PRELIMINARY

It's Always Sunny in Finland: Investment and Extrapolation from Cash Flow Growth

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Current Draft: November 2017

Abstract

Managerial expectations of cash flow growth are positively correlated with past growth rates, even when these growth rates convey no information about future growth rates. This can lead to overinvestment following good years. Using rainfall as an instrumental variable for cash flow shocks to firms which are weather sensitive, I find that companies increase investment 28.5% following a one-standard-deviation drop in summer rainfall, even though the drop is transitory. The excess investment appears to be driven by extrapolation from past cash flows while traditional explanations, such as loosening of credit constraints or agency problems, do not fully explain the result. High levels of investment are not optimal from the point of view of the firms, and the years following the cash flow shock feature an abnormally high number of companies closing down.

JEL Classification: G31, D22, G02

Keywords: Corporate investment, managerial extrapolation, weather shock

* Department of Finance, Aalto University. I am grateful to Sami Torstila for extensive comments and advice. I also wish to thank Ramin Baghai (discussant), Matti Keloharju, Matthijs Lof, Kasper Meisner Nielsen, Elias Rantapuska and participants at the Aalto Finance Brown Bag, the Swedish House of Finance PhD Seminar and Nordic Finance Network PhD Workshop for comments and Antti Lehtinen and Mikko Niemenmaa for help with geographic and weather data. I am also grateful to the OP-Pohjola Group Research Foundation and the Jacob Palmstierna Scholarship from the Swedish House of Finance for financial support for my studies, the Foundation for Economic Education (Liikesivistysrahasto) for travel support for my visit to HKUST, the Helsinki School of Economics Foundation for travel support related to AFA 2018 and to the Academy of Finland for financial support to the Department of Finance. mikael.paaso@aalto.fi.

Introduction

Forecasts of future cash flows are very important for real investment decisions, but forecasting is difficult and, as a result, managers frequently use heuristics to help. One such heuristic is extrapolation from the past, using past growth to estimate future growth. This extrapolation may be rational, in the sense that future cash flows and investment opportunities may be correlated with past cash flows because of business trends (for example, the early days of the internet featured both a market with high past growth and many investment opportunities). However, extrapolation may also be irrational if past cash flows are uncorrelated with future cash flows. Prior literature has shown that a correlation between cash flows and investments exists and, that in many cases, this investment leads to worse firm outcomes.

The main contribution of this paper is to show that managers extrapolate from cash flows even when these cash flows are completely uninformative about general economic conditions and the future. Prior literature has shown a correlation between investment and cash flows. However, this overinvestment may potentially be driven by factors unrelated to extrapolation, such as more favorable terms from creditors or biased expectations about the economy that are driven by factors unrelated to cash flows.

This paper provides causal evidence that firms overinvest when past cash flow growth has been high. Showing that managers extrapolate from cash flow growth is difficult because in most cases, changes in cash flows are not random and may correlate with other factors that affect expectations and investment decisions. In an ideal experiment, the researcher would be able to identify noise in a large cross-section of firm cash flows and see how this affects managerial expectations and corporate policies. As it is very difficult for researchers to decompose cash flows, I use temporary changes in cash flows caused by weather as an alternative. Managerial expectations are also difficult to accurately measure, so I use investment as a proxy. In order to claim that investment reflects expectations, I show that other potential channels through which temporary cash flows could affect investment, such as loosening of credit constraints or "empire building" behavioral by managers, do not fully explain the increased investment.

I also show that past cash flows affect entrepreneurial entry decisions, or the investment decisions of people who were not directly exposed to the cash flow shock. These investments can be characterized as overinvestment as the years after the cash flow shock feature lower levels of profitability as well as an increased number of companies shutting down.

My research design is an instrumental variable (IV) setup. I use rainfall in "summer home municipalities" in Finland[1] as an IV for cash flow shocks for tourism-oriented firms in these municipalities. The weather affects the amount of time people spend at their summer homes and as a result, the revenues of certain businesses in these municipalities. As such, weather is clearly linked to firm revenues, but is also plausibly exogenous to general economic conditions.[2]

While the institutional setting raises some questions about external validity, it also provides the opportunity to cleanly identify the impact of extrapolation, which is nearly impossible with larger companies who are rarely exposed to easily quantifiable transitory and exogenous shocks. Another advantage of the institutional setting is that it easily allows me to rule two common explanations for the observed correlation between cash flows and investments, namely agency problems and credit constraints. Almost all of the firms in my sample are owner-managed and are the main source of income for their managers. As such, investment mistakes are very costly for the managers themselves. Finnish SMEs have also historically been among the least credit constrained in the EU (ECB, 2015), helping rule out credit constraints. The setting also allows me to run a number of other tests related to credit constraints, such as looking at the number of new companies being established as well as splitting the sample by various measures of constraints.

The empirical setup in this paper is the following: My sample consists of small (median revenue €171,000), tourism-oriented businesses. I first regress revenue on summer rainfall in these municipalities. I find that low rainfall leads to higher revenues, but only if rainfall is below its median (i.e. very low rainfall → very high revenues). This is likely to be due to people taking a minimum number of summer vacation days every year (making demand insensitive to weather beyond a certain point), but extending their stays if the weather is good. In prior literature, free cash flows or EBITDA has been used as the main measure of cash flows. I proxy for cash flows using revenues as data availability is slightly better for revenues than for operating profits (and significantly better than for any proxy of EBITDA or free cash flow) and because discontinuities and changes in Finland's tax system (specifically with regards to whether it makes sense to

[1] In the Nordic countries, it is very common to own a summer home – Finland has about 500,000 summer homes for a population of 5.4 million people. According to Statistics Finland, in 2015, 65 out of 318 municipalities in Finland had more homes designated as holiday homes than normal homes. These municipalities see a huge increase in population during the summer months, making the summer months important for many local businesses. More details on these municipalities are provided in the data section.

[2] Rainfall has been used as an instrument in many papers, including Paxson, 1992, Fujiwara, Meng and Vogl, 2016 and is generally acknowledged as being exogenous to economic conditions, fairly stable over time and being difficult to predict (with the historical average being the best predictor of rainfall until about 2 weeks prior). The use of firm fixed effects means that my analyses focus on changes in rainfall relative to its historical average. In unreported analyses, I use percentage deviations from a municipality's median rainfall, with the results being almost identical.

pay a dividend or a salary) make operating profit less useful as a metric than revenues. More details are provided in the "Data" section.

I then test the relationship between investment and revenues using only the predicted revenue from the first stage regression. I find that investment responds positively to temporary, uninformative cash flow shocks. A one standard deviation drop in rainfall leads to a four-percentage-point increase in revenues for firms, which is about double the median yearly increase. Firms respond to this by increasing their fixed assets by approximately 1.6 percentage points. This is economically highly significant as the median yearly investment by firms is 5.6%. In Euro terms, the same one s.d. decrease in rainfall is correlated with a €6,840 increase in sales for the median firm, of which €608 is invested into fixed assets. The results are very similar for my main regression sample, consisting only of firms with above median fixed assets as they are for all firms.

These estimates are significantly higher than the corresponding OLS estimates. This can be explained by "lumpy" investment patterns, which cause OLS estimates to underestimate the relation between investment and cash flows.[3]

It is also important to rule out the possibility that the increased investment is a rational response to a cash flow shock. For example, it may be possible that tourists extrapolate from the previous year's weather when making vacation decisions the next year. Low rainfall could also serve as a "coordination device" which prompts many firms to invest which leads to the realization of positive externalities (Angeletos and Pavan, 2006).

While anecdotal evidence about the institutional setting helps rule out the possibility of customers extrapolating from the weather, as most of the demand is from Finns instead of foreign tourists, meaning that awareness of weather conditions is high and planning times are low (as work is relatively flexible and distances are not too great). However, more formally, there is also evidence that firms underperform after investing. A year with good weather is typically followed by an increase in the number of companies shutting down in the subsequent two years. This suggests that the investments being made are not optimal

[3] If revenue growth is informative about future revenue growth (cash flow growth is correlated across years) and the firm invests once following a cash flow shock (at t=1), OLS estimates can be lower than IV estimates even if the potential endogeneity problem is "affirmative endogeneity" (Jiang, 2017) where the omitted variable positively impacts both cash flows and investment. The OLS estimate will regress investment in one year against cash flow growth in multiple years whereas an instrument that captures temporary cash flows will not face this problem.

and is in line with Povel, Sertsios, Kosova and Kumar (2016) who find that hotels built during local construction booms perform worse than other hotels.

To attribute the increased investment to extrapolation, two other potential explanations must be ruled out or controlled for. Firstly, agency problems may be driving the results. If a manager receives a cash flow infusion, they may make decisions to maximize the size of the company through decisions which do not increase shareholder value (this is typically called "empire building" behavior). Second, the cash infusion may loosen credit constraints, either by increasing the amount of internal financing available for new projects or by making the firm appear more creditworthy to lenders or investors.

The institutional setting, small Finnish firms, helps rule out agency problems – almost all the firms in my sample are owner managed. It is still possible however that the weather-related cash flow shock helped loosen financial constraints for firms, or that better weather is somehow associated with "looser" credit (for instance through a mood channel). I attempt to control for financing constraints in a number of ways.

- I split the sample into groups based on several measures of financial constraints (cash holdings and size) and find that unconstrained firms show *higher* investment-cash flow sensitivities than constrained firms, the opposite of what a theory based on loosening of credit constraints would predict.
- To control for local credit shocks, I control for investment by similar firms in non-touristic industries
- Finally, survey evidence suggests that Finnish SMEs do not consider themselves constrained

The main results are also robust controlling for general economic and credit conditions and, more importantly, for investment by other firms in the same municipalities during the same year. This helps rule out nationwide economic shocks.[4] In a placebo test, I also show that rainfall in the winter months (January and February) have no predictive power over cash flows. As most summer homes in Finland are only occupied during the summer, rainfall during the winter months should have little to no effect on cash flows for firms operating in municipalities with many summer homes (importantly for this test, summer and winter rainfall levels are not strongly correlated). Thus, the null result is comforting as it makes it less likely that random chance and economic conditions during the year are driving the results.

