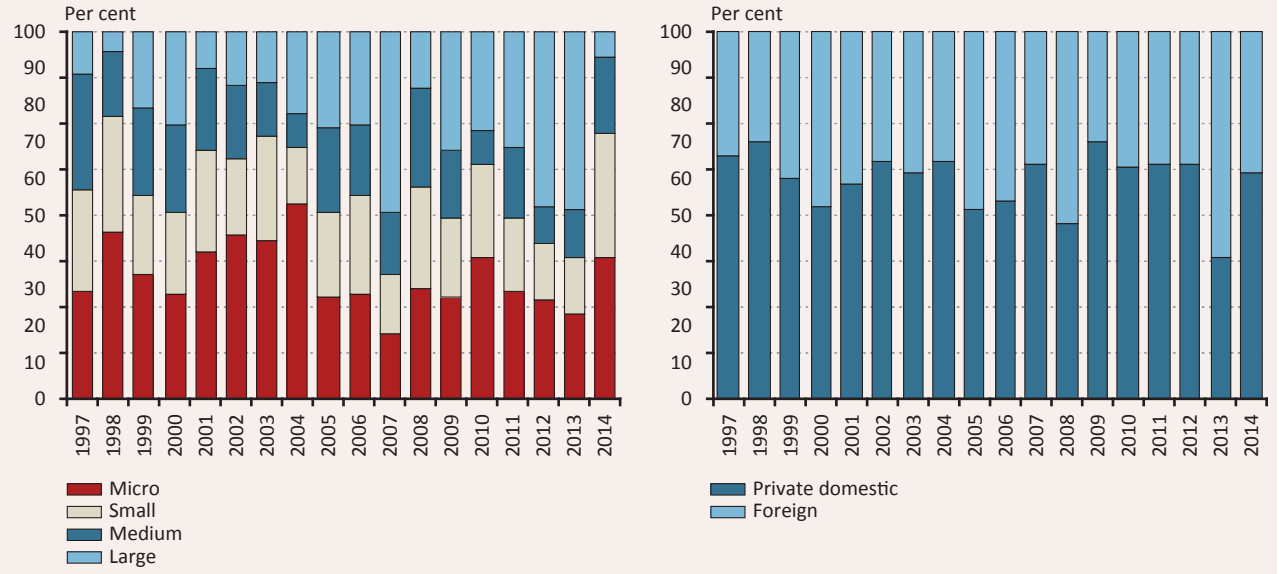
[15] Here for the sake of easier definition of the treated and control groups, spikes and positive investors are grouped together.

5.3 ROLE OF ENTRIES

As we have seen, the age of companies has a strong impact on their investment performance. Age in turn is driven by the share and composition of entering and exiting firms.[16] The role of entry is straightforward: the increasing share of new entries lowers average age. However, the role of exit depends not just on the rate of exit, but on the age composition of exiting firms as well. Since the impact of entry is likely to be larger (given the dynamism of young firms) and because it is easier to measure their contribution to investment, we now focus on the role and composition of entrants and their changes over time. A short descriptive analysis on exits can be found in the Appendix.

The composition of the investment of newly entering firms according to firm size is volatile (Chart 22, left panel). While large companies account for about one half of the total investment, in the case of new entries the share of smaller companies is higher. This is not surprising, as we expect entering firms to be small. However, in the second half of the sample the proportion of newly entering medium-sized and large companies increases to above 50%. The composition of new entries by company ownership is more stable; the ratio of domestic and foreign companies' investment is 60 to 40 (Chart 22, right panel).

Chart 22
Composition of the investment of new entrants by size and ownership



Source: Authors' calculations.

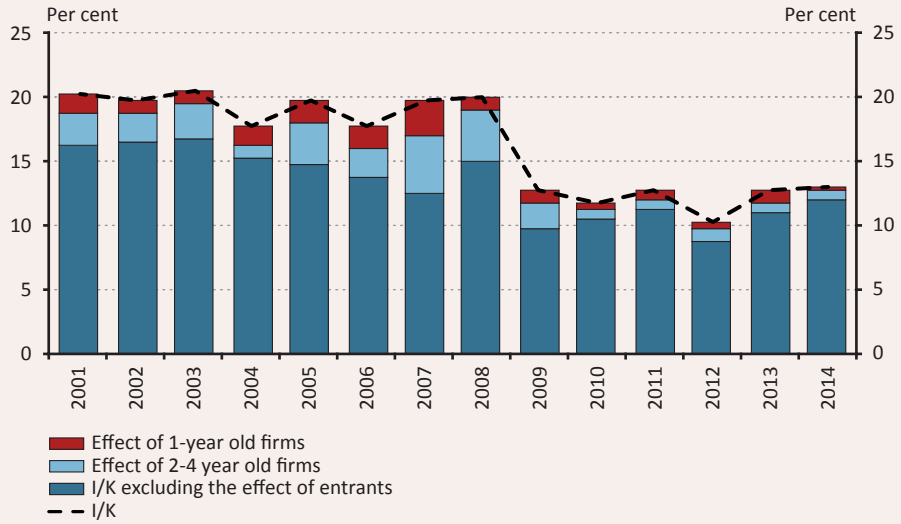
The contribution of new entrants to the investment rate is large. Entering companies are typically more active following entry as well, and their investment rate is higher than that of their older peers. Therefore, fewer entries in a given year may impair the investment rate during the following years as well. In order to present the role of entering firms, the total aggregate investment rate is decomposed into the impact of older companies, the impact of new entrants (1-year old) and of 2-4-year old companies. The latter shows the impact of the later activity of companies that entered in previous years (Chart 23). In practical terms, we calculate the investment rate for the sample of firms older than 4 years, then we add 2-4-year old firms to the sample; finally, we plot the aggregate investment rate for the entire corporate sector. The contribution of younger firms comes from two sources: either the share of firms in the given age group or their aggregate investment rate changes. In the pre-crisis years, entries significantly raised the investment rate.[17] However, with the outbreak of the crisis, from

[16] The first/last NAV reports for each firm ID are identified as entry/exit. Entry occurs at age 1 most of the time but not exclusively. As for exits, we also see temporary exits – some firms disappear from the sample and then reappear later - which induce some noise towards the end of the sample, where final and temporary exits cannot be distinguished.

[17] Not only is the contribution of entries and young firms to growth significant, their share in total investment is also substantial (between 20-40 per cent)

2009 this changed significantly: the contribution of 2-4-year old companies to the investment rate declined. Entering firms' contribution at the moment of entry also decreased, starting from as early as 2008. Hence the persistently low level of the aggregate investment rate observed after the crisis is also attributable to the weaker effect of entering firms. Not just the number of entering companies decreased, but their investment activity was also weaker than before the crisis.

Chart 23
Effect of entrant firms on the aggregate investment rate
(investment/capital in the previous year, per cent)



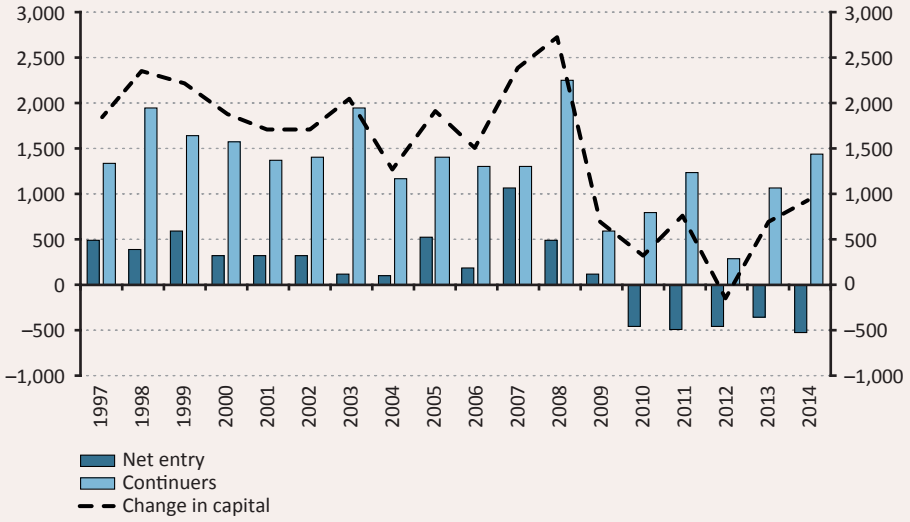
Source: Authors' calculations.

