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THE ECONOMIC POWERHOUSE

CORPORATE PROFITABILITY AND GROWTH FROM THE 19th TO THE 21st CENTURY

INAUGURAL DISSERTATION

SUBMITTED TO THE UNIVERSITIES OF BAMBERG AND CASTELLÓN

Bamberg 2024

This dissertation has been submitted under a specific agreement of joint supervision between the Faculty of Social Sciences, Economics, and Business Administration of the Otto-Friedrich-Universität Bamberg and the Doctoral School of the Universitat Jaume I in Castellón de la Plana (Spain).

Diese Arbeit wurde im Rahmen einer Vereinbarung zur gemeinsamen Betreuung durch die Fakultät Sozial- und Wirtschaftswissenschaften der Otto-Friedrich-Universität Bamberg und der Escuela de Doctorado der Universitat Jaume I Castellón (Spanien) als Dissertation vorgelegt.

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Date of thesis defense/Tag der mündlichen Prüfung: 20.02.2024

URN: urn:nbn:de:bvb:473-irb-946852
DOI: https://doi.org/10.20378/irb-94685

First printing, January 2023, final printing April 2024

Acknowlegdements

I am thankful to my supervisors, Mishael Milaković and Simone Alfarano, for their guidance and support. Their view on the economy and their intution for its interactions and inner workings have opened up an interesting and intriguing research field. Without them, this work would have taken a very different path.

I also want to thank Frank Westerhoff for serving on my dissertation committee. During my bachelor and master studies it were his classes that drew my interest to macroeconomics. Furthermore, I am grateful to Eva Camacho Cuena, Miguel Ginés Vilar and the entire Departament d'Economia at Universitat Jaume I for their support and hospitality during several research visits in Castellón de la Plana, Spain. My research made substantial progress there, as did my knowlegde of the Spanish administration. I guess, my case was not a smooth one so I would like to thank Begonya Herrero and the team of the Escola de Doctorat for their enduring support and patience.

The company of Philipp Mundt and Ilfan Oh was precious and my research benefitted greatly from the many fruitful discussions with them. Over the years, there has been a wonderful team at the Chair but also at the Department of Economics at the University of Bamberg. The support of both, colleagues and friends, has been vital for completing this thesis. Special thanks go to Isabella Geis, Philipp Mundt, Stefanie Schmitt, Noemi Schmitt, Markus Schlatterer, Marc Saur, Jan Schulz and Michael Wegener. Moreover, I am indebted to Stephan Eitel, Maximilian Göldl, Nicolas Klas, Laura Linhardt, Laura Louzil, Christian Menden, Michael Neuner, Lisa Planer-Friedrich, Jan Schulz, Anja Volk, Jan Weber and Eva Willer for their able research assistance and active support in preparing and digitizing data out of historical annual reports. I would also like to thank Roswitha Albert for her universal support and help in the day-to-day business, keeping the administrative work under control.

Last but not least, I am deeply grateful to my dearest Lisa for her love, patience and support, and to my beloved parents who supported me all the way. I am grateful far beyond what words can describe, for your advice, encouragement and patience. This would not have been possible without you.

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English

Three research projects are at the core of this thesis. Their common point of departure is the seminal paper by Alfarano et al. (2012), in which the authors analyze the statistical and distributional patterns that characterize profitability of corporations in the U.S. during the years 1980 to 2011. They find the profitability of competitive corporations, measured by their return on assets (ROA), to be best described by a stationary diffusion process comprising a deterministic mean-reverting tendency and stochastic noise. The parameters of the process then are the median (location) and mean deviation from the median (dispersion) of the profit rates of the overall population of competitive firms and a firm-specific diffusion constant.

In this thesis, we find this process to describe the statistical behavior of profit rates in very different countries and very different time periods. Time-series and cross-sections of profit rates fall onto Laplace distributions for the U.S. between 1863 and 2013 (chapter 3), for Germany between 1919 and 1944 (chapter 4) as well as 45 countries around the world between 1983 and 2013 (chapter 5).[1] So profit rates display qualitatively the same statistical behavior, culminating in the Laplace distribution of profit rates, across time and space. Significant departures from the distribution are transitory and only occur under exceptional circumstances, such as severe economic depressions or wartime. Quantitative differences in the parameter values, however, appear persistently across countries, potentially being the result of country-specific characteristics like the legal system. Thus, departures from the distribution mark exceptional economic conditions and severe distress while different parameter values seem to be the result of country-specificities. Overall, profitability qualifies as reliable vital signs of the economy with robust statistical patterns across space and time. Departures from these statistical patterns then carry substantial information about the potential length and severity of crises.

[1] Chapters 3 and 5 are based on collaborative work with Mishael Milaković and Simone Alfarano.

Español

Tres proyectos de investigación constituyen el núcleo de esta tesis. Su punto de partida común es el trabajo seminal de Alfarano et al. (2012), en el que los autores analizan los patrones estadísticos y distributivos que caracterizan la rentabilidad de las empresas en EE.UU. durante los años 1980 a 2011. Encuentran que la rentabilidad de las corporaciones competitivas, medida por su rendimiento sobre los activos (ROA), se describe mejor mediante un proceso de difusión estacionario que comprende una tendencia determinista de reversión de la media y ruido estocástico. Los parámetros del proceso son la mediana (localización) y la desviación media de la mediana (dispersión) de las tasas de beneficio de la población global de empresas competitivas y una constante de difusión específica de la empresa.

En esta tesis, encontramos que este proceso describe el comportamiento estadístico de las tasas de beneficio en países y periodos de tiempo muy diferentes. Las series temporales y los cortes transversales de las tasas de beneficio se ajustan a las distribuciones de Laplace para Estados Unidos entre 1863 y 2013 (capítulo 3), para Alemania entre 1919 y 1944 (capítulo 4), así como para 45 países de todo el mundo entre 1983 y 2013 (capítulo 5). [2] Así, las tasas de ganancia muestran cualitativamente el mismo comportamiento estadístico, que culmina en la distribución de Laplace de las tasas de ganancia, a través del tiempo y el espacio. Las desviaciones significativas de la distribución son transitorias y sólo se producen en circunstancias excepcionales, como depresiones económicas graves o tiempos de guerra. Sin embargo, las diferencias cuantitativas en los valores de los parámetros aparecen de forma persistente en los distintos países, pudiendo ser el resultado de características específicas de cada país, como el sistema jurídico. Así pues, las desviaciones de la distribución marcan condiciones económicas excepcionales y dificultades graves, mientras que los diferentes valores de los parámetros parecen ser el resultado de las especificidades de cada país. En general, la rentabilidad se considera un signo vital fiable de la economía con patrones estadísticos sólidos en el espacio y el tiempo. Las desviaciones de estos patrones estadísticos aportan información sustancial sobre la duración y la gravedad potenciales de las crisis.

[2] Los capítulos 3 y 5 se basan en un trabajo de colaboración con Mishael Milaković y Simone Alfarano.

1
Introduction

"Profit in the economic sense – entrepreneurial profit – doesn't exist in the never-never land of perfect competition that economists invent sometimes to explain what they're talking about. If it existed, perfect competition would drive the price of goods and services down until it equals the cost of producing them."

Mord Bogie (1998, p. 47)

1.1 Motivation and Research Question

In his three-volume magnum opus on the *History of the Great American Fortunes*, Gustavus Myers (1909, 1910a,b) provides a meticulous account of family wealth in 19th century United States. As expected, his accounts center on individuals, in many cases the founding fathers of the most popular dynasties in American business. Just to drop some family names: Astor, Vanderbilt, and Morgan. These three representative fortunes alone provide an exemplary account of the major themes in the American economy of the 19^{th} century. The fortune of the Astor family was founded on land and real estate speculation. The fortune of the Vanderbilt family was founded on railroads. And finally, the fortune of the Morgan family was founded on banking and finance. Yet, whatever their economic activity was, these fortunes may have been less tied to individuals or families than they have been tied to an artificial legal entity. As Myers (1910a, p. 13) remarks,

> "[l]ooking back and summing up the course of events for a series of years, it may be said that there was created over night a number of entities empowered with extraordinary and far-reaching rights and powers of ownership. These entities were called corporations, and were called into being by law. Beginning as creatures of law, the very rights, privileges and properties obtained by means of law, soon enabled them to become dictators and masters of law. The title was in the corporation, not in the individual; hence the men who controlled the corporation swayed the substance of power and ownership."

Myers' perspective on the corporation resembles the power-centered perspective of organizational sociology. For Roy (1997) and Perrow (2002), among others, corporations are an artificial entity created to exercise power over the economic, political and social environment. The logical consequence of the hunger for power then is the struggle for growth and profitability, or more general the struggle for survival. A corporation able to *actively* control and thus tame the volatile environment can be considered in a better position than an equivalent corporation only able to *passively and most likely inadequately* anticipate and adapt to the volatile environment. As Fligstein and Freeland (1995) put it, continued profitability and growth rest on predictable and smooth business which, in turn, rests on a predictable and stable environment in which the corporation operates.

In our view, the corporation is a modern marvel that has not yet been acknowledged adequately in economics. No other organizational form has grown as large and has been applied as universally across economic activities as the corporation. From transportation and utilities in the 19^{th} century, where corporations built the foundations of railroad, telegraph and electricity networks, over manufacturing and distribution in the 20^{th} century, where corporations turned exclusive luxuries of a few into affordable necessities of the many, to technology and the internet in the 21^{st} century, where corporations provide "virtually" anything one can imagine. And yet, standard (text-book) economics remains relatively silent about corporations and their role in the economy. The corporation is subsumed in the more abstract concept of the *firm*, a hypothetical place where the production and distribution of goods and services are organized. Its main reason of existence is efficiency; increasing the *scale and scope* of production and distribution brings valuable cost advantages (see Chandler, 1965b, 1990). In this view, the firm becomes a set of decision and optimization problems (e.g., cost minimization, profit or sales maximization, determination of optimal size), spiced up by agency problems resulting from the separation of ownership and control (see Berle and Means, 1932). Consequently, the firm, or better said its internal decision-making, is treated almost exclusively in microeconomics.

At the same time, we see firms featuring prominently in the behavior of the overall economy. Gabaix (2011) finds the largest firms to contribute substantially to aggregate fluctuations, coining the vision of the economy as a granular system. Anecdotal evidence on the pivotal role that corporations play in the economy can also be found in crises. The Panic of 1873 caused such an international financial and economic crisis initially known by the name *Great Depression*, later referred to as the *Long Depression*. From 1873 to at least 1877[1] economies on both sides of the Atlantic were shattered. Although its scale seemed unprecedented, it was by far not the first financial crisis. New York's *The Indepedent* concluded on June 11, 1874 that *"[c]ommercial and financial crises, in which business men are overwhelmed with embarrassment and individual fortunes take to themselves wings and fly away, are not mere accidents, or events that happen without adequate cause. When the necessary conditions are present they are sure to occur, sooner or later. They have repeated themselves so often as to establish the fact of general laws in respect to their occurrence."*. A caricature on the front page of *The Daily Graphic* from September 29, 1873 (see Figure 1.1) is clear on the *necessary conditions* of the crisis, written on the ticker snippets that are swept out of Wall Street: besides speculation and *shaky banks* it was *rotten railways* and *wild cat & wild goose R[ail]R[oads]*, in other words, financially unsound firms. About half a century later, in 1929, an unprecedented stock market crash triggered what by today is known as the *Great Depression*, a depression

[1] The duration of the *Long Depression* varies over countries and is debated in the literature. While many early contributions defined the *Long Depression* from 1873 to 1896 as a continuous depression, more recent contributions see the depression lasting to only around 1879, succeeded by several recessions until the end of the century (see, e.g., Saul (1969)).

Figure 1.1: Frontpage of the *The Daily Graphic* from September 29, 1873, the eleventh day after Jay Cooke & Company had declared bankruptcy and the tenth day the New York stock exchange had shut down. At that time, many perceived crises as a healthy fever necessary to cure the ills of the economy. The original caption says "Panic as a health officer, sweeping the garbage out of Wall Street."

cutting deeper and lasting longer than any other financial and economic crisis before. Again, corporations featured prominently in this crisis, with as many of them on the brink of bankruptcy as never before. Later crises saw firms featuring prominently again, e.g., in the Dot.Com Crash in 2001, when lots of tech start-ups went bust or in the sovereign debt crisis in 2009, when collapsing banks, also organized in corporate form, took the economy and thereby the firms with them.

With corporations being the place where economic power is concentrated – making them the economic powerhouses that run the economy – and stories of neither booms nor busts told without them, we want to analyze the economy from the perspective of the corporation. Therefore, we analyze performance on the firm-level in order to understand better the performance of the economy. In doing so, we want to identify statistical and distributional patterns in the profitability and growth of corporations and relate deviations from these patterns to the economic, social and political environment.

1.2 Results and General Conclusions

Our core finding is a surprising stability and universality in the statistical and distributional characteristics of corporate profit rates across time (from the 19th to the 21st century) and across space (45 countries from all around the world). Built on a common methodological basis (see chapter 2), the three research projects that form this thesis are the following:

- The first research project (*U.S. Corporations in Prosperity, Crisis and War: 1863-1893, 1923-1953 and 1983-2013*, see chapter 3, collaborative work with Mishael Milaković and Simone Alfarano) takes the original work of Alfarano et al. (2012) as a point of departure. In their paper, the authors observe a surprising stability in the cross-sectional and pooled distribution of profit rates of competitive firms for the U.S. during the 1980s to early 2000s. They propose a reduced-form model resting on the idea of capital-reallocation according to the profit motive that is able to replicate the observed statistical and distributional characteristics. In order to test for the persistence of these statistical and distributional characteristics and thereby the applicability of the reduced-form model, we extend the analysis to historical periods. We collect by hand comparable data on U.S. corporations during the periods 1863-1893 and 1923-1953 from printed and (largely) digitalized resources to complement the readily available original data on the period 1983-2013, provided by Thomson Reuters. Figure 1.2 visualizes the finding for utility corporations, which are among the first corporations to regularly report standardized financial information, for all three periods. Similar findings characterize non-financial corporations in the two later periods, 1923-1953 and 1983-2013. Apart from transitory deviations during the Great Depression and wartime production, the distribution of profit rates appears surprisingly robust over a timespan of about 150 years. And even the transitory deviations are shedding new light on the Great Depression: deviations signal the critical dependence of a functioning economy on continuing capital reallocation and accumulation. Once the reallocation of capital comes to a halt and the accumulation of capital reverses, the economy is in free fall.

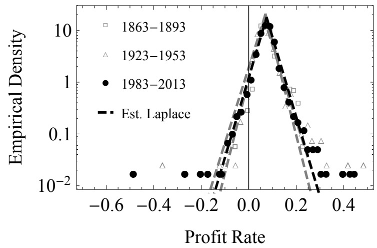


Figure 1.2: Empirical distribution of profit rates of long-lived utility corporations in the U.S. during the periods 1863-1893, 1923-1953 and 1983-2013.

- In the second research project (*German Corporations in Democracy and Totalitarianism: 1919-1944*, see chapter 4, single authored work), we analyze the profitability and growth of German corporations during the period 1919-1944. Again, we collect comparable data from historical annual reports by hand, using the recently digitalized press archives of the *Hamburgisches Welt-Wirtschafts-Archiv* (HWWA) and the *Institut für Weltwirtschaft* (IfW). Similar to the findings for the United States, the Great Depression in Germany is characterized by a temporal reversal in capital accumulation and a decline in profitability. While the resulting deviations from the distributional form are transitory, the defining parameters of the

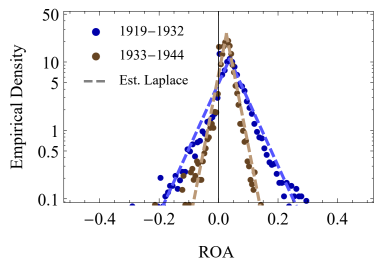


Figure 1.3: Empirical distribution of profit rates of long-lived, non-financial corporations in Germany during the period 1919-1944.

distribution change persistently after 1933. Overall, profitability of corporations in Nazi Germany is lower and less dispersed than in Weimar Germany (see Figure 1.3). Thus, the regime switch from a democratic to a totalitarian system leaves a mark on the profitability of corporations, yet the observed statistical and distributional characteristics qualitatively remain the same. So apart from a different parametrization, the original reduced-form model of the profitability of competitive firms, is also applicable to Germany, even in a more extreme socio-political environment than in the U.S.

- The third research project (*The Myth of Corporate Individualism: Universal Profit and Growth Dynamics Around the World*, see chapter 5, collaborative work with Mishael Milaković and Simone Alfarano) takes an international perspective on corporate profitability and growth. In contrast to the two historical studies, this study relies on more recent data readily available from Thomson Reuters Datastream, covering more than 54,000 corporations from 45 countries around the world during the period 1983-2013. Again, we find the statistical and distributional patterns identified in the U.S. and Germany to be qualitatively the same, yet quantitatively different. The location and dispersion of profit rates vary in a non-trivial way across countries. While we cannot find sectoral differences in the distribution of profit rates, ruling out the sectoral composition of an economy as an explanation, we find differences across different families of legal systems. The median profit rate generally is highest in countries with legal systems originating from English Law and lowest in countries with legal systems originating from German Law. In spite of quantitative differences across countries, pooling the data leads once more to the expected distributional outcome (see Figure 1.4), strengthening the robustness of the Laplace distribution of profit rates.

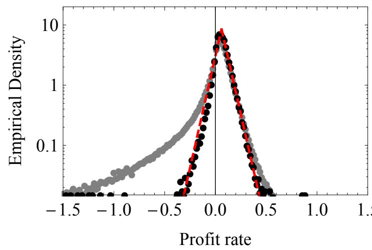


Figure 1.4: Empirical distribution of profit rates of long-lived (black) and all (gray) non-financial corporations in 45 countries around the world during the period 1983/97-2013.

In all studies, we use growth rates as a counterpart, as growth is the more prominent measure of corporate performance in the pertinent literature. Their statistical and distributional characteristics are also similar across time periods and countries, yet they are contrasting with profit rates. In general, corporate growth is characterized by substantial fluctuations. Location and dispersion of growth rates of sales, operating costs and total assets vary from year to year, reflecting the booms and busts of the business cycle. Once standardized, however, growth rates of sales, operating costs and total assets display a similar tent-shape distribution, albeit more leptokurtic, at all periods. Yet, to arrive at this characteristic distributional shape we sacrifice the information on the location and dispersion of growth rates; an informational loss we can avoid in case of profit rates.

The extensive stability in the location, dispersion and distribution of profit rates is an outstanding statistical observation. In fact, competitive corporations around the world seem to be in a kind of statistical equilibrium that is disturbed only by either extreme economic crises or large-scale wars. We thus refute the statement that "[e]mpirical evidence for statistical equilibrium has never been produced for any real market." (McCauley, 2006). As we show, the actions of competitive corporations produce very stable statistical patterns, where temporary deviations carry substantial information on the severity of crisis. Severe economic depressions, most prominently the Great Depression after 1929, see the median profit rate in free fall and the distribution of profit rates heavily tilted towards negative rates. Concurrently, these episodes mark the very rare occasion when capital accumulation reverses and capital reallocation seems to grind to a halt. Milder economic crises do not show comparable effects. In contrast, large-scale wars see the median profit rate skyrocketing. It is wartime production and heavy government procurement driving profits to new heights. Outside these extreme conditions, the interactions of competitive firms seem to lead to some form of statistical equilibrium, with profit rates displaying very stable and robust statistical and distributional patterns.

2
Concepts, Definitions, Methodology and Model

2.1 Concepts and Definitions

Combs et al. (2005) provide a conceptual framework of the multiple dimensions of corporate performance. They identify two separate, multidimensional performance constructs: operational and organizational performance. Operational performance covers the different activities within the organization individually; operational performance therefore is internal performance. In contrast, organizational performance combines the different activities within the corporation in order to capture performance of the organization as a whole; organizational performance therefore is external performance. From a macroeconomic perspective, we are more interested in the interactions between rather than actions within corporations. Thus we are more interested in measures of external (organizational) than in measures of internal (operational) performance. Therefore, we analyze the organizational, thus external performance of private corporations along two commonly used dimensions identified by Combs et al. (2005): profitability and growth.

To calculate measures of profitability and growth, we collected accounting information on corporate sales, total costs, operating income and total assets. Sales or gross sales represent operating revenues less discounts, returns and allowances. Total costs represent all production and operating costs including depreciation and amortization and excluding state and federal income taxes. Operating income is the difference between sales and total costs and represents profits from operations before taxes and distribution. Total assets represent the corporate capital, including current assets, long-term receivables, investments in unconsolidated subsidiaries and other investments, net property, plant and equipment, and all other (non-tangible) assets. While sales, total costs and operating income track income generation, total assets capture the size of capital involved; all variables together provide a reasonable insight into organizational performance. Due to the breadth and generality of the chosen income and capital positions, we are able to collect comparable data over a time span of more than 150 years, reaching back well into the 19th century.

We measure the dimensions of external performance with the most commonly accepted metrics of the literature. Thereby, growth is measured by the annual rate of percentage change $g^S_{i,t}$ in size S, given by

$$g^S_{i,t} = \frac{S_{i,t} - S_{i,t-1}}{S_{i,t-1}} \tag{2.1}$$

where $S_{i,t}$ and $S_{i,t-1}$ are the size of corporation i at times t and $t-1$. Straightforward measures of size S are aggregate variables from the income statement as well as the balance sheet such as sales (Sa), costs (Co) or number of employees (Emp) as well as total assets (TA) or equity (Eq). These size variables and their respective growth rates build the baseline in much of the industrial and firm size dynamics literature. In the analysis of pooled data, growth rates are usually standardized in order to abstract away from temporal fluctuations. The standardized growth rate is given by

$$g^{S,st}_{i,t} = \frac{g^S_{i,t} - m^S_t}{\sigma^S_t} \tag{2.2}$$

where m_t is a measure of location (e.g., the mean or median) and σ_t is a measure of dispersion (e.g., the standard or mean absolute deviation) across all corporations at a given time t. By this standardization, the location and dispersion of growth rates are disassociated from temporal fluctuations (e.g., the business cycle) that otherwise would hinder comparability of cross-sectional findings. In other words, standardized growth rates allow for pooling of the data, but only at the loss of all information on temporal fluctuations. Thereby, standardized growth rates do not allow for the analysis of time-series patterns. Thus, the distributional analysis of growth rates can be carried out only with high informational costs.

Profitability, in contrast to growth, is a more diffuse concept that can be measured in multiple ways. Profitability can be measured in absolute terms, e.g., by the profit that is left over from sales after deduction of all (production and operating) costs. This absolute measure, however, does not take into account the size of the corporation; its comparability across a heterogeneous population of corporations is limited as the measure does not allow to differentiate between increased efficiency (increasing profit out of stable sales at decreasing unit costs) and an increased scale of operations (increasing profit out of increased sales at stable unit costs). To circumvent these shortcomings, we measure profitability in relative terms by dividing profits by a measure of size, arriving at a more comparable profit rate. The most common relative measure for profitability is the return on assets (ROA), given by

$$X_{i,t} = \frac{Sa_{i,t} - Co_{i,t}}{TA_{i,t}} = \frac{OI_{i,t}}{TA_{i,t}} \tag{2.3}$$

where $X_{i,t}$ denotes the profit rate of firm i at time t, calculated as the division of operating income OI by total assets TA. Given that both, the numerator and the denominator of the profit rate are susceptible to the same fluctuations (e.g., the business cycle), we would expect profit rates to display more stability over time. Therefore, the need for standardization may be less of an issue in profit rates. If, however, there are significant and persistent fluctuations in profit rates, we may consider to apply the same standardization as given by equation 2.2 for growth rates.

In the following, we discriminate between unbalanced, semi-balanced and balanced panels of corporations. This discrimination directly relates to the question of whether we allow or prohibit entry and exit and, implicitly, whether we take account of non-surviving corporations as opposed to surviving ones. In an unbalanced panel, we include both, surviving and non-surviving corporations. Consequently, the number of corporations observed at any point in time varies over time; it declines when there are net exits and it increases when there are net entries. In other words, individual corporate time-series are of very different length with some corporations having reported at just one point in time while others having reported at many or even all points in time. In a balanced sample, in contrast, we restrict ourselves to corporations that survived for the entire sample period. Thereby, we entirely prohibit entry and exit, leaving us with a constant number of corporations at any given time, with all individual time-series being of the same length. Yet, the longer the sample period, the smaller the number of surviving corporations and thus the number of observations. At several instances, we therefore use semi-balanced panels, that is panels of corporations that survived for a minimum period of time. Thereby, we blank out the infant years of corporations, where many businesses perish with their business models failing to generate (adequate) turnover and/or profits. At the same time, we keep corporations that survived for a substantial although not the entire period of time. Irresponsible of their fate, their business models once were successful, keeping these corporations alive. Thereby, the semi-balanced panel maximizes the number of observations for corporations that at least at one point in time were economically viable.

The panel structure of the data will allow us to apply both, time-series as well as cross-sectional statistical methods. The choice of methods is largely guided by the reduced-model of Alfarano et al. (2012) that we introduce in the next chapter. Both, the methods and their underlying reduced-form model built the methodological core to all three studies presented in this dissertation throughout chapters 3 to 5.