[4] Ruling out industry-specific shocks is unfortunately impossible as rainfall itself constitutes an industry-specific shock to the tourism industry and any controls would remove the impact of rainfall.

The main contribution of this paper is to provide causal evidence that extrapolation affects real investment decisions of companies. This paper is related to several other papers providing evidence for extrapolation in corporate investment (Greenwood and Hanson, 2015 and Gennaioli, Ma and Shleifer, 2016), but there is a risk that these results may be driven by factors (such as economic conditions, or expectations of economic conditions) that are correlated with past cash flows and future investment.

Extrapolation also provides an alternative and behavioral explanation for the cash-flow sensitivity of investment (Fazzari, Hubbard and Petersen, 1988). More broadly, the paper also adds to the literature on extrapolation and personal financial decisions, where prior evidence (e.g. Kuchler and Zafar, 2017 and Greenwood and Shleifer, 2014) has shown that investors overweight recent experienced returns when forming expectations about future returns. Finally, the paper also adds to the literature on the use of noisy signals by managers. Previous papers have shown that managers extract information from their own share prices (e.g. Chen, Goldstein and Jiang, 2007) as well share prices of peer companies, even when they are uninformative (Dessaint, Foucault, Fresard and Matray, 2017).

I briefly cover previous literature and the contribution of this paper in the next section. The "Data" section covers the data used in the paper and gives some background information on the setting. The results section starts out with an overview of summary statistics, followed by a discussion and results on instrument validity and then presents the main findings of the paper. Robustness checks on entrepreneurial starts and closures follow. This section is followed by the conclusion. Several notes on sample construction and variable definitions are provided in the appendix.

Literature Review

This paper contributes to and borrows from three areas of the literature: The literature on investment-cash flow sensitivity, the literature on extrapolation and financial decisions and the literature on managerial learning and outside signals. However, the closest papers to this one are those that attempt to provide evidence of managerial extrapolation (Greenwood and Hanson, 2015 and Gennaioli, Ma and Shleifer, 2016). Greenwood and Hanson (2015) show that shipping companies invest more when the price of shipping is high and that these investments subsequently perform poorly. The main contribution of this paper is that by using random variation in cash flows, I can better rule out the idea that something correlated to cash flows is driving both investment and past cash flows.

Prior papers have shown that managers use noisy signals, such as their own share price or peers' share prices, when making corporate investment decisions (Dessaint, Foucault, Fresard and Matray, 2017, Chen, Goldstein and Jiang, 2007). In this paper, I show that managers also use past cash flows when making investment decisions, even though this are also noisy.

Several other papers have shown that people's expectations (measured using surveys) of returns on property (Kuchler and Zafar, 2017) and stocks (Greenwood and Shleifer, 2014, Da, Huang and Jin, 2017), among others, are influenced by recently experienced returns. This can lead to suboptimal and pro-cyclical financial decision making. These papers generally show that this is the case by showing that extrapolation leads to lower long run returns or bad forecasts.

Finally, this paper is related to the literature on investment-cash flow sensitivity (the puzzle that firm investment is correlated with cash flows, see for example Fazzari, Hubbard and Petersen (1988), Kaplan and Zingales, 1997, Baker, Stein and Wurgler, 2003 and Lewellen and Lewellen, 2016). The relationship is a "puzzle" in finance because with perfect capital markets, cash flows should be unrelated to investment. Several other reasons for investment-cash flow sensitivities have been proposed, aside from the possible correlation between investment opportunities and past cash flows:

1) The presence of credit/financing constraints which might make internal financing a more attractive option for firms (Fazzari, Hubbard and Petersen, 1988). Prior literature has shown that firms receiving exogenous cash flow shocks tend to increase investment (Blanchard, Lopez-de-Silanes and Shleifer, 1994, Lamont, 1997, Adelino, Lewellen and Sundaram, 2015, Thakor, 2017, von Beschwitz, 2017) and that firms facing constraints invest less (Rauh, 2006)

2) Agency problems associated with free cash flow (Jensen, 1986)

3) Extrapolation from past cash flows (Greenwood and Hanson, 2015) or sentiment being correlated with past cash flows (Gennaioli, Ma and Shleifer, 2016, Shivakumar and Urcan, 2017 and Arif and Lee, 2014)

I provide causal evidence for the extrapolation channel, showing that managers respond to exogenous cash flow shocks. Previous papers looking at cashflow shocks that are unrelated to investment have typically either looked at one-off cash infusions, which are unlikely to affect perceptions about future cash flows (Thakor, 2017, von Beschwitz., 2017) or attribute the results to agency problems (Blanchard et al, 1994), credit constraints or both (Lamont, 1996, Rauh, 2006, Adelino et al. 2015). I also show that if cash flows are correlated over time and investment is lumpy, OLS estimates of investment-cash flow sensitivity may understate the magnitude of the relationship.

Finally, this paper's empirical strategy is similar to several other papers in finance that use weather-related events for identification. Giroud, Mueller, Stomper and Westerkamp (2012) examine the impact of reducing debt overhang on performance by using snowfall as an instrument for the performance of Austrian ski hotels. Brown, Gustafson and Ivanov (2017) use extreme winter weather events in the US as a large negative shock to cash flows and find that firms respond by drawing on lines of credit but not by reducing investment. The results in Brown et al. (2017) differ from mine in that they find a significant negative impact of adverse weather on cash flow whereas cash flow sensitivity to weather in my sample exists mainly for good weather. This may be explained due to the different type of weather shock and in general the different sample (summer rainfall affects demand whereas winter weather could cause both supply and demand disruptions). Brown et al. (2017) also do not claim that extreme weather events alter managerial expectations about the future and instead focus on how firms deal with negative cash flow shocks. Finally, Dessaint and Matray (2017) analyze the responses of managers to severe weather events (hurricanes) in nearby counties. They find that managers adopt more conservative corporate policies following a hurricane strike and that companies are more likely to mention weather in their risk disclosures, even though the probability of a firm being hit by extreme weather is unchanged.

Data

Data Sources

In my analysis, I focus on the 65 Finnish municipalities with more summer homes than all other residential buildings in 2015, as measured by Statistics Finland. These municipalities are located all around Finland, but two large clusters exist: One on the southwest coast of Finland and another around Lake Saimaa in the southeast.

The data on weather come from the Finnish Meteorological Institute (FMI). For each municipality in Finland[5], I use the level of precipitation at the geographical centroid of the municipality as my measure of

[5] I use the 2015 municipality borders even if a municipality's borders have changed to ensure that the same weather measure is applied to the same location at all times. I sort firms into municipalities based on which municipality's 2015 borders their location (based on postal area) in a given year is. This allows firms to move (though this is extremely

rainfall. I use data on monthly precipitation. My variable of interest is the average monthly rainfall during the summer months (June, July and August). I further divide this variable into two separate variables, high and low precipitation. High precipitation is coded as average summer rainfall during years where rainfall is above its long-term average, measured for the municipality from 1960-2014 (years when data is available). Low precipitation is a variable that equals summer rainfall when it is below its long-term average. More details on matching rainfall data and firm-year level data is provided in the appendix.

Financial data on firms comes from the Voitto+ database maintained by Suomen Asiakastieto, the largest provider of credit information in Finland. The database covers a large (over 60%) and representative sample of Finnish firms. I use financial data from 1999-2014 due to data availability (the database changed significantly prior to the 2003 version which allows me to download data from 1999 onwards). I exclude housing corporations (Finnish industry code 682), foundations, governmental entities and co-operatives. In addition to this, I drop firm years that are not 12 months old. Data on the number new enterprises and closed enterprises come from Statistics Finland, which has more comprehensive coverage than Voitto+ (but does not provide financial information on firms).

Sample Selection and Variables

As the vast majority of firms in my sample are very small (see *Table 1*), with median fixed assets of €38,000 (firm-year median) and 10% of firm-years having fixed assets less than €2,000, the main analyses in this paper only include firm-years where fixed assets are greater than the median fixed assets for the financial year. The main results are robust but noisier when alternative specifications are used, highlighting the impact of outliers. *Table 3* presents the main results of the paper for other sample selection criteria, including all firms (column (3), firm-years with fixed assets > €2,000 in column (4) and firm-years with fixed assets greater than €10,000 in column (5)).

My outcome of interest is investment. While most studies using public company data are able to measure investment through accounting items such as CAPEX, this is more difficult for small private companies. In order to measure investment, I broadly follow Asker, Farre-Mensa and Ljungqvist (2015) and define

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rare in the sample) but applies the same weather measure to any given location in the sample for all years, even if that location is assigned from one municipality to another.

As an example, in 2007, the municipality of Längelmäki was split and merged into two larger municipalities, Jämsä and Orivesi. The parts of Längelmäki that moved to within the 2015 borders of Jämsä are coded as having the weather in Jämsä's 2015 centroid in every year of the sample.

investment as the percentage change in fixed assets[6] compared to the end of the previous financial year if this change is positive, and zero otherwise.

I proxy for cash flows with revenue. I do this for two main reasons:

- The Finnish taxation system for small companies may distort operating profits. Essentially, entrepreneurs can receive income from their firms in two ways: 1) via dividends and 2) by paying themselves a salary. If the tax system was the same for all firms and years, this could be discounted as noise and operating profit might still be representative. However, the system currently has multiple kinks and discontinuities which may distort operating profits in the cross-section. The tax system has also changed over time, meaning that the time series may also be biased.
  As a result, revenue is more likely to provide a clean and representative measure of the cash flows available to entrepreneurs.
- Data availability for revenue is slightly better than for operating profits and significantly better than for EBITDA or free cash flows.

I measured investment and cash flow contemporaneously as the financial year for most companies ends in December, meaning that there are several months after the summer to invest and the cash flow shock is most likely to be salient immediately after the summer. As there may be errors in reporting and changes in legal structure, the data have a lot of extreme values (see *Table 1* for summary statistics). As a result, I drop the highest and lowest 10% firm-year observations for both variables. Details on other financial variables used can be found in the appendix.