The analysis of new entrants' contribution to investment is impeded by the difficulties involved in identifying entries as discussed in the data section. In many cases, firms are registered years before the start of investment and in the meantime the operation of the firm is low scale. Several recent large investments in the car industry provide such examples. In addition, outsourcing and transformation by termination leading to the creation of new companies causes us falsely detect entries and investment. To deal with these issues, in the following we analyse the impact of net entries (entries minus exits) on the change in capital (instead of investment), where entrants are defined as firms less than 3 years old. By nature, investment analysis – which focuses on the investment ratio – ignores the impact of exits. In analysing the change in capital, one takes not only new investments and disinvestments of existing firms into account, but also disinvestments due to exits. In Chart 24, the change in capital is decomposed into the change in capital at continuing, older firms (3 years and older) and the net change in capital due to entries and exits. Entrants are firms entering in the given year or those less than 3 years old, while exitors are firms which exit from the sample in the given year. In this manner, an alternative and presumably more reliable picture can be drawn regarding the importance of (net) entries and its development over time.

On average, before the crisis net entries accounted for 20% of the growth in capital, indicating the new entrants' contribution to the creation of productive capacities. Their contribution becomes negative from 2010. Older firms started recovering from 2013, but the contribution of net entries remained negative. Apparently, weaknesses in business formation contributed significantly to the sluggish recovery in investment.

As seen in section 4, the share of entries was declining in the 2000s. The aggregate picture is mainly driven by changes in the micro firm group, because of their large number. To examine the heterogeneity of time trends by size and ownership, we ran a regression on the probability of entry. Estimation results by the size of company show that before the crisis the share of new entries decreased only for smaller firms (Chart 25). Due to the crisis, the entry of foreign companies became less likely in all size categories, while in the case of domestic firms, the fall is material only in the group of micro firms. At the same time, there is no sign of recovery in any of the size groups.

Chart 24
Decomposition of the change in net capital: net entries and firms older than 2 years



Source: Authors' calculations.

Chart 25
Probability of entry
(year fixed effects, base year 2008=0)

Source: Authors' calculations.

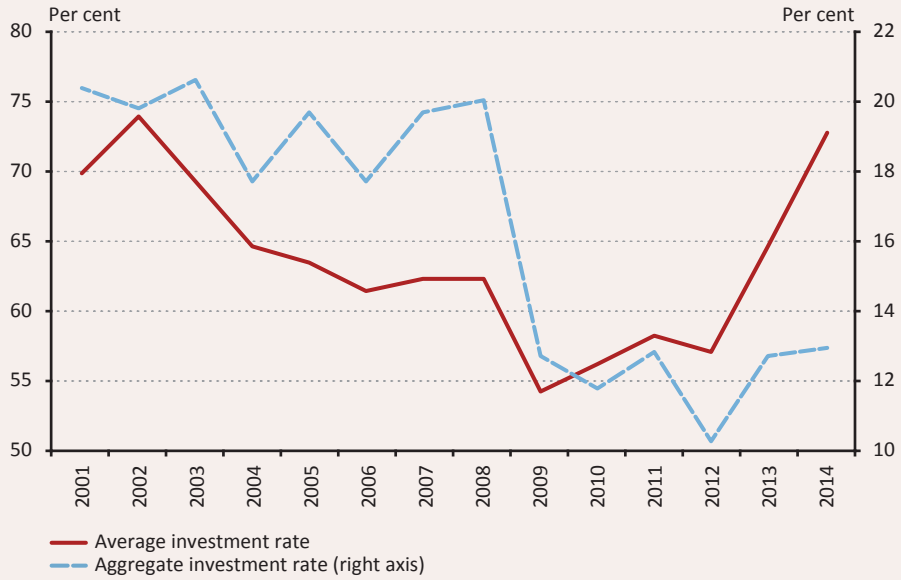
5.4 DECOMPOSITION OF THE INVESTMENT RATE

In this section, we explain the changes in the investment rate over time by running multiple regression. So far we analysed the impact on the aggregate investment rate of certain variables one by one. However, these variables (size, sector, ownership, etc.) are related to each other. Estimating the contribution of the variables to the change in the investment rate requires estimating the effect of these variables jointly, using multivariate regression analysis. Despite several advantages, this methodology has the drawback that firms have the same

weight in the estimation, so we essentially explain the average investment rate,[18] whereas previously, we analysed the aggregate investment rate which is approximately a weighted average of firm-level investment rates.[19]

For a start, it is worth comparing the development of the average and aggregate investment rate over time (Chart 26). Most of the time the two deviate greatly. The average rate declines more steeply in the 2000s than the aggregate rate. This is not entirely surprising considering that the aggregate rate declined mainly among smaller firms, and that the average rate is determined primarily by the numerous micro and small firms. The average rate also declined in 2009 due to the crisis; the recovery, however, is much more pronounced during 2013-14, the rate is higher in 2014 than in 2001. This is starkly different from the development of the aggregate rate, which remains persistently low after the crisis. This suggests that the strong recovery in the average investment rate stems mainly from the average behaviour of low-capital micro firms, while the subdued recovery in the aggregate investment rate is caused by firms endowed with more capital.

Chart 26
Average and aggregate investment rate
(investment/previous year's capital, per cent)



Source: Authors' calculations.

In the following, we analyse the effect of several variables on the investment rate. We estimated a linear regression model for the period of 2001-2014, where investment rate is explained by the size, ownership, age, export status and industry of the firm and we control for year, lagged capital, lagged depreciation rate and various financial variables.[20] We also include the ESI (Economic Sentiment Index), to control for economic outlook.

Estimated coefficients of the main categorical variables of the model are shown in Chart 27. Coefficients can be interpreted as the difference in the investment rate of a given category of a given variable compared to

[18] A possible solution is to use weighted regression analysis (WLS). The problem here is that influential observations (outliers) based on capital should be omitted from the sample to obtain appropriate estimates. But if we omit the observations with the largest capital then we will not be able to generate the results relevant for the aggregate investment rate.

[19] This approximation is not perfect. This is because investment rate is not defined for firms in the year of their entry and in the year following their exit, while they are included in aggregate investment rate (investment for entry and capital for exit). A small approximation error also stems from our outlier handling method (winsorisation) of firm-level investment rates.

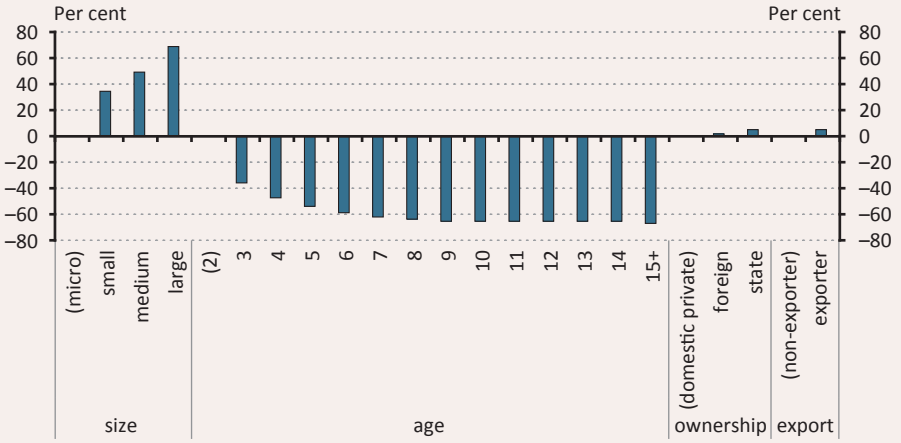
[20] These financial variables are: profitability, liquidity, leverage, sales/total assets. They are lagged in the regression to avoid the problem of endogeneity.

the control group holding other variables fixed. For example, the investment rate of small firms is about 35 percentage points higher than that of micro firms if the values of other variables are the same.