2.2 *Methodology and Model*

The approach taken in the following chapters is first and foremost a descriptive analysis of corporate performance across space and time. Using data provided in annual reports, we aim at the identification of statistical regularities (or stylized facts), that is regular patterns in the cross-section and time-series statistics of corporate performance measures that persist across time and space. In this respect, our approach is similar to Bowman (1934, p. 59), who set out to study "*distributions of earnings ratios for different industries, note persistent traits in space and time, and interpret them.*" Yet, in order to not get lost in the large amounts of data, our present analysis is guided by Alfarano et al. (2012) and Mundt et al. (2015), who propose a reduced-form model to describe the time evolution and cross-section of profit rates of long-lived (surviving) corporations. The stochastic differential equation of the model takes the form

$$dX_{i,t} = -\frac{D_i}{2\sigma} sign(X_{i,t} - m)dt + \sqrt{D_i}\, dW_{i,t} \tag{2.4}$$

where $X_{i,t}$ denotes the profit rate of firm i at time t, m denotes the median profit rate (i.e., location), and σ denotes the mean deviation of the median profit rate (i.e., dispersion). The firm-specific diffusion coefficient D_i (or noise level $\sqrt{D_i}$) is time-independent and determines the influence of both the deterministic mean reversion tendency represented by the $sign(\cdot)$ function and the stochastic noise represented by the Wiener increments dW_t on the change in the profit rate.

The deterministic mean reversion tendency formalizes the idea of classical competition and capital reallocation motivated by Ricardo (1815) among other classical economists. In this view, investors compare the rate of profit on capital in its current use $X_{i,t}$ with rates in alternative uses or, in more general terms, with an industry- or even economy-wide average m. Uses that generate above-average profitability attract additional capital; uses that generate below-average profitability release capital. Given that investors now reallocate their resources away from less profitable towards more profitable uses, we should observe an equalization in profit rates across uses. For a given level of profits, the profit rate in above-average profitable uses shall decrease as its denominator increases with inflows of capital; the profit rate in below-average profitable uses shall increase as its denominator decreases with outflows of capital. Once the profit rate would fall onto the average, there would be no further incentive to either invest or disinvest in the use. Thus the profit rate would finally settle down in the static average characterized by $X_{i,t} = m$ with $dX_{i,t} = 0$ for all subsequent t.

The stochastic noise term, however, introduces random shocks that impact on a firm's profit rate and hinder its settlement in m. The term is composed of the square root of the firm-specific diffusion coefficient D_i and normally distributed Wiener increments dW_t. The idiosyncratic shocks can be thought of as either internal to the firm (e.g. a decrease in costs due to advances in production technology or a decrease in assets due to downsizing) or external to the firm (e.g. a decrease in sales due to new entrants in the market or a destruction of assets through natural disasters). Irrespective of the nature of the shocks, their constant appearance ensures that the profit rate fluctuates and does not settle down in m. Thus, the interplay between the mean reverting tendency and the idiosyncratic shocks ensures a dynamic evolution of corporate profitability, with profit rates fluctuating around a location m with dispersion σ.

Assuming m and σ to be time and firm independent, Alfarano et al. (2012) and Mundt et al. (2015) show that the mean-reverting nature of the reduced-form model in (2.4) implies a stationary Laplace distribution in the cross-section and time-series of the profit rates $X_{i,t}$, given by

$$f(X;\mu,\sigma) = -\frac{1}{2\sigma} exp\left(-\left|\frac{X-m}{\sigma}\right|\right) \tag{2.5}$$

where the parameters m and σ correspond with the parameters of the reduced-form model in (2.4), representing the population median and population mean deviation from the median. We interpret this outcome as *statistical regularity* or *statistical equilibrium*: a situation of constant change and fluctuations on the micro-level that generates stable patterns on the macro-level. In the words of capital seeking profits, the fluctuations of profit rates on the level of the individual firm cause capital flows that lead to a robust distribution of pooled profit rates on the economy-level.

The time-series behavior of profit rates implied by the reduced-form model in (1) can be described by the autocorrelation function $\kappa(\tau)$ presented in Mundt et al. (2015) and derived by Touchette et al. (2010), taking the form

$$\kappa(\tau) = \frac{1}{6\sqrt{\frac{2\pi D\tau}{\sigma^2}}} \exp\left(-\frac{D\tau}{8\sigma^2}\right) \left\{ \left(\frac{\sqrt{\frac{\pi D\tau}{2\sigma^2}}}{2} \exp\left(\frac{D\tau}{8\sigma^2}\right) \operatorname{erfc}\left(\frac{\sqrt{\frac{D\tau}{\sigma^2}}}{2\sqrt{2}}\right) - 1 \right) \right. \tag{2.6}$$
$$\left. \left(\frac{D^3\tau^3}{8\sigma^6} + \frac{3D^2\tau^2}{2\sigma^4} - \frac{6D\tau}{\sigma^2} + 24\right) + \frac{D^2\tau^2}{2\sigma^4} + 24 \right\}.$$

where τ is the time lag. Parameters σ and D correspond with the parameters of the reduced-form model in (2.4). The resulting autocorrelation structure of (2.6) is positive with (approximately) exponential decay. The reduced-form model implies persistence in profit rates and thus predictability over time. A high profit rate in one year is likely to be followed by a high profit rate in the subsequent year; the time-evolution of profit rates is expected to be continuous rather than erratic.

While the stationarity of cross-sectional median profit rates m_t and mean deviations from median profit rates σ_t are well established, materializing in a robust Laplace distribution of cross-sectional profit rates, we additionally investigate the statistical patterns in the year-to-year change in the profit rate, $dX_{i,t}$, and the firm-specific diffusion coefficient D_i. Since the diffusion coefficient D_i is the only firm-specific parameter, it captures firm heterogeneity and is directly related to both the speed of the mean reversion and the impact of random shocks (Mundt et al., 2015). Given the time-independence of D_i, the firm-level distribution of shocks should be characterized by a Gaussian distribution as the product of (the square root of) a constant and a Gaussian distributed variable is itself characterized by a Gaussian distribution. In contrast, the economy-level (pooled) distribution of shocks may deviate from the Gaussian distribution, depending on the distribution of D_i. The interplay between mean reversion and Wiener increments should also lead to a non-normal distribution of changes in the profit rate $dX_{i,t}$ that, due to the stationarity in m_t, is expected to be highly concentrated around 0.

Thus we investigate the statistical patterns in the cross-sectional and in the time-series domain of the profit rate (X), of the year-to-year change therein (dX) and of the model parameters (m, σ and D_i) that characterize the reduced-form model of corporate profitability. We apply the original analysis of Alfarano et al. (2012) and Mundt et al. (2015), who analyzed U.S. corporate profitability for the episode 1980 to 2006/2011 to other historical episodes and a variety of countries. With the reduced-form model in mind we compare (i) the time-series of the empirical median (m) and mean deviation from the median profit rate (σ), (ii) the cross-sectional distribution of profit rates X, (iii) the cross-sectional distribution of changes in profit rates dX, (iv) the empirical autocorrelation structure of X and dX and (v) the empirical distribution of firm-specific diffusion coefficients D_i implied by the model with the empirical data. Wherever possible, we report comparable results for growth rates (in sales, costs and total assets) as growth rates are still the more accepted measure of corporate performance in the literature.

2.3 *Data and Criticisms*

Each of the three research projects in this thesis uses its own dataset on corporate performance, that we describe in more detail within the respective main chapters. What unites all datasets is their common use of accounting information, either collected by hand from published annual reports or taken from commercial databases (e.g., Thomson Reuters Datastream). The use of accounting information in economics, however, has been discussed controversially and has been subject to substantial criticism. Most prominently, Morgenstern (1963)[1] provides in his book *On the Accuracy of Economic Observations* a pessimistic view on the value of accounting information for economics, claiming a lack of accuracy, definiteness and comparability. In his view, it is both, economic theory and accounting practice that need to mutually make a leap forward in order to arrive at useful measurands and measurements. In his words, accounting information is of no use "until the time when economic theory develops observable measures for profits which are free from these objections [that is lack of accuracy, definiteness and comparability] and until accountants produce substantially new ideas of constructing balance sheets composed of conceptually homogeneous figures." (Morgenstern, 1963, p. 85) Several authors take the same line later on, basi-

[1] Originally published in 1950, we refer here to the revised and extended edition from 1963. An interesting review of Morgenstern's critique in its 1963 edition is provided by Kenessey (1997), who also places Morgenstern's critique in the wider context of measurement problems in the natural sciences.

cally stating that for economics there are no insights to gain from accounting data (e.g., Harcourt, 1965; Kay, 1976; Fisher and McGowan, 1983; Benston, 1985; Kay and Mayer, 1986).

The essay *The Problem of Measuring Profits*[2] by Mitchell (1934) brings up similar criticisms, yet makes a good counterargument. Mitchell sees business profits as the most difficult form of income to measure, affected by accounting practices as well as sentiments. Yet, he counters all criticisms by stating that *"[i]t is pedantic, however, to treat profit statements as if their significance depended wholly upon their accuracy. To take that view would be to misconceive the role that profit statements play in modern life. They are made primarily as guides to future action."* (Epstein, 1934, p. 7) For Crum (1965), another influential analyst of corporate profitability in the interwar period[3], the high standards placed on measurands of profitability are the result of a misunderstanding, as *"[s]tatistical data, because they are in numerical form, have an insidious appearance of accuracy; and the user, especially the layman unskilled in testing statistical data, is regrettably prone to accept a published figure as an indisputable fact and even as having a precision implied by too numerous digits."* (p. 508) Therefore, rather than formulating unattainable standards that potential measurands of profitability need to fulfill, the given accounting measures with all their limits and deficiencies should be analyzed statistically, as they feed into economic decision-making and therefore reflect the economy.

[2] The essay by Wesley C. Mitchell makes the foreword to *Industrial Profits in the United States* by Ralph C. Epstein (1934), one of the most comprehensive studies of profit rates of U.S. corporations in the interwar period.

[3] His two most influential works "Corporate Earning Power" (Crum, 1929) and "Corporate Size and Earning Power" (Crum, 1939) reflect the back-then state-of-the-art empirical analysis of corporate profitability.

Another issue is the comparability of accounting information from different time periods, industries and countries. The data gathered for the three research projects roughly cover the entire non-financial sector and span a timespan of 150 years. Furthermore, the data were collected in very different circumstances (during booms, busts and wars) and at very different stages in the evolution of the accounting profession. Internationalization and therefore comparability across countries is a rather recent phenomenon, with country-specific accounting standards prevailing for most of the time. Traditionally, comparisons of accounting information of any kind, either of different time periods, of different industries or of different countries would be met with harsh objections. Morgenstern (1963) summarizes the problem by stating that "[t]he greatest difficulty is faced by economists in divers[e] countries, confronted with material of such varying characteristics, trying to derive economic laws which should be universally applicable." (p. 86). In this negative view, our bold project to identify common dynamics in the profitability of corporations across time and space would be doomed to failure.

In a positive view, however, analyzing large amounts of accounting information from different time periods, industries and countries will allow us to check for deficiencies and, possibly, to quantify them. If there is a dominant influence of industry particularities, accounting conventions, sentiments or any other potential disturbances, we should at least be able to observe it. And even if many of these disturbances do not appear conducive to analysis on first view, they could very well be part of the explanations of economic phenomena as they might be of a systematic nature. Unsystematic disturbances, in contrast, possibly fade out in the bigger picture with the individual observation becoming less important with more observations. Thus, we may even prefer the "messy" (un-cleansed) data as it may carry just the information we are looking for. The remaining question is how to filter this information. Therefore, we take a rather "forensic" approach in analyzing accounting data. Statistics are our method to uncover hidden relations and patterns. We want to distill statistical characteristics (or stylized facts) from corporate financial records that give us a better understanding of the dynamics of corporate profitability and growth on the one hand and the economy on the other. Accounting data might just be the most comprehensive and granular information on the economy that is publicly available, allowing us insights into the financial position of one if not the most important economic actor — the corporation — as well as the environment it shapes — the economy.

2.4 *Simulation Results*

With the reduced-form model of competitive firms in Formula (2.4) we are able to simulate profit rate time-series of individual corporations. The simulations are based on the sample characteristics of non-financial corporations in the U.S. between 1983 and 2013, analyzed in chapters 3 and 5.[4] Thereby, we simulate 546 profit rate time-series (that is 546 synthetic corporations) of 31 periods length (that is 31 years), fixing the location and dispersion parameters to the sample's phenomenological values of $\mu = 0.0949$ and $\sigma = 0.0571$. Since the distributional characteristics of the firm-specific diffusion coefficients D_i have not been analyzed yet, we run simulations for four different distributional assumptions: a one-point distribution, an exponential distribution, a Weibull distribution, and an inverse Gaussian distribution.[5]

The various distributional assumptions on D_i reflect different ideas about the underlying population of firms w.r.t. the role of the mean-reversion and the stochastic noise in the dynamics of the profit rate. A one-point distribution implies homogeneity in corporations w.r.t. the impact of the mean reversion tendency and the random Wiener increments. Taking the mean of all D_is for the point, we would assume that all corporations are homogeneous. Other distributions, e.g., the exponential, the Weibull, or the inverse Gaussian distribution, display an asymmetric dispersion and, partially, allow for extreme realizations, thus, implying substantial heterogeneity across corporations. The respective D_is of individual corporations then may differ by orders of magnitudes, implying varying impacts of the mean reversion tendency and the random Wiener increments on the movement of profit rates across different corporations. For each setting, we simulate 546 time-series, each of 31 periods length. In order to minimize the impact of any given starting point on the results, the process is allowed to burn-in within the first $10,000$ time steps.

[4] The choice of sample/simulation characteristics is arbitrary. We have chosen the respective sample for two reasons: it is based on the most comprehensive sample and it covers exceptional circumstances such as the Dot.com crash around 2000 and the Great Recession around 2007/08. The first guarantees meaningful results at a still acceptable computing time, the latter informs the process with data generated under less favorable conditions than just based on fair weather episodes.

[5] Initially, we simulated the model for even more alternative distributional assumptions on D_i. Yet, the exponential, Weibull and inverse Gaussian distribution resembled closest the empirical distribution of diffusion coefficients D_i. In fact, the inverse Gaussian displays the closest fit.

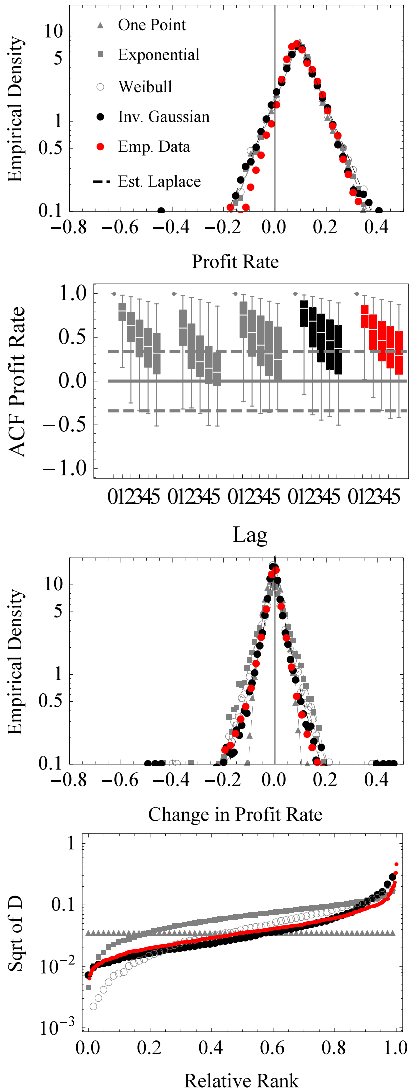


Figure 2.1: Cross-sectional statistical behavior of simulated (gray and black) and empirical (red) profit rate time-series for different distributional assumptions concerning the firm-specific diffusion coefficients D_i (or noise levels $\sqrt{D_i}$). From top to bottom, we see the pooled distribution of profit rates, the autocorrelation functions of profit rate time-series, the pooled distribution of point-changes in profit rates and the rank plot of company specific diffusion coefficients $\sqrt{D}$. Different plot markers indicate the different distributional assumptions concerning the diffusion coefficients D_i, which are drawn from a one-point, an exponential, a Weibull and an inverse normal distribution (in this order from left to right in the autocorrelation plot). Specifications of the simulations are based on the U.S. sample for the period 1983-2013, drawn from Thomson Reuters (see data descriptions in chapters 3.2 and 5.2).

Figure 2.1 presents simulation results (gray and black) in comparison to empirical observations for the US between 1983 and 2013 (red). From top to bottom, we show the cross-sectional distribution of profit rates, the autocorrelation in profit rates, the cross-sectional distribution of the change in profit rates, and the rank plot of the square root of the firm-specific diffusion coefficients D_i. As suggested by equation 2.5, we observe a Laplace distribution of profit rates independent (of the assumptions on the distribution) of firm-specific diffusion coefficients D_i (see Figure 2.1, top). Thus the cross-sectional distribution of profit rates materializes independent of the strength of the mean reversion tendency (as determined by the diffusion coefficient D_i) and the noise level (as determined by the square root of D_i). Observations for the US between 1983 and 2013 suggest a median $\sqrt{D}$ (D) of around 0.0349 (0.0012), yet the relative rank plot suggests wide dispersion around the median, spanning more than one order of magnitude (see Figure 2.1, bottom). While calibration of the exponential and the Weibull distributions with the data does not allow to capture the characteristic range and the more extreme realizations of

$\sqrt{D_i}$ in the margins, the calibration of the inverse Gaussian distribution fully captures the empirical observations.

The heterogeneity in D_i directly impacts on the dynamics of profit rates, especially the autocorrelation structure and the distribution of annual changes in profit rates. Both the autocorrelation structure (given by equation 2.6) and the distribution of changes in the profit rates (implicit in equation 2.4), depend on the diffusion coefficient D and, thus, on the distribution of $\sqrt{D}$. Consequently, we can simulate profit rate times series for different distributional assumptions on $\sqrt{D}$ to identify the theoretical distribution fitting best the empirical observations. With a one-point and an exponential distribution of $\sqrt{D}$, autocorrelation decays faster than with a Weibull and an inverse Normal distribution. The distribution of changes in profit rates is less peaked for a one-point distribution of $\sqrt{D}$, while it is substantially more peaked and closer to the tent-shape for the other distributional assumptions. Overall, simulations under the assumption of an inverse Gaussian distribution of $\sqrt{D}$ compare most favorably with the empirically observed patterns. Especially in the rank plot of the $\sqrt{D}$ the inverse Gaussian distribution shows the closest fit with the empirical observations for U.S. corporate profit rates in the period 1983-2013. Thus, the inverse Gaussian distribution of the firm-specific diffusion coefficient $\sqrt{D}$ is the missing link to synthetically replicate time-series of profit rates for a realistically diverse population of corporations.

Part I
Corporate Profitability and Growth in Historical Perspective

3
U.S. Corporations in Prosperity, Crisis and War: 1863-1893, 1923-1953 and 1983-2013

Abstract

Recent literature on corporate dynamics reports persistent statistical regularities in profit rates. We analyze the U.S. economy through the lens of corporate accounts during three defining periods (1863-1893, 1923-1953, and 1983-2013), comprising three of the most severe economic crises within the past 150 years (the Long Depression after 1873, the Great Depression after 1929 and the Great Recession after 2008). Thereby we are able to analyze corporate dynamics throughout an extended period of time, allowing us to identify time-independent statistical patterns and reassure the regularities in corporate profitability. We show the Great Depression after 1929 and large-scale military conflicts (Civil War and World War 2) to cause significant and enduring deviations from otherwise remarkably stable and regular statistical patterns in corporate profitability. Other crises, such as the Long Depression after 1873 and the Great Recession after 2008 only cause minor and transitory deviations. Our findings demonstrate that firm-level observations on profitability and capital accumulation can contribute substantially to the understanding of macro-level patterns. Therefore, we propose disaggregate, firm-level factors that relate to the length and severity of economic crises and thus form important vital signs of the economy.

3.1 U.S. Economic History From the Perspective of the Corporation

More than ever before, economic activities are organized within large corporations. Since at least Gabaix (2011) and his *granular hypothesis* we know that the fates of large corporations leave a significant mark on the fate of the aggregate economy.[1] Economists have sought to better understand the dynamics of individual corporations and entire economies through the analysis of firm size and growth, purveying a plethora of empirical evidence, stylized facts and potential data-generating processes.[2] However, cross-sectional and time-series

[1] Before, anecdotes and case studies provided tentative evidence on the economic relevance of (groups of) large companies. E.g., Jantzen et al. (2009) see sales trends of Wal-Mart as a "*contrarian economic bellwether*" for the US economy.

[2] This strand of the literature is known by the name of Gibrat (1931) for his *Law of Proportionate Effect*, a process that relates log-normal firm size distributions to i.i.d normally-distributed growth rates. Sutton (1997) provides a comprehensive summary concerning the empirical findings and the different proposed data-generating processes.

patterns in corporate growth rates are not robust; location and dispersion of the growth rate distributions vary with firm size (e.g., Hart (1962), Hymer and Pashigian (1962), Singh and Whittington (1968, 1975) and Bottazzi and Secchi (2006b)) and the business cycle (e.g., Higson et al. (2002, 2004) and Holly et al. (2013)). In this study we show that corporate profit rates, measured by the return on assets (ROA), in contrast, display surprisingly stable cross-sectional and time-series patterns across a 150 years history. Besides statistical regularities in profit rates such as stability in (long-run) location and dispersion as well as significant patterns of autocorrelation, we observe a robust distributional regularity. Profit rates fall onto Laplace distributions of very similar parametrizations in all analyzed periods (1863-1893, 1923-1953, and 1983-2013), independent of the economic, social and political circumstances. When deviations from the statistical and distributional regularities occur, they are confined to periods of extreme economic crisis (e.g., the Great Depression after 1929) and war (e.g., the Civil War 1860-1865 or World War II 1942-1945), hinting at the prevalence of distortions in the economic system. We thus add to the economy-level literature on economic crises, as we propose disaggregate factors, such as a breakdown in capital accumulation and reallocation, that relate to the length and severity of economic crisis. Consequently, our corporation-level comparison of different episodes within the last 150 years unveils corporate profit rates as major life signs of the economy, where deviations from statistical and distributional regularities are symptomatic for distortions and crisis.

Over a century ago, in 1910, William James Ashley opened the discussion on *The Statistical Measurement of Profit*, criticizing a lack of empirical evidence on corporate profitability for the U.S. (Ashley, 1910).[3] While rent, wages and interest had been at the focus of statistical work for long, profits remained a theoretical concept and, thus, marked a missing link in the understanding of modern capitalism. Aside from a plethora of statistical works on profits produced in the decades after Ashley's call, economists failed to agree on a common set of statistical characteristics of (corporate) profits. This lack of agreement is rooted in a lack of comparability along at least four dimensions. First, the measurement concepts differ across studies that either analyze absolute profits or relative profits, where the latter is absolute profits put in relation to one of multiple size measures (e.g., sales or gross profits, total assets or equity). Second, the definitions of measures differ across studies that either use gross income (revenues minus costs of goods sold, depreciation, depletion and amortization), operating income (gross income minus selling, general and administrative costs) or some form of net income (operating and non-operating income either before or after taxes and dividends).[4] Third, the level of aggregations of the data differs across studies that either use aggregate data (industry or economy totals or averages) or individual data. Fourth and finally, the methods applied differ substantially, spanning the range from the analysis and interpretation of

[3] Ashley (1910) provides a comprehensive summary of early empirical investigations of corporate profitability by Korösy (1901) on the Austrian-Hungarian Empire and Wagon (1903),Dermietzel (1906) and Werner (1909) on Germany. Epstein (1930) provides a good discussion of influential investigations that try to fill this gap by taking an American perspective, namely Crum (1929) and Sloan (1929).

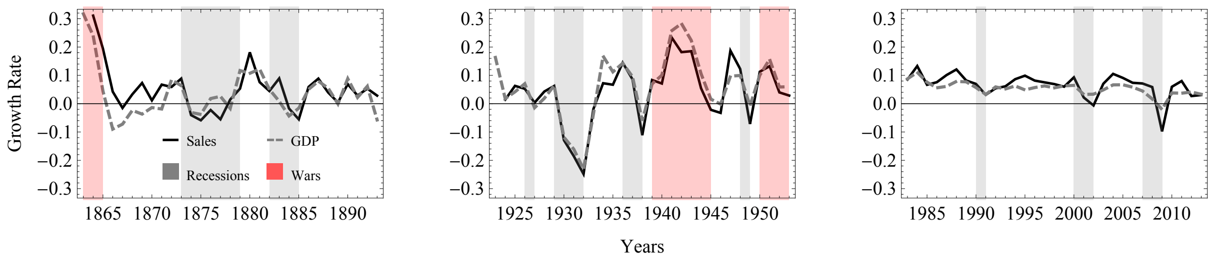
[4] In some cases, authors changed the concepts in the course of analysis. In his early work, Crum (1929, 1933a,b) almost exclusively focused on the profit ratio (that is net income divided by gross income) as an indicator for earning power. In Crum (1934), however, he remarked that the profit ratio is not a reliable and comparable indicator, since asset turnover differs markedly across industries. He then refocused on the return to equity (that is net profits divided by total equity (Crum, 1938a,b, 1939).

summary statistics (such as averages, interquartile ranges, etc., e.g. Epstein (1934)) to frequency distributions (e.g. Bowman (1934)[5], with space being confined to the U.S. and time being confined to the 1910s and 1920s.). Given this very fragmented landscape of study designs, it is of no surprise that textbook macroeconomics neither assigns the rate of return a central role nor that it does provide a unified theory of profitability and capital (re-)allocation, even in face of the pivotal role that profitability plays in the competitive dynamics of a capital-driven economy (Howard, 1983; Duménil and Lévy, 1993).