The sample of weather-sensitive firms (tourism-affected businesses) is defined according to the Finnish standard industry classification system ("TOL 2008"). The classification system is based on the EU's NACE industry classification system and is comparable to more commonly used US classification systems, such as NAICS or SIC. I use firms in six 2-digit TOL 2008 categories that are linked to tourism[7]:

- 45 Wholesale and retail trade and repair of motor vehicles and motorcycles

[6] The accounting items used to define fixed assets are listed in the appendix. Asker et al. (2015) scale the change in fixed assets by the previous year's total assets while I use the previous year's fixed assets because of the structure of the Voitto+ database (discussed further in the appendix).

[7] The list is roughly comparable with for instance that provide by the Office of National Statistics in the UK (2016), who classify six industry groups in the UK as being tourism-related. I modify their list to suit a Finnish setting by excluding several industries that are more related to local demand than visitor demand in Finland and including three retail industry groupings, which benefit from the population influx during the summer.

- 46 Wholesale trade, except of motor vehicles and motorcycles
- 47 Retail trade, except of motor vehicles and motorcycles
- 55 (Holiday) Accommodation
- 56 Food and beverage service activities
- 79 Travel agency, tour operator and other reservation service and related activities

Data on new and closed enterprises is from Statistics Finland and is available for 2001-2013. Statistics Finland provides the number of new companies, closed companies and existing companies at the 2-digit TOL2008-municipality-year level, but my analyses use municipality-year level data due to the number of 0 observation cells at the industry-municipality-year level in some municipalities (75% of industry-municipality-year combinations have less than 3 firms total, so even a single firm closing or starting up can make a huge difference). I handle municipality mergers in the same way as in the investment analysis, except that I drop all municipalities that merged into multiple municipalities as I do not have access to the addresses of the firms and cannot place them in a new municipality.[8]

Results

Summary Statistics

Summary statistics for the full sample of firms are presented in *Table 1*. Some interesting patterns are visible. For example, median investment is 5.6% at the firm-level. However, at the firm-year level median investment is zero as most firms will only invest once every three to four years, but will make larger investments when they do. As mentioned in the previous section, many firms in the sample are very small and many as such, the investment and change in revenues variables are highly skewed. The high investment figures may be driven by small firms (for instance with starting fixed-assets of €2,000) making minor investments. Because of this, most of the analyses in this paper are run for firms with above median fixed assets (calculated at the year level), and the investment and change in revenue variables are truncated at 10% on both tails.[9] However, I present the main results of the paper using other sample selection criteria in *Table 3*.

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[8] The number of companies per municipality is much higher in the Statistics Finland data as not only is it more comprehensive, but also includes forms of incorporation that I am able to exclude in the company level data.

[9] Winsorizing the financial information (as opposed to the calculated ratios) leads to even more skewed ratios

Figure 1 shows the location of municipalities with more summer homes than other residences around Finland in 2015 (according to Statistics Finland). From the figure, two clusters of municipalities emerge: one around Lake Saimaa in the east and one across the southwestern coast and Åland Islands. Figure 2 shows the yearly distribution of rainfall across my sample period. The key things to note are that average summer rainfall has been fairly constant throughout the sample, and that rainfall in one year does not do a better job of predicting rainfall the next year than the long term average (discussed in for instance Paxson, 1992 and Fujiwara, Meng and Vogl, 2016).

The level of cross-sectional variation in rainfall within each year is quite low. The major implication of this is that including year fixed effects in later tests will prove to be impossible as this removes most of the relevant variation in rainfall.

Instrument Validity

I use summer rainfall as an instrumental variable (IV) for an unexpected change in cash flows that hits tourism-oriented businesses.

For the IV estimation to be valid, several criteria have to be met. First, the instrument must be "strong", i.e. statistically significant and economically motivated. This means that the instrument (summer rainfall) must have an impact on the cash flows of companies in my sample. Intuitively, this seems very plausible – rainfall can plausibly affect both the number of visitors to a municipality and the length of their stay[10], and through that company cash flows. The relationship between rainfall and revenues of the companies in my sample is plotted in Figure 3. In the "First Stage" columns of *Table 2*, I test this formally by regressing revenues on summer rainfall (split into high or low rainfall, depending on whether rainfall is above the municipality's long term average) and find a significant and negative coefficient and an F-statistic greater than 10 (a common rule of thumb) for low rainfall and an insignificant coefficient (unreported) for high rainfall. The within R^2 of the first stage is low however, suggesting that most variation in cash flows is not caused by weather. While this is reasonable, especially in the context of small firms that face considerable variation in cash flows, some caution must be adopted when interpreting the coefficients. As an extension, I run the first stage for firms outside the tourism industry (column 5 of *Table 2*) and find a smaller coefficient that is

[10] Prior literature, for instance Agarwal, Chomsisengphet, Meier and Zou (2017) and Roth Tran (2017) has also documented an increase in spending on days with good weather. I expect even stronger results as my setting involves people choosing to stay at (or come to) a municipality as well as their normal consumption.

not significant at 10% (of course, there may be spillovers and misclassification of firms, so a negative coefficient is expected).

The asymmetry in the cash flow-rainfall relationship (low rainfall/high rainfall) is likely due to the fact that people seem to take a minimum amount of holidays in summer home municipalities regardless of the weather but may extend them. Essentially, people face the choice of spending more time at the summer homes during the summer vs. perhaps taking a longer Christmas vacation or simply working more (Finnish employers, along with other Nordic ones, are among the most flexible globally when it comes to vacation time). As a result of people taking a certain amount of vacation at their summer homes regardless of the weather every year, cash flows are insensitive to fluctuations in weather for high levels of rainfall.

The exclusion restriction must also be met. The exclusion restriction states that the instrument cannot affect the outcome in any other way other than through its impact on the variable of interest. In this case, this means that rainfall should be unrelated to investment other than through its impact on cash flow. The exclusion restriction is untestable but some evidence can be presented to mitigate the largest concerns about the instrument. For instance, there may be a relationship between investment and rainfall if repairs are needed after heavy investment. This is mitigated by the fact that the relation I observe only exists in *good weather* (i.e. low rainfall).

Finally, unrelated to the IV but in order for the theory presented in this paper to be valid, rainfall must convey no information about future rainfall and rainfall must be difficult to predict. This has been shown in various settings (Paxson, 1992, Miguel, 2005) and Figure 2 – Rainfall Statisticsindicates that it is also true in my Finnish sample. The only relationship appears to be mean reversion – which should bias managers to *underinvest* following low rainfall. It is also unlikely that managers are able to anticipate future rainfall via forecasts in a time horizon that would allow for investments. Beyond time horizons of about 2 weeks, past average rainfall becomes the best predictor of future rainfall and forecasts of deviations from the past are difficult to predict in most climate systems (Silver, 2012 p. 107).

Main Relationships

Column 1 of *Table 2* (“Endogenous”) presents the results of a regression of investment in year *t* on change in revenue in the same year for tourism-oriented companies. Unsurprisingly, a positive and significant relationship between the two variables exists. This is not causal evidence however. While it may be a sign of managerial responses to shocks in revenue, it may also be mechanical (higher investment increases revenues), driven by a common economic shock, or the result of a number of other factors.

The results of the two stage least squares (2SLS) IV regressions are in columns 6-9. The outcome variable is investment in year t, defined as the change in fixed assets at the end of year t compared to t-1 (if the change is positive, and 0 otherwise). My variable of interest is change in revenue, which is instrumented for with rainfall (if rainfall is below its municipality-level median in any given year).

All specifications include controls for firm fixed effects. The first specification includes no other controls, which are progressively added on, starting with economic conditions (GDP growth, unemployment for years t and t-1, term spread in year t), investment by other firms in the same year (to control for unobserved economic shocks affecting investment) and finally several lagged firm attributes.

The 2SLS results all indicate a strong and positive relationship between cash flows and investment, even when these cash flows say nothing about market growth. This means that companies increase investment in response to increased cash flows. The economic magnitude is significant – the first stage indicates that a one-standard-deviation (about 20 mm) decrease in summer rainfall (conditional on rainfall being below its median) is correlated with an increase in sales growth of 4 percentage points. The second stage impact of such a move would imply a decrease in investment of 1.6 percentage points[11], or almost 25% of the median yearly level of investment. In Euro terms, this is equivalent to a €6,804 increase in revenues and a €608 increase in fixed assets for the full, unwinsorized sample, which is significant as median fixed assets for the sample is €28,000.

The 2SLS results are also much higher than the OLS estimates (about 7 times greater) even though the endogeneity is "affirmative endogeneity" (Jiang, 2017), where an omitted variable is likely to drive both investment decisions and cash flow growth. However, the magnitude of the IV coefficients in relation to the OLS coefficients in this case is unlikely to be due to the factors highlighted in Jiang (2017), but instead because of lumpy investment.[12] The intuition for this result is as follows: If current cash flow growth is informative about future cash flow growth and also increases the probability of investment in the current year, there will be a strong relationship between cash flow growth and investment in the current year. However, as investment is lumpy, investment in the next few years is likely to be 0 while cash flow growth will be high. This means that the relationship will appear smaller than that implied by the IV estimates,

[11] The coefficient of the second-stage multiplied by the predicted change in revenue.

[12] It is not possible to rule out the idea that a low R^2 in the first stage means that the estimates are only valid for a very special group of compilers, however it seems unlikely that only certain tourism-oriented firms are affected by rainfall.

where cash flows are more random. Lumpiness of investment may help explain some of the low investment-cash flow sensitivities documented in the literature.

Table 3 shows the sensitivity of these results to various changes in the specification used. Columns (1) and (2) replace the default truncation of variables at 10% with truncation at 5% and 1%. The coefficient (on change in revenue) is still significant (at 5%) with the 5% cuts but loses significance if the sample is cut at 1% on both tails. The coefficient also increases, which may be due to more extreme values of investment influencing the results (the minimum value that investment can take is 0 but the maximum is infinite, so if investment is correlated with revenue but some levels of investment are implausibly high, the coefficient will also be very large). Columns (3-5) change the sample selection criteria from firms with above median fixed assets to all firms (column (3)), firm-years with fixed assets greater than €2,000 (4) and greater than €10,000 (5). The coefficients of change in revenue are once again greater than the coefficients in my baseline specification, likely reflecting the impact of introducing larger values ("outliers") of investment and change in revenue to. Column (6) presents the results for the entire unwinsorized sample. As expected this result is no longer significant or economically plausible as the very high levels of investment in the tails of the distribution cause the regression to lose all economic meaning. In general, the coefficients in these specifications are larger than in my baseline regressions, reflecting the fact that outliers (high levels of investment) may now have more weight than if they are completely removed from the regressions.