According to our estimation, firms invest more if they are bigger, younger and do export. It is worth recalling that previously – analysing the aggregate investment rate – we found that smaller firms have a higher investment rate. The apparent contradiction can be solved by considering that we controlled for lagged capital in the regression that also captures firm size. Thus, results show that the investment rate is increasing in size category if their capital stock is the same.

The estimated coefficients of ownership show that foreign-owned firms have a higher investment rate compared to domestic privately-owned firms, and state-owned firms have even higher rates. As for age, the investment rate decreases with age, especially during the first few years of firms' life. Therefore, the relationship between age and the investment rate – as shown in the previous part of this paper – remains in place, even if we control for other attributes of firms.

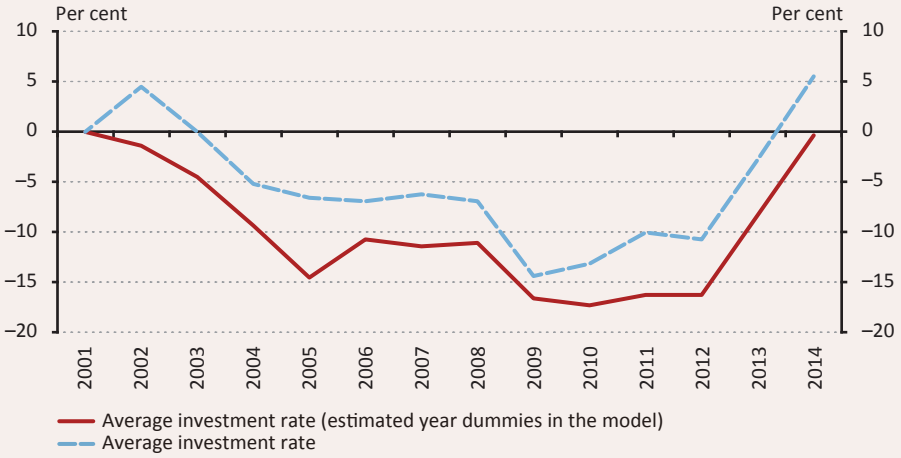
Chart 27
Partial effect of selected variables on the investment rate
(size of coefficients in the model, percentage points)



Note: The model also includes year and industry dummies, financial variables, lagged capital, lagged depreciation rate and the ESI index. Control groups are indicated by parentheses.
Source: Authors' calculations.

The explanatory power of the model can be considered moderate (R^2=0.19, see Table 1 in the Appendix for details). However, the development of the investment rate over time is essentially explained by the year dummies. These capture year-specific effects that firm-level variables cannot explain. This is illustrated in Chart 28: the evolution of year dummies in the model only differs slightly from the development of the investment rate. The dynamics of year dummies are even somewhat more unfavourable than in the case of the original investment rate. This means that changes in the attributes of firms cannot properly explain the decline in the investment rate in the 2000s, the fall during the crisis, or the recovery period.

Chart 28
Development of the investment rate unexplained by the regression model
(estimated year dummies, compared to 2001, percentage points)



Source: Authors' calculations.

To answer the question, what is the contribution of individual variables to the change in the investment rate over time, we use the model presented above and variants of the model estimated by size categories. We decompose the change in the average investment rate over time to the effect of the change of the mean of the various explanatory variables (results by size categories as charts are presented in the appendix, here we only emphasise the difference from the results on the full sample).

The mean of explanatory variables can change over time because of two reasons: the value of variables can change in the case of existing firms (e.g. profitability improves or deteriorates), or firms that enter or exit change the mean (i.e. the composition effect). The two can occur simultaneously.

Year-specific effects (i.e. the year dummies) explain a large part of change in the investment rate (Chart 29). These unexplained effects can be factors that are aggregate effects, not being captured by either firm-level qualitative and quantitative variables or the ESI confidence index.[21] Aggregate demand, credit supply or uncertainty may be among these factors.

We divided the sample into three time periods, but these are somewhat different from the ones used in the previous parts of the paper, in line with the different development of aggregate and average investment rate: 1) the period of steady decline, 2001-2008; 2) the crisis period, which comprises 2009 only; 3) and the recovery between 2010-2014.

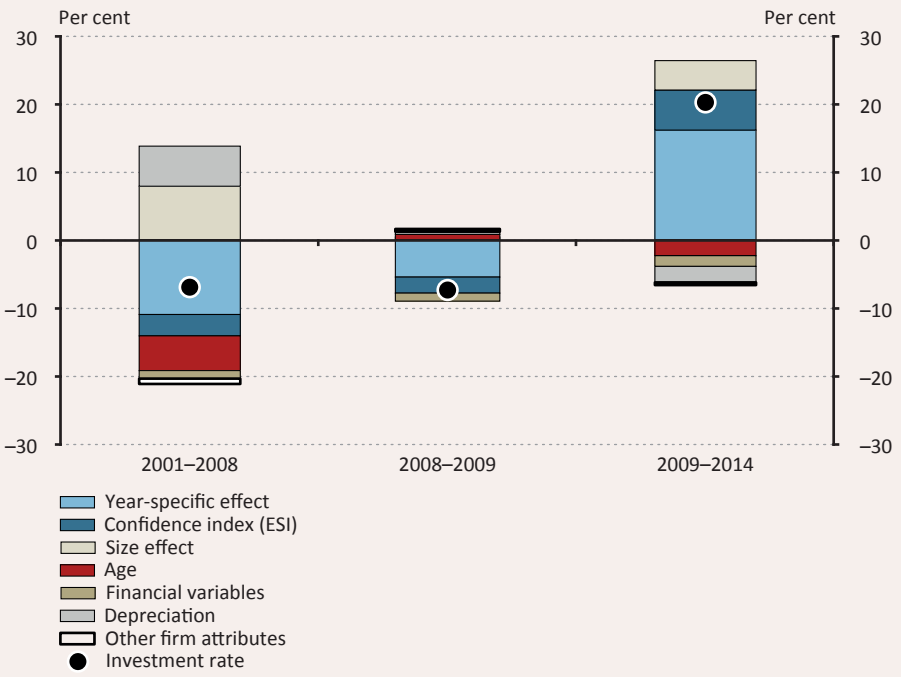
The ageing of firms played a role in the decline in average investment during 2001-2008, and this role was the strongest in the case of smaller firms (see Chart 30 and Chart 31 in the Appendix), supporting our earlier analysis on aggregate investment rate. The size effect – the combined effect of size category and capital – improved the investment rate. This is explained by the large number of low-capital micro firms founded in the first half of the 2000s, which have a higher investment rate. This also explains why size effect is not material in this period for larger-than-micro firms. The increase in the depreciation rate also pushed the investment rate higher, because it is an incentive for replacement investments. Finally, moderation of the ESI index and deterioration of financial variables also contributed to the decline in the investment rate during 2001-2008.

[21] The ESI index is available for several two-digit industries. Where it was not available, we imputed the value with averages for more aggregated industry groups.

During the crisis, from 2008 to 2009, the investment rate fell significantly. This decrease cannot be explained by firm-specific factors included in the regression model. This is not surprising because the crisis can be considered as an aggregate shock which was the consequence of the weakening of domestic and foreign demand and because access to financing became more difficult and more expensive. According to our model, a small part of this aggregate shock is captured by the decrease in the confidence index, but it mainly appears in the year-specific effect. We note that the structure of our model also contributes to this result, as the financial attributes of the firms are lagged explanatory variables in the regression equation to avoid simultaneity which would bias the estimates. Thus, the downturn in 2009 is explained by financial variables of 2008, but firms' condition calculated as the yearly average of 2008 did not show a dramatic deterioration.

We find that the recovery in the average investment rate from the trough of 2009 is affected by the improvement in the confidence index. The ageing of firms slows the recovery which is consistent with our earlier results. The decrease in the depreciation rate also affected the investment rate negatively. The year-specific unexplained effect improved the investment rate: according to our interpretation aggregate factors such as the improvement in demand and outlook is the main reason behind the recovery. The size effect also contributed to the recovery, stemming from the decrease in average (but not total) capital. On the one hand, capital per firm mechanically lifts the investment rate through the decrease in the denominator of the rate, and on the other hand it generates investments that are necessary to replace the capital which depreciated during the crisis.