[5] To the authors' knowledge, Bowman (1934) is the first study to explicitly analyze and interpret the empirical distribution of profit rates in the context of economic theory. In line with the aim of this dissertation, it is "a study of the persistence of these [frequency curve] attributes in both space and time." (p. 59)

We share the opinion of Epstein (1930) that "[p]robably in no part of the entire field of economic theory is there more need for inductive evidence which will enable a set of sound generalizations to be built up than in that of business profits." (p. 320) In order to provide (with some delay to his original publication) *inductive evidence and sound generalizations* we introduce a novel dataset that combines comparable accounting information on large corporations for economically, politically and socially defining periods of the United States. We comparatively analyze corporate profitability and growth during the periods 1863-1893 (including the Civil War 1860-1865 and the Long Depression after 1873), 1923-1953 (including the Great Depression after 1929, World War II 1942-1945 and the Korean War 1950-1953) as well as 1983-2013 (including the Great Recession after 2008). Despite of substantial alterations in the economic, political and social environment within the last 150 years, we identify a set of surprisingly robust statistical patterns in corporate profitability that are common to all three periods. The location (median) and dispersion (mean deviation from median) of corporate profit rates (measured as return on assets) display stability across most of the years, morphing individual observations on the corporation-level into a well-defined, tent-shaped Laplace distribution in the cross-section, with indistinguishable parametrizations across all three periods. Additionally, the time-series domain is characterized by similar autocorrelation patterns in all three periods, suggesting significant predictability of corporate profit rates along short time horizons, all despite the fact that the cross-sectional distribution of year-to-year movements in the profit rate is symmetrical with its peak at zero.

Deviations from this set of robust statistical patterns are temporary and confined to periods of war and severe economic crises. During war-time production, we observe a transitory rise in profitability that can readily be explained by the transformation of the economic system from price- and profit-based to command-based. Excessive government procurement and rising prices bloat profits and profit rates, even in face of increasing capital investment. During economic crises we observe a transitory decline in profitability that is followed by immediate recovery to pre-crisis levels. The Long Depression after 1873 and the Great Recession after 2008 follow this pattern as do the minor recessions of 1883 and 1937. The Great Depression after 1929 marks the only exception with profitability being severely depressed for more than a decade. A corporation-level comparison of



a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.1: Median corporate sales and GDP growth (nominal, per annum) in the U.S. for sample periods 1863-1893 (30 companies, 892 observations), 1923-1953 (136 companies, 3,063 observations), and 1983-2013 (546 companies, 16,840 observations). Shaded areas indicate NBER-identified recessions/depressions (gray) and major military conflicts (red).

the Great Depression with the other economic crises suggests disaggregate factors, such as a unique halt in capital accumulation and reallocation in the majority of corporations, signing responsible for the exceptional length and severity of the Great Depression. Further inspection into Greek data for the Great Recession after 2008 confirms the intricate relation between a halt or even reversal of capital accumulation, the decline of profitability and the severity of crisis. The analysis of large corporations, thus, delivers a set of strikingly robust statistical patterns of economic activity; deviations from these patterns hint at traceable explanations for the peculiarities of the war economy or the exceptional severity of the Great Depression in the US and the Great Recession in Greece.

Our perspective on macroeconomic dynamics through the lens of large corporations and their performance is rooted in Gabaix (2011) and his "granular" hypothesis. There, Gabaix proposes idiosyncratic shocks to large corporations to be a vital impetus for aggregate fluctuations. Accordingly, we find a close relationship between the average growth paths of samples of large corporations and the growth of GDP (see Figure 3.1); a relationship that rests on the skewness in firm size distributions and the resulting disproportionately large GDP contributions of large corporations (see Figure 3.2). Between 1863 and 2013 the sales-to-GDP ratio of the largest 25 corporations in our samples grew about eighteenfold, from 1.2% in 1863 to 19.7% in 2013.[6] Matching the temporal evolution during the 93 years with an exponential trend, we observe a doubling of the sales-to-GDP-ratios of the 1, 5, and 25 largest corporations every 45 to 60 years. Given the large number of corporations making up the U.S. economy, we see large corporations to increasingly dominate the overall economy. Thus, given the importance of large corporations for aggregate outcomes, the focus on this particular group shall provide valuable insights in aggregate phenomena such as large-scale economic crises.

[6] We are potentially underestimating the sales-to-GDP ratio in the sample period 1863-1893 since our sample rests on public utilities/railroads only. Nevertheless, Sylla and Wright (2013) show that in 1860 20 out of the 25 largest corporations were in railroads. Thus, our estimate can be seen as a good proxy for concentration in industrial activities during this period.

The traditional research focus on firm size and its distribution naturally implied a closer look at firm growth. While firm growth makes but one dimension of performance, we extend the analysis to profitability. In so doing, we follow the suggestion of Mundt et al. (2015) to refocus on the statistical behavior of profit rates instead of

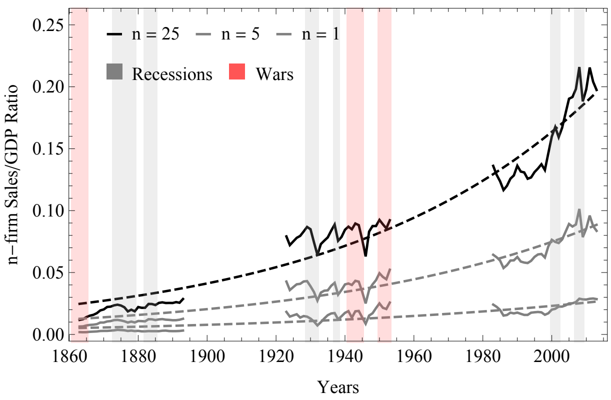


Figure 3.2: Sales-to-GDP concentration ratios for the n largest corporations (solid line) in the U.S. during periods 1863-1893, 1923-1953 and 1983-2013. Dashed lines indicate estimated exponential trends of firm concentration. Shaded areas indicate NBER-identified recessions (gray) and major military conflicts (red).

growth rates, as profit rates follow a universal stochastic process that is characterized by robust statistical patterns in the cross-section and time-series dimension (see Alfarano and Milaković, 2008; Alfarano et al., 2012; Erlingsson et al., 2013; Mundt et al., 2015; Mundt, 2017). Our empirical results unveil identical statistical patterns across several instances within the last 150 years and, thus, strongly support the idea of statistical regularities in U.S. corporate profitability, as we find similar descriptive and distributional patterns in the cross-section and time-series of corporate profitability across the last 150 years. In understanding better the dynamics of modern capitalism, we use the robust descriptive and distributional patterns in corporate profitability and the observed deviations during economic depression and war production to arrive at more conclusive disaggregate factors that relate to the length and severity of economic crisis.

Our analysis of profitability follows the original strand of the literature on statistical regularities in corporate growth and extends on the younger strand on statistical regularities in corporate profitability. The following chapter introduces a novel dataset on corporate growth and profitability during three episodes of U.S. economic history: 1863-1893, 1923-1953, and 1983-2013.

3.2 *Data Description*

To keep the data mining manageable we focus our analysis on three 31-year sample periods that enclose defining periods of the U.S. economy within the last 150 years. Our most recent sample period is taken from Thomson Reuters Datastream and covers the years 1983 to 2013, enclosing the DotCom-Crash around 2001 and the Great Recession after 2007/08. Data source and sample period overlap with the ones analyzed in the related contributions of Alfarano et al. (2012) (1980 to 2006) and of Mundt et al. (2015) (1980 to 2011) among others, providing us with a point of reference against which we can analyze earlier periods. As Thomson Reuters itself does not provide data for years before 1980 we had to tap alternative sources. Therefore, we collected data out of corporate manuals and collections (Poor's and Moody's Industrial Manuals, Interstate Commerce Commission and Bureau of Statistics Industry and Sector Reports) and original corporate reports.[7] With these data at hand, we complement the recent sample period from 1983 to 2013 with two historical 31-year periods ranging from 1863 to 1893 and 1923 to 1953. The first period encloses the Long Depression after 1873 that marks one of the first international financial crises while the latter period encloses the Great Depression that marks the worst economic downturn in history.

[7] Although most of these sources were digitalized in pdf-format, an automated extraction of the data was not possible due to problems in scan qualities and (historical) font types. Thus, the specific data had to be extracted by hand.

For each period, we collected financial information on non-financial corporations that stayed in business throughout all 31 years, resulting in three balanced panels.[8] As non-financial corporations we consider all corporations that concentrate their main operations outside SIC codes 60-67 (Finance, Insurance and Real Estate). The focus on non-financial corporations stems from quantitative discrepancies in the assets of non-financial and financial corporations; assets of financial corporations usually exceed the ones of comparable non-financial corporations by about one order of magnitude, resulting in income-to-capital ratios of financial corporations to fall short about one order of magnitude to the ones of comparable non-financial corporations. The focus on balanced panels of surviving firms is to a large extent synonymous with the focus on large corporations. Since large corporations act in the same environment and the same markets as their smaller upcoming or perishing counterparts, the competitive impact of entry and exit is implicitly recorded in the profitability and growth of the large corporations.[9]

[8] The use of balanced panels of corporations allows for the application of cross-section as well as time-series concepts for each individual corporation.

[9] We want to emphasize that all results in this paper exclusively apply to long-lived, in other words competitive corporations that were able to survive in the market for a minimum of 31 years. This restriction, however, does not automatically translate into survivorship bias, as we do not aim at identifying individual firm characteristics conducive to survival. In fact, we take survival as a core objective of corporate activity rather than a pure outcome of some special corporate DNA (cf. Mundt, 2017).

The industry composition within the group of non-financial corporations differs across sample periods along the lines of economic history (see Table 3.1). For the period of 1863 to 1893, our sample is confined to 30 railroad corporations (see Appendix B.1, list B.1.1). While up to the Civil War (1861-1865) railroad corporations made up no more than 15% of non-financial corporate charters, they made up about 60% of the authorized minimum capitalization (Sylla and Wright, 2013). Thereby, railroad corporations dwarfed the large businesses in other industries at that time (e.g., textile and steel mills in industry; canals, roads and transatlantic shipping lines in transportation) and became the first corporate giants (Chandler, 1965a,b). So despite of the absence of other industries in this sample period, we obtain valuable and representative information on the dynamics of early corporate capitalism in the 19th century. For the period of 1923 to 1953, our sample contains 148 corporations from almost all industries (see Appendix B.1, list B.1.2). While transportation and utilities still play a significant role, this period is characterized by mass-manufacturing and mass-consumerism, with manufacturing increasingly dominating the economy. Finally, for the period 1983 to 2013, our sample contains 552 corporations from virtually all non-financial industries (see Appendix B.1, list B.1.3). While manufacturing still dominates the sample, this period is characterized by the emergence of a sizable services industry. All three samples together provide valuable information on the corporate dynamics during key stages of economic development in the U.S.: from the transport revolution

Division	**SIC**	**1863-1893**	**1923-1953**	**1983-2013**
A: Agriculture, forestry, fishing	01-09	—	—	2 (0.00)
B: Mining	10-14	—	11 (0.07)	22 (0.04)
C: Construction	15-17	—	2 (0.01)	10 (0.02)
D: Manufacturing	20-39	—	76 (0.51)	310 (0.57)
E: Transportation, communications, electricity and gas	40-49	30 (1.00)	54 (0.36)	95 (0.17)
F/G: Wholesale and retail trade	50-59	—	5 (0.03)	57 (0.10)
I: Services	70-89	—	—	50 (0.09)
Total		**30**	**148**	**546**

Table 3.1: Number of long-lived U.S. corporations by business division (two-digit SIC codes), numbers in brackets indicate the relative share. Corporations that were active in more than one division are allocated according to the division generating the highest revenues.

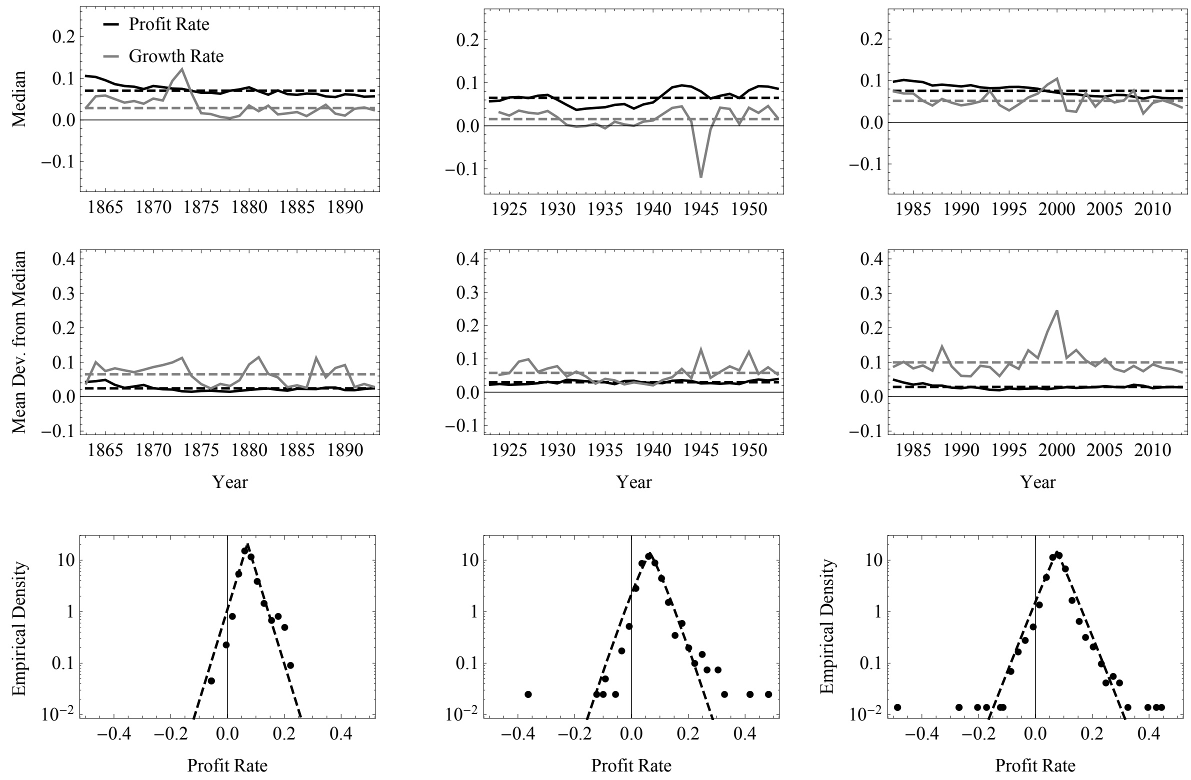
in the 19th century to the mass-manufacturing revolution of the 20th century to the services revolution of the early 21st century.

The structure of our samples leaves us with two comparative settings: First, we can compare the dynamics of corporations within a single industry (SIC division E) across three distant periods (1863-1893, 1923-1953, and 1983-2013) (Table 3.1, line E: Transportation, communications, electricity and gas). Second, we can compare the dynamics of corporations in multiple industries (SIC divisions A-G and I) across two distant periods (1923-1953 and 1983-2013) (Table 3.1, columns 1923-1953 and 1983-2013). Furthermore, the temporal placement of the three 31-year time windows allows for the comparison of tranquil and disturbed periods in U.S. economic history. We cover two periods of severe economic depression (the *Long Depression* of 1873 and the *Great Depression* of 1929) and four periods of significant recession (the recession of 1883, the *double-dip recession* of 1937, the *Dot.Com Crash* of 2001 and the *Great Recession* after 2007/08). Additionally, the three periods comprise major military conflicts and large-scale war production during the Civil War from 1861 to 1865, World War 2 from 1941 to 1945, and the Korean War from 1950 to 1953. Therefore, the two comparative settings and the many different historical circumstances of our samples provide us a fertile testing ground for validating empirical regularities and stylized facts in corporate profitability and growth.

3.3 *Empirical Findings*

Utility corporations during 1863-1893, 1923-1953 and 1983-2013

We begin our analysis by comparing profitability and growth of utility corporations across the three episodes of 1863-1893, 1923-1953, and 1983-2013. On average, utility corporations generated a median profit rate of about 7% within all three sample periods (see Figure 3.3, top, black line). Deviations from this apparent long-run median profit rate were rare and coincided with extreme historic events. During large-scale military conflicts (Civil War 1861-1865, World War 2 1941-1945, and the Korean War 1950-1953) the median rate jumped to about 10% and during the Great Depression after 1929 the median rate fell to about 4%. Outside these extreme episodes — even dur-



a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.3: Location, dispersion and empirical distribution of profit (black) and growth rates (gray) of utility corporations in the U.S. From top to bottom: time evolution of the annual median of profit and asset growth rates, time evolution of the mean deviation from the median profit and growth rates, and the empirical distribution of profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates result in the estimated Laplace distribution. Sample periods (from left to right) are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013.

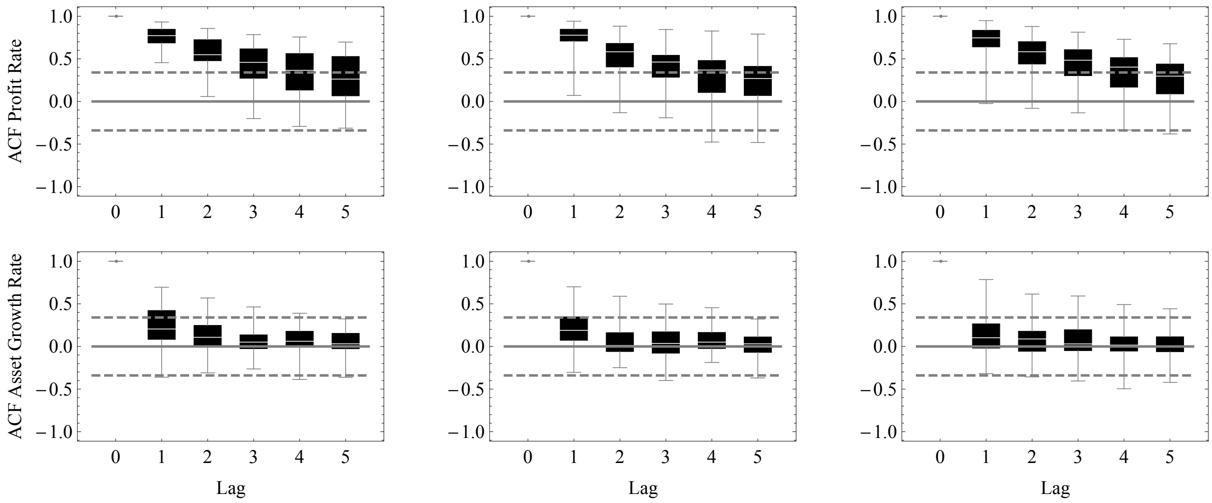
ing other depressions (Long Depression after 1873) and recessions (1883, 1937, 2001, and 2008) — the median profit rate was stable (or at least recovered immediately) and stuck close to the long-run value of 7%. The mean deviation from the median profit rate rested at about 2.5% in all three episodes, showing no systematic deviation at all (see Figure 3.3, middle, black line). Thus corporate profitability is characterized by an unexpected stationarity [10] that is unknown in other corporate and economic performance measures, most notably growth.

The median total assets growth rate and its mean deviation, in contrast, fluctuate wildly, displaying cyclical patterns of expansion, stagnation and contraction throughout all three periods. We observe a significant slowdown in median growth after the Long Depression of 1873, a whole decade of stagnation after the Great Depression of 1929, and a pronounced boom and bust around the Dot.Com Crash in 2000, all together embedded in irregular minor up- and down-

[10] In appendix C we compare the location and dispersion across individual time-series and cross-sectional (that is annual) samples with the phenomenological values of the pooled data. Estimates of location and dispersion in the individual time-series and the cross-sectional annual samples seem to coincide with the phenomenological values in the pooled data.

Table 3.2: Parameter estimates of the Subbotin distribution for profit rates of utility corporations in the U.S. Standard errors are given in parentheses.

Sample\Years	**1863-1893**	**1923-1953**	**1983-2013**
Shape α	0.9920 (0.0550)	1.0284 (0.0394)	0.9521 (0.0260)
Location m	0.0703 (0.0057)	0.0649 (0.0054)	0.0756 (0.0040)
Dispersion σ	0.0240 (0.0010)	0.0306 (0.0009)	0.0291 (0.0006)



a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.4: Autocorrelation plots for profit (top) and asset growth rates (bottom) of utility corporations in the U.S. Sample periods (from left to right) are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).

swings (see Figure 3.3, top, grey line). The mean deviation from the median growth rate generally was lower during the depressions after 1873 and 1929 and the recessions in 1883, 1937, and 2008, yet fluctuated wildly throughout all three episodes (see Figure 3.3, middle, grey line). The accumulation of capital, thus, is characterized by cycles and waves rather than stability or stationarity.

The fluctuations in the location and dispersion of total asset growth rates hinder the analysis of their empirical distribution; standardization of the data becomes a necessary precondition and therefore a loss of information is inevitable (cf. Bottazzi and Secchi (2006a)).[11] The stationarity in the location and dispersion of profit rates, in contrast, allows for the pooling of the data and the immediate analysis of the empirical distribution. In all three episodes, the distribution of profit rates of utility corporations is matched by Laplace distributions (Figure 3.3, bottom) that, above all, share similar parameter values for m and σ (see Table 3.2). Profitability of large utility corporations within the last 150 years, thus, can be well described by one and the same Laplace distribution, even in face of multiple episodes of prosperity and crisis. On average, 100$ of assets earned a return of approximately 7$ p.a., irrespective of whether we take Cornelius Vanderbilt's New York Central and Hudson River Railroad in the late 19th century or the telecommunications giant AT&T in the early 21st century. The regularity in statistical patterns is, however, not confined to the cross-section but also characterizes the time series.

[11] In Appendix D we report a preliminary statistical analysis for sales, total costs and total assets growth that allows for direct comparison with the corporate growth literature. Once growth rates are standardized according to Bottazzi and Secchi (2006a), we observe the characteristic tent-shape distribution in all samples for all variables at all times.