I also show that the results are robust to measuring investment as the change in fixed assets from the beginning of year t to the end of year t+1 (extending the measurement period by one year) as an alternative measure of investment.

Reduced Form

In *Table 4*, I present the results of OLS regressions of investment on rainfall. The coefficients (for instance, -0.0874 in the main specification) imply that a one-standard-deviation decrease in rainfall is associated with a 1.7% decrease in investment. The magnitude of the IV estimates (measured in terms of the impact of a one-standard-deviation change in rainfall) in the previous section is very close, which is reassuring as it helps rule out that the instrument is weak or that the sample of compliers is significantly different from the full sample. A weak instrument may lead to biased second-stage estimates, but as the reduced form regression is a linear OLS for the full sample, the estimates will be unbiased.

Credit Constraints

Table 2 demonstrated a relationship between unexpected cash flows and investment. However, this relationship could be driven by factors other than extrapolation about future cash flows and growth opportunities. Credit constraints may have been loosened as a result of the unexpected cash flow infusion arising from good weather. In this section, I attempt to rule out the idea that credit constraints are the only driver of these results.

First – Finnish small-to-midsize enterprises (SMEs) in general do not "consider" themselves to be credit constrained. Survey evidence from the European Central Bank (2016) suggests that most SMEs in Finland think that they would be able to get a bank loan if they wanted to. Of 75 firms which had applied for a loan in the past 6 months, over 80% had the full loan granted and another 10% had it partially granted or still pending. Less than 10% of firms considered "Access to Finance" as their key problem, compared to 25% for "competition" and 20% for "regulation". This suggests that the variation in cash flow is unlikely to significantly affect the kind of credit constraints these firms face, should they finance their investments with debt.

Secondly, if local credit shocks unrelated to the increased cash flows were responsible for the change, controlling for investment by other (non-tourism) firms in the same municipalities should cause the significance of the coefficient of changes in revenue to disappear. As the results in *Table 2* include controls for investment by other firms, local credit shocks should be captured by this.

Thirdly, I check whether financially constrained firms are more or less affected by a weather shock. If the results were driven by loosening of credit constraints, we would expect to see financially constrained firms invest more following a cash flow shock than unconstrained firms. While defining financial constraints for private firms with limited information available is difficult, I use two proxies. Firstly, I split firms into two groups based on their one year lagged cash holdings (as a percentage of total assets) in any given year. Firms with lower cash holdings as a proportion of assets would be expected to invest more. Secondly, Farre-Mensa and Ljungqvist (2016) find that small private firms do not change their capital structure in response to tax rate changes, suggesting that they are more constrained. As most firms in my sample are very small by the standards of Farre-Mensa and Ljungqvist (2016), I designate the largest 10% of firms in my sample as large firms and the rest as small firms.

Table 5 summarizes these results. I run 2SLS regressions of investment on changes in revenue (instrumented by rainfall, but only during low rainfall years). In columns 1-4, I split the sample based on lagged cash holdings (cash/total assets). If financial constraints were driving the results, one would expect to see much higher sensitivities for low-cash firms, who are able to borrow more after receiving the revenue shock. Instead, the opposite is true, as the coefficients in columns 1 and 3 (high cash firms) are larger than those in columns 2 and 4. Columns 5 and 6 involve splitting the sample into large and small firms, depending on whether the firm-year has fixed assets in the 90th percentile for that year (or the 80th percentile of the regression sample). Once again, large firms, who are expected to be less financial constrained, have a significant (at 10%) investment-cash flow sensitivity.

Enterprise Closures

In order to attempt to rule out the idea that investment may be a rational response to a weather related cash flow shock, I test whether years with good weather are followed by years with abnormally high enterprise closures. In order to do this, I regress the number of shut down enterprises (from Statistics Finland) on rainfall and 2 lags of rainfall. In this test, I use all rainfall observations as the sample shrinks greatly when considering only municipalities that have had successive years of below or above median rainfall.

In Figure 5, I show graphically the relationship between summer rainfall and firm closures at various lags, controlling for municipality fixed effects. There is a weak positive relationship between current rainfall and firm closures (in regressions with controls the relationship is stronger and statistically significant), but a negative one between rainfall and future firm closures.

The results of regressions where the dependent variable is the number of shut down enterprises in a municipality per year are shown in *Table 7*. A negative coefficient on lagged rainfall implies that a year with low rainfall (good weather) is associated with an increased number of enterprises closures in the next year or in the following two years. This is consistent with the idea that many of the businesses that start following a summer with nice weather are not economically viable or compete each other out of business. The coefficient of rainfall on the number of business shutting down in the current year is not significantly different from zero. In terms of economic magnitude, Column 5 of *Table 7* predicts an extra 5.5 firms closing down in 2 years after a 1 s.d. drop in rainfall, which is roughly 2.5% of the municipality's stock of firms (this is greater than the univariate estimate in Figure 5, which shows that in the 2 years following a low rainfall year, 13.5% of business close down compared to a baseline rate of about 12.75%).

As the cash flow shocks from rainfall are not persistent but investment is rarely reversible, a likely explanation for the association between low past rainfall and high firm shutdowns is that the investment response to a positive cash flow shock is not optimal and leads to an increased risk of bankruptcy.

Placebo and Robustness Tests

In order to further attempt to rule out the results being down to chance, I test the relation of another weather variable that is *ex ante* not expected to have any impact on cash flows for the majority of the sample and changes in revenue. The weather variable I use is precipitation in the winter months (January and February). While it is possible that some summer home municipalities receive a tourist inflow in the winter months (especially northern municipalities and those located around ski resorts), it is uncommon and therefore unlikely that weather during the winter months should have an impact on revenues.[13] *Figure 6* plots changes in revenue against bins of winter precipitation for both high and low winter precipitation (defined depending on whether winter precipitation is above or below its sample average).

I also address the concern that certain years might be driving the results (for reasons that may or may not be related to rainfall). In *Table 8*, I repeat the 2SLS regressions from *Table 2* (both the fixed effects only specification as well as fixed effects + economic controls specification in column 8), excluding one year from the regressions at a time. While the basic regression is no longer significant if 2006 (and 2009, 2011 and 2014 with controls) are excluded, the coefficients are similar and the lack of significance appears to be driven by higher standard errors. This is partly driven by the fact that in these years many municipalities have low rainfall, therefore sample size is higher. Excluding a sizable part of the sample leads to weaker overall predictive power in the first stage and less significant second stage coefficient estimates.

Conclusion

In this paper, I provide causal evidence showing that firms respond to cash flow shocks with investment, even when these cash flow shocks are temporary and convey no information about future cash flows. Using a sample of Finnish companies exposed to a weather shock, this paper demonstrated that firms adjust investment in response to cash flows induced by the weather. Unlike results on investment and cash flow shocks in previous papers, the results do not appear to be driven by credit constraints being loosened and are likely to be attributable to managerial extrapolation. The results are consistent with other findings on managerial extrapolation and investment (Greenwood and Hanson, 2015) and managerial use of noisy

[13] Many Finns make it a point of pride to not have heating, plumbing or electricity in their summer homes, making them fairly uncomfortable in the winter!

signals in investment decisions, such as those documented by Dessaint et al (2017) or Chen, Goldstein and Jiang (2007).

The result has many potentially interesting macro implications not explored in the paper. If managers extrapolate future cash flow growth from current growth, this could contribute to the formation of business cycles. Policymakers might also benefit from this knowledge for instance in the planning of stimulus policies. If policymakers are able to provide a cash flow shock to firms that firms are unable to attribute to exogenous forces, this might cause firms to increase investment beyond what has been traditionally expected.

There are several limitations to the paper: Firstly, the sample of small Finnish firms may limit the conclusions that can be drawn. Large corporations with more resources may be able to better distinguish between transitory and permanent cash flow shocks. Secondly, the implications of this are not yet clear. While it appears that more firms shut down following a cash flow shock, it is unclear whether this is due to extrapolation of demand, competition neglect or potentially "asset parking" (as documented in Thakor, 2017). Finally, further robustness and falsification tests are needed to rule out economic shocks – the lack of variation in rainfall across Finland means that there are limited sources of variation in this study and thus more care must be taken to rule out any other possible economic shocks that could be affecting the results purely by chance.

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Figure 1 – Location of Summer Home Municipalities

This figure displays the location of municipalities with more summer homes than other residential buildings in 2015.