Chart 29
Decomposition of the development of the average investment rate by explanatory variables, all firms
(percentage points change during the periods 2001-2008, 2008-2009, and 2009-2014)



Source: Authors' calculations.

6 Conclusion

In this paper, we analysed corporate investment in Hungary between 2001 and 2014 using firm-level data. We showed that the distribution of investments among firms and the development of investment performance over time were heterogeneous along certain firm attributes.

Investments are concentrated by firm size, ownership and export status: large companies, foreign-owned companies and exporting companies have a disproportionately high share in Hungarian corporate investment compared to their number. Investments are also concentrated by the size of the investment projects: on average, the 20 largest investment projects each year account for one quarter of total annual investment.

The period examined can be split into three distinct parts, based on the development of investment performance over time. After the period of significant structural change of the 1990s, the 2000s were characterised by a stagnant investment rate and declining investment activity. During the crisis, between 2009 and 2012, investment performance deteriorated sharply. Signs of recovery were seen in 2013 and 2014, but the aggregate investment rate remained subdued.

The performance of firms was heterogeneous in the pre-crisis period. The investment performance of smaller firms was weakening, while the investment rate of larger firms actually increased. Not only the investment performance of smaller (especially micro) companies declined, but the growth rate of sales revenues also decelerated, and the ratio of firms moving into higher size categories also decreased. Apparently, during the pre-crisis period, the share of smaller companies that were unable to or did not want to grow and invest was rising. It is an open question as to what factors caused this inactivity among smaller firms. A possible explanation is that smaller firms were credit constrained; this could be a topic of further research.

The ageing of the sector played an important role in the weak investment performance of smaller firms. Irrespective of size, companies tend to invest more and grow faster in the first years of their life. However, while smaller firms invest less and less as they become older, ageing above a certain threshold results in no further deterioration in investment performance in the case of larger companies. This explains why ageing had a major negative effect on investment performance only in the case of smaller companies, although firms were growing older in every size categories. The age distribution is jointly determined by entry and exit. A deeper analysis of the life-cycle of firms goes beyond the scope of this paper, but can be a subject of further investigations.

Newly established companies are the most dynamic segment of the sector, and as such they make a great contribution to investment. Changes in the number and share of entries can have a large impact on the investment performance, while at the same time they are strongly related to the ageing of the corporate sector as well. With the outbreak of the crisis, the contribution of entering and young firms to the investment rate fell. The share of new entrants decreased even during the years of recovery and reached historically low levels in 2014. The lack of new entrants contributed greatly to the sluggishness of the recovery. Further research could shed light on the reasons behind the declining share of new entrants.

Changes in the sectoral structure can have an impact on investment performance indicators as the composition of capital vary across industries, and different types of capital goods have different useful life and depreciation pattern. According to our results, changes in the sectoral structure did not play a role in the development of investment performance.

The decomposition of the average investment rate underlines the findings based on the analysis of single factor changes on aggregate performance: the negative role of ageing before the crisis and during the recovery

is detected, while sectoral changes are found to have no impact. The year fixed effects explain most of the variation over time, underscoring the importance of aggregate shocks and unobserved systemic factors, such as aggregate demand, credit supply or uncertainty. The effect of user cost of capital was not investigated in this paper, but could also be an important driver of corporate investment. An update of earlier estimates of Kátay and Wolf (2004) is a possible subject of further research.

7 Appendix

7.1 DEFINITION OF VARIABLES

The following variables are used in the regression for the investment rate or investment activity:

year: year of the observation
drate: depreciation rate
logK: natural logarithm of the real capital
ESI_std: Economic Sentiment Indicator, standardised over each 2-digit industries.
age: age of the firm since foundation, a maximum value is set at 15.
size: firm size, based on employment, sales and total assets. See Section 2 for details.
owner: domestic private, foreign or state.
d_exp: =1: if the firm is exporting.
profit: profitability, defined as (gross operating surplus + depreciation)/total assets.
loss: =1 if profit1<0.
leverage: 1-equity/total assets.
neg_equity: =1 if equity<0.
liquid: liquidity, defined as liquid assets over short term liabilities.
sales_TA: sales/total assets.
Financial ratios were trimmed at their 1st and 99th (or 95th) percentile.

7.2 REGRESSION RESULTS

Table 1
Regression results of the investment rate
(2001-2014)

Dependent variable: I(t)/K(t-1)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	full sample	only year dummies, full sample	micro firms	small firms	medium–sized firms	large firms
year=2002	–0.0143***	0.0431***	–0.0143**	–0.0217**	–0.00134	–0.00817
year=2003	–0.0462***	–0.00121	–0.0556***	–0.0259***	0.00334	0.0312
year=2004	–0.0942***	–0.0534***	–0.113***	–0.0425***	0.0115	0.0257
year=2005	–0.145***	–0.0658***	–0.174***	–0.0508***	0.00393	0.0820***
year=2006	–0.109***	–0.0699***	–0.132***	–0.0512***	0.00706	0.0521*
year=2007	–0.116***	–0.0639***	–0.142***	–0.0486***	0.0137	0.0902***
year=2008	–0.110***	–0.0696***	–0.137***	–0.0438***	0.0369**	0.131***
year=2009	–0.165***	–0.144***	–0.190***	–0.122***	–0.0276	–0.0396
year=2010	–0.174***	–0.130***	–0.200***	–0.0977***	–0.0483***	0.0150
year=2011	–0.162***	–0.101***	–0.190***	–0.0697***	–0.00886	0.0107
year=2012	–0.162***	–0.108***	–0.192***	–0.0649***	–0.0104	0.00119
year=2013	–0.0822***	–0.0294***	–0.108***	0.00609	0.0165	0.0537*
year=2014	–0.00427	0.0564***	–0.0248***	0.0578***	0.0170	0.0524
L.drate	0.958***		0.950***	1.125***	0.942***	0.875***
L.logK	–0.126***		–0.126***	–0.136***	–0.113***	–0.0953***
ESI_std	0.0183***		0.0182***	0.00880***	0.0223***	0.0104
age=3	–0.354***		–0.347***	–0.430***	–0.493***	–0.592***
age=4	–0.461***		–0.447***	–0.617***	–0.685***	–0.748***
age=5	–0.528***		–0.512***	–0.708***	–0.746***	–0.802***
age=6	–0.579***		–0.563***	–0.749***	–0.816***	–0.859***
age=7	–0.613***		–0.594***	–0.803***	–0.858***	–0.899***
age=8	–0.630***		–0.610***	–0.830***	–0.851***	–0.907***
age=9	–0.642***		–0.621***	–0.841***	–0.903***	–0.936***
age=10	–0.651***		–0.625***	–0.868***	–0.905***	–0.954***
age=11	–0.648***		–0.622***	–0.865***	–0.902***	–0.966***
age=12	–0.651***		–0.623***	–0.878***	–0.913***	–0.973***
age=13	–0.654***		–0.627***	–0.878***	–0.909***	–1.001***
age=14	–0.653***		–0.624***	–0.886***	–0.919***	–1.016***
age>=15	–0.662***		–0.631***	–0.903***	–0.934***	–0.981***
size=small	0.343***					
size=medium	0.494***					
size=large	0.696***					
owner=foreign	0.0288***		0.0169***	0.0191***	0.0164**	0.0422***
owner=state	0.0498***		0.0583***	0.0292**	–0.0215	0.0161
L.d_exp	0.0613***		0.0930***	0.0197***	0.00565	–0.0591***
L.profit	0.00992***		0.00884***	0.0291***	0.0765***	–3.30e–05
L.loss	–0.167***		–0.178***	–0.0791***	0.00630	0.0409**
L.leverage	–0.0324***		–0.0332***	0.00241	0.0437***	0.0135
L.neg_equity	–0.125***		–0.129***	–0.126***	–0.0500***	–0.0774**
L.liquid	–0.00169***		–0.00199***	0.00361***	0.00259**	0.00565**
L.sales_TA	0.00634***		0.00762***	–0.0126***	–0.0152***	–0.0228***
Observations	3,281,391	3,281,391	2,808,714	375,248	79,091	18,338
R–squared	0.194	0.002	0.189	0.242	0.230	0.216