Figure 3.4 compares the autocorrelation functions of profit (top) and total asset growth rates (bottom) for all three periods. While autocorrelation in growth rates is insignificant, we find significant positive and (approximately) exponentially decaying autocorrelation in profit rates. Past growth does not allow any inference about future growth; growth appears erratic and restless characterized by

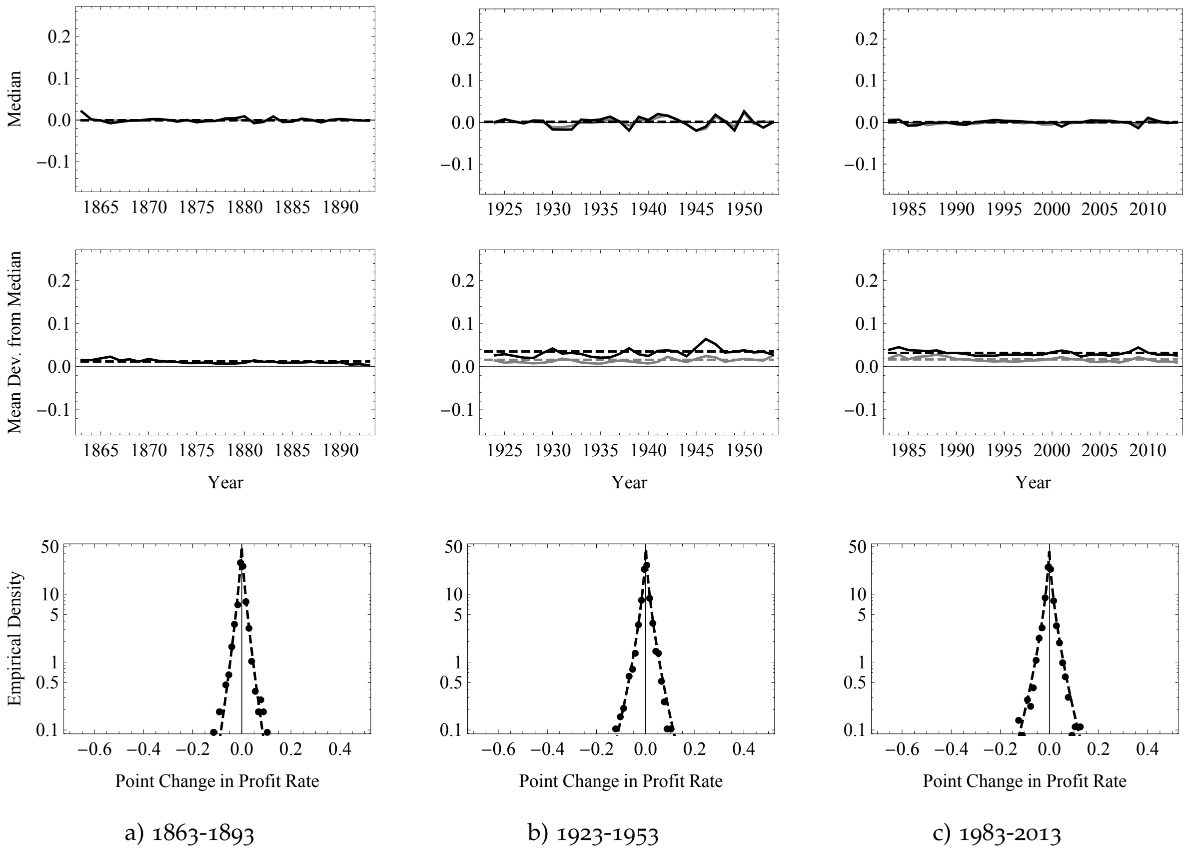


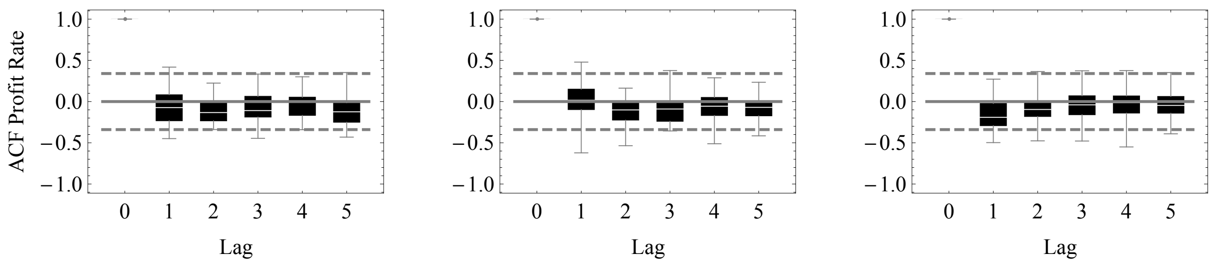
Figure 3.5: Location, dispersion and empirical distribution of point changes in profit rates of utility corporations in the U.S. From top to bottom: time evolution of the annual median point change of profit rates, time evolution of the mean deviation from the median point change in profit rates, and the empirical distribution of point changes in profit rates. Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of point changes in profit rates result in the estimated Subbotin distribution. Sample periods (from left to right) are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013.

significant jumps. In contrast, past profitability does allow inferences about future performance; profitability appears continuous with jumps marking the exception rather than the rule. The median change in the profit rate remains (close to) zero for almost all the 93 years analyzed (Figure 3.5, top), its mean deviation sticks to about 0.01 (Figure 3.5, middle). The resulting empirical distribution appears fatter-tailed than a Laplace; estimates of the shape parameter α of the more general Subbotin distribution are smaller than one and, thus, confirm a fatter-tailed departure from the Laplace distribution (see Table 3.3). Therefore changes in the profit rate usually are small and close to zero with large jumps rarely occurring. The direction of change, however, is unpredictable as the change in profit rates does not display any significant autocorrelation (Figure 3.6).

Despite structural and organizational differences that obviously separate 19th century utility corporations from their 21st century de-

Sample\Years	**1863-1893**	**1923-1953**	**1983-2013**
Shape α	0.7786 (0.0439)	0.6464 (0.0240)	0.6276 (0.0173)
Location m	-0.0007 (0.0022)	0.0010 (0.0022)	-0.0005 (0.0015)
Dispersion σ	0.0108 (0.0005)	0.0125 (0.0004)	0.0131 (0.0003)

Table 3.3: Parameter estimates of the Subbotin distribution for point changes in profit rates of utility corporations in the U.S. Standard errors are given in parentheses.



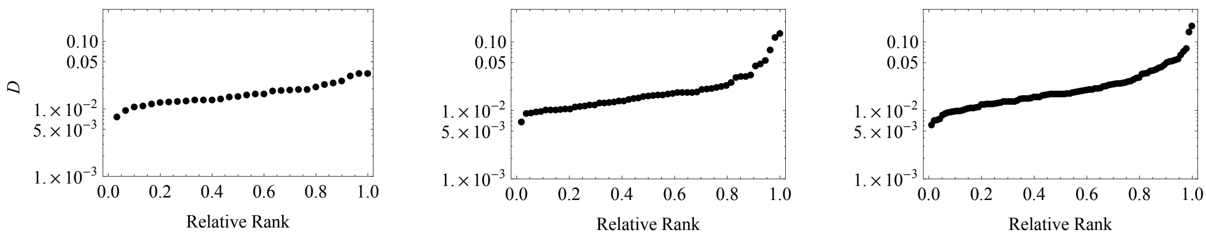
a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.6: Autocorrelation plots for point changes in profit rates of utility corporations in the U.S. Sample periods (from left to right) are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).

scendants, we also find the square root of firm-specific diffusion coefficients $\sqrt{D_i}$ distributed similarly across utility corporations in all three episodes (Figure 3.7). Mundt et al. (2015) show an inverse relationship between the diffusion coefficients and the adjustment or relaxation time — the time the profit rate needs to return to the location m. With the diffusion coefficients similarly distributed in all three periods, we cannot identify any significant differences in the firm idiosyncrasies across the past 150 years. The diffusion coefficients and thus adjustment speeds of utility corporations in the 19th century do not appear any different from the ones of their 21st century descendants.

In line with Alfarano et al. (2012) and Mundt et al. (2015) we find that the statistical patterns of corporate profit rates are well described by the reduced form model of capital reallocation and profit rate equalization introduced in chapter 2.2. As the same statistical patterns appear not only qualitatively but also quantitatively in all three periods and across a timespan of 150 years, the terminology of *statistical regularity* or *statistical equilibrium* is indeed an appropriate choice. Although utility corporations have been subject to dramatic change in their internal organization and competitive environment — railroads vs. the automobile, telegraph and telephone vs. the internet — their profitability dynamics have been remarkably stable around a characteristic profit rate of 7%. Early analyses of the profitability of utility corporations, such as Sterrett (1916) or Friday (1921), arrive at very similar characteristic values; Friday (1921) summarizes that *"with rate cases and with public investigations [...] the public mind*

Figure 3.7: Relative rank plot of firm-specific diffusion constants $\sqrt{D}$ for utility corporations in the U.S. Sample periods (from left to right) are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013.



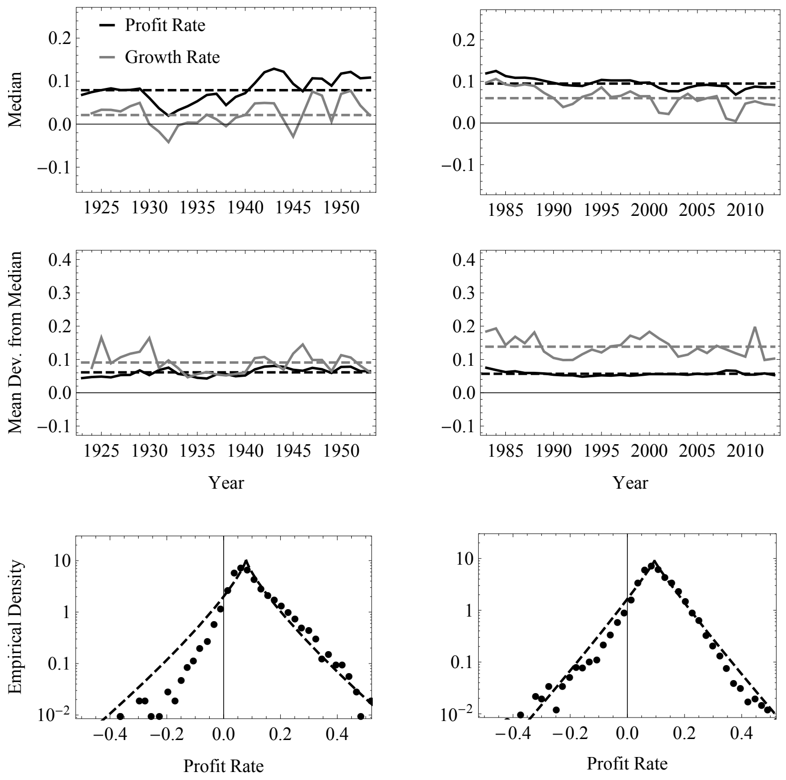
a) 1863-1893 b) 1923-1953 c) 1983-2013

had come to consider six to eight per cent. a normal profit for railroads and public utilities" (p.33). From the 1880s onward, large manufacturing corporations emerged that increasingly outweighed railroads and public utilities in their economic relevance to the overall economy. Building upon the infrastructures laid out by the railroads and public utilities, we would expect their profitability and growth to leave a mark in the overall results.

Non-financial corporations during 1923-1953 and 1983-2013

We continue our analysis by comparing profitability and growth of a more diverse sample of corporations from all industrial divisions (including utilities, excluding banking, insurance, and real estate) across the two episodes 1923-1953 and 1983-2013. By and large, we confirm the major findings for utility corporations qualitatively yet not quantitatively. On average, the diverse sample of corporations generates a median profit rate of about 9% (see Figure 3.8, top, black line) as compared to 7% among utility corporations with a mean deviation from the median profit rate of about 5% to 6% (see Figure 3.8, middle, black line) as compared with 2.5% among utility corporations. Figure 3.8 (bottom) shows that profit rates in both episodes largely fall onto Laplace distributions with similar estimates of their parameters (see Table 3.4). Similar to the rate cases and public investigations of the profitability of railroads and utilities summarized by Friday (1921), we could suggest a profit rate around 8% to 10% as normal or typical for corporations outside banking, insurance and real estate. Similar to our findings, Bowman (1934) observed the median profit rate "for all industries [to] fall within the limits of 10 to 12 per cent." (p. 234); he had analyzed a plethora of non-financial U.S. industries during the 1910s to 1920s. Bagwell (1929), analyzing 267 large industrial corporations in the U.S. during the years 1917 to 1928, finds an average rate of about 10% in normal times. Adams (1918), putting forward the example of the first American excess profits tax instated in 1917, saw a return on invested capital above 8% already as an excessive return. As we show, during the mid-20th century and the late 20th to early 21st century, industrial corporations earned on average an 8$ to 10$ on a capital investment of 100$.

Figure 3.9 compares the autocorrelation functions of profit (top) and total asset growth rates (bottom) for the diverse sample of corporations for both episodes. The results are qualitatively and quantitatively identical with the previous findings on utilities. Total assets growth rates display no significant autocorrelation while profit rates display significant, approximately exponentially decaying positive autocorrelation. The median change in the profit rate also remains (close to) zero in both periods (Figure 3.10, top), its mean deviation sticks to about 2.5% (Figure 3.10, middle). The resulting empirical distribution is similar to the one identified for utility corporations; estimates of the shape parameter α and the location parameter m are

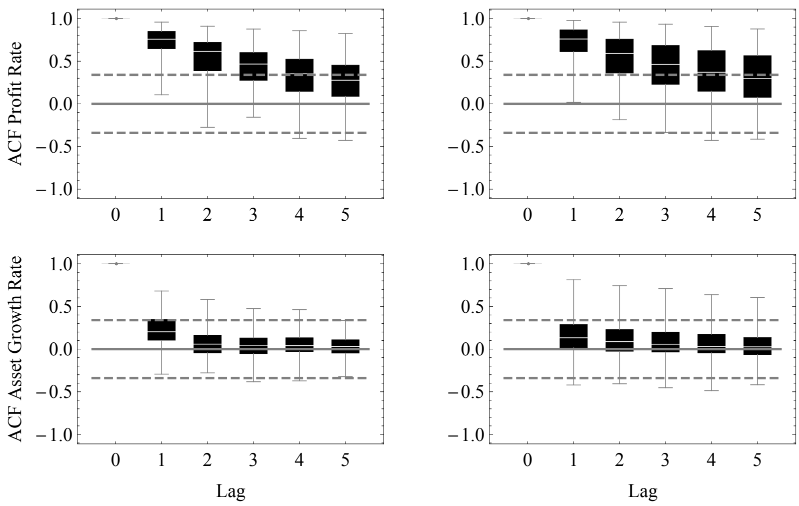


a) 1923-1953 b) 1983-2013

Figure 3.8: Location, dispersion and empirical distribution of profit (black) and growth rates (gray) of non-financial corporations in the U.S. From top to bottom: time evolution of the annual median of profit and asset growth rates, time evolution of the mean deviation from the median profit and growth rates, and the empirical distribution of profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates result in the estimated Laplace distribution. Sample periods (from left to right) are (a) 1923-1953 and (b) 1983-2013.

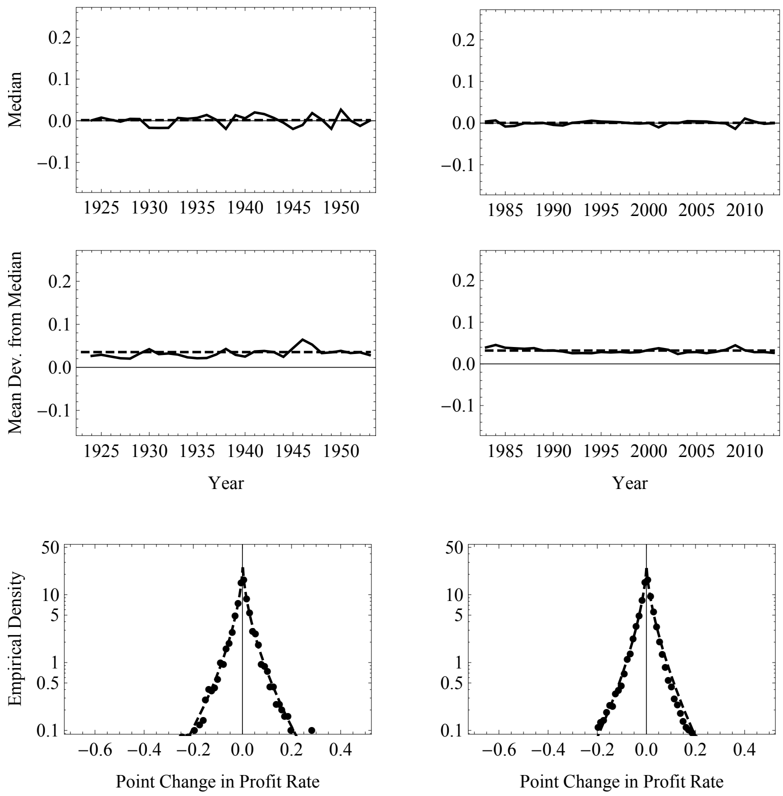
Sample\Years	**1923-1953**	**1983-2013**
Shape α	0.8292 (0.0204)	0.9203 (0.0114)
Location m	0.0789 (0.0055)	0.0949 (0.0031)
Dispersion σ	0.0563 (0.0011)	0.0568 (0.0005)

Table 3.4: Parameter estimates of the Subbotin distribution for profit rates of non-financial corporations in the U.S. Standard errors are given in parentheses.



a) 1923-1953 b) 1983-2013

Figure 3.9: Autocorrelation plots for profit (top) and asset growth rates (bottom) of non-financial corporations in the U.S. Sample periods (from left to right) are (a) 1923-1953 and (b) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).

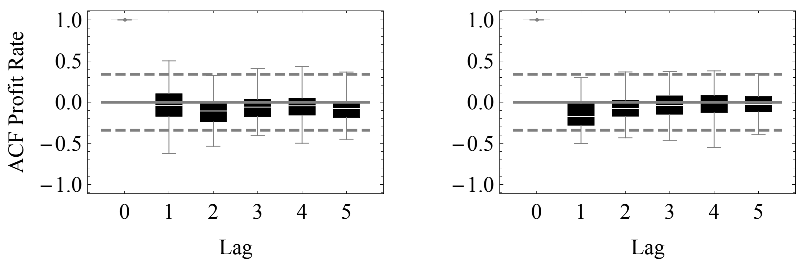


a) 1923-1953 b) 1983-2013

Figure 3.10: Location, dispersion and empirical distribution of point changes in profit rates of non-financial corporations in the U.S. From top to bottom: time evolution of the annual median point change in profit rates, time evolution of the mean deviation from the median point change in profit rates, and the empirical distribution of point changes in profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of point changes in profit rates result in the estimated Subbotin distribution. Sample periods (from left to right) are (a) 1923-1953 and (b) 1983-2013.

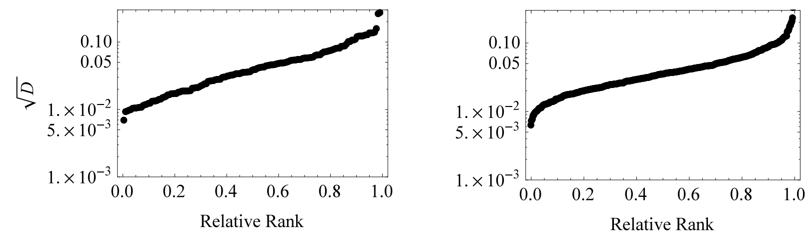
Sample\Years	**1923-1953**	**1983-2013**
Shape α	0.5791 (0.0140)	0.6393 (0.0253)
Location m	0.0015 (0.0020)	0.0006 (0.0011)
Dispersion σ	0.0259 (0.0006)	0.0253 (0.0003)

Table 3.5: Parameter estimates of the Subbotin distribution for point changes in profit rates of non-financial corporations in the U.S. Standard errors are given in parentheses.



a) 1923-1953 b) 1983-2013

Figure 3.11: Autocorrelation plots for point changes in profit rates of non-financial corporations in the U.S. Sample periods (from left to right) are (a) 1923-1953 and (b) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).



a) 1923-1953

b) 1983-2013

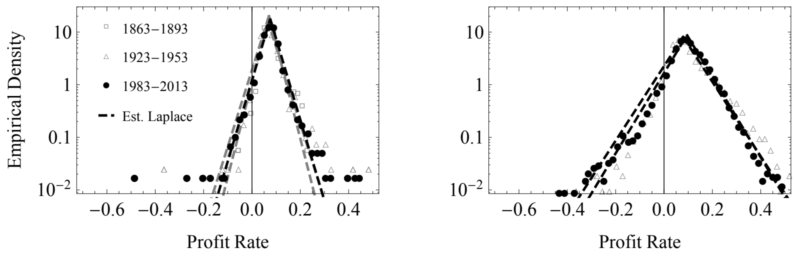
Figure 3.12: Relative rank plot of firm-specific diffusion constants $\sqrt{D}$ for non-financial corporations in the U.S. Sample periods (from left to right) are (a) 1923-1953 and (b) 1983-2013.

similar, the dispersion parameter σ is around 2.5% (see Table 3.5) and thus larger than the around 1.0% observed for utilities . Therefore, changes in the profit rate display more extreme realizations in the diverse sample. Still, these changes are distributed symmetrically around zero, indicating that on average gains in profitability match declines in profitability across corporations. This finding is in accord with the idea of zero-sum competition advanced by Porter and Teisberg (2004) and Porter (2008); in a limited market one corporation's gain becomes another corporation's loss. On the macroscopic, economy-wide level, zero-sum competition implies a situation in which neither gains nor losses in profitability dominate so that average profitability across corporations is left unchanged. On the microscopic firm-level, however, we can still observe substantial and erratic movements in profitability as the distribution of changes is heavy-tailed and changes themselves are not significantly correlated (Figure 3.11).

The firm-specific diffusion coefficients $\sqrt{D_i}$ for the diverse set of corporations obey a similar pattern as for the utility corporations (Figure 3.12). Even across diverse industries and different sample compositions between episodes 1923-1953 and 1983-2013, diffusion coefficients take on similar values and show similar patterns. In both episodes, utility corporations cluster on the lower ranks and thus are typically characterized by long adjustment periods; corporations in mining, construction and related manufacturing industries cluster on the top ranks and thus are typically characterized by short adjustment periods. Generally, the square root of diffusion coefficients falls into the range from 0.01 to 0.1, irrespective whether we analyze utility corporations in specific or non-financial corporations in general. Across a time span of 150 years, we observe firm idiosyncrasies as covered by $\sqrt{D_i}$ to play a stable role in corporate dynamics, resulting in similar adjustment speeds across time.

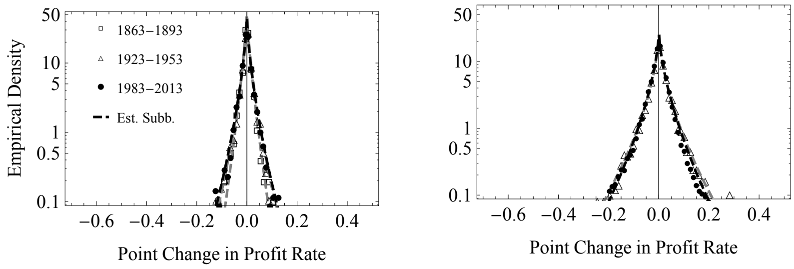
Blended findings for 1863-1893, 1923-1953 and 1983-2013

Our core finding is summarized best by blending the empirical densities of all three sample periods in one plot. Figure 3.13 shows the empirical distributions for profit rates $X_{i,t}$ of utility corporations



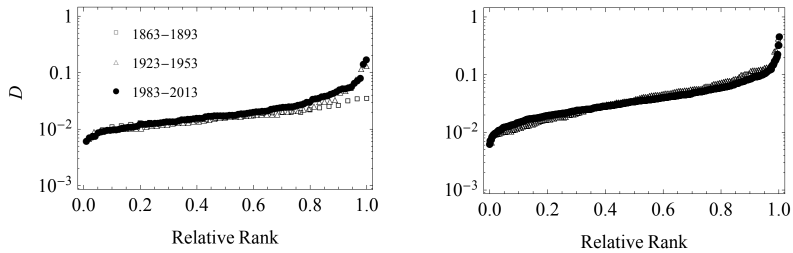
a) Utilities b) Non-Financials

Figure 3.13: Empirical distributions of profit rates of utility (left) and non-financial corporations (right) in the U.S., all sample periods blended in one plot. Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates result in the estimated Laplace distribution.



a) Utilities b) Non-Financials

Figure 3.14: Empirical distributions of profit rates of utility (left) and non-financial corporations (right) in the U.S., all sample periods blended in one plot. Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of point changes in profit rates result in the estimated Subbotin distribution.



a) Utilities b) Non-Financials

Figure 3.15: Relative rank plots of firm-specific diffusion constants $\sqrt{D}$ for utility and non-financial corporations in the U.S, all sample periods blended in one plot.

(left) and non-financial corporations (including utilities, right). The empirical distributions almost perfectly fall onto each other, in spite of the very different economic, political and social environments characterizing the three sample periods, and in spite of changing accounting conventions. The same holds for point changes in profit rates $dX_{i,t}$ (s. Figure 3.14) and the firm-specific diffusion constants $\sqrt{D_i}$ (3.15). Thus, we find remarkably robust statistical and distributional regularities in profit rates across a wide range of industries and time periods.

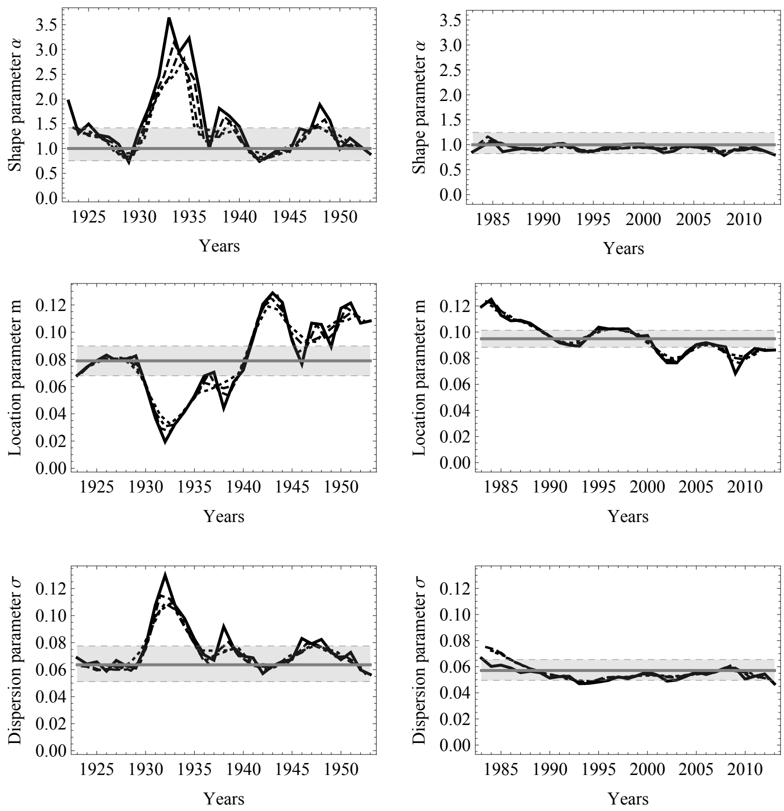
Therefore, the reduced-form model that guided the original analysis of the U.S. during the 1980s to 2010s also captures the dynamics of corporate profit rates in earlier episodes. Prolonged deviations seem to only occur with salient historic events. Most prominently, the Great Depression after 1929 pressured the median profit rate well below its long-run value to as low as 2% while the Civil War (1861-65), World War 2 (1941-45), and the Korean War (1950-53) pushed the median profit rate well above its long-run value to as high as 14%. Outside these episodes — even during the Long Depression after 1873 or the recessions after 2000/01 and 2007/08 — the median profit rate stuck close to its long-run value. Empirical deviations from the statistical and distributional regularities thus coincide with salient historical events, with the magnitude and durability of deviations shedding a new light on the length and severity of economic disaster.