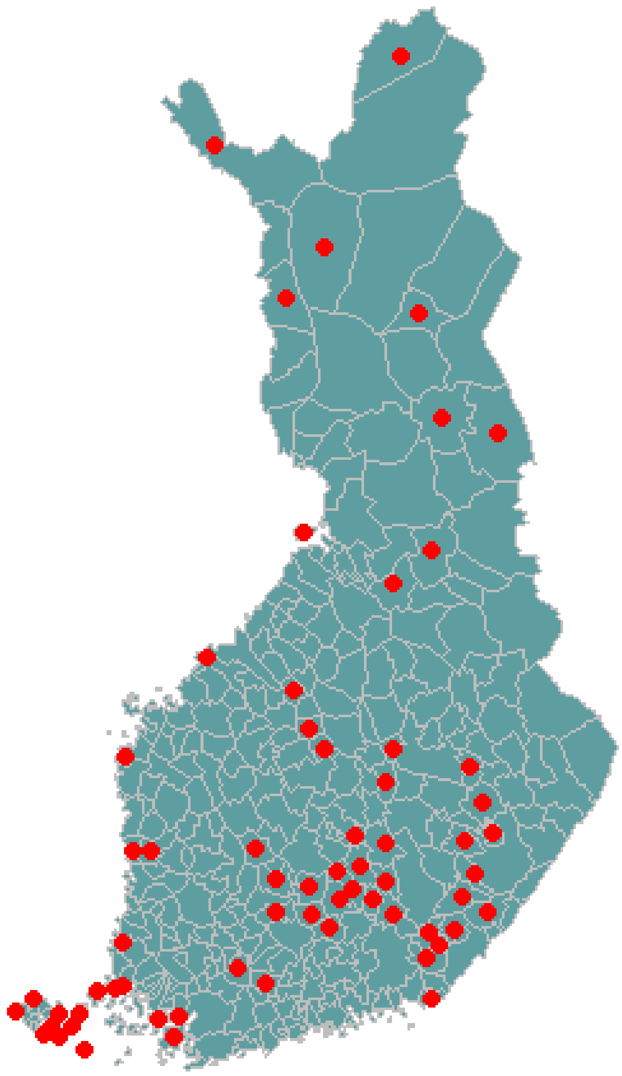

Figure 2 – Rainfall Statistics

This graph shows average summer (June, July, August) rainfall (mm per month) for each municipality in the sample (green dots), the average precipitation across all of the sample municipalities as well as a trendline from 1998 to 2014

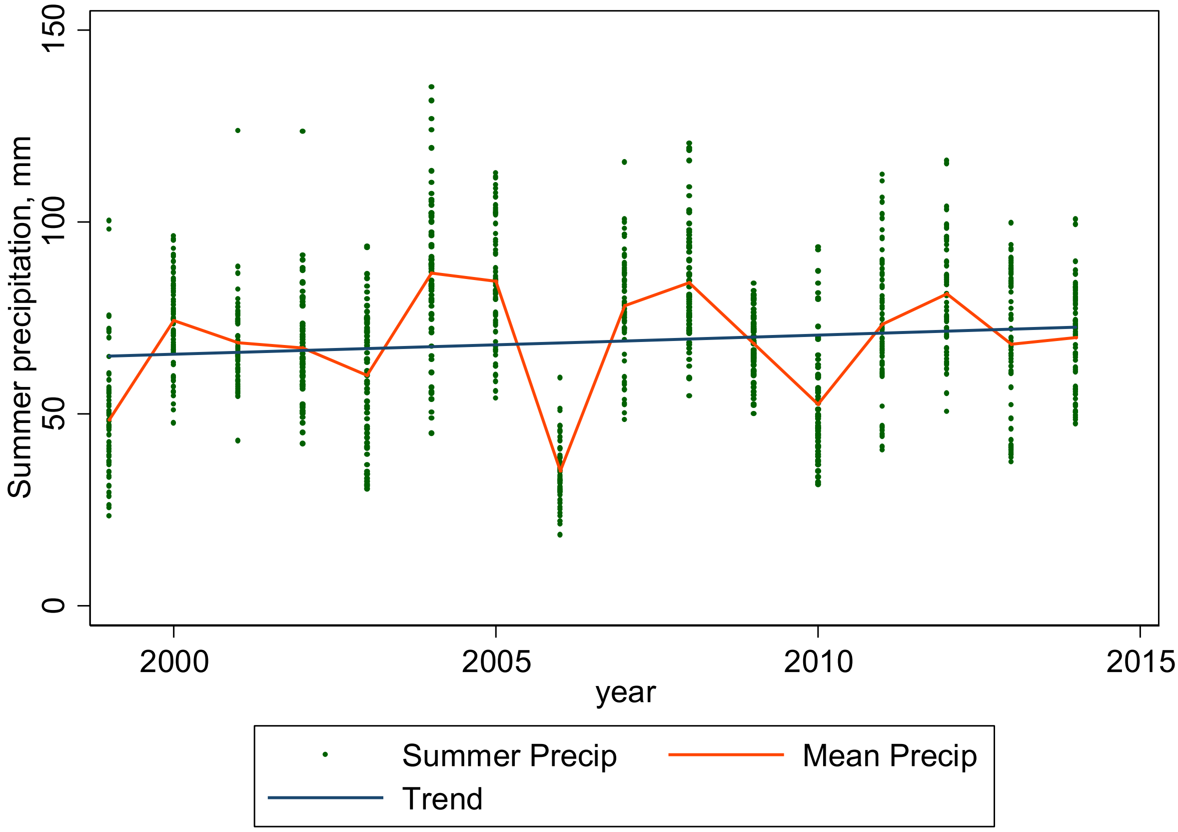

Figure 3 – First Stage: Cash flows and Rainfall

This binned scatterplot shows change in revenue (%, annual) against bins of average summer rainfall (mm per month) for levels of rainfall above and below municipality-level long term medians (calculated from 1960-2014). Low precipitation refers to levels of rainfall below the municipality long-term median and high precipitation refers to levels of rainfall above it. The sample of companies is tourism-focused businesses and the graphs include controls (i.e. display the residual after accounting for) for firm fixed effects and nationwide economic controls.

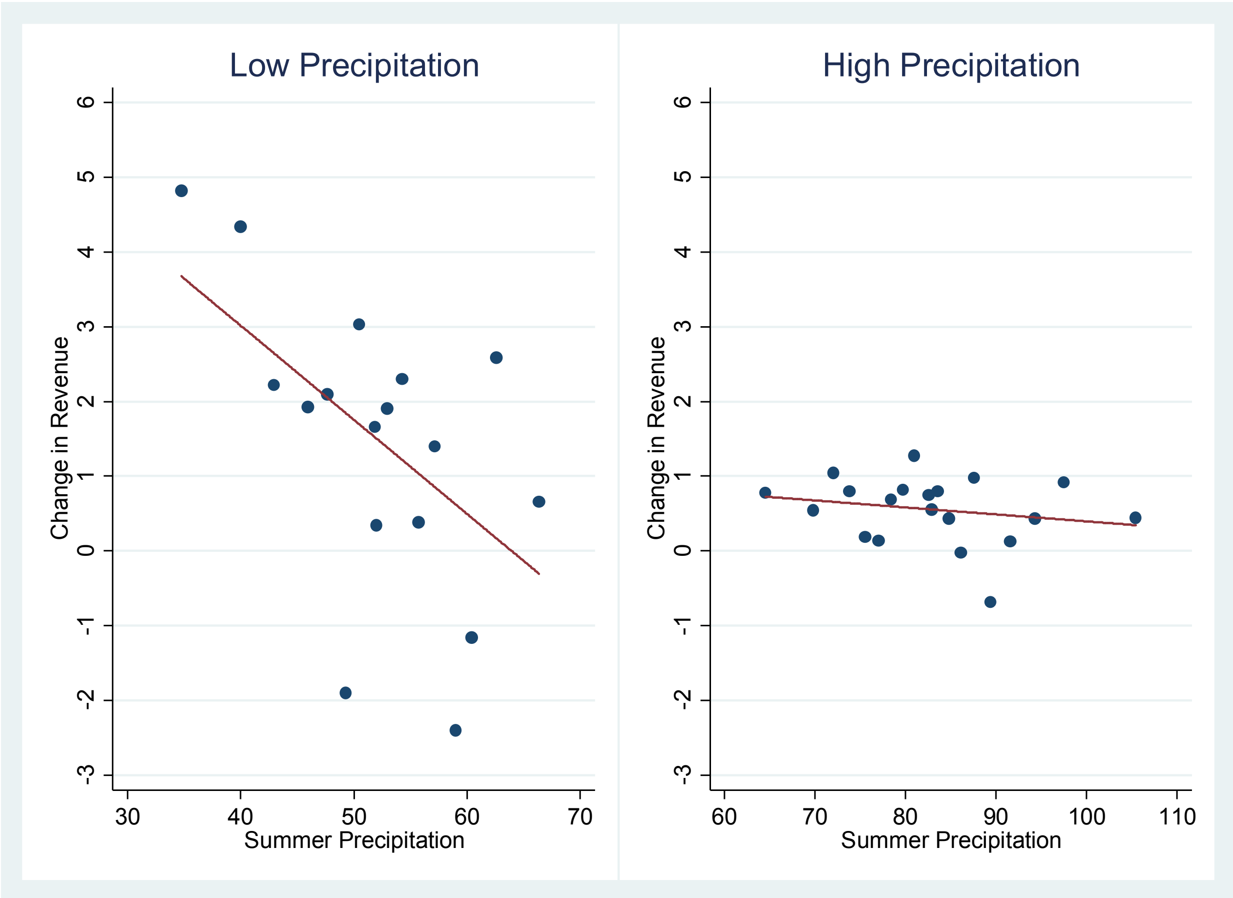

Figure 4 – New Enterprises and Rainfall

This binned scatterplot displays new entrepreneurial starts (new registered companies) by municipality and year and bins of contemporaneous rainfall. Low precipitation refers to levels of rainfall below the municipality long-term median and high precipitation refers to levels of rainfall above it. The sample includes all new formed enterprises in the sample municipalities. The graphs include controls for municipality fixed effects.