*Note: *** p<0.01, ** p<0.05, * p<0.1, significance is based on robust standard errors, control group for year is 2001, it is 2 for age, micro for size, domestic private for owner. 2-digit industry fixed effects are included. L is the lag operator.*

Table 2
Regression results of the probability of entry
(2001-2014)

Dependent variable: Probability of entry

	(1)	(2)	(3)	(4)
VARIABLES	**micro**	**small**	**medium**	**large**
owner=foreign	–0.0521***	0.00161	–0.0123**	–0.0129
owner=state	–0.101***	0.00633	0.000861	–0.0225**
d_exp	–0.0523***	–0.0165***	–0.0171***	–0.0108***
year==2002	–0.0453***	–0.00732***	–0.0114***	–0.00106
year==2003	–0.0678***	–0.00657***	–0.0153***	–0.00173
year==2004	0.107***	0.0153***	–0.0107**	–0.00262
year==2005	–0.157***	–0.0264***	–0.0158***	–0.00311
year==2006	–0.173***	–0.0298***	–0.0139***	0.00199
year==2007	–0.170***	–0.0300***	–0.0138***	–0.00714
year==2008	–0.144***	–0.0268***	–0.0195***	–0.00665
year==2009	–0.154***	–0.0290***	–0.0172***	0.00630
year==2010	–0.155***	–0.0283***	–0.0237***	–0.0226***
year==2011	–0.146***	–0.0282***	–0.0185***	–0.0156*
year==2012	–0.186***	–0.0429***	–0.0293***	–0.00789
year==2013	–0.197***	–0.0382***	–0.0240***	–0.0197**
year==2014	–0.213***	–0.0489***	–0.0336***	–0.0133
foreign # 2002	0.0284***	–0.00860	0.0115	–0.00273
state # 2002	0.0215	–0.0136	–0.00354	–0.000433
foreign # 2003	0.0439***	–0.00624	0.0278***	0.0247*
state # 2003	0.0532***	–0.0171	–0.0158	0.000274
foreign # 2004	–0.0594***	–0.0270***	0.0143*	0.00684
state # 2004	–0.0251	–0.0401***	–0.0179	0.0120
foreign # 2005	0.0881***	0.0259***	0.0280***	0.0139
state # 2005	0.0846***	–0.0256**	0.00835	0.00641
foreign # 2006	0.0909***	0.0334***	0.0275***	0.00833
state # 2006	0.0792***	–0.0104	–0.0204	0.00600
foreign # 2007	0.109***	0.0293***	0.0268***	0.0281**
state # 2007	0.0961***	–0.00105	–0.0136	0.0298
foreign # 2008	0.0981***	0.0299***	0.0284***	0.0152
state # 2008	0.107***	–0.0106	–0.00420	0.0197
foreign # 2009	0.0731***	0.00423	0.00949	–0.00317
state # 2009	0.0999***	–0.00431	–0.0167	0.0117
foreign # 2010	0.0707***	0.00411	0.0118*	0.0203**
state # 2010	0.0727***	–0.0221*	–0.0163	0.0247*
foreign # 2011	0.0800***	0.00729	0.0128*	0.0155
state # 2011	0.0866***	0.0113	0.0169	0.00593
foreign # 2012	0.0717***	0.00636	0.0113*	0.00317
state # 2012	0.0783***	0.00261	0.00836	–0.00863
foreign # 2013	0.100***	0.00425	0.0122*	0.0112
state # 2013	0.102***	–0.00398	0.0115	0.0330**
foreign # 2014	0.116***	0.0127**	0.0236***	0.0109
state # 2014	0.0712***	–0.0139	–0.00752	0.0137
Observations	4,166,805	412,537	84,990	19,714
R–squared	0.072	0.017	0.028	0.023

*Note: *** p<0.01, ** p<0.05, * p<0.1. Estimates are from a linear probability model. Significance is based on robust standard errors, control group for year is 2001, domestic private for owner. 2-digit industry fixed effects are included. # denotes interactions.*

Table 3
Regression results of investment activity
(2001-2014)

	probability of spike				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	all	micro	small	medium	large
year=2002	–0.00140	0.00141	–0.00560	–0.0227***	–0.0231
year=2003	–0.0183***	–0.0169***	–0.0194***	–0.0260***	0.00517
year=2004	–0.0386***	–0.0388***	–0.0356***	–0.0292***	0.0130
year=2005	–0.0421***	–0.0403***	–0.0516***	–0.0415***	0.0199
year=2006	–0.0449***	–0.0432***	–0.0543***	–0.0379***	–0.00101
year=2007	–0.0467***	–0.0458***	–0.0521***	–0.0398***	0.00305
year=2008	–0.0544***	–0.0543***	–0.0597***	–0.0321***	0.0252
year=2009	–0.0917***	–0.0884***	–0.115***	–0.0856***	–0.0632***
year=2010	–0.0908***	–0.0892***	–0.101***	–0.0915***	–0.0325**
year=2011	–0.0818***	–0.0818***	–0.0815***	–0.0684***	–0.0218
year=2012	–0.0877***	–0.0876***	–0.0858***	–0.0798***	–0.0455***
year=2013	–0.0557***	–0.0562***	–0.0487***	–0.0429***	–0.0294*
year=2014	–0.0200***	–0.0197***	–0.0184***	–0.0321***	0.00416
age=3	–0.104***	–0.106***	–0.0844***	–0.0846***	–0.0811**
age=4	–0.150***	–0.151***	–0.142***	–0.156***	–0.133***
age=5	–0.174***	–0.176***	–0.164***	–0.170***	–0.179***
age=6	–0.192***	–0.194***	–0.183***	–0.199***	–0.180***
age=7	–0.205***	–0.205***	–0.207***	–0.224***	–0.202***
age=8	–0.215***	–0.215***	–0.221***	–0.218***	–0.211***
age=9	–0.222***	–0.222***	–0.225***	–0.241***	–0.201***
age=10	–0.230***	–0.228***	–0.246***	–0.258***	–0.231***
age=11	–0.233***	–0.230***	–0.249***	–0.262***	–0.238***
age=12	–0.237***	–0.233***	–0.261***	–0.261***	–0.266***
age=13	–0.243***	–0.238***	–0.266***	–0.269***	–0.267***
age=14	–0.246***	–0.241***	–0.276***	–0.272***	–0.259***
age=15	–0.262***	–0.255***	–0.295***	–0.294***	–0.269***
size=small	0.138***				
size=medium	0.180***				
size=large	0.226***				
owner=foreign	–0.0251***	–0.0396***	0.000729	0.0161***	0.0498***
owner=state	–0.0163***	–0.00539	–0.0120**	–0.0303***	0.00433
L.profit	0.0180***	0.0170***	0.0561***	0.143***	0.0627***
L.sales_TA	0.0096***	0.0098***	0.0047***	0.0022**	0.0052**
L.leverage	–0.0136***	–0.0141***	0.0136***	0.0591***	0.0425***
L.liquid	–0.0011***	–0.0011***	0,0003	0.0007*	0,001
L.neg_equity	–0.0717***	–0.0723***	–0.0791***	–0.0479***	–0.0392**
L.d_exp	0.0387***	0.0532***	0.0215***	0.0114***	–0,0085
L.logK	–0.0390***	–0.0379***	–0.0505***	–0.0473***	–0.0428***
Observations	3,281,838	2,808,838	375,384	79,215	18,401
R–squared	0.115	0.115	0.134	0.128	0.134