3.4 Discussion

At several instances during the 93 years covered by the sample periods 1863-1893, 1923-1953 and 1983-2013, we observe prolonged deviations from the statistical regularities, especially in the median profit rate m and to a lesser extent in the shape and dispersion of the distribution. Deviations largely coincide with politically, socially and economically exceptional conditions during economic crises and wars. While wars — national or international in scope — consistently create booms in growth and profitability of comparable magnitudes, economic crises — recessions and depressions – create downturns in growth and profitability of varying magnitude and duration; the Great Depression after 1929 and the appendant recession of 1937 mark the only persistent decline in corporate profit rates below the long-run rate. Consequently, it is open to question whether the proposed model of competitive firms is invalidated during the Great Depression and wartime production.

A closer inspection of the distributional characteristics of profit rates sheds more light on the magnitude and duration of deviations in the location and dispersion of profit rates, in other words, deviations from the equilibrium (Laplace) distribution.[12] Concerning the distributional shape, analysis of annual parameter estimates of the more general Subbotin distribution signals a significant and prolonged deviation from the Laplace distribution only during the Great Depression, materializing in a significant deviation of the shape parameter α from 1 and spikes in the related dispersion parameter σ (see Figure 3.16, top and bottom). During prosperity, milder economic crises and wartime, however, estimates of α remain reasonably close to 1, thus indicating a Laplace distribution of profit rates. So despite cyclical fluctuations in the location parameter m and consequently cyclical fluctuations in the parametrization of the diffusion model (2.4), the Great Depression marks a singularity with the only significant distributional deviation and thus invalidation of the proposed diffusion model of corporate profit rates. Cyclical variations in m as well as singular deviations in α, however, both relate to the

[12] In order to get meaningful year-by-year parameter estimates, we focus this analysis on the two largest samples and thereby on the two later time periods 1923-1953 and 1983-2013. For the earlier time period 1863-1893, the limited amount of only 30 observations per year hinders a year-by-year analysis.



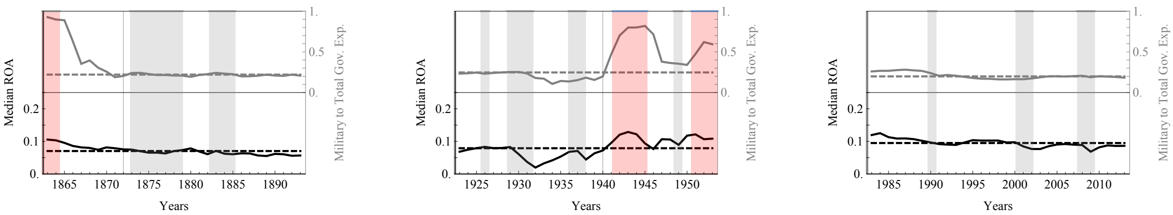
a) 1923-1953 b) 1983-2013

Figure 3.16: Time evolution of annual (—), two-year (- - -), three year (- · -) and four-year (· · ·) moving-window parameter estimates of the Subbotin distribution, from top to bottom shape parameter α, location parameter m and dispersion parameter σ, for non-financial corporations in 1923-1953 (left) and 1983-2013 (right). Solid gray lines indicate the phenomenological estimates from pooled profit rates, dashed gray lines and shaded areas indicate the 95% confidence intervals based on 10,000 Monte Carlo simulations of the phenomenological Laplace distribution.

interruption of the main mechanism of the model: capital reallocation (and accumulation). Thus, we propose disaggregate, firm-level factors that critically relate to the magnitude and duration of the deviations.

From the Civil War to the Korean War

Deviations in wartime appear in the Civil War (1861-1865), World War 2 (1941-1945) and the Korean War (1950-1953), that is around all large-scale military conflicts covered by the three sample periods. During wartime, the median profit rate is elevated above its long-run value by about 2 to 3 percentage points. The sample of utilities (and railroads) earns a median rate around 9% to 10% during wartime compared to about 7% to 8% across all episodes; the sample of diverse industries earns a median rate around 12% to 13% compared to about 9% to 10%. Excess profitability is a well-known peculiarity of the war economy, a result of the introduction of large-scale government control and public procurement as well as institution of a command- rather than price- and profit-based allocation and re-allocation of capital and resources. In war the profit motive, in fact, becomes an instrument of the government to mobilize all available resources for the wartime demands by subscribing high prices in strategic sectors (Keith, 1943; Kohler and Cooper, 1945). The com-

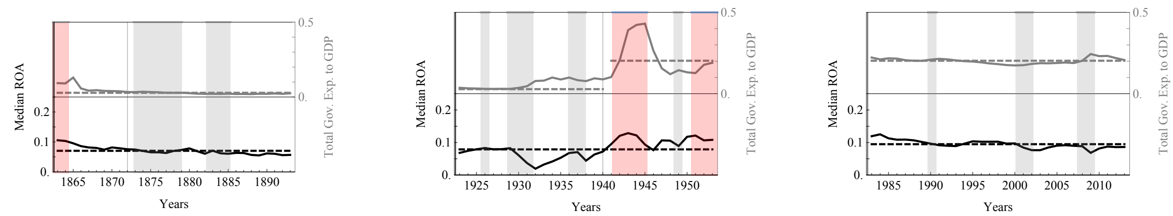


a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.17: Comparison of annual median corporate profit rates and annual ratios of military to total government expenditures for sample periods 1863-1893, 1923-1953, and 1983-2013. Shaded areas indicate NBER-identified recessions (gray) and major military conflicts (red). Dashed lines indicate the medians of the pooled data.

petitive element of (re-)allocating capital to the more profitable uses, however, is impaired; capital gets ordered to the uses that are strategically relevant for war, irrespective of the profitability of these uses. With the economy abiding by these rules, the equalization of profit rates is ineffective and profits surge. No wonder that the discussion about profit control through taxation to arrive at socially acceptable levels of profitability sparks during the world wars as well. (Adams, 1918; Keith, 1943; Plehn, 1920).

Government control, public procurement and resource scarcity critically impact on the profitability of corporations. Figure 3.17 displays the time-evolution of the median profit rate (left axis) in comparison to the ratio of military to total federal government expenditures (right axis), both in reference to their respective (long-run) sample medians (dashed lines). In the 93 years covered by our data, the ratio of military to total government expenditures remains surprisingly stable inbetween 20% to 25% most of the time. Severe deviations are a unique characteristic of wartime production that is the Civil War (1860-1865), World War II (1942-1945) and the Korean War (1950-1953), when the ratio of military to total expenditures triples to 60% or even more than quadruples to above 90%. Thus, the upward deviations in the ratio of military to total government expenditures reflect accurately the upward deviations in the median profit rate; the war economy is conducive to profitability. The broader perspec-



a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure 3.18: Comparison of annual median corporate profit rates and annual ratios of government spending to GDP for sample periods 1863-1893, 1923-1953, and 1983-2013. Shaded areas indicate NBER-identified recessions (gray) and major military conflicts (red). Dashed lines indicate the medians of the pooled data.

tive taken by the ratio of total federal government expenditures to gross domestic product shows similar results, despite displaying an upward shift in the ratio around the Great Depression and World War 2 (see Fig. 3.18). In peacetime, government expenditures made up between 2% to 2.5% of GDP before 1929. After 1945, the share has increased by one order of magnitude to about 20%, potentially marking the birth of the social welfare state in response to the Great Depression and the devastation of two world wars.

From the Long Depression to the Great Recession

Deviations appear during the three most severe economic crises over the last 150 years covered: the *Long Depression* (or original Great Depression) after 1873 with an ensuing recession in 1883, the *Great Depression* after 1929 with and intervening recession in 1937, and the *Great Recession* after 2008. In contrast to the impact of war on corporate profitability, the impact of economic crises shows more variation in magnitude and duration.

Table 3.6 gives an overview of average growth rates in macroeconomic and corporate performance indicators in the four years before and after the onset of crisis. The macroeconomic aggregates display expected and well-established trends: population growth slows down in the past 150 years and especially during depressions (line 1); unemployment soars during depressions and recessions, yet not in recessions ensuing a depression were unemployment generally declines (line 2); the Long Depression and its ensuing recession as much of the 19th century are characterized by persistent deflation while the Great Depression marks a short deflationary period in an otherwise inflationary 20th and 21st century (line 3); GDP growth slows down and at times turns negative (line 4); in response to the Civil War debt is decreased, yet in response to the Great Depression after 1929 debt increases (line 5); short- and long-term interest rates drop (lines 6 and 7); trade openness declines from the end of the 19th to the mid-20th century and then increases again (line 8). The corporate performance indicators add new insights that are potent to explain the variation in the magnitude and length of crises. In all crises except the *Great Depression*, total costs on average decline faster or grow slower than sales, thus mitigating the impact of a decline in demand on the profit rate. Total assets growth slows down, thus also mitigating the impact of a decline in profits on the profit rate. In the *Great Depression*, the decline in demand was most pronounced, dwarfing all other crises. As costs declined slower than sales, operating income. Growth in total assets reversed, with an annual average of -1.7% in the first four years after 1929. With operating income plummeting contracting slower than sales with an annual decline of -15.6%.

Figure 3.19 plots the median corporation-level indices for sales

	Episode	Long Depression				Great Depression				Great Recession	
	Variable\Year of Crisis	1873		1882		1929		1937		2008	
	(in %)	1869-72	1874-77	1878-81	1883-86	1925-28	1930-33	1933-36	1938-41	2004-07	2009-12
Macroeconomic Data											
(1)	Population growth	2.7	2.3	2.1	2.4	1.4	0.8	0.6	0.9	0.9	0.8
(2)	Unemployment rate	3.8	6.5	5.8	4.2	4.9	15.2	19.3	16.0	4.9	9.0
(3)	Inflation rate (GDP defl.)	-4.2	-3.2	-0.1	-2.3	0.2	-7.1	1.5	1.0	2.9	1.5
(4)	Nom. GDP growth	0.3	0.7	8.1	-0.1	2.9	-14.0	9.3	8.6	5.9	2.4
(5)	Nom. debt growth	-3.8	-0.5	-1.0	-4.3	-4.6	7.4	14.7	7.7	7.3	12.5
(6)	Short-term interest rate,										
	ordinary funds	3.9	2.6	2.5	2.4	1.6	1.1	0.3	0.1	3.1	0.1
	surplus funds	4.5	2.2	3.2	1.9	2.9	1.2	0.6	0.6	3.2	0.1
(7)	Long-term interest rate	6.4	5.9	4.9	4.2	4.7	4.7	3.8	3.0	5.5	4.6
(8)	Trade openess indicator	14.9	16.1	16.0	14.4	12.4	8.6	8.1	8.6	34.2	36.4
Corporate Data (SIC-Division E: Utilities)											
(9.1)	Corporate growth										
	in sales	5.2	-4.4	8.0	1.7	3.3	-14.0	5.4	6.3	7.4	0.0
	in costs	4.3	-6.6	8.8	0.9	1.3	-13.9	6.2	5.1	7.5	-1.1
	in total assets	5.7	2.5	1.7	1.4	3.6	0.9	0.4	1.3	4.8	3.9
(9.2)	Return on assets (ROA)	7.7	6.6	7.3	6.4	6.4	4.1	3.9	5.0	6.4	5.9
Corporate Data (SIC-Division A-G and I: Nonfinancial Industries)											
(10.1)	Corporate growth										
	in sales	—	—	—	—	4.6	-15.6	7.8	6.7	8.1	0.0
	in costs	—	—	—	—	3.3	-14.4	6.2	5.1	8.0	0.7
	in total assets	—	—	—	—	3.7	-1.7	1.0	2.1	5.9	3.6
(10.2)	Return on assets (ROA)	—	—	—	—	8.2	3.3	4.7	6.8	8.9	8.0

Table 3.6: Four-year geometric means of key macroeconomic and corporate aggregates for the U.S. around financial and economic crises in 1873 and 1882 (Long Depression), 1929 and 1937 (Great Depression), and 2008 (Great Recession). Sources of macroeconomic data: population, GDP and trade from Johnston and Williamson (2015); inflation rate from Officer and Williamson (2015); interest rates from Officer (2015); unemployment rates from Bureau of Labor Statistics (2015), Coen (1973), Romer (1986) and Vernon (1994).

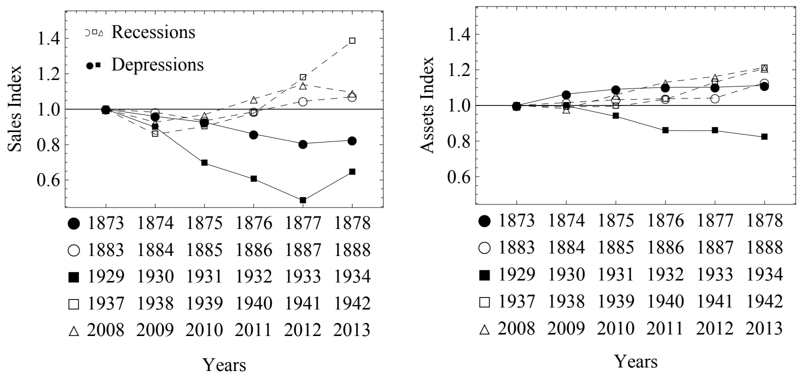


Figure 3.19: Median nominal sales (left) and nominal asset indices (right) of non-financial corporations for the economic depressions in 1873 and 1929 and the recessions in 1883, 1937, and 2008, expressed in levels of the respective initial year of crisis. Therefore, firm-level indices are normalized to 1 in the first year of crisis, tracking the level of sales and assets in reference to the initial level the five years thereafter.

(left) and total assets (right) for the five economic crises, normalized to the first year of the respective crisis. Both depressions — the *Long Depression* and the *Great Depression* — display a prolonged decline of several years, albeit of different magnitude. In the *Long Depression* average corporate sales had dropped to as low as 80% of their 1873's level by 1877. In the *Great Depression* this sales mark was hit already after only two years of crisis; by 1933 average sales had dropped even further to an all-time low of 60% of its 1929's level. Recessions, in contrast, saw hardly any decline below 90% and usually saw a full recovery of sales after four years the latest. Thus the (demand-side) sales experiences reflect well the definitional boundaries that see the decline in economic activity during depressions as more severe and persistent as during recessions. The (supply-side) total assets experiences show a different picture. Almost all crises — the *Long Depression* 1873 and the recession in 1883, the recession in 1937 and the *Great Recession* in 2008 — display an ongoing accumulation of assets which, in the worst of all cases, is interrupted by a period of stagnation. An actual decline over an extended period can only be observed for the *Great Depression* 1929; by 1934 total assets had fallen to about 85% of their 1929's level. In the 93 years covered by our samples we find no other period that was characterized by a (prolonged) decline in total assets. The halt in asset and capital accumulation remains a unique feature of the *Great Depression* of 1929.

The halt in capital accumulation and the subsequent dissipation of capital during the *Great Depression* critically impact on the validity of the reduced-form model of the profit rate. The model rests on the idea of capital reallocation; yet the reallocation of capital itself may rely critically on the inflow of new capital (that is capital accumulation). A simple story: A large decline in demand prevents new investment and thus slows the inflow of new capital into the system; with the inflow of new capital breaking down, capital reallocation is hindered as the old capital often is tied to its location and original use and cannot easily be relocated or adjusted to novel uses. Therefore, when the inflow of new capital is paralyzed, capital reallocation is paralyzed as well. The profit motive is no longer attainable and the profit rate loses its signaling function. The capital-driven economic system collapses. As we have seen earlier, corporate profitability (as well as the levels of sales and assets) did not recover to the pre-war levels within the first years of the New Deal but only after excessive expenditures in response to World War 2 (cf. Figures 3.17 and 3.18).

A modern-day Great Depression in Greece

Admittedly, a single observation does not instate a rule and the historical circumstances as well as the American economic system are unique. In the end, the argument could describe a U.S. specific case rather than a universal phenomenon. We therefore compare the *Great Depression* in the United States with the more recent experience of the *Great Recession* in Greece.[13] Thereby, we compare two of the hardest hit economies during defining economic downturns. Table 3.7 compares the growth in macroeconomic and corporate performance indicators for the U.S. around 1929 and for Greece around 2008. The general trends identified across U.S. economic crises persist and the magnitudes of 1929 and 2008 fall into the same range. Thus, with an average annual decline in sales of 11.3% and an average annual dissipation of assets of 5.9% in the first four years after 2008, the *Great Recession* is for Greece what the *Great Depression* is for the United States. In the Greek case, the median profit rate even turned negative to an geometric annual average of −1.5% in the four years after 2008, indicating that the majority of the largest Greek corporations generated losses at that time. Thus the Greek case displays the same patterns: the halt and reversal of capital accumulation, followed by a

[13] Data on Greek corporations is taken from the Worldscope Database of Thomson Reuters. In contrast to the U.S., records of smaller economies entered this database to a later point in time so that we have to restrict the analysis of Greek corporations to the years 1997 to 2013. For more details, see chapter 5.

	Country	**U.S.**		**Greece**	
	Variable\Year of Crisis	**1929**		**2008**	
	(in %)	1925-28	1930-33	2004-07	2009-12
Macroeconomic Data					
(1)	Population growth	1.4	0.8	0.3	-0.1
(2)	Unemployment rate	4.9	15.2	9.3	14.4
(3)	Inflation rate (GDP defl.)	0.2	-7.1	2.9	-6.5
(4)	Nom. GDP growth	2.9	-14.0	5.3	-4.4
(5)	Nom. debt growth	-4.6	7.4	7.4	4.3
(6)	Short-term interest rate,				
	ordinary funds	1.6	1.1	2.8	0.9
	surplus funds	2.9	1.2	2.8	0.3
(7)	Long-term interest rate	4.7	4.7	4.1	11.4
(8)	Trade openess indicator	12.4	8.6	52.7	54.8
Corporate Data (SIC-Division A-G and I: Nonfinancial Industries)					
(9.1)	Corporate growth				
	in sales	4.6	-15.6	8.0	-11.3
	in costs	3.3	-14.4	8.4	-8.0
	in total assets	3.7	-1.7	6.8	-5.9
(9.2)	Return on assets (ROA)	8.2	3.3	3.2	-1.5

Table 3.7: Four-year geometric means of key macroeconomic and corporate aggregates for the U.S. around 1929 (Great Depression, left) and Greece around 2008 (Great Recession, right). Data sources: macroeconomic series for the U.S. are stated in Table 3.6, for Greece series on population, GDP, trade, interest and unemployment are taken from Organisation for Economic Co-operation and Development (2015a,b, 2016a,b), on inflation from Worldbank (2015). Corporate data for Greece is taken from Thomson Reuters Datastream, also described in Chapter 5.2.

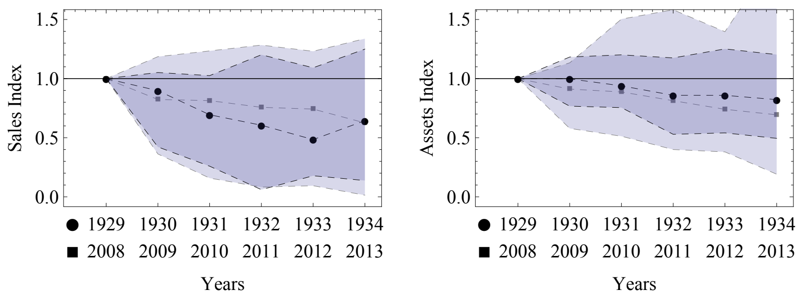
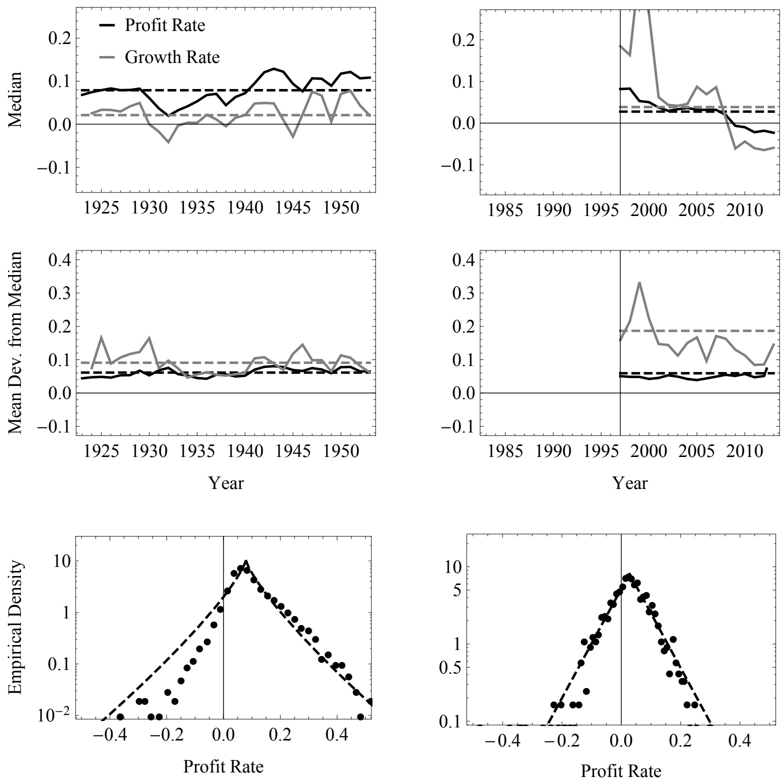


Figure 3.20: Median nominal sales (left) and nominal asset indices (right) of non-financial corporations for economic and financial crises in 1929 (U.S) and 2008 (Greece), expressed in levels of the respective initial year of crisis. Therefore, firm-level indices are normalized to 1 in the first year of crisis, tracking the level of sales and assets in reference to the initial level the five years thereafter. Dashed lines indicate the range between the 5% and 95% quantiles of the data.

continuous decline of the median profit rate. The breakdown of capital accumulation and reallocation and the related loss of the signaling function of profitability seem to push the capital-driven economy to the edge.

Figure 3.20 contrasts the indices of sales (left) and total assets (right) for the median U.S. corporation during the *Great Depression* 1929 (black) with the experience of the median Greek corporation during the *Great Recession* 2008 (gray). Both countries faced a steep and prolonged decline in sales with most of the corporations in the sample seeing a substantial decline (shaded areas indicate 90% of the sample population). While the New Deal in 1933 may have put the decline in sales to an end, we see a further steep decline in Greece after 2012, when two of the most comprehensive austerity packages (package 6 and 7) have been enacted. While the decline in total assets levels off in the U.S. around 1932, we see a prolonged decline for Greece that possibly continues beyond our sample period. By 2013, more than half the corporations in our sample had lost approximately 30% or more of their assets. The term *Great Recession*, coined internationally for the crisis after 2008, thus might be a misnomer, at least in the case of Greece. The Greek economy experienced another *Great Depression*, in magnitude and duration even more extreme than the American antecedent. The less fortunate path of the Greek economy reflects also the different responses in economic policies. Although expansionary policy of the European Central Bank may have led to a substantial decline in short-term interest rates (see Table 3.7, line 6), bleak long-term expectations caused a rise in long-term interest rates. While the New Deal (and World War 2) generated demand at the cost of increasing debt, the austerity packages reduced debt growth at the cost of additional demand (see Table 3.7, line 5). Despite the different policy responses, the magnitudes of both, the *Great Depression* and the *Great Recession*, have had a profound and persistent impact on corporate profitability.