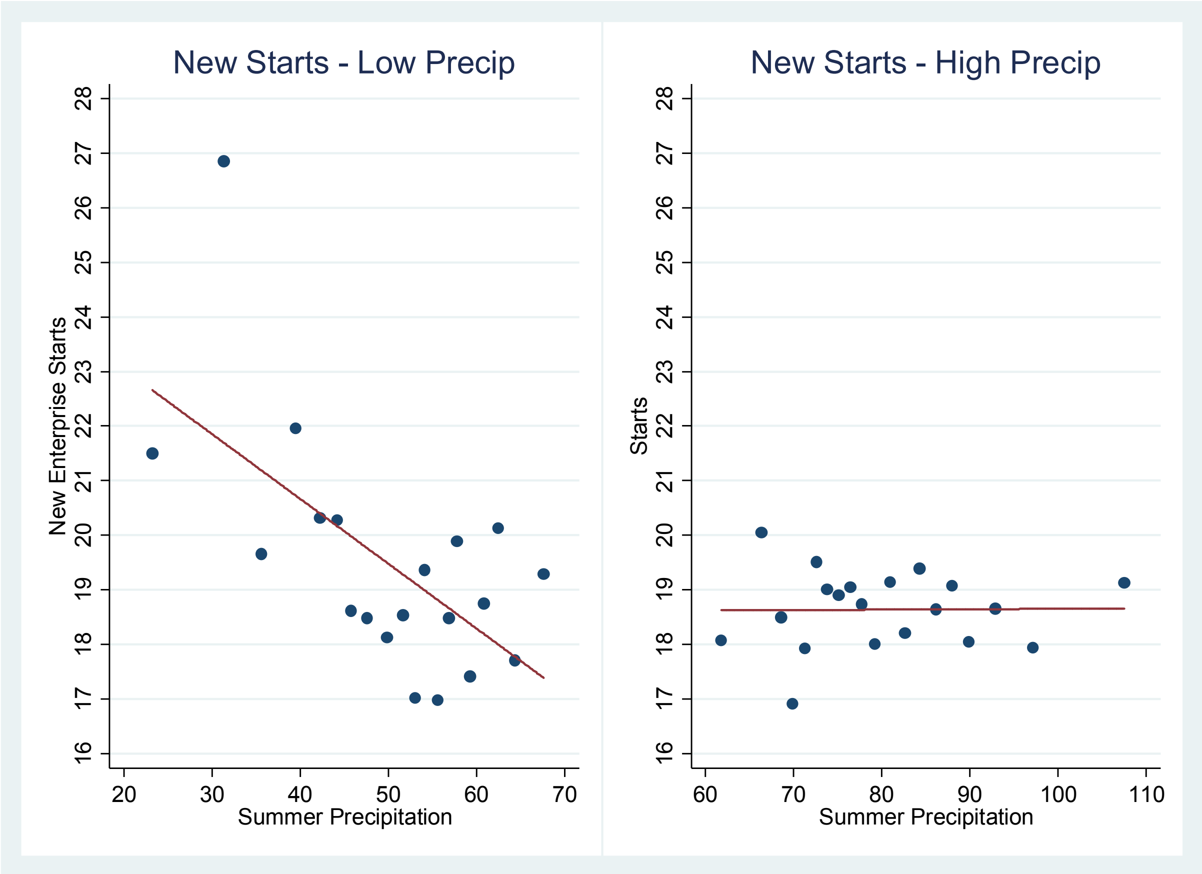

Figure 5 – Enterprise Closures and Rainfall

The bar graphs show the relationship between the percentage enterprises closing down versus rainfall in year t. Rainfall is divided into quartiles based on the percentage deviation from the municipality median, with 1 representing the lowest rainfall. The upper left graph shows the proportion of companies shutting down in years 1 and 2 after the rainfall observation, the upper right graph presents the results for the year after rainfall is observed, the bottom left graph shows the same result for the year that rainfall is observed while the bottom right graph serves as a falsification test, showing that there is no relationship between rainfall and the number of companies closing down *prior* to the year rainfall is observed.

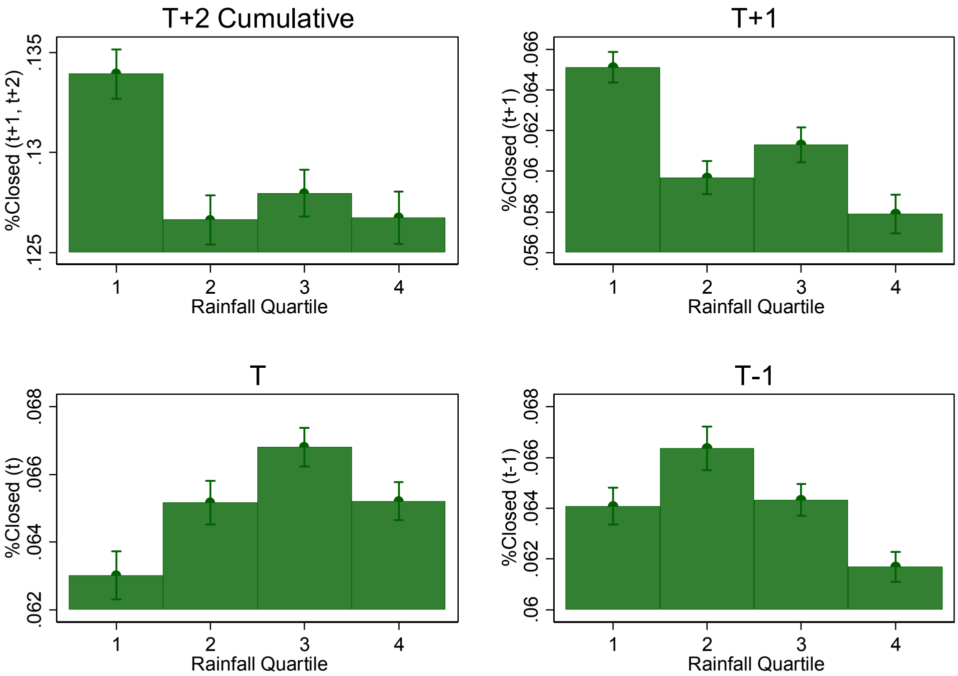

Figure 6 – Falsification Test: Winter Precipitation and Cash flows

This binned scatterplot shows the relationship between winter (January and February) precipitation in any given year and the change in revenue for tourism-oriented companies in that year.

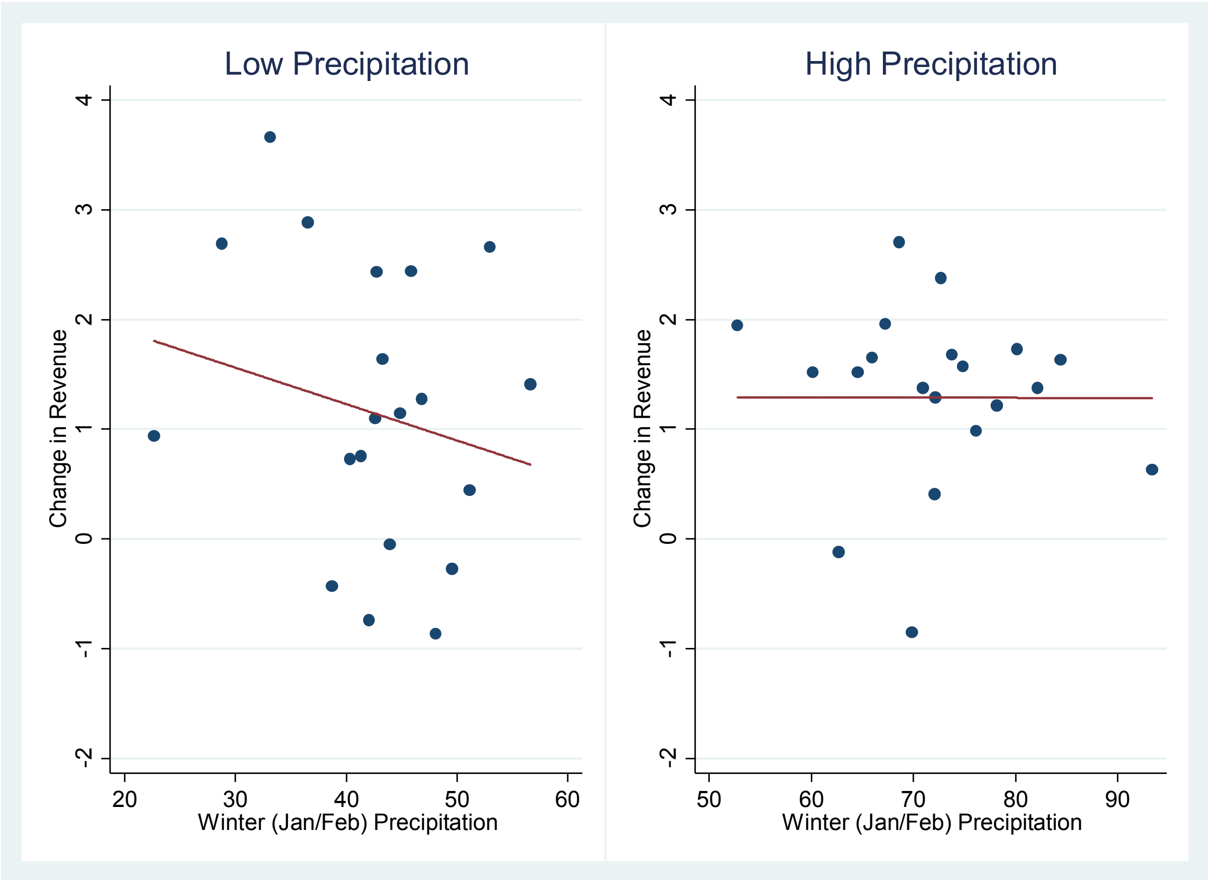

Table 1 – Summary Statistics

Panel A

This table presents firm and firm-year level summary statistics. Firm-level stats are averages across all years that the firm is present in the sample (i.e. change in revenue denotes the average yearly change in revenue). The sample consists of tourism-affected firms in “summer home municipalities” Finland. All variables are presented before any changes to the sample.

Change in revenues is defined as $\left(\frac{revenue_t}{revenue_{t-1}} \quad 1\right) \quad 100$. Investment is defined as $\left(\frac{(fixed\ assets)_t}{(fixed\ assets)_{t-1}} \quad 1\right)$ 100 and Investment (Other Firms) refers to the average of this variable for non-tourism firms in the sample municipalities in the same year. Leverage (Fixed/Total Assets) is defined as total debt divided by either fixed or total assets. Detailed variable definitions are available in the appendix. The appendix also explains why there are more observations with fixed asset available than total assets.