Table 4
Regression results of investment activity, cont.
(2001-2014)

	probability of positive investment				
	(6)	(7)	(8)	(9)	(10)
VARIABLES	all	micro	small	medium	large
year=2002	–0.00721***	–0.00791***	–0.00784**	–0.00966	–0.0100
year=2003	–0.0116***	–0.0140***	–0.00854**	–0.0128**	–0.00996
year=2004	–0.0308***	–0.0352***	–0.0224***	–0.0208***	–0.0122
year=2005	–0.0348***	–0.0383***	–0.0319***	–0.0348***	–0.00964
year=2006	–0.0469***	–0.0514***	–0.0397***	–0.0232***	–0.0224*
year=2007	–0.0627***	–0.0685***	–0.0453***	–0.0468***	–0.0139
year=2008	–0.0783***	–0.0838***	–0.0642***	–0.0530***	–0.0300**
year=2009	–0.123***	–0.126***	–0.127***	–0.123***	–0.0984***
year=2010	–0.124***	–0.127***	–0.122***	–0.112***	–0.0546***
year=2011	–0.120***	–0.125***	–0.109***	–0.0898***	–0.0540***
year=2012	–0.134***	–0.138***	–0.123***	–0.122***	–0.126***
year=2013	–0.0995***	–0.105***	–0.0824***	–0.0887***	–0.0768***
year=2014	–0.0566***	–0.0612***	–0.0406***	–0.0676***	–0.0591***
age=3	–0.0931***	–0.0955***	–0.0524***	–0.0476***	–0.0308
age=4	–0.130***	–0.134***	–0.0757***	–0.0654***	–0.0310
age=5	–0.150***	–0.154***	–0.0821***	–0.0871***	–0.0482*
age=6	–0.165***	–0.169***	–0.0940***	–0.0856***	–0.0499**
age=7	–0.175***	–0.179***	–0.102***	–0.0957***	–0.0675***
age=8	–0.181***	–0.188***	–0.0973***	–0.0859***	–0.0632***
age=9	–0.186***	–0.193***	–0.0998***	–0.0907***	–0.0678***
age=10	–0.192***	–0.198***	–0.107***	–0.0994***	–0.0600***
age=11	–0.192***	–0.199***	–0.107***	–0.0895***	–0.0618***
age=12	–0.195***	–0.202***	–0.111***	–0.0886***	–0.0702***
age=13	–0.198***	–0.205***	–0.116***	–0.0724***	–0.0769***
age=14	–0.202***	–0.209***	–0.117***	–0.0835***	–0.0575**
age=15	–0.221***	–0.230***	–0.139***	–0.0801***	–0.0475**
size=small	0.178***				
size=medium	0.247***				
size=large	0.306***				
owner=foreign	–0.0955***	–0.123***	–0.0245***	0.00936***	0.0206***
owner=state	–0.0160***	–0.0313***	0.00248	0.0526***	0.0854***
L.profit	0.0212***	0.0204***	0.0602***	0.139***	0.0576***
L.sales_TA	0.0132***	0.0133***	0.0089***	0.0071***	0.0082***
L.leverage	–0.0213***	–0.0212***	–0.0065***	0.0152**	–0.0134
L.liquid	–0.003***	–0.0030***	–0.0031***	–0.0052***	–0.006***
L.neg_equity	–0.108***	–0.108***	–0.106***	–0.0657***	–0.0561***
L.d_exp	0.0664***	0.0797***	0.0342***	0.0270***	0.0104
L.logK	0.00404***	0.0051***	–0.0084***	–0.0058***	–0,0011
Observations	3,281,838	2,808,838	375,384	79,215	18,401
R–squared	0.112	0.095	0.070	0.092	0.115

*Note: *** p<0.01, ** p<0.05, * p<0.1. Estimates are from a linear probability model. Significance is based on robust standard errors, control group for year is 2001, it is 2 for age, micro for size, domestic private for owner. 2-digit industry fixed effects are included. L is the lag operator.*

Table 5
Regression results of investment activity, cont.
(2001-2014)

	probability of zero investment				
	(11)	(12)	(13)	(14)	(15)
VARIABLES	all	micro	small	medium	large
year=2002	0.00619***	0.00713***	0.00675**	0.00808	0.00299
year=2003	0.0102***	0.0133***	0.00480	0.00993*	0.00607
year=2004	0.0285***	0.0334***	0.0197***	0.0175***	0.00307
year=2005	0.0335***	0.0380***	0.0284***	0.0310***	0.00299
year=2006	0.0428***	0.0483***	0.0342***	0.0192***	0.0104
year=2007	0.0575***	0.0643***	0.0392***	0.0397***	0.000510
year=2008	0.0728***	0.0794***	0.0575***	0.0451***	0.0152
year=2009	0.121***	0.126***	0.119***	0.106***	0.0797***
year=2010	0.124***	0.130***	0.118***	0.106***	0.0560***
year=2011	0.120***	0.126***	0.103***	0.0855***	0.0493***
year=2012	0.133***	0.140***	0.116***	0.107***	0.100***
year=2013	0.101***	0.108***	0.0812***	0.0851***	0.0681***
year=2014	0.0577***	0.0631***	0.0411***	0.0692***	0.0508***
age=3	0.0904***	0.0931***	0.0463***	0.0393***	0.0218
age=4	0.127***	0.131***	0.0679***	0.0644***	0.0356
age=5	0.147***	0.151***	0.0760***	0.0783***	0.0394*
age=6	0.163***	0.168***	0.0885***	0.0834***	0.0428*
age=7	0.174***	0.179***	0.0996***	0.0918***	0.0613***
age=8	0.183***	0.189***	0.0960***	0.0860***	0.0559***
age=9	0.189***	0.195***	0.100***	0.0905***	0.0621***
age=10	0.195***	0.201***	0.105***	0.0957***	0.0662***
age=11	0.198***	0.204***	0.108***	0.0887***	0.0649***
age=12	0.202***	0.208***	0.115***	0.0900***	0.0717***
age=13	0.206***	0.212***	0.120***	0.0733***	0.0746***
age=14	0.210***	0.216***	0.123***	0.0850***	0.0642***
age=15	0.231***	0.240***	0.145***	0.0827***	0.0600***
size=small	–0.168***				
size=medium	–0.228***				
size=large	–0.273***				
owner=foreign	0.106***	0.136***	0.0297***	–0.00166	–0.0107*
owner=state	0.0174***	0.0255***	0.000729	–0.0360***	–0.0723***
L.profit	–0.0208***	–0.0201***	–0.0557***	–0.122***	–0.0482**
L.sales_TA	–0.0133***	–0.0134***	–0.0087***	–0.0067***	–0.0066***
L.leverage	0.0229***	0.0227***	0.0043**	–0.0165***	0.0137
L.liquid	0.0034***	0.0033***	0.0036***	0.0057***	0.0055***
L.neg_equity	0.100***	0.101***	0.0906***	0.0542***	0.0560***
L.d_exp	–0.0700***	–0.0849***	–0.0379***	–0.0264***	–0.0192***
L.logK	–0.0095***	–0.0107***	0.0045***	0.0023**	–0.0012
Observations	3,082,902	2,634,340	355,423	75,456	17,683
R–squared	0.123	0.105	0.073	0.095	0.115

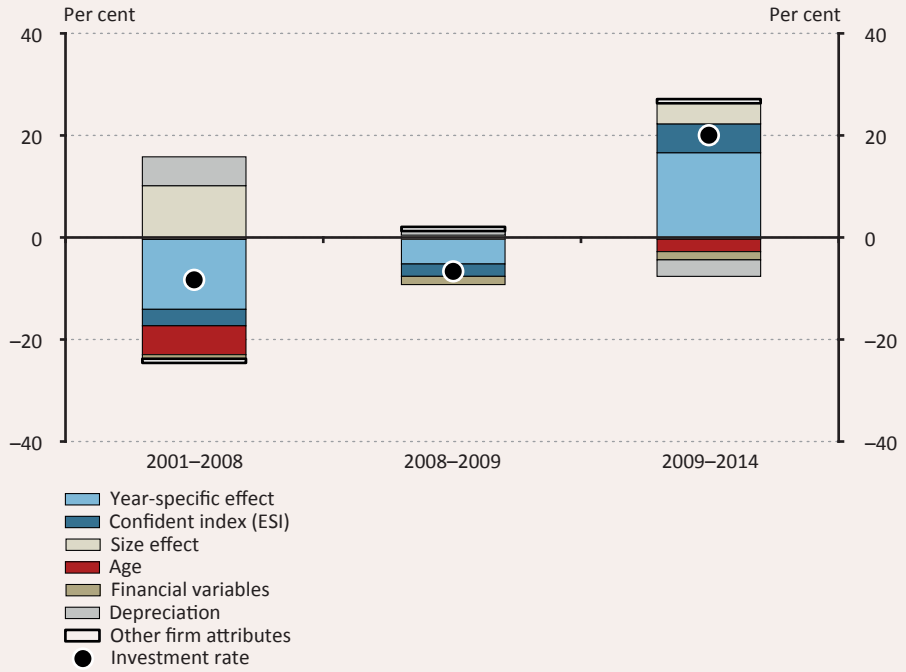
Table 6
Regression results of investment activity, cont.
(2001-2014)