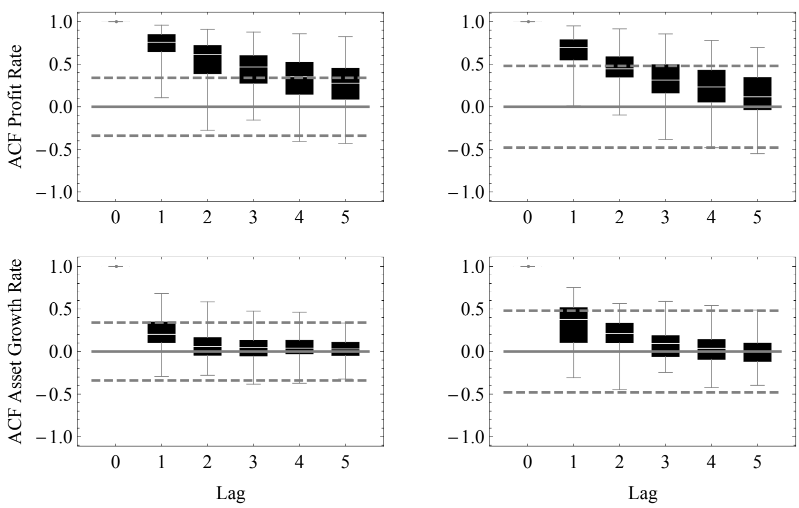
Figure 3.21 compares the findings on the time evolution of profit and total asset growth rates and the empirical distribution of profit rates for the U.S. during the Great Depression (left, reported earlier in Figure 3.8) with the findings for Greece during the Great Reces-



a) U.S., 1923-1953

b) Greece, 1997-2013

Figure 3.21: Location, dispersion and empirical distribution of profit rates of non-financial corporations in the U.S. (left) and Greece (right). From top to bottom: time evolution of the annual median profit rates, time evolution of the mean deviation from the median profit rates, and the empirical distribution of profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates result in a Laplace distribution. Sample periods (from left to right) are (a) 1923-1953 and (b) 1997-2013.



a) U.S., 1923-1953

b) Greece, 1997-2013

Figure 3.22: Autocorrelation plots for point changes in profit rates of non-financial corporations in the U.S. (left) and Greece (right). Sample periods (from left to right) are (a) 1923-1953 and (b) 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 and 17 years respectively.).

sion (right). The Greek experience of the Great Recession resembles closely to the U.S. experience of the Great Depression in that profitability displays a sharp and prolonged decline and capital accumulation (positive asset growth) turns into a dissipation of assets (negative asset growth). Despite of shorter time series and fewer firms in the Greek sample, resulting in less observations, profit rates still largely fall onto a Laplace distribution. The time-series behavior matches previous findings as well (Figure 3.22). Despite of broader confidence intervals, autocorrelation in profit rates is significant for at least the first lag, displaying a similar decay as in the U.S. sample. Furthermore, autocorrelation in growth rates is not significant.

Besides a temporal breakdown in the stability of median profit rates during large-scale crisis and wartime, we observe robust statistical and distributional regularities in corporate profit rates. The reversal of capital accumulation on the corporation level during economic crisis and the peculiarities of a wartime economy constitute disaggregate factors that contribute to the length and severity of economic crises. The observed deviations from statistical and distributional regularities in profit rates are symptomatic for a collapsing capital-driven economy that fundamentally rests on continuous capital accumulation and capital reallocation guided by profitability. Out of this perspective, the fates of large corporations resemble a stable "heart-beat" during normal times while deviations indicate unraveling economic crises and excesses.

3.5 *Concluding Remarks*

The analysis of corporate growth and profitability in the U.S. across a time span of 150 years unveiled a set of astounding statistical and distributional regularities. Corporate growth is characterized by fluctuations with cyclical boom and bust patterns; corporate profitability in contrast is characterized by stability and stationarity with few and transitory yet systematic deviations. In all periods (1863-1893, 1923-1953, and 1983-2013), utilities corporations earned a median return of about 6% to 7% on their assets with a mean deviation of around 2.5% during most years. Deviations occurred only during years of wartime production (Civil War 1861-1865, World War 2 1941-1945, Korean War 1950-1953) and the *Great Depression* (1929-1941). For samples of diverse industrial activities, we found a median return of about 8% to 9% on assets with a mean deviation of around 6%, obeying the same systematic deviations during wartime and the *Great Depression*. Once we plot the empirical distributions of the raw (that is non-standardized) profit rate data in one graph, the individual distributions for the periods 1863-1893, 1923-1953, and 1983-2013 become almost indistinguishable (see Figure 3.13). Thus, the dynamics of U.S. corporate profitability are characterized by robust statistical and distributional regularities that hold across very different political, social and economic environments — from the Gilded Age in the late 19th century to the "Digital" Age of the early 21st century.

The long-term perspective uncovers the systematic nature of deviations from the statistical and distributional regularities in corporate profitability. Wartime production systematically leads to excessive profits that result from tight control of the economy, large-scale government procurement and acute resource scarcities. In consequence, capital (re-)allocation is guided by command and war demands rather than by profitability. The guiding role of profits in the (re-)allocation of capital is overridden and the regularities dissolve as profits surge. In a similar vein, economic crises systematically lead to declining profits that result from declining demand, yet with varying magnitude and persistence. In the long line of major economic turmoil, from the *Long Depression* after 1873 (incl. the recession of 1882), the *Great Depression* after 1929 (incl. the recession of 1937) to the *Great Recession* after 2008 it is the *Great Depression* where corporate profitability deviates significantly and persistently from the statistical and distributional regularities; a deviation that is apparently overcome only with wartime production for World War 2.

The depth and duration of the *Great Depression* coincide with another exceptional observation: the decline of total assets, in other words, the reversal of capital accumulation. We thus propose the reversal in capital accumulation and the resulting breakdown in capital (re-)allocation as vital disaggregate factors in explaining the depth and duration of economic crisis. The steep and persistent decline in the median profit rate then is symptomatic for an ailing economy and a large-scale economic crisis. Using comparable data on Greek corporations during the *Great Recession*, we observe the same patterns of declining total assets and a steep and persistent decline in the median profit rate, signaling a Greek depression after 2008 that is on a comparable scale of the U.S. *Great Depression*. Consequently, we consider the statistical and distributional regularities in the profitability of large and long-lived corporations as the vital signs of and significant and persistent deviations as threatening symptoms of malfunction in the economic system.

The robustness of the statistical and distributional regularities in corporate profitability and the systematic nature of deviations across several episodes within the last 150 years have profound implications for economic theory and policy. Large corporations make a reliable economic bellwether, reflecting the disproportionately large influence of large corporations on the overall economy. Their corporate profitability dynamics, characterized by an invariable core mechanism (competitive capital (re-)allocation) that reproduces stable macroscopic outcomes (statistical and distributional regularities in profit rates), define a standard that is independent of the political, social and economic environment and independent of fashions and fads in the organization of production or in products themselves. The distinctive deviations from this standard make a reliable warning signal of a serious malfunction of the economy. Thus we propose disaggregate factors such as capital accumulation and (re-)allocation as conducive to the severity and duration of crisis. Growth and profitability of large corporations thereby mark a promising point of departure for further analysis of the economy in prosperity and crisis.

4 German Corporations in Democracy and Totalitarianism: 1919-1944

Abstract

From an economic perspective, the interwar period in Germany is often interpreted as a prime example of a regime switch from a market-based to a command-based economy. Recent studies in economic history cast a doubt on the severity of systemic change, stating that market-based institutions were left largely in place even during wartime. We analyze the profitability of non-financial corporations in Germany during the years 1919 to 1944. We find qualitatively identical, yet quantitatively different statistical patterns with respect to the cross-sectional distribution and the autocorrelation structure of profit rates before and after the regime switch in 1933. The hyperinflation around 1923, the Great Depression after 1929 and the war economy mark significant yet transitory deviations. Overall, our findings suggest that institutions of a market-based system, such as competition and capital-reallocation according to the profit motive, were always at play and exploited rather than restrained after 1933.

4.1 Market vs. Command: Profits as Signal, Instrument and Tax Base

In the first half of the 20th century, institutions in Germany had to develop in a politically fragile environment. With the monarchy overthrown after World War I, Germany became a democracy that in the wake of the Great Depression morphed into a totalitarian state. After the hyperinflation of the early 1920s, German corporations faced prosperity and crisis much like their American counterparts, yet within two politically opposed regimes: the democratic Weimar Republic (1918-33) and totalitarian Nazi Germany (1933-45). In this chapter, we analyze the dynamics of corporate profitability and growth in Germany between 1919 and 1944, thus under democracy and totalitarianism. In so doing, we obtain a corporate-level perspective on the impact of the Great Depression on the German economy and of the Nazi regime on the performance of German corporations and thus the overall economy.

It is tempting to see the analysis of German corporate performance in the interwar period as a clear-cut comparison of two opposing economic systems: a price- and profit-based system of free markets in the Weimar Republic and a centrally planned and command-based system of government control in Nazi Germany. Contradictory findings, however, suggest that the dividing line between the two economic systems is anything but clear. Overy (2001) sees little gain in fitting economic policy in Nazi Germany to a diametrical scale, as the conception of Nazi economic policy was *"intellectually unstable, a loose alliance of ideas borrowed from the anti-capitalist and anti-liberal academic establishment."* (p. 51-52) Similarly, Tooze (2001) sees continuities rather than discontinuities throughout the period 1914-1945, with the interwar period being one of constant *"struggle over the boundaries between economics and politics."* (p. 182) Simpson (1959) illustrates this struggle with a dispute between Hjalmar Schacht, then Reichsbank president, comptroller of state finance and plenipotentiary general for the war economy, and Hermann Göring, minister and plenipotentiary general for the Four Year Plan, culminating around 1936/37. While Schacht saw rearmament as a temporary means to overcome crisis and return to the world market, leaving the system of free enterprise untouched, Göring saw re-armament and autarky as the ultimate means to prepare the economy for war, threatening to completely subordinate the economy to politics whenever necessary. Yet, despite substantial regulation and intervention in the preparation for and during the war, the Nazi regime abstained from large-scale nationalization and left private property and market mechanisms widely in place (Ziegler, 2013). Even more so, Bel (2010) remarks that there had been numerous (re-)privatizations during the 1930s, which the Nazi regime used as a political tool to enhance support among industrialists.

As early as 1946, Schweitzer (1946) remarked that *"the record of the interactions between the [Nazi] party and big business reveals no uniform power relationship in all phases of the regime."* (p. 1) Rather than depriving business of all its power, the Nazi regime seemingly integrated business organizations in its economic control apparatus early on. Thereby, businesses and governmental organizations coexisted, making the economy of Nazi Germany a mixture of a private profit-based and a public command-based economy (p.13). The contrariness of these two economic set-ups is also evident in a more recent debate. There, Buchheim and Scherner (2006, 2009) argue that there has been substantial room for maneuver by private corporations to devise individual production and investment profiles, manifested in private property and freedom of contract. Hayes (2009), in contrast, argues that this voluntarist turn lacks account of the political context in which corporations and their executives acted in. As Hayes (2009) remarks, "Nazi economic policies structured opportunities and thus corporate executives' choices" (p. 41). So despite of corporations not being under tight and direct control of the Nazi regime, their decisions on production and investment profiles were not made autonomously anymore. This change in the nature of interactions between corporations and the state should impact profit dynamics.

We use the reduced-form model of corporate profitability in a capital-driven economy (equation 2.4 in chapter 2.2) and its implied statistical regularities as a point of reference in analyzing German data for the interwar period. Assuming universality of the model, we would expect to identify patterns in the profitability data of Weimar Germany similar to the patterns identified in the U.S. data, at least during the period before 1933. Before 1933, corporations in both countries faced a market-based economic system where capital reallocation (and accumulation) were rather free at play. After 1933, corporations in Germany faced increasing government controls — among others the rationing of resources and the regulation of prices and therefore profits. In contrast to their American counterparts, these controls may have increasingly hindered the free play of capital reallocation and, thereby, may have changed fundamentally the dynamics of corporate profitability.

4.2 Data Description

The recently digitalized press archives of the *Hamburgisches Welt-Wirtschafts-Archiv* (HWWA) and the *Institut für Weltwirtschaft* (IfW) contain extensive collections of corporate material, including relatively complete records of published annual reports for the interwar period (ZBW, 2019). We tap this rich yet to our knowledge still idle resource by extracting key accounting information for more than 700 non-financial corporations. Besides the usual master data (company name, location of the headquarters, founding year, industrial sector classification) we collected accounting information on sales, net income after taxes (German *Reingewinn*), taxes and total assets in order to calculate the most common profitability and growth metrics. From this data, we furthermore calculate costs (incl. taxes) by the difference between sales and net income, and net income before taxes by the sum of net income (after taxes) and taxes. Therefore, we are left with five income statement items and one balance sheet item that allow us to calculate the previously specified organizational performance indicators in terms of financial growth and profitability (see chapter 2.1).

In general, the dataset is based on corporations that endured for a minimum of 15 to 20 years[1], for which we collect annual data for the years 1919 to 1944. For about one third of the corporations, the reporting (or fiscal) year differs from the calendar year (c.f. Sweezy, 1940). We allocated these divergent observations to the respective calendar year that overlaps most with the fiscal year, e.g., for a fiscal year covering March 1, 1928 to April 30, 1929 the data is reported as of 1928. In rare cases of an equal split of the fiscal year between two calendar years (July 1 to June 30), we reported the results as of the later of the two calendar years, as more recent events leave less time for counteraction and are thus more present. In so doing, we keep

[1] In cases of mergers and acquisitions, we took into account the overall lifespan of the predecessor(s) and the current corporation, even though the lifespans of the individual corporations may have been substantially shorter than 15 years. Thereby, we were able to include in the sample several large corporations that were formed in the 1920s and 1930s. In their number, these cases make a small fraction of the sample as the majority of corporations (698 out of 738 or 94.6%) was founded before 1920.

all available information on the financial condition of German corporations at the calculable, potentially low cost of temporally blurred cross-sections. As we do not discuss the short-run timing of events but rather the long-run trends and robust patterns in pooled data, the temporal blurring of the data is a negligible side effect.

The exceptional historical context, has led to hesitancy in the use of data from this time period, fearing the omission and manipulation of records especially after 1933 (c.f. Sweezy, 1940). One issue indeed is the missing of annual reports in the archive. Corporate records for the 738 sampled corporations are most complete within the core period 1924-1940 while in the margins (1919-1923 and 1941-1944), records are somewhat fragmentary, potentially due to the exceptional historical circumstances of hyperinflation and war. For the time before 1924, the archives contain corporate reports for between 50% to 60% of the sampled corporations. From 1925 to 1940, coverage jumps to between 95% to 98%, with only single reports missing for different corporations in different years. With ongoing war, coverage deteriorates again, dropping from 95% in 1940 to 88% in 1941, 68% in 1942, 29% in 1943 and 21% in 1944. In 1945, coverage virtually breaks down with reports available for only 26 of the 738 corporations. Since missings of annual reports in the archives occur across different corporations, industrial sectors, geographic regions and years, they appear to be the result of (increasing) chaos in face of exceptional historical circumstances rather than of intentional concealment by systematically not publishing reports.

Another issue are changes in the way accounting information is presented and accounting items are defined. In the context of official statistics, Sweezy (1941) remarks that "*one discovers that concealment frequently takes the form of not publishing certain economic facts. A statistical series available up to 1934, for example, will no longer be published or the specification of the numerical items will be changed from year to year so that they are no longer comparable and must be rejected.*" (p. 5). Records appear to be the more reliable concerning their definitions, the more aggregate the income statement and balance sheet items are. Aggregate items such as net income after taxes (German "Reingewinn") or total assets were standard in reporting already for a long period of time and not subject to substantial changes in accounting conventions. More disaggregate items on revenues and costs, such as taxes paid, in contrast, became compulsory/common in reporting only by the late 1920s/early 1930s and were subject to frequent and substantial changes in their definitions. Furthermore, and in line with Fremdling and Stäglin (2012), we find disaggregate positions veiled by aggregation, e.g. when the reporting of net revenues replaces the reporting of gross revenues and (several items on) costs towards the end of the 1930s. While some changes in the presentation and definition of accounting items – e.g., the reporting of taxes paid from the late 1920s/early 1930s onward – may represent the continuing revolution of accounting, others – e.g. the reporting of net instead of gross revenues – may very well be the result of inten-

Division		SIC	ZBW STW	Sampled corporations
A:	Agriculture, forestry, fishing	01-09	01-03	6 (0.01)
B:	Mining	10-14	05	87 (0.12)
C:	Construction	15-17	07	22 (0.03)
D:	Manufacturing	20-39	06, 08	502 (0.68)
E:	Transportation, communications, electricity and gas	40-49	04, 12	88 (0.12)
F/G:	Retail and wholesale trade	50-59	10	9 (0.01)
I:	Services	70-89	11, 13, 17, 21, 25, 27-29	24 (0.03)
Total				**738**

Table 4.1: Number of long-lived German corporations by business division (two-digit ZBW STW and SIC codes), numbers in brackets indicate the relative share. Corporations that were active in more than one division are allocated according to the division generating the highest revenues.

tional concealment during wartime.

Given the limitations, we end up with more than 15,000 corporation-year observations for metrics involving aggregate positions such as net income and total assets. For metrics involving more disaggregate items such as gross revenues or taxes paid we end up with about a third less observations.[2] Independent of the limitations in coverage and definitions, the data reflects the information available and accessible to an investor from the late 1910s to the early 1940s. Therefore the data provides a fair representation of the financial situation of the (non-financial) German economy as perceived by the public and used in making investment decisions.

[2] In contrast to the pre-tax data analyzed throughout the other chapters, the present data would allow us to compare the return on assets before taxes (cf. chapter 2.1) with the return on assets after taxes. Yet, due to the limited coverage and changing definitions in the more disaggregate income statement items, the before tax data would not be available for all years and would have to be interpreted with great care, so that we focus our analysis on the readily available after tax data.

In order to enhance comparability with other studies, we translate the German two-digit *Leibniz Information Centre for Economics (ZBW) Standard Thesaurus for Economics (STW)* industrial classification provided in the original data into the more widely used *Standard Industrial Classification (SIC)*. In so doing, we end up with seven industrial divisions that reflect all activities on the real side of the economy. Table 4.1 shows that the German economy of the mid-20^{th} century is, much like its American analog (cf. chapter 3.2, Table 3.1), dominated by manufacturing and mining industries. Compared to the U.S., utilities and especially the railroads seem to play a comparatively smaller role in Germany, since there has been a long tradition and permanency in their consolidation and socialization. As in the other studies, we exclude financial corporations (i.e., banking and insurance) from the sample due to well-known structural differences between financial and non-financial corporations. Overall, the 738 corporations represent a comprehensive cross-section of the German real economy in the Weimar Republic and Nazi Germany.

The domiciles of the 738 corporations in the sample are widely dispersed across the German Reich. We use as domicile the city a corporation has its headquarters in and assign these to the historical federal states.[3]. Table 4.2 illustrates the geographical dispersion of the corporations' headquarters. Of the 30 provinces (Provinzen) and states (Länder) — 14 Prussian provinces and 16 states — that formed the German Reich before 1945, we lack corporate records in only two of the smallest ones, the Hohenzollerische Lande (also: Provinz Hohenzollern) and the Land Schaumburg-Lippe. Berlin marks the cor-

[3] In the HWWA and IfW press archive, cities are assigned to present federal states (Bundesländer) rather than to historical ones, with the latter reported only for cities outside present day Germany. In order to achieve historical consistency, we assign each of the 256 domicile cities reported to its historical state, using the *Amtliches Gemeindeverzeichnis für das Deutsche Reich* in its 1936 version (Statistisches Reichsamt, 1936).

Federal states and provinces	German AGs in 1935	Sampled corporations
1. Provinz Ostpreußen	58 (0.01)	12 (0.02)
2. Stadt Berlin	1,507 (0.19)	102 (0.14)
3. Provinz Brandenburg	117 (0.01)	12 (0.02)
4. Provinz Pommern	102 (0.01)	13 (0.02)
5. Provinz Grenzmark Posen-Westpreußen	4 (0.00)	1 (0.00)
6. Provinz Niederschlesien	234 (0.03)	26 (0.04)
7. Provinz Oberschlesien	40 (0.01)	8 (0.01)
8. Provinz Sachsen	322 (0.04)	35 (0.05)
9. Provinz Schleswig-Holstein	114 (0.01)	7 (0.01)
10. Provinz Hannover	302 (0.04)	27 (0.04)
11. Provinz Westfalen	342 (0.04)	37 (0.05)
12. Provinz Hessen-Nassau	345 (0.04)	38 (0.05)
13. Rheinprovinz	969 (0.12)	82 (0.11)
14. Hohenzollerische Lande	5 (0.00)	— (—)
15. Land Bayern	737 (0.09)	88 (0.12)
16. Land Sachsen	818 (0.10)	94 (0.13)
17. Land Württemberg	355 (0.05)	22 (0.03)
18. Land Baden	334 (0.04)	25 (0.03)
19. Land Thüringen	191 (0.02)	11 (0.01)
20. Land Hessen	149 (0.02)	5 (0.01)
21. Land Hamburg	282 (0.04)	51 (0.07)
22. Land Mecklenburg	33 (0.00)	1 (0.00)
23. Land Oldenburg	48 (0.01)	1 (0.00)
24. Land Braunschweig	99 (0.01)	5 (0.01)
25. Land Bremen	142 (0.02)	21 (0.03)
26. Land Anhalt	49 (0.01)	7 (0.01)
27. Land Lippe	14 (0.00)	2 (0.00)
28. Land Lübeck	19 (0.00)	4 (0.01)
29. Land Schaumburg-Lippe	4 (0.00)	— (—)
30. Saarland	5 (0.00)	1 (0.00)
Total	**7,840**	**738**

Table 4.2: Number of German corporations by federal states and provinces of domicile, based on the 14 Prussian provinces and 16 Länder before 1945. Numbers in brackets indicate the relative share. For comparison, the second left column reports findings for the population of German stock corporations in 1935, reported by Statistisches Reichsamt (1937, , p. 404).

porate center of the German Reich (102 corporations), followed by the States of Saxony (Sachsen, 94) and Bavaria (Bayern, 88) as well as the Rhine Province (Rheinprovinz, 82). Overall, the patterns in corporate domiciles in our sample mirror the patterns found across the overall population of German publicly-listed corporations (in 1935) as reported by the Statistisches Reichsamt (1937, p. 404). Thereby, the 738 corporations cover real economic activity across almost all parts of the German Reich, leaving us with a comprehensive geographical cross-section.

The resulting, comprehensive dataset provides us with ample settings of analysis with respect to the structure of the economy and its geography. The nation-wide (aggregate) perspective can be enriched by zooming in on different industries or administrative divisions, such as provinces and states as well as (major) cities.[4] Consequently, the data allows for a scaling analysis, that is to observe corporate profitability and growth at different levels of aggregation.

Our analysis follows three different strategies to check for the ro-

[4] The analysis of time-series characteristics and empirical distributions needs substantial amounts of observations. Therefore, the structural analysis is restricted to broad industrial divisions (s. 4.1), the geographical analysis on lower levels of aggregation is restricted to granular states and cities. On the level of provinces and states, we analyze the states of Saxony, Bavaria, the Rhine Province and the provinces of Hesse-Nassau (Hessen-Nassau, 38 corporations), Westphalia (Westfalen, 37), Saxony (Sachsen, 35) and Hannover (27). On the level of cities, we analyze Berlin (102 corporations), Hamburg (51), Frankfurt a.M. (23), Bremen (21), Dresden (19), Leipzig (18) and Munich (17).

bustness of statistical regularities as described by the reduced-form model (see chapter 2.2): (i) pooling by time and space (benchmark), (ii) pooling by time, comparing different spaces, e.g., different industries or different provinces and states or cities (scaling analysis), and (iii) pooling by space, comparing different time periods, e.g., Weimar with Nazi Germany (regime comparison). Thus, we analyze the emergence of statistical regularities in corporate profitability and growth from a macroscopic (country-wide) down to a microscopic scale (state- and city-wide), and across socio-politically very different time periods. The result is a comprehensive robustness check of the statistical regularities and the describing reduced-form model along both dimensions, space and time.

4.3 *Empirical Findings*

In the years 1919 to 1944, Germany faced several episodes of prosperity and crisis. The German economy of the interwar period was extraordinarily turbulent. After World War I, a desolate economy was hit hard by hyperinflation. A monetary reform in 1923 brought stabilization and recovery that ended abruptly with the financial market meltdown in 1929, culminating in the Great Depression. With steep decline followed by only slow recovery, the young democratic institutions faced increasingly extreme political tensions. In early 1933, democracy collapsed and the Nazi regime took over, leading Germany and its economy straight into World War II. The time evolution of the median growth rates of sales, costs, and assets and the respective mean deviation reflect this turbulence of the German economy (see Figure 4.1, right top and middle). Leaving the severely distorted figures of the hyperinflation period between 1919 and 1923 aside[5], it is especially the Great Depression after 1929 that significantly interrupts growth and prosperity. The median annual growth rates of sales and costs fluctuated between −18% to 20% p.a., with growth slowing down towards the late 1930s/early 1940s. The median growth rate of assets, despite depicting similar yet somewhat delayed cyclical movements, fluctuated far less, only between −5% and 8%. In contrast to profit rates, growth rates of sales, costs and assets are characterized by cyclical movements that reflect the business cycle.

[5] We omit the hyperinflation period (1919-1923) from the calculation of long-run trends, as growth rates in those years display increasingly extreme values that substantially alter the location and dispersion of the pooled distribution, which become increasingly meaningless w.r.t. to the overall population. In other words, the instability in the underlying value of the German Reichsmark during those years distorts the information carried by the accounting numbers.

In contrast, profit rates display no cyclical movements in neither location nor dispersion. Aside from transitory deviations during the hyperinflation and the Great Depression, location and dispersion of profit rates remain remarkably stable from year to year (see Figure 4.1, left top and middle). Between 1924 and 1944, corporations earned on average a profit rate of 2.8%, annual median profit rates varying between 4.4% in 1927 and 0.2% in 1932, the latter value marking the bottom of the Great depression. Closer inspection suggests a somewhat higher median profit rate of 4.1% before the Great Depression (between 1924 to 1928) and a somewhat lower median profit rate of 2.6% thereafter (between 1933 and 1944). Significant year-to-year fluctuations and therefore deviations from the median rate as well as local peaks in the dispersion of profit rates (see Figure 4.1, left middle) are, however, confined to the hyperinflation period (1919-23) and the Great Depression (1929-32). While the former deviation is likely to be an artifact of difficulties in accounting for unstable currency values, the latter deviation is the result of operating incomes (numerator) decreasing faster during the Great Depression than total assets (denominator).