	# Firms	mean	sd	p5	p10	p50	p90	p95	p99
Change in Revenue (%)	1425	14	251	-49	-28	2.3	45	103	477
Investment (%)	1425	122	1189	0	0	4.2	100	237	1694
Fixed Assets (€ 000)	1425	199	985	1.1	2	28	330	654	2486
Total Assets (€ 000)	1425	403	1332	9.1	17	123	769	1451	4634
Total Debt (€ 000)	1394	63	218	1.5	3.1	21	116	213	759
Cash holdings (Cash/Assets)	1391	0.18	0.18	0.0059	0.015	0.12	0.42	0.55	0.81
Leverage (Fixed Assets)	1386	4.7	20	0.061	0.11	0.9	8.6	18	57
Leverage (Total Assets)	1371	0.46	1.9	0.021	0.039	0.17	0.67	1.1	6.1
Investment (Other Firms, %)	1425	3.8	0.7	3	3.3	3.8	4.2	4.9	6.2

	# Firm-Years	mean	sd	p5	p10	p50	p90	p95	p99
Change in Revenue (%)	7474	16	289	-58	-34	0.63	38	78	327
Investment (%)	7474	392	12194	0	0	0	51	140	1217
Fixed Assets (€ 000)	7474	276	1453	1	2	38	430	808	3644
Total Assets (€ 000)	7474	618	2375	11	23	159	1073	1891	9323
Total Debt (€ 000)	6825	87	399	1.3	3	24	151	273	1097
Cash holdings (Cash/ Assets)	7082	0.16	0.19	0	0.0045	0.086	0.44	0.57	0.8
Leverage (Fixed Assets)	6825	4	25	0.033	0.067	0.51	6	13	58
Leverage (Total Assets)	6707	0.26	0.66	0.011	0.023	0.13	0.52	0.8	2.3
Investment (Other Firms, %)	7474	4	1.2	1.9	1.9	4.2	5.4	5.4	6.2

Panel B

This table presents municipality level summary statistics on the entrepreneurship sample. The sample consists of all municipalities with more summer homes than normal homes. The numbers represent yearly averages for each municipality in the sample. Unlike the firm-level sample, this sample includes all companies across all industries/organizational forms.

	# Municipalities	mean	sd	p5	p50	p95
Started Companies (#)	65	18	17	3.1	13	51
Closed Companies (#)	65	13	12	2	10	36
Total Companies (#)	65	218	197	31	178	565

Panel C

This panel shows the number of summer home municipalities based on whether summer rainfall is below or above the municipality's median summer rainfall from 1960-2014.

year	Municipalities with High Rainfall	Municipalities with Low Rainfall
2001	41	24
2002	38	27
2003	23	42
2004	61	4
2005	60	5
2006	0	65
2007	62	3
2008	65	0
2009	44	21
2010	20	45
2011	43	22
2012	54	11
2013	34	31

Table 2 – Main Results

This table presents the results of an endogenous regression of investment on cash flow (change in revenue) as well as the first and second stages of a 2-Stage Least Squares Instrumental Variables regression where rainfall is used as an instrument for cash flows. The sample includes firm-years with above median fixed assets and the change in revenue/investment variables are truncated at 10%. Column (1) presents the endogenous regression whereas columns (2)-(4) show the first stage (the impact of rainfall on cashflows). Columns (6)-(9) show the results of a regression of the predicted cashflows from the first-stage on corporate investment. The result in column (5) is presented as an extension and shows the impact of rainfall on changes in revenue for non-touristic industries.

All variable definitions are provided in the appendix. Rainfall (low) refers to rainfall when it is below its municipality long term median. Investment Other Firms refers to average investment by firms outside of tourism in the same municipalities in the same year. Log of assets and revenue and leverage are lagged by one year.

All regressions include firm fixed effects and standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Endogenous	First Stage (2-5)				2SLS (6-9)			
Change in Revenue	0.0422***					0.298**	0.404**	0.413**	0.479*
	(0.0127)					(0.124)	(0.200)	(0.209)	(0.282)
Rainfall (Low Only)		-0.290***	-0.233***	-0.222***	-0.0870*				
		(0.0446)	(0.0510)	(0.0485)	(0.0461)				
GDP Growth			0.149	0.460***	0.990***		-0.109	-0.174	-0.102
			(0.147)	(0.148)	(0.126)		(0.130)	(0.229)	(0.197)
Unemployment Rate			3.086*	3.448*	2.872**		0.456	0.353	0.0640
			(1.839)	(1.817)	(1.278)		(1.873)	(2.174)	(1.575)
Term Spread			-3.657*	-4.547**	1.515		0.618	0.835	0.826
			(2.082)	(2.091)	(1.350)		(2.070)	(2.659)	(2.086)
Investment (Other Firms)				-2.553***				0.524	-0.434
				(0.937)				(1.555)	(1.326)
Lag Log Fixed Assets									-9.596**
									(4.022)
Lag Log Revenue									8.984*
									(5.386)
Lag Leverage									-6.134***
									(1.734)
Constant	4.214***								
	(0.0226)								
Observations	2,917	775	775	775	2,194	775	775	775	720
Number of Firms	662	277	277	277	813	277	277	277	258
Kleinbergen Paap F-stat		42.245	20.865	20.982	3.561				
Within R^2		0.0425	0.0625	0.0688	0.0785				
Firms	Tourism	Tourism	Tourism	Tourism	Other	Tourism	Tourism	Tourism	Tourism
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Rainfall		Below Average	Below Average	Below Average	Below Average	Below Average	Below Average	Below Average	Below Average

Table 3 – Alternative Specifications

This table presents the 2nd stage of 2SLS regressions of investment on changes in revenue, instrumented by rainfall (below median rainfall). Each column has a different sample selection criteria. Columns (1) and (2) include all firm-years with above median fixed assets, except that these variables are now truncated at 5% (1) and 1% (2) instead of 10% as in table 2. Column (3) includes all firm-years instead of just those with above median fixed assets (with truncation at 10% for changes in revenue and investment). Columns (4) and (5) change the threshold for firms to include – column (4) includes firms with fixed assets above €2000 (10th percentile) and (5) includes firms with fixed assets greater than €10,000. In column (6), the outcome (investment) is measured as the percentage change in fixed assets from t-1 to t+1. Column (7) presents results for the full sample of all weather-sensitive firms with no truncation.

	(1) Truncated 5%	(2) Truncated 1%	(3) Full Sample	(4) Fixed Assets > €2,000	(5) Fixed Assets > €10,000	(6) 2-year Inv	(7) Full Sample
Change in Revenue	0.839**	1.550*	0.666*	0.799*	0.640**	0.930**	47.26
	(0.379)	(0.897)	(0.363)	(0.468)	(0.286)	(0.401)	(57.35)
Investment (Other firms)	7.611***	38.19*	1.585**	1.749	0.306	2.677**	808.9
	(2.432)	(19.61)	(0.770)	(1.283)	(1.399)	(1.238)	(760.3)
GDP Growth	-1.327**	-4.502	-0.288*	-0.356	-0.174	-0.478	-181.4
	(0.560)	(2.885)	(0.157)	(0.256)	(0.228)	(0.320)	(201.8)
Unemployment	4.252	56.11*	-1.617	-1.369	0.0420	-5.230	649.1
	(4.330)	(29.32)	(1.562)	(2.083)	(2.056)	(4.612)	(793.4)
Term Spread	1.478	3.888	2.836	3.157	1.965	6.577	-689.9
	(4.101)	(23.65)	(2.079)	(2.676)	(2.548)	(4.602)	(1,108)
# Observations	995	995	1,362	1,261	1,054	640	1,834
# Firms	337	337	491	458	381	232	632
Firms	Tourism	Tourism	Tourism	Tourism	Tourism	Tourism	Tourism
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality
Rainfall	Low	Low	Low	Low	Low	Low	Low

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 – Reduced Form

This table presents the results of OLS (reduced form) regressions of investment on rainfall, for below median levels of rainfall only. The outcome variable in columns (1-4) is investment in the year of the rainfall shock while the outcome variable in column (5) is the change in fixed assets from the year of the rainfall shock to the end of the year after. The sample includes all firm years with above median fixed assets, and the investment variable is truncated at 10%.

	(1)	(2)	(3)	(4)	(5)
Rainfall (Low Only)	-0.0874**	-0.0961***	-0.0964***	-0.109***	-0.189**
	(0.0352)	(0.0357)	(0.0359)	(0.0393)	(0.0786)
Investment (Other Firms)			0.269	0.423	-1.151
			(0.826)	(1.156)	(2.192)
GDP Growth		-0.0834	-0.118	-0.141	0.0512
		(0.0970)	(0.146)	(0.179)	(0.304)
Unemployment Rate		1.189	1.225	0.351	1.592
		(1.163)	(1.126)	(1.123)	(2.761)
Term Spread		-0.972	-0.948	-0.0346	-0.671
		(1.197)	(1.228)	(1.235)	(2.719)
Lag Log Fixed Assets				-5.069***	-9.301**
				(1.583)	(4.432)
Lag Log Revenue				-0.173	1.348
				(0.783)	(1.568)
Lag Leverage				-4.921***	-10.09***
				(0.953)	(2.265)
Constant	8.821***	0.452	-0.865	34.14***	51.90*
	(1.834)	(9.045)	(7.984)	(10.34)	(27.55)
Observations	1,173	1,173	1,173	1,029	840
R-squared	0.010	0.014	0.014	0.068	0.068
Number of Firms	543	543	543	491	421
Firms	Tourism	Tourism	Tourism	Tourism	Tourism
Firm FE	Yes	Yes	Yes	Yes	Yes
Cluster	Municipality	Municipality	Municipality	Municipality	Municipality

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 – Financial Constraints Test

This table presents results of my main (table 2) regressions with firms split into "constrained" and "unconstrained" firms on two measures. The dependent variable in every regression is investment, and the variable of interest is change in revenue (instrumented by average summer rainfall for "good" years as define in table 2). Firms are split into several categories in different columns. The categorization aims to measure financial constraints for these firms. Columns 1-4 involve splitting firms into high and low cash holding firms depending on whether their cash/assets ratio is above/below the median for tourism oriented firms in any given year. Columns 5 and 6 split firms into large and small firms, with large firms being firms with fixed assets above the 90th percentile of all firms.

All regressions include firm fixed effects. Standard errors are clustered at the firm level.