	probability of negative investment				
	(16)	(17)	(18)	(19)	(20)
VARIABLES	all	micro	small	medium	large
year=2002	0.00192**	0.00202*	0.00196	0.00197	0.00603
year=2003	0.00238***	0.00214**	0.00480**	0.00332	0.00237
year=2004	0.00530***	0.00574***	0.00404**	0.00450	0.00769
year=2005	0.00441***	0.00432***	0.00552***	0.00575	0.00541
year=2006	0.00971***	0.0101***	0.00810***	0.00493	0.0137*
year=2007	0.0131***	0.0138***	0.00894***	0.00952**	0.0151*
year=2008	0.0147***	0.0153***	0.0114***	0.0113***	0.0162**
year=2009	0.0139***	0.0131***	0.0183***	0.0278***	0.0254***
year=2010	0.00940***	0.00911***	0.0122***	0.0130***	–0.000688
year=2011	0.0116***	0.0116***	0.0127***	0.00982**	0.00721
year=2012	0.0126***	0.0119***	0.0159***	0.0275***	0.0366***
year=2013	0.00612***	0.00632***	0.00515***	0.00778*	0.0113
year=2014	0.00276***	0.00310***	0.000516	0.00173	0.0113
age=3	0.00960***	0.00951***	0.00997***	0.0117*	0.00949
age=4	0.0131***	0.0132***	0.0136***	0.00540	–0.00705
age=5	0.0156***	0.0159***	0.0119***	0.0165***	0.0114
age=6	0.0140***	0.0143***	0.0122***	0.00820	0.00896
age=7	0.0137***	0.0143***	0.00910***	0.0115*	0.00876
age=8	0.0118***	0.0125***	0.00713***	0.00689	0.0109
age=9	0.00986***	0.0108***	0.00492**	0.00629	0.00946
age=10	0.00950***	0.00994***	0.00795***	0.0113**	–0.00631
age=11	0.00602***	0.00634***	0.00553**	0.00778	0.000544
age=12	0.00474***	0.00554***	0.00206	0.00541	0.000925
age=13	0.00327***	0.00389***	0.00135	0.00487	0.00681
age=14	0.00235***	0.00316***	0.000377	0.00364	–0.00499
age=15	0.00100*	0.00174***	0.000886	0.00228	–0.0138
size=small	–0.0317***				
size=medium	–0.0520***				
size=large	–0.0758***				
owner=foreign	–0.00691***	–0.00816***	–0.00369***	–0.00857***	–0.0123***
owner=state	0.000171	0.0119***	–0.00465	–0.0235***	–0.0203***
L.profit	–0.0012***	–0.00107***	–0.0088***	–0.0315***	–0.0193**
L.sales_TA	–0.00097***	–0.00101***	–0.00087***	–0.0008*	–0.00198**
L.leverage	–0.00099***	–0.00089***	0.00358***	0,0015	–0.0004
L.liquid	–0.00026***	–0.00025***	–0.00044***	–0.0003	0.0012**
L.neg_equity	0.0280***	0.0274***	0.0286***	0.0155***	0,00054
L.d_exp	–0.00136**	–0.00096	0.00185	–0.003	0.0083**
L.logK	0.0088***	0.0092***	0.0053***	0.0046***	0.00295***
Observations	3,281,838	2,808,838	375,384	79,215	18,401
R–squared	0.013	0.014	0.009	0.014	0.024

*Note: *** p<0.01, ** p<0.05, * p<0.1. Estimates are from a linear probability model. Significance is based on robust standard errors, control group for year is 2001, it is 2 for age, micro for size, domestic private for owner. 2-digit industry fixed effects are included. L is the lag operator.*

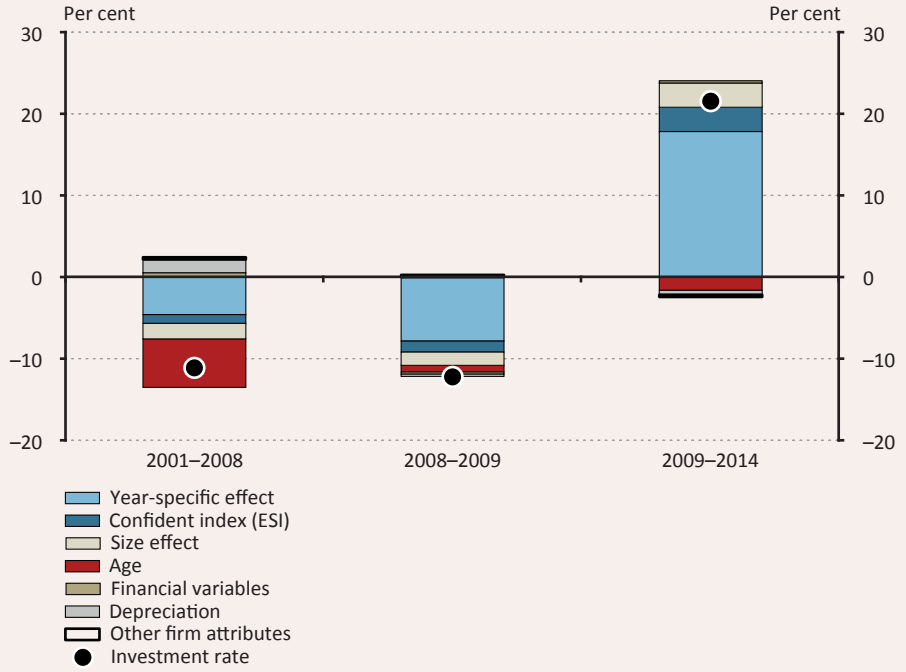
7.3 DECOMPOSITION OF THE CHANGE OF AVERAGE INVESTMENT RATE BY FIRM SIZE

Chart 30
Decomposition of the development of the average investment rate by explanatory variables, micro firms
(percentage points change during the periods 2001-2008, 2008-2009, and 2009-2014)



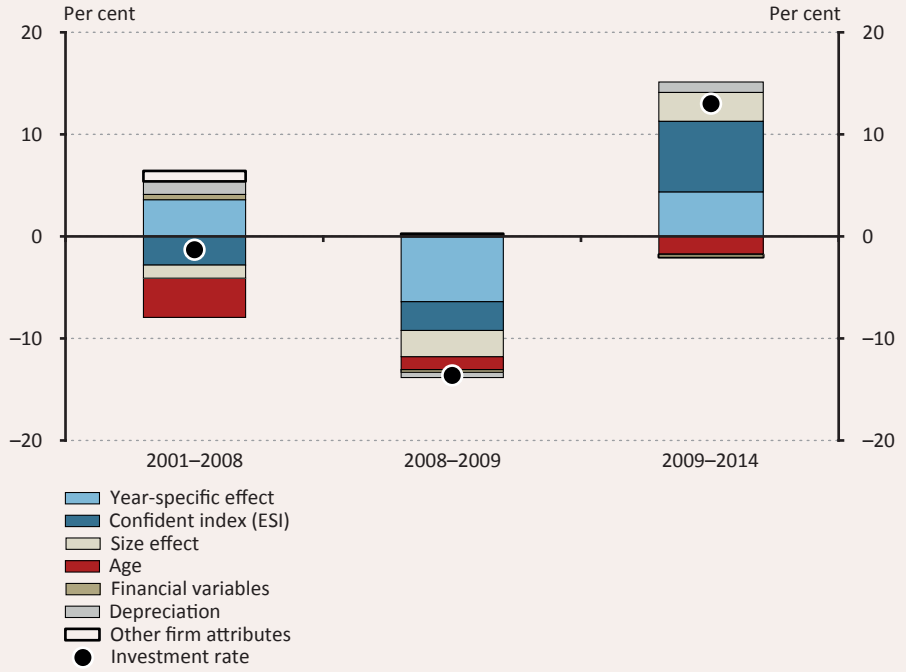
Source: Authors' calculations.