Figure 4.1 (bottom) visualizes the empirical frequency distributions of profit rates (left) and growth rates (right). While the empirical frequency distribution of profit rates uses the raw data, the frequency distribution of growth rates uses standardized rates in order to abstract away from cyclical movements. Foremost, growth rates of sales, costs and assets collapse onto the same fat-tailed, tent-shape distribution. Growth rates appear more concentrated around the location (median) yet wider dispersed than in a normal and even Laplace distribution. Profit rates, in contrast, fall well onto a Laplace distribution with the by now well-known deviation around zero profits.

Figure 4.2 shows Box-Whisker plots of the autocorrelation coefficient estimates for the 738 corporate time series. While autocorrelation in growth rates of sales, operating expenses and total assets is insignificant, profit rates display significant positive autocorrelation that decays with increasing lag time. Thus, the time-evolution in sales and costs as well as assets appears erratic; past growth does not provide substantial information about current (or future) growth. In contrast, profitability appears to be more persistent; past profitability translates (to a large part) into current (or future) profitability. Due to its inherent persistence and its distributional stability (as captured by the stability in the location and dispersion), profit rates make an intriguing economic indicator that deserves further investigation.

Figure 4.3 shows the time evolution of the location and dispersion of the annual change in corporate profit rates (top and middle) as well as the underlying empirical distribution (bottom). The median change in profit rates is zero with deviations only occurring under exceptional conditions such as the hyperinflation period or the Great Depression. This finding attests to the inherent stability in profit rates as opposed to the fluctuating nature of growth rates. The mean deviation from the median is also characterized by stability, although after the Great Depression dispersion seems to continuously decline. The underlying empirical distribution (bottom) appears fat-tailed and, more importantly, symmetric. This attests to a competitive setting where any gain in profitability of one corporation is matched by equal losses in profitability by one or more other corporations.

While profit rates themselves are characterized by significant positive autocorrelation, annual changes in profit rates do not display any significant autocorrelation (see Fig. 4.4). Thus, the level of profitability is persistent while changes in the level of profitability appear

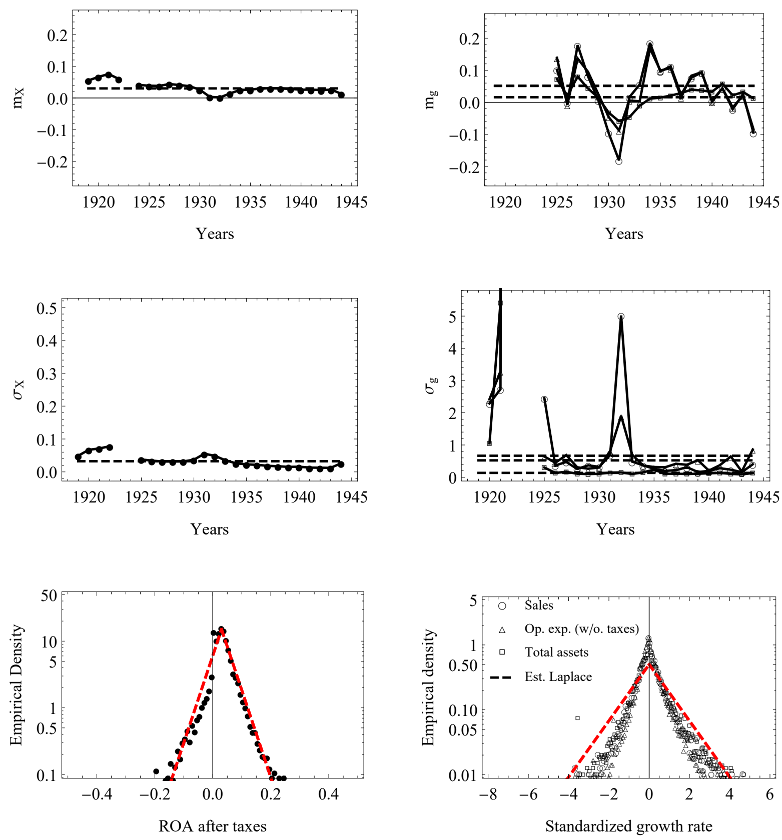


Figure 4.1: Location, dispersion and empirical distribution of profit (left) and growth rates (right, ○ sales, △ costs and □ total assets) of non-financial corporations in Germany in the period 1919-1944. From top to bottom: time evolution of the annual median of profit and growth rates, time evolution of the mean deviation from the median profit and growth rates, and the empirical distribution of profit and growth rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates are used to estimate a Laplace distribution (red). In case of growth rates, red dashed lines indicate a standard Laplace distribution $(0, 1)$. Extreme values during the hyperinflation between 1922 and 1925 have been omitted.

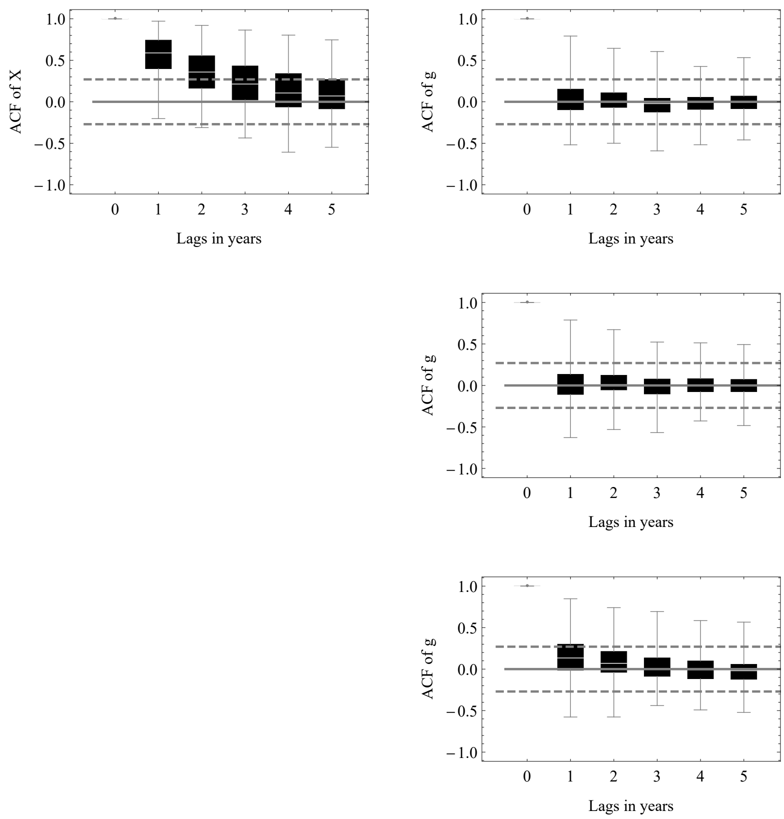


Figure 4.2: Autocorrelation plots for profit (left) and growth rates (right, from top to bottom: sales, costs and total assets) of non-financial corporations in Germany in the period 1919-1944. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 26 years.).

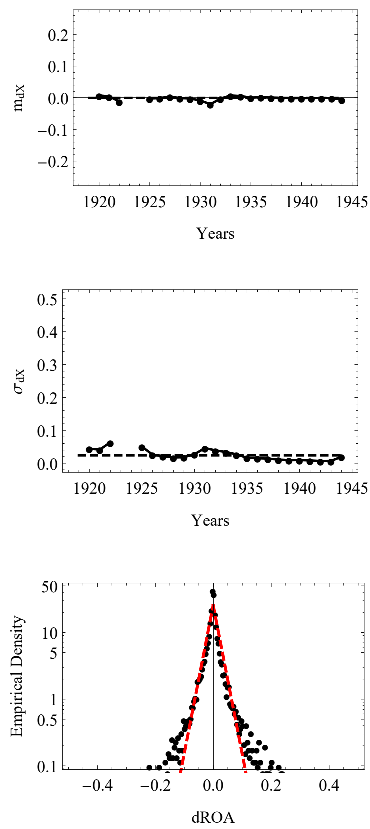


Figure 4.3: Location, dispersion and empirical distribution of profit rates of non-financial corporations in Germany in the period 1919-1944. From top to bottom: time evolution of the annual median point change in profit rates, time evolution of the mean deviation from the median point change in profit rates, and the empirical distribution of point changes in profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates are used to estimate Laplace distribution (red). Extreme values during the hyperinflation between 1922 and 1925 have been omitted.

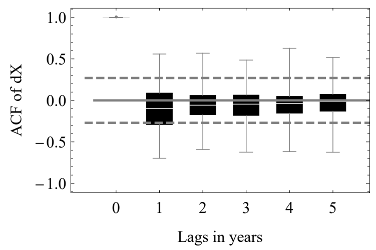


Figure 4.4: Autocorrelation plots for point changes in profit rates of non-financial corporations in Germany in the period 1919-1944. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 25 years.).

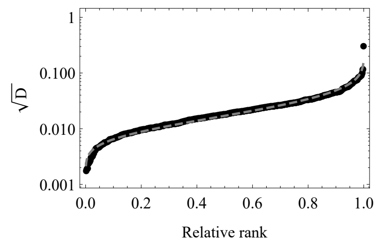


Figure 4.5: Relative rank plot of firm-specific diffusion constants $\sqrt{D}$ for non-financial corporations in Germany in the period 1919-1944. Dashed lines indicate an estimated Inverse Normal distribution.

erratically. As we show in appendix A, the annual change in profit rates relates directly to the diffusion coefficient of the reduced-form model of corporate profitability. Being the only firm-specific parameter in the model, the diffusion coefficient D captures all idiosyncracies of individual corporations. Figure 4.5 shows the rank plot of the square roots of diffusion coefficients ($\sqrt{D}$) for the 738 corporations. The values roughly span two orders of magnitude (0.001 to 0.100) with a median $\sqrt{D}$ of 0.019, which is surprisingly similar to the value 0.018 for the international sample in chapter 5.

Overall, our empirical findings on the statistical behavior of profit rates match our model-based simulations from chapter 2.2 and compare favorably with the empirical findings in the historical U.S sample in chapter 3 and the international sample in chapter 5. Characteristic to profit rates are (i) a stability in the location (median) and dispersion (mean deviation from median) of profit rates, with only transitory fluctuations during extreme events (such as economic crises and wars), (ii) an empirical distribution matching with a Laplace distribution (characterized by the median and mean deviation thereof), (iii) significant positive, decaying autocorrelation. Our previous findings support these characteristics for the profit rates of German corporations during the period 1919-1944.

4.4 *Discussion*

Although the period 1919-1944 was a particularly turbulent time in German history, we encountered statistical regularities in the profitability and growth of corporations, first and foremost a stable location and dispersion of profit rates in most years, leading to a harmonious empirical distribution in the pooled data. In this respect, our findings on profitability in the German interwar period qualitatively resemble the ones identified in the economy of the United States (see chapter 3) or the international sample (see chapter 5). Our focus on statistical and especially distributional regularities and our use of comprehensive microdata rather than aggregate macrodata, however, differ markedly from the predominant methodology in earlier studies. Thereby, our study delivers novel insights but also contrary findings that need further explanation and qualification.

Figure 4.6 displays side-by-side the empirical distributions of profit rates (left) and annual changes in profit rates (right) for different industries. The profit rate distributions of different industries all fall well onto each other and coincide with the estimated distribution of the pooled data.[6] Thus, the distributional shape that characterizes the pooled data, also characterizes the disaggregated data of individual industries. Thereby, the reduced-form model proposed earlier delivers a potential explanation for the outcomes on the aggregate (country) as well as disaggregate level (industries). Capital reallocation and profit rate equalization seem to work within and across industries, leading to identical distributional outcomes.

[6] Note that agriculture is omitted from the analysis as there are only 6 corporations in the sample. The very few observations do not allow for a distributional analysis.

In a similar vein, Figure 4.7 displays side-by-side the empirical distributions of profit rates (left) and annual changes in profit rates (right) for German cities, counties and the country. Dashed lines indicate the estimated Laplace Distribution of the pooled data. Independent of the scale we are analyzing, distributions fall onto each other and coincide with the estimated distribution from the pooled data for Germany. In other words, we find the same distributional patterns that the reduced-form model is able to replicate on the level of cities, counties and the country. Thus, capital reallocation and profit rate equalization are mechanisms at play on all geographic levels. Given the idea of (high) capital mobility within a legally, economically and socially unified German state, equalization of profit rates across cities and counties does not come as a surprise. Organizational patterns such as corporations absorbing their suppliers (vertical integration) or their competitors (horizontal integration) as well as corporations operating several plants across different cities and counties might all just be symptoms of capital reallocation that (knowingly or unknowlingly) equalizes profit rates at different levels of aggregation. Thereby, the estimated Laplace distribution of the pooled data (see Figure 4.1, bottom left) remains a valid description of corporate profitability on different levels of aggregation.

In order to unveil the impact of systemic change in 1933 on corporate profitability, we split the sample in the time dimension into one for the democratic Weimar Republic (1919-1932) and one for the totalitarian Nazi Germany (1933-1944). Figure 4.8 replicates the plots of figures 4.1 (left) and 4.3, yet with location and dispersion esti-

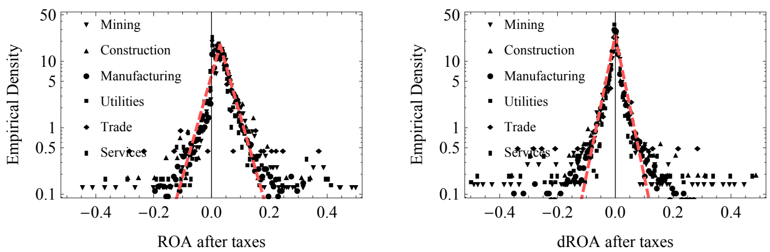


Figure 4.6: Scaling analysis of profit rates (left) and point changes in profit rates by industries. Red dashed lines indicate the estimated Laplace distribution (m, σ) for the pooled data.

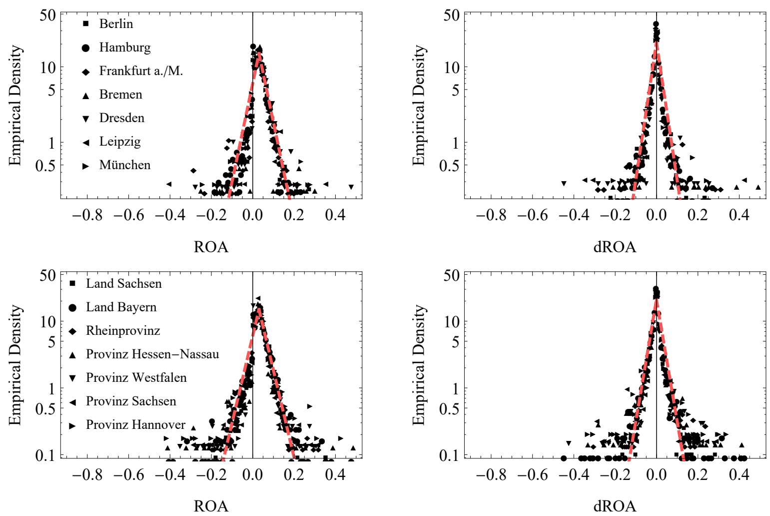


Figure 4.7: Scaling analysis of profit rates (left) and point changes in profit rates for German cities (top) and counties (bottom) in the period 1919-1944. Red dashed lines indicate the estimated Laplace distribution (m, σ) for the pooled data.

mated for each time period individually (excluding the years of hyperinflation). Outside years of hyperinflation (before 1924) and the Great Depression (1929-1932), the location and dispersion of profit rates are characterized by stability, yet at different levels before and after the Great Depression (see Figure 4.8, top left). Before the crisis (1924-1929), the median profit rate amounted to about 4.0%. In the wake of the Great Depression the median rate declined to 0.2% (1932), not fully recovering thereafter, leveling off around 3.1% in the period 1933 to 1944. Thus, the Weimar Republic saw profitability of the median corporation almost one percentage point higher than Nazi Germany.

The higher profitability of German corporations during the Weimar years, however, came at the cost of more dispersion in profit rates (see 4.8, middle left). The mean deviation from the median rate was around 4.5% before the crisis, increased to 5.5% during the Great Depression (1931) and declined to around 2.0% thereafter. Similarly, the dispersion in the annual changes in profit rates decreased markedly after 1933 (see 4.8, middle right), leading to a narrower distribution of annual changes in profit rates (see 4.8, bottom right).[7] Thus, profitability differentials between German corporations decreased markedly after 1933, leading to a tighter, more peaked distribution of profit rates (see 4.8, bottom left). In that sense, the Nazi regime saw profitability across German corporations more equalized but around a lower median rate than during the Weimar years.

[7] The change in profit rates for the median corporation stays close to 0% for almost all years, the hyperinflation period and the Great Depression marking the only deviations. Thus, any gains in profitability by some corporations seem to be matched by losses of profitability by other corporations.

Figure 4.9 shows annual plots of the empirical distribution of profit rates for each year from 1919 to 1944, where once more blue is associated with the democratic Weimar Germany, brown with to-

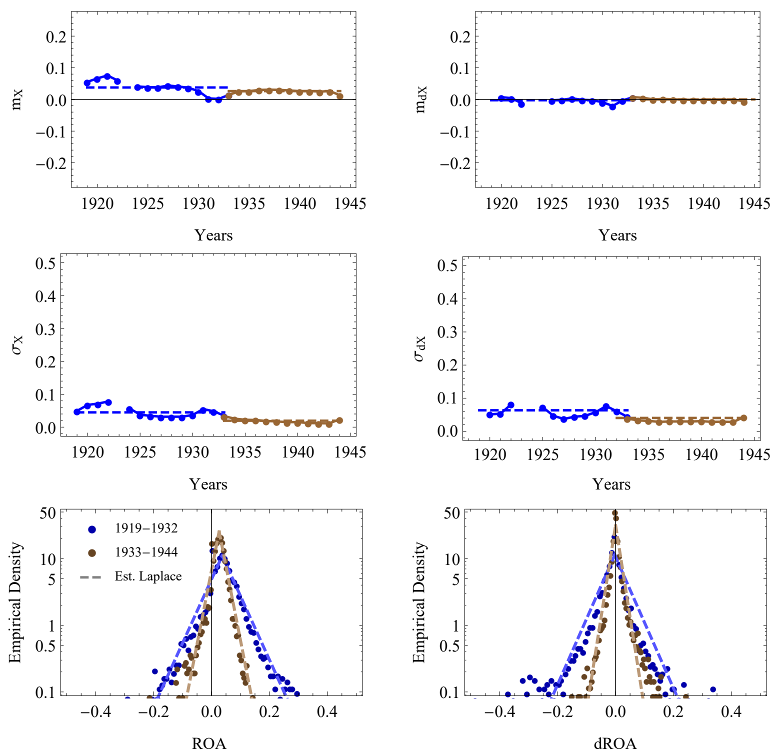


Figure 4.8: Location, dispersion and empirical distribution of profit rates (left) and point changes in profit rates (right) of non-financial corporations in Germany in the period 1919-1944, comparing outcomes before (blue) and after 1933 (brown). From top to bottom: time evolution of the annual median of profit rates and point changes in profit rates, time evolution of the mean deviation from the median profit rate and point change in profit rates and the empirical distribution of profit rates and point changes in profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that are used to estimate a Laplace distribution. Extreme values during the hyperinflation between 1922 and 1925 have been omitted.

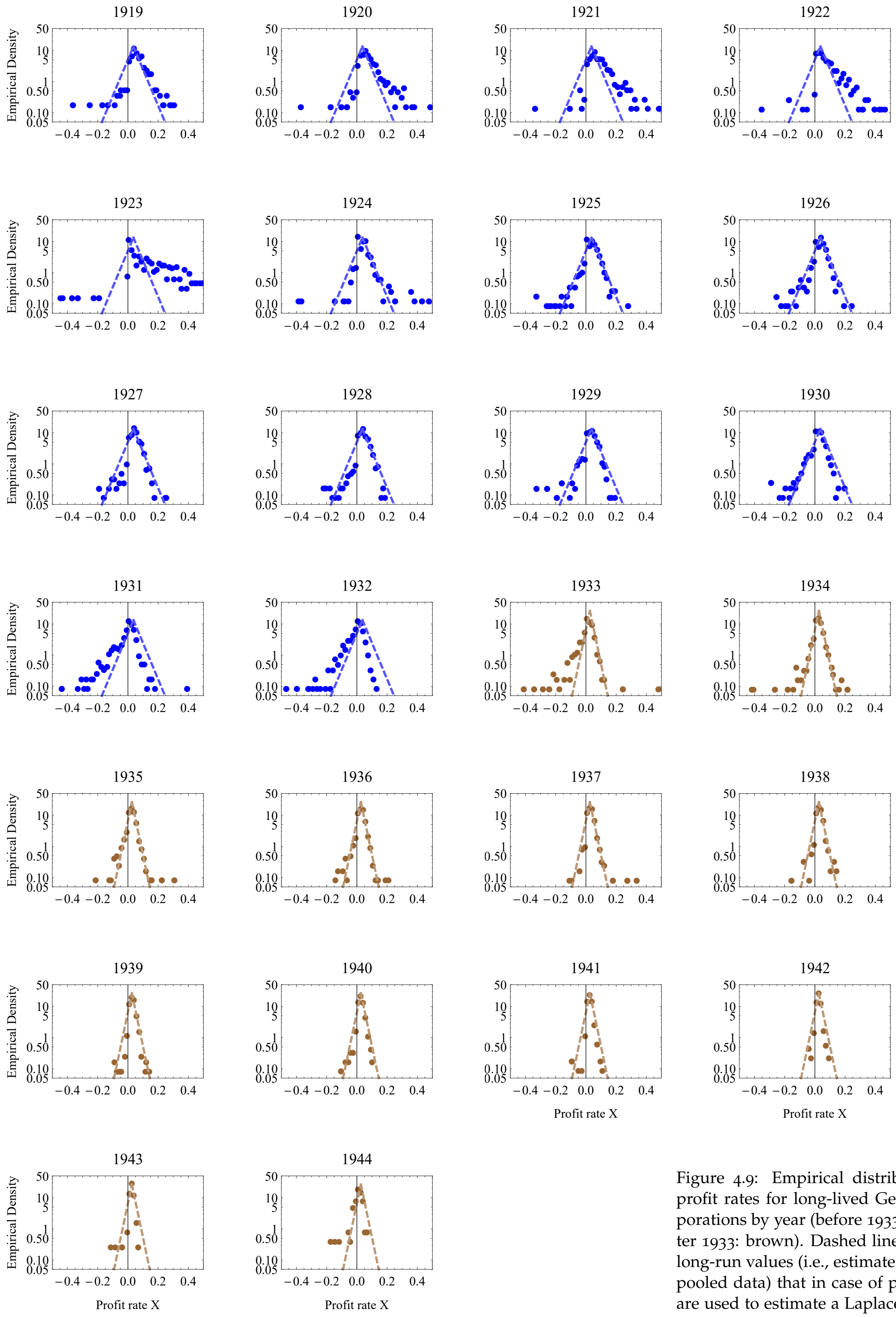


Figure 4.9: Empirical distributions of profit rates for long-lived German corporations by year (before 1933: blue, after 1933: brown). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that in case of profit rates are used to estimate a Laplace distribution.

talitarian Nazi Germany. Dashed lines indicate estimated Laplace distributions for the pooled data of the period 1924-1932 (blue) and 1933-1944 (brown). While for most years observations fall well onto estimated Laplace distributions, there are two pronounced deviations observable. First, during the hyperinflation period (1920-1923) more and more corporations turned increasingly profitable, making unprofitable corporations a rare exception. Thus, the right tail of the distribution bends outwards while the left tail disappears almost completely. Rather then representing real economic tendencies, the bending reflects the struggle of accounting to account for inflation. While operating income is largely driven by immediate adjustments in prices and wages, total assets comprise past investments whose current values need to be determined according to valuation and depreciation conventions. Therefore, the numerator of the profit rate adjusts almost automatically with changes in prices or costs while the denominator is subject to rigid conventions that make adjustment slow.

Second, during the severest years of the Great Depression (1929-1932), an increasing number of corporations incurred heavy losses, heavier than before the Great Depression. At the same time, the remaining corporations able to operate profitable, earned profits substantially smaller than those before the Great Depression. Thus, the left tail bends outwards while the right tail bends inwards. Recovery set in around 1932 with losses becoming less frequent and, more importantly, smaller. Consequently, profits became more frequent again, yet they did not recover to pre-crisis levels. As remarked earlier, the distribution of profits after 1932 is characterized by a lower median profit rate and a smaller dispersion, that is a lower mean deviation from the median. By 1934, the empirical distribution of profit rates once more had stabilized in a shape well described by a Laplace distribution. In contrast to the period before 1929, however, parameters have persistently changed. Therefore, the distributional shape of profit rates appears to be robust w.r.t. to time and the political environment, yet location and dispersion are not.