	(1) High Cash Holdings	(2) Low Cash Holdings	(3) High Cash Holdings	(4) Low Cash Holdings	(5) Large Firms	(6) Small Firms
Change in Revenue	0.552**	0.247	1.072	0.391	0.282	0.408
	(0.240)	(0.273)	(0.739)	(0.412)	(0.309)	(0.377)
Investment (Other Firms)			1.140	-0.693	-4.116**	2.457
			(2.693)	(2.730)	(1.704)	(2.250)
GDP Growth			-0.629	-0.00938	0.159	-0.245
			(0.457)	(0.400)	(0.449)	(0.301)
Unemployment Rate			-5.178	2.002	3.235*	-0.675
			(7.077)	(2.156)	(1.941)	(2.626)
Term			5.245	0.405	-3.634	3.343
			(8.480)	(2.951)	(2.360)	(3.847)
Observations	339	313	339	313	227	523
Number of Firms	130	120	130	120	78	197
Firms				Tourism		
Firm FE				Yes		
Cluster				Muni		

*** p<0.01, ** p<0.05, * p<0.1

Table 6 – New Enterprises Results

This table presents the results of OLS regressions of the number of new enterprises starting up in a municipality in a given year on rainfall in that year (rainfall low refers to below median rainfall. I also include rainfall high, above median rainfall, as a robustness test and find no effect). The dependent variable in column 4 is the number of new enterprises starting up in the next year after rainfall is observed. Controls include nationwide economic controls, municipality fixed effects, a linear municipality-level trend measure and the lagged number of new enterprises. The municipalities in the sample include all municipalities in Finland with more summer homes than other residences. Standard errors are clustered at the municipality level.

	(1)	(2)	(3)	(4) New Ent_{t+1}	(5) Robustness
Rainfall (Low)	-0.128***	-0.0746**	-0.0657	-0.0767**	
	(0.0374)	(0.0363)	(0.0395)	(0.0382)	
Rainfall (High)					0.000196
					(0.0228)
GDP Growth		0.00671	-0.0599	-0.180	
		(0.0830)	(0.0967)	(0.124)	
Unemployment Rate		-0.254	1.119	-0.142	
		(1.416)	(1.473)	(2.370)	
Term Spread		-2.160*	-3.742**	-2.720	
		(1.285)	(1.506)	(1.959)	
Municipality Trend		0.358**	0.401**	-0.00299	
		(0.165)	(0.161)	(0.225)	
Lagged # Starts			-0.0227	-0.0540	
			(0.0964)	(0.119)	
Constant	26.42***	26.07**	16.14	31.15	19.15***
	(1.886)	(12.11)	(13.37)	(20.84)	(1.842)
Observations	301	301	277	247	544
R-squared	0.057	0.146	0.135	0.110	0.000
Number of Municipality	65	65	65	65	65
Industries	All	All	All	All	All
FE	Municipality	Municipality	Municipality	Municipality	Municipality
Cluster	Municipality	Municipality	Municipality	Municipality	Municipality

*** p<0.01, ** p<0.05, * p<0.1

Table 7 – Closed Enterprises Results

This table presents the results of regressions where the dependent variable is the number of enterprises closing down in a municipality in a given year (either year t=0, t=1 or t=1 and 2 cumulative). The variable of interest is summer rainfall, for low values of rainfall. The sample includes all companies in "summer home municipalities." All regressions include municipality fixed effects and standard errors are clustered at the municipality level

	(1)	(2)	(3)	(4)	(5)
	t=1	t=1,2	t=0	t=1	t=1,2
Rainfall (Low)	-0.0855**	-0.244***	-0.00964	-0.0759*	-0.252***
	(0.0356)	(0.0485)	(0.0256)	(0.0428)	(0.0629)
GDP Growth			-0.0738	0.260***	-0.366**
			(0.119)	(0.0925)	(0.183)
Unemployment			6.518***	0.874	-0.540
			(1.599)	(1.277)	(1.685)
Term Spread			-6.320***	0.968	-1.468
			(1.594)	(0.905)	(1.644)
Lagged # Businesses			-0.0190	0.00130	0.0285
			(0.0439)	(0.0154)	(0.0350)
Constant	19.80***	43.94***	-29.15	9.124	45.00**
	(1.795)	(2.418)	(21.02)	(12.19)	(21.48)
Observations	271	262	277	271	262
R-squared	0.034	0.113	0.189	0.059	0.142
# of Municipalities	65	65	65	65	65
Industries	All	All	All	All	All
FE	Municipality	Municipality	Municipality	Municipality	Municipality
Cluster	Municipality	Municipality	Municipality	Municipality	Municipality

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8 – Robustness Check: Excluding Years (Warning: Not updated, uses old data)

This table presents the results of the regressions in table 2 (2SLS regressions of investment on changes in revenue, instrumented by rainfall) when any given year is excluded from the sample. The Year column shows the year that is excluded while the coefficient column displays the coefficient value of the change in revenue coefficient. The No Controls column reports regression results based on a regression with firm fixed effects only while the Controls column reports the coefficient from a regression with economic c1ontrols (see column 8 in table 2).

All standard errors are clustered by firm.

	Coefficient		Standard Error	
Year	No Controls	Controls	No Controls	Controls
1999	0.283**	0.403**	(0.113)	(0.187)
2000	0.275**	0.417**	(0.108)	(0.185)
2001	0.261**	0.426**	(0.107)	(0.195)
2002	0.261**	0.403**	(0.107)	(0.185)
2003	0.227**	0.335**	(0.103)	(0.169)
2004	0.251**	0.384**	(0.108)	(0.187)
2005	0.271**	0.415**	(0.114)	(0.199)
2006	0.339	0.601	(0.214)	(0.571)
2007	0.254**	0.331**	(0.100)	(0.135)
2008	0.271**	0.417**	(0.109)	(0.189)
2009	0.306**	0.458	(0.120)	(0.293)
2010	0.280**	0.420**	(0.124)	(0.192)
2011	0.270**	0.533	(0.110)	(0.347)
2012	0.260**	0.542**	(0.109)	(0.266)
2013	0.316**	0.482**	(0.128)	(0.218)
2014	0.253**	0.812	(0.122)	(1.054)

*** p<0.01, ** p<0.05, * p<0.1

Appendix

Data and Variables Coding

Rainfall: In order to merge rainfall data into the firm-year sample, I match on year and municipality. If a company's financial year ends before June, I match on (year – 1) and municipality instead. For example, if a company's financial year 2005 ends in March 2005, the weather in June-August 2005 will not be relevant. Instead, weather from 2004 is used. Firms with financial years ending in the summer are dropped. About 55% of firm-years end in December and about 75% end after September.

Industry Codes: For years prior to 2007, only the 2002 industry classification is available. I match the 2008 and 2002 industry codes using a two-step process: Firstly, for companies that operate both before and after 2007, I use the 2008 industry code. For firms which close down before 2007, I use the conversion table provided by Statistics Finland to match industries at the 3-digit level. In case of multiple matches (i.e. more than one 2008 industry code per 2002 industry code), I pick the industry code pair that has the highest total revenue transitioning.

Financial Variables/Address Details: In order to use address and financial information from Voitto+, I have to make several adjustments. I download Voitto+ data from 2003 (fiscal years 1998-2002), 2007 (2003-2006), 2011 (2007-2010) and 2015 (2011-2015). The financial information and company details are in separate tables. Firstly, the "company details" table in Voitto+ has several duplicate rows. I delete all excess copies of items that are completely identical. When the table has multiple entries for a company that are not identical (industry or address differs), I drop all instances of the company. I then merge these tables with the financial information tables and append them together.

In order to define the financial variables, I have to deal with frequent missing observations when defining two variables: fixed assets and total debt. I use https://relipe.fi/wp-content/uploads/Tase_suomi-englanti.pdf to translate from Finnish to English as the balance sheet outline is identical to the format in Voitto+.

I define fixed assets using the following guide[14]:

[14] Counterintuitively, this method leads to more observations of fixed assets than total assets (which is taken directly from a column called "Total Assets")

- If "Tangible Assets" (within non-current assets) is non-zero, use tangible assets
- If "Tangible Assets" is equal to zero or missing,
    - If any of the following (subcategories of tangible assets)[15] are non-zero, use their sum (coding the missing observations as 0 only if at least one category is non-missing):
        - Land and Waters
        - Buildings
        - Machinery and Equipment
        - Other tangible assets
        - Advance payments and construction in progress
    - Otherwise, leave Fixed Assets as missing

I define total debt using the following guide:

- If any of the following are non-zero, use their sum (coding the missing observations as 0):
    - Bonds
    - Convertible Bonds
    - Loans
    - Pension Loans
- Otherwise, leave Total Debt as Missing

[15] These are all the possible subcategories of tangible assets in Voitto+. The most common format of the data has "tangible assets" as missing but non-missing values for the subcategories

Variable Definitions and Data Sources

Variable	Definition	Source
Investment	Fixed Assets (t) / Fixed Assets (t-1) * 100	Calculated from Voitto+ data
Fixed Assets	*As defined above*	Voitto+
Total Debt	*As defined above*	Voitto+
Total Assets	"Total Assets" (Taseen Loppusumma) from a company's balance sheet	Voitto+
Change in Revenue	Revenue (t) / Revenue (t-1) * 100	Calculated from Voitto+ data
Summer Precipitation	Average monthly rainfall (mm) for June, July and August in any given municipality	Finnish Meteorological Institute (FMI)
Precip_up	Average monthly rainfall (mm) in June-August when this is above its median from 1960-2014	FMI
Precip_down	Average monthly rainfall (mm) in June-August when this is below its median from 1960-2014	FMI
Investment (Other Firms)	Average change in fixed assets (investment) for other firms	Calculated from Voitto+ data

	(non-tourism) operating in the sample municipalities in any given year	
GDP Growth	National GDP Growth	Statistics Finland
Unemployment	National unemployment rate	Statistics Finland
Term spread	Govt 10 Year Bond yield minus EURIBOR 12 month interest rate (calendar year average, matched to fiscal year)	OECD and Bank of Finland
New Enterprises	Number of new companies started in a municipality in a given year	Statistics Finland
Closed Enterprises	Number of existing companies shutting down in a municipality in a given year	Statistics Finland