Chart 31
Decomposition of the development of the average investment rate by explanatory variables, small firms
(percentage points change during the periods 2001-2008, 2008-2009, and 2009-2014)



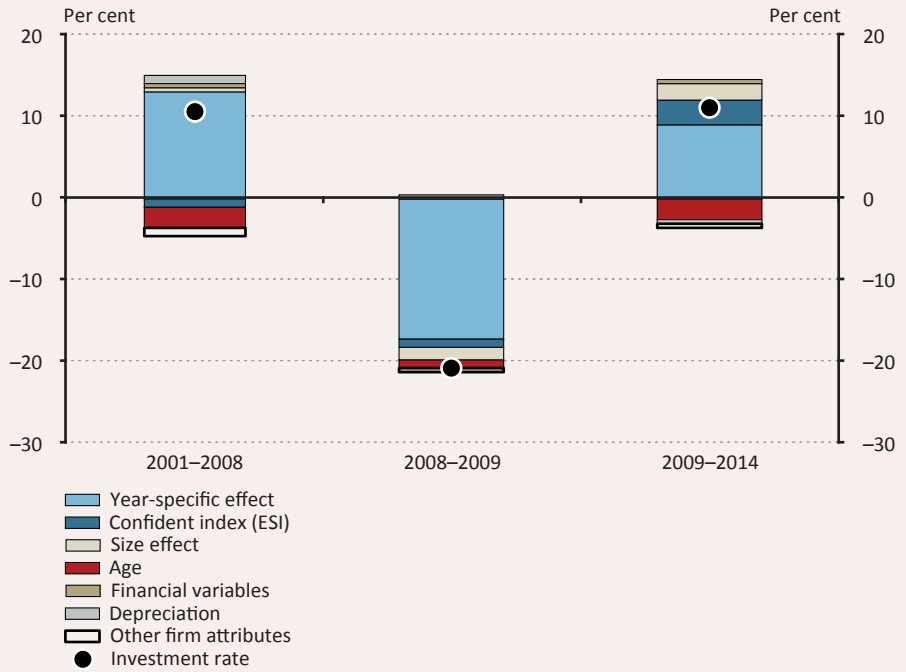
Source: Authors' calculations.

Chart 32
Decomposition of the development of the average investment rate by explanatory variables, medium-sized firms
(percentage points change during the periods 2001-2008, 2008-2009, and 2009-2014)



Source: Authors' calculations.

Chart 33
Decomposition of the development of the average investment rate by explanatory variables, large firms
(percentage points change during the periods 2001-2008, 2008-2009, and 2009-2014)



Source: Authors' calculations.

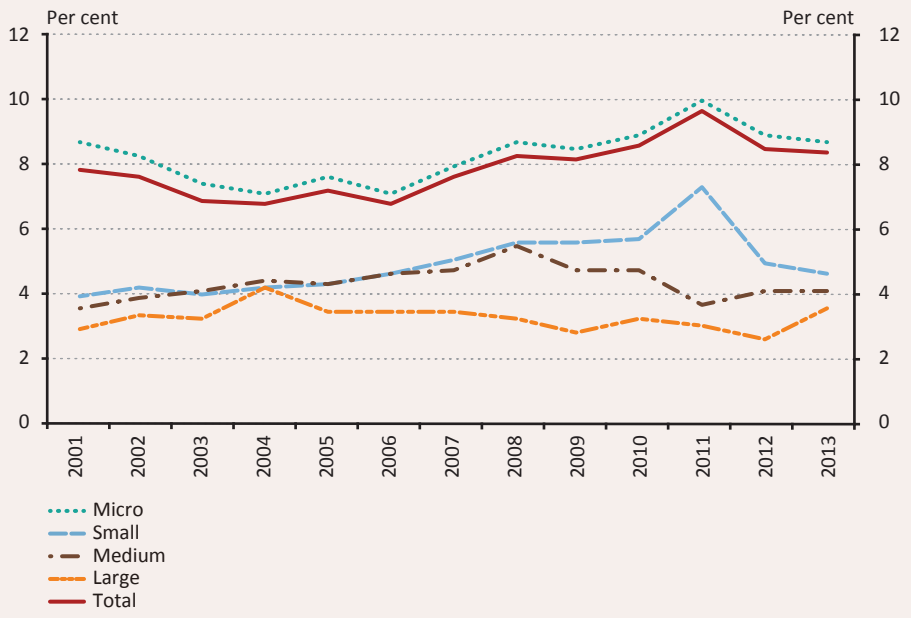
7.4 ANALYSIS OF EXITS

As we argued earlier, ageing depends on the number and activity of entries, but also on the share and age composition of exits. Measuring the impact of exits on the investment rate is more burdensome than measuring the impact of entries. First, we do not know what the investment would have been if the firm did not exit. Second, the deterioration of capital and investment performance starts years before the actual exit.[22] In any case, in the following we report at least some features of exit rates, its development over time and its heterogeneity by firm characteristics.

The share of exits is on average about 8% (Chart 34). The double recession made exits increase, but since the ratio has started declining – with some variation by the size of firm. Because of the weakness in entry, in 2013 net entry became negative, as fewer firms were established (around 6%) than the number of firms which exited the year after (above 8%).

The exit rate also depends on the size of the firm. The smaller the firm, the more likely it is to exit. The difference is the largest between micro firms and the rest. Their exit rate is more than double of the exit rate in any of the other size categories.

Chart 34
Share of exits by size of firm
(per cent)



Source: Authors' calculations.

Exits vary by age of firm. Young firms are not just more dynamic – growing and investing more than older ones – but are more likely to exit as well. Some projects are successful and some fail. Projects which have survived the first years and proved to be viable are less likely to exit. The correlation between age and exit rate is shown in Chart 35. More than 10% of entering firms (1-year old) exit after the first year of operation. The frequency of exits steadily declines with age in all size categories, but – except in the micro group – the decline is steeper in the first 4-5 years. Because of the small number of observations for the middle and especially in the large size group, the graph is rather volatile.

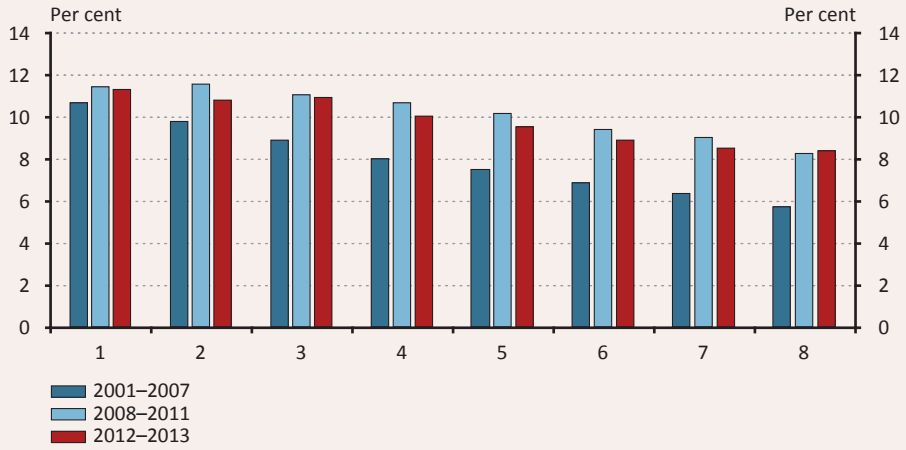
[22] To assess the impact of exit on investment rate we modified definition of investment rate. We considered exit as disinvestment of the full existing capital stock. According to the results, the dynamics of the corrected investment rate is the same as the uncorrected one (the level is necessarily lower).

Chart 35
Share of exits by age and size of firm
(per cent)

Source: Authors' calculations.

In addition to raising the exit rate, the crisis made its age dependence flatter (Chart 36).

Chart 36
Impact of crisis on the exit rate by age



Note: share of firms which exit in the following year.
Source: Authors' calculations.

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