Overall, fluctuations in the location and dispersion of profit rates during the Great Depression and World War 2 appear to be less pronounced in Germany than in the U.S., the latter shown in chapter 3. While in the U.S. profit rates did not recover to pre-crisis levels as well, World War 2 was accompanied by excessive profits and thus, profit rates far above pre-crisis levels. Thereby, the location of profit rates before and after the Great Depression, at least on average, reached similar levels in the U.S. while it remained below pre-crisis levels in Germany. This difference in the experiences might be an artifact of the data analyzed. While the U.S. data is based on income before taxes, the German data is based on income after taxes. Unfortunately, data on taxes has not been part of the standard accounting representations in German annual reports up until the 1930s, leaving us with only fragmentary and inharmonious records. Profit rates calculated on pre-tax income derived from these fragmentary records,

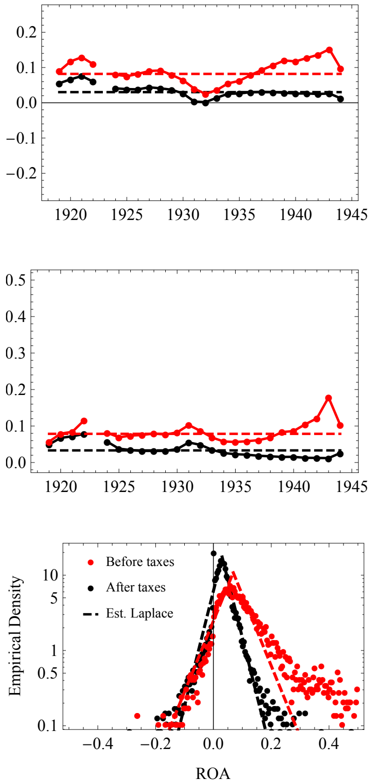


Figure 4.10: Location, dispersion and empirical distribution of pre-tax (red) and after-tax profit rates (black) of non-financial corporations in Germany in the period 1919-1944. From top to bottom: time evolution of the median of profit rate, time evolution of the mean deviation from the median profit rate, and the empirical distribution of profit rates (dots). Dashed lines indicate long-run values (i.e., estimates from the pooled data) that are used to estimate a Laplace distribution. Extreme values during the hyperinflation between 1922 and 1925 have been omitted.

however, unveil a full recovery until the late 1930s and excessive profitability during World War 2 also in Germany (see 4.10, top). There, high wartime profit rates even lead to a deviation from the Laplace distribution in the left tail (see 4.10, bottom). Thus, in face of the Great Depression and World War 2 profitability of German corporations moves very similar to the profitability of American corporations, once we use comparable pre-tax income data. The persistently lower profitability of corporations in Nazi Germany as compared to Weimar Germany observed earlier, therefore might be the result of heavier taxation of businesses during the 1930s and 1940s.

4.5 Concluding Remarks

In this chapter we have analyzed the profitability and growth of German corporations during the interwar period and World War II, using data collected from annual reports deposited in the press archives of the *Hamburgisches Welt-Wirtschafts-Archiv* (HWWA) and the *Institut für Weltwirtschaft* (IfW). Our sample covers 738 non-financial corporations from all throughout the German Reich in the years 1919 to 1944. We then applied the statistical and distributional analysis of profit rates suggested by the reduced-form model of capital reallocation across competitive firms of Alfarano et al. (2012) presented in chapter 2.2. We are able to replicate all their key findings, especially the Laplace distribution of profit rates. Deviations exclusively appear throughout exceptional economic circumstances such as the hyperinflation in the early 1920s or the Great Depression in the late

1920s/early 1930s. Overall, the observed patterns in corporate profitability match with observations in other studies on other countries. Even the turn from a democratic to a totalitarian system seems not to alter the qualities of profit rate dynamics — the statistical and distributional patterns remain. It is the quantities that change after 1933 — the location and dispersion of profit rates decrease to a lower level. Yet, the decline might be the result of the use of after-tax income data, as the more fragmentary before-tax income data hints at excessive wartime profits and excessive wartime taxation of businesses respectively. Thus, the lower profitability of corporations in Nazi Germany may reflect a heavier tax burden on corporations, financing the regime and the war. In line with the pertinent literature in economic history, we cannot identify a clear-cut break.

Nevertheless, corporate profitability is characterized by surprisingly robust and universal statistical and distributional patterns that apparently keep their validity at very different times and in very different countries. The original findings on the U.S. during the 1980s to early 2010s presented by Alfarano et al. (2012) and further elaborated on by Mundt et al. (2015) and Mundt (2017), seem be valid inside and outside the U.S., for earlier, economically and even politically more extreme time periods. With the collection of historical data being an exceptionally tedious task — for both studies, on the U.S. in chapter 3 and Germany in this chapter, the data was largely collected by hand — the last puzzle piece is to analyze the statistical and distributional patterns in profitability for a diverse set of countries. This is done in the next chapter, by using the readily available data from Thomson Reuters Datastream on as much as 49 countries around the world throughout the 1980s to early 2010s.

Part II
Corporate Profitability and Growth in International Perspective

5
The Myth of Corporate Individualism: Universal Profit and Growth Dynamics Around the World

Abstract

We analyze the statistical patterns in corporate profitability and growth within an international dataset of more than 54,000 publicly-traded corporations from 45 countries for the period 1983 to 2013. We find pronounced differences in the profitability and growth of the average corporation across different countries, relating to the legal origins of the underlying corporate law. At the same time, the scale of fluctuations, the Laplace-like distribution and the characteristic time scales involved in the dissipation of abnormal profit and growth rates are remarkably similar across countries, independent of their stage of economic development, their political and social environment. We interpret this finding in the sense that the processes of competition and capital reallocation – the core processes embedded in our proposed data-generating model – are universal, marking an international phenomenon.

5.1 Profitability and Growth Dynamics of Corporations Around the World

In the previous chapters, our analysis of the dynamics of corporate profitability and growth focused on extensions along the time dimension. In analyzing corporate profitability and growth during various episodes throughout the 19th, 20th and 21st century, we uncovered surprisingly robust and strikingly similar statistical patterns, both within and across the United States and Germany. In this chapter, we reorient our analysis to extensions along the geographical dimension by adding more countries to the sample.[1]

We apply the approach of Alfarano et al. (2012) and Mundt et al. (2015), who analyzed corporate profitability and growth in the United states, to an additional 44 countries from around the world. In doing so, we are not aiming for a country-by-country replication of the original analyses in the first place but for an overarching analysis of all 45 countries. Thereby we test for the robustness and universality of the originally observed statistical regularities within an interna-

[1] Extending the number of observations along the geographical dimension comes at the cost of less observations along the time dimension. Thomson Reuters Datastream provides company fundamentals for large and established economies such as the United States or the United Kingdom from no earlier than the 1980s; for smaller and/or transition economies records are even sparser and start from no earlier than the mid-1990s. Extending the sample period with historical data as we have done in chapters 3 and 4 is beyond the scope of this thesis. Therefore, this analysis focuses on the time period 1983 to 2013.

tional set of corporations. We furthermore document differences in profitability between countries and sectors, identify their potential origins and evaluate their impact on the observed statistical regularities.

First, we will provide a description of our data set concerning its geographical and temporal coverage as well as its sectoral composition. We will then discuss the empirical findings, starting from a comparative view on profit and growth rates and moving into an in-depth analysis of profit rates w.r.t. the proposed model of Alfarano et al. (2012) presented in chapter 2.2. We will then discuss observed differences in profitability across countries, their potential origins and impacts on the dynamics of corporate profitability.

5.2 *Data Description*

We obtain our data from *Thomson Reuters Datastream* and its *Worldscope Database*, a comprehensive collection of corporate financial data covering developed and emerging markets. For the present study, we extracted the accounts of 54,422 corporations that are domiciled in 45 countries around the world (see Figure 5.1).[2] The selection of countries was significantly determined by the availability of sizable corporate records along the time-series and cross-sectional dimension. In this respect, Africa, Central Asia and much of Eastern Europe form a blind spot. In Africa, corporations are a rather uncommon form of business organization so that small cross-sections (besides generally incomplete/short time-series) are the limiting factor. In Central Asia and Eastern Europe, corporations just reemerged as a form of business organization relatively recently after the fall of communism so that short time-series are the limiting factor. Table 5.1 summarizes the sample characteristics for the 45 countries included in the study.

[2] We used Worldscope items WC06026 (Nation) and WC06027 (Nation Code) to identify the country in which a corporation is domiciled. While economic activities often take place across borders, the domicile exerts influence on the legal and organizational structures and, thus, impacts critically on the performance of the corporations (cf. chapter 5.4, Institutional Hypothesis).

In general, we organize our data in two distinct and diametrically opposed settings: unbalanced and balanced panels. Unbalanced

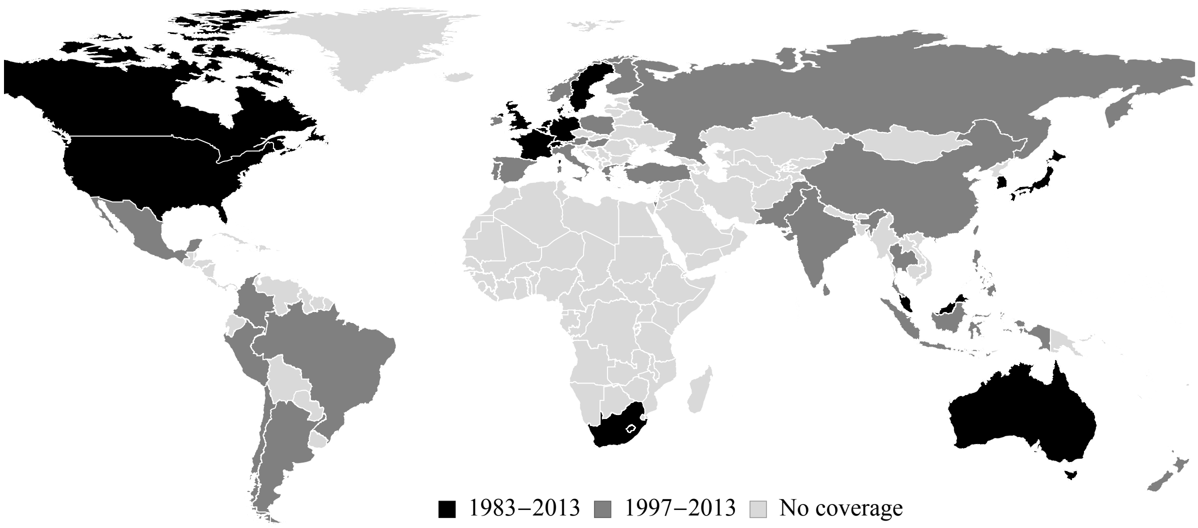


Figure 5.1: World map visualizing the countries inlcuded in the sample. Data availability varies between countries, leading to different observation periods (short series, 1997-2013; long series, 1983-2013).

Country	Series	Unbalanced	Balanced	Surv. Rate
Argentina	1997-2013	116	23	0.198
Australia	1983-2013	2,402	17	0.007
Austria	1997-2013	138	36	0.261
Belgium	1983-2013	221	10	0.045
Brazil	1997-2013	532	62	0.117
Canada	1983-2013	3,966	48	0.012
Chile	1997-2013	228	57	0.250
China	1997-2013	3,279	116	0.035
Colombia	1997-2013	79	10	0.127
Denmark	1983-2013	261	10	0.038
Finland	1997-2013	187	70	0.374
France	1983-2013	1,469	44	0.030
Germany	1983-2013	1,268	51	0.040
Greece	1997-2013	366	71	0.194
Hong Kong	1983-2013	1,068	20	0.019
Hungary	1997-2013	56	10	0.179
India	1997-2013	2,502	225	0.090
Indonesia	1997-2013	441	113	0.256
Ireland	1997-2013	125	20	0.160
Israel	1997-2013	484	27	0.056
Italy	1997-2013	371	82	0.221
Japan	1983-2013	4,647	467	0.100
Malaysia	1983-2013	1,142	17	0.015
Mexico	1997-2013	181	51	0.282
Netherlands	1983-2013	330	17	0.052
New Zealand	1997-2013	189	25	0.132
Norway	1997-2013	374	46	0.123
Pakistan	1997-2013	242	39	0.161
Peru	1997-2013	147	20	0.136
Philippines	1997-2013	196	56	0.286
Poland	1997-2013	475	22	0.046
Portugal	1997-2013	111	23	0.207
Russian Federation	1997-2013	695	17	0.024
Singapore	1983-2013	737	18	0.024
South Africa	1983-2013	663	18	0.027
South Korea	1983-2013	2,038	16	0.008
Spain	1997-2013	222	65	0.293
Sri Lanka	1997-2013	172	12	0.070
Sweden	1983-2013	740	17	0.023
Switzerland	1983-2013	317	14	0.044
Taiwan	1997-2013	2,004	171	0.085
Thailand	1997-2013	585	170	0.291
Turkey	1997-2013	314	60	0.191
United Kingdom	1983-2013	3,571	71	0.020
United States	1983-2013	14,771	546	0.037
Short Series (28)	1997-2013	14,811	1,699	0.115
Long Series (17)	1983-2013	39,611	1,401	0.035
Total	————	54,422	3,100	0.057

Table 5.1: Number of corporations in the unbalanced and balanced samples by countries. The survival rate states the corporations in the balanced sample as a share of the unbalanced sample.

panels contain the records of corporations of any age, irrespective of whether they survived in the market for a single year or an entire sample period. In other words, unbalanced panels reflect market selection with firms continuously entering and exiting the sample. Thus, we observe different firms at different points in time. In total, the 54,422 corporations deliver more than half a million corporation-year observations. Balanced panels, in contrast, only contain corporations that survived the market for the entire sample period (either 1983-2013 for long series or 1997-2013 for short series countries). Entry and exit of firms is basically neutralized so that we observe the same firms at any given point in time. Only 3,100 corporations stayed in the market for the entire sample period (1,401 for 1983-2013 and 1,699 for 1997-2013), giving us more than 70,000 corporation-year observations. The distinction between unbalanced and balanced panels of firms, thus, is a distinction between the analysis of profitability and growth dynamics with and without entry and exit.

Overall, we compiled the records of 54,422 corporations from 45 countries, containing annual information on sales (field ID: WC01001), operating income (WC01250), operating expenses (difference between income and sales, WC01001 - WC01250) and total assets (WC02999). For 17 out of 45 countries, a total 39,611 corporations, the records cover the period 1983-2013 (long series). These countries constitute mostly large and established economies that between 1983 and 2013 accounted for around 70% of world GDP. For the remaining 28 countries, a total of 14,811 corporations, the records cover the period 1997-2013 (short series). Among these countries we find many of the smaller and also several emerging/developing economies. Together these 28 countries accounted for another 20% of world GDP so that between 1997 and 2013 all 45 countries accounted for around 90% of world GDP. For the period 1983 to 1996, the corporations in our sample make up about 60% of all listed companies in the world, for the period 1997 to 2013 we cover between 80% to 90% of the world's listed companies. Thus, despite of substantial blind spots in Africa, Central Asia and Eastern Europe, the countries and corporations in the sample provide comprehensive insight into economic activities on an international level.

With respect to the specific areas of economic activity, we limit ourselves to the non-financial sphere, as the structure of and magnitudes in accounting records of non-financial corporations differ substantially from the ones of financial corporations. Therefore, we explicitly exclude all financial corporations, generally covered by industrial division H (Finance, insurance and real estate, four-digit Standard Industrial Classification (SIC) codes $60xx$ to $67xx$).[3] Table 5.2 shows the distribution of corporations in the unbalanced sample across the eight non-financial industrial divisions for each of the 45 countries. In general, there are corporations present in all of the eight industrial divisions in almost all countries, Hungary and Portugal forming rare exceptions. In specific, almost one half of all corporations is in manufacturing (division D), making up the largest share

[3] The Worldscope Database assigns up to eight SIC codes (WC07021-28, four-digit SIC Codes 1-8) to a corporation, describing its economic activities in descending order of importance. Many corporations are assigned only one SIC code or, as is the case for many diversified corporations, multiple related SIC codes that fall into the same industry group (first three-digits), major group (first two-digits) or industrial division. For example, production of butter is given SIC code 2021 (Creamery butter), which is part of industry group 202 (Dairy products), major group 20 (Food and kindred products), and industrial division D (Manufacturing). For our purposes we focus on the industrial division of the most important economic activity of a corporation (SIC code 1).

Country	Industrial divisions*								
	A	B	C	D	E	F	G	I	Total
Argentina	7	10	7	55	27	3	3	4	116
Australia	44	1,224	49	366	162	75	56	426	2,402
Austria	1	1	9	77	16	7	5	22	138
Belgium	3	9	7	101	24	16	13	48	221
Brazil	15	15	32	250	133	13	31	43	532
Canada	22	2,372	29	690	227	81	88	457	3,966
Chile	13	10	10	77	63	10	12	33	228
China	61	109	226	2,065	241	140	135	302	3,279
Colombia	11	3	5	34	15	1	3	7	79
Denmark	4	3	11	127	29	22	7	58	261
Finland	1	3	6	99	15	14	11	38	187
France	14	21	41	670	113	96	99	415	1,469
Germany	5	20	31	650	134	65	56	307	1,268
Greece	12	6	36	136	55	37	35	49	366
Hong Kong	10	40	99	419	109	103	94	194	1,068
Hungary	0	1	0	27	15	3	5	5	56
India	29	51	150	1,682	132	65	29	364	2,502
Indonesia	20	49	38	177	60	37	27	33	441
Ireland	4	29	3	37	10	6	3	33	125
Israel	1	20	33	226	38	42	20	104	484
Italy	1	5	8	202	76	14	12	53	371
Japan	9	17	346	2,093	250	421	560	951	4,647
Malaysia	66	33	117	547	99	57	43	180	1,142
Mexico	1	6	17	86	28	7	23	13	181
Netherlands	2	8	23	142	29	32	14	80	330
New Zealand	13	10	5	57	39	12	21	32	189
Norway	9	66	13	132	72	11	12	59	374
Pakistan	1	4	3	195	21	4	2	12	242
Peru	16	24	2	69	17	7	6	6	147
Philippines	3	33	21	59	37	6	7	30	196
Poland	2	7	54	193	49	35	26	109	475
Portugal	1	0	8	46	16	7	6	27	111
Russian Federation	7	77	41	311	199	18	22	20	695
Singapore	7	31	66	335	69	60	46	123	737
South Africa	10	117	27	205	52	48	60	144	663
South Korea	10	9	95	1,470	83	86	46	239	2,038
Spain	2	4	24	89	43	15	9	36	222
Sri Lanka	12	1	4	80	10	17	10	38	172
Sweden	4	36	17	327	69	30	34	223	740
Switzerland	1	3	7	183	41	11	20	51	317
Taiwan	3	1	95	1,546	62	113	46	138	2,004
Thailand	3	10	48	304	59	48	27	86	585
Turkey	5	5	11	208	23	16	21	25	314
United Kingdom	28	359	124	1,144	303	180	297	1,136	3,571
United States	67	1,067	188	5,816	1,594	592	975	4,472	14,771
Total	560	5,929	2,186	23,804	4,958	2,683	3,077	11,225	54,422

* Industrial divisions are given by: A (Agriculture, forestry and fishing), B (Mining), C (Construction), D (Manufacturing), E (Transportation, communications, electric, gas and sanitary services), F (Wholesale trade), G (Retail trade), and I (Services).

Table 5.2: Total number of all corporations in the sample by industrial division.

across all and within most countries. Corporations in services (division I) make up the second largest share of all corporations, with one fifth of all corporations across yet not within all countries. There are several Latin American and Asian countries, where the majority of corporations is to be found in manufacturing and corporations in services are less numerous. Finally, corporations in mining (division B) make up the third largest share with one tenth of all corporations across all countries yet the majority of these is concentrated in only two countries, Australia and Canada. Both these countries make an exceptional case given their dominant focus on mining. The remaining divisions of agriculture (division A), construction (division C), transport and utilities (division E) as well as wholesale and retail trade (divisions F and G) together make up a quarter of all corporations across countries, with agriculture being the smallest division.

Starting with the analysis of the pooled data, we will split the data along salient geographical, cultural, sectoral and temporal dimensions proposed by the literature later on. In so doing, we obtain robustness checks for the observed statistical regularities and potential explanations for distortions and departures from these statistical regularities that inform the discussion of our findings. The respective requirements for and implications of splitting the data along salient dimensions are to be discussed at the respective instances in chapters 5.3 and 5.4.

5.3 *Empirical Findings*

We start with the analysis of the pooled data, shuffling together corporations from all (non-financial) industrial divisions, all countries and all sample periods. In so doing, we follow a highly unconventional strategy for analyzing the data, at odds with much of the pertinent literature. While studies of (groups of) corporations, industries, sectors, and countries usually take account of individual fates as well as specificities of sectors, industries, countries and time, we explicitly neglect all these specificities by pooling the data. Put differently, we lift the analysis in Alfarano et al. (2012) from the country to the global level, aiming for an identification of universal statistical patterns in corporate profitability (and growth) and for a validity test of the proposed statistical equilibrium model of profitability in competitive firms. Despite the information loss in the time-series and cross-sectional dimension of corporate profitability at the first stage, we will reintroduce many potential specifities in robustness checks at the second stage. [4] Thereby, we gain a comprehensive insight into the dynamics of corporate profitability on all levels.

Figure 5.3 illustrates the location, dispersion and empirical distribution of pooled profit (left) and growth rates (right) for unbalanced and balanced samples of corporations. Despite the unconventional pooling of the data, shuffling short and long series of corporate performance from different industrial sectors and countries, the by now well known statistical regularities for profit and growth rates emerge.

[4] In Appendix E we provide individual country profiles that reproduce the results reported in this chapter for each of the 45 countries individually. Discussing in detail each individual case is beyond the scope of this study. Therefore, we will only episodically compare the findings in the pooled data to individual country cases and otherwise will stick to a global perspective.

The median profit rate (m) for yearly cross-sections of the balanced panel follows a remarkably stable and continuous path around the phenomenological value of $m = 6.0\%$, while the median profit rate of the unbalanced panel, initially following a similar path, diverges below the phenomenological value from the mid-1990s onward. At the same time, the mean deviation from the median profit rate (s) of the unbalanced panel increases dramatically, diverging from the relative stable value of near the phenomenological $\sigma = 5.8\%$ in the balanced panel. The empirical density plot unveils a stark asymmetry in the distribution of profit rates of the unbalanced panel. We observe substantially more frequent and more extreme losses than in the balanced panel, which follows a symmetric Laplace distribution of phenomenological parametrization ($m = 0.060$ and $\sigma = 0.058$).

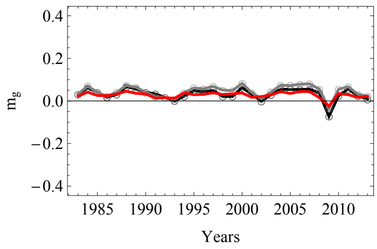


Figure 5.2: Time-series of annual median growth rates of real sales for the unbalanced (gray) and balanced panel (black) compared to the annual median growth rate of real GDP (red) for the period 1983-2013. Data sources for GDP data: Organisation for Economic Co-operation and Development (2016a)

The location and dispersion of real growth rates, irrespective of whether we use deflated sales, operating expenses or total assets, tend to follow similar trends, displaying stability neither in the unbalanced nor in the balanced panel. Annual cross-sectional median real sales growth is characterized by cyclical fluctuations that resemble closely the general fluctuations of the business cycle observable in real GDP growth (cf. Figure 5.2), with significant downturns during the late 1980s/early 1990s, around 2000 (Dot.Com Crash) and 2007 (Great Recession). Much as in the case of profit rates, location and dispersion of growth rates in the unbalanced panel diverge from the location and dispersion of the balanced panel. From the mid-1990s onward, the median growth rate and even more so its deviation increase substantially in the unbalanced panel as compared to the balanced panel. Given these substantial changes in both, location and dispersion, we plot the empirical density for standardized growth rates. Irrespective of whether we plot the empirical density of sales, operating costs or total assets growth rate, for either the unbalanced or balanced panel, once standardized the distributions fall onto each other, close to the standard Laplace distribution ($m = 0$ and $\sigma = 1$), yet slightly fatter tailed. Thus, we observe standardized growth rates in the center and out in the tails of the distribution more frequently than expected under a Laplace distribution. Differences in the statistical behavior of profit and growth rates, so far w.r.t. to the stability in location, dispersion and the empirical distribution, are also present in the autocorrelation of corporation-level time-series of profit and growth rates

Figure 5.4 shows Box-Whisker plots of the autocorrelation coefficients of profit (left) and growth rates (right) for the balanced panel.[5] While we cannot detect significant autocorrelation in growth rates, a finding well established in the literature, we find significant positive, (approximately exponentially) decaying autocorrelation in profit rates. Thus, growth rates behave rather erratically with current growth rates not carrying information about future growth rates. In contrast, profit rates display persistence so that current profit rates carry substantial information about future profit rates.

[5] Given the difficulties in calculating time-series statistics for varying sample lengths, we cannot report comparable findings on autocorrelation for the unbalanced panel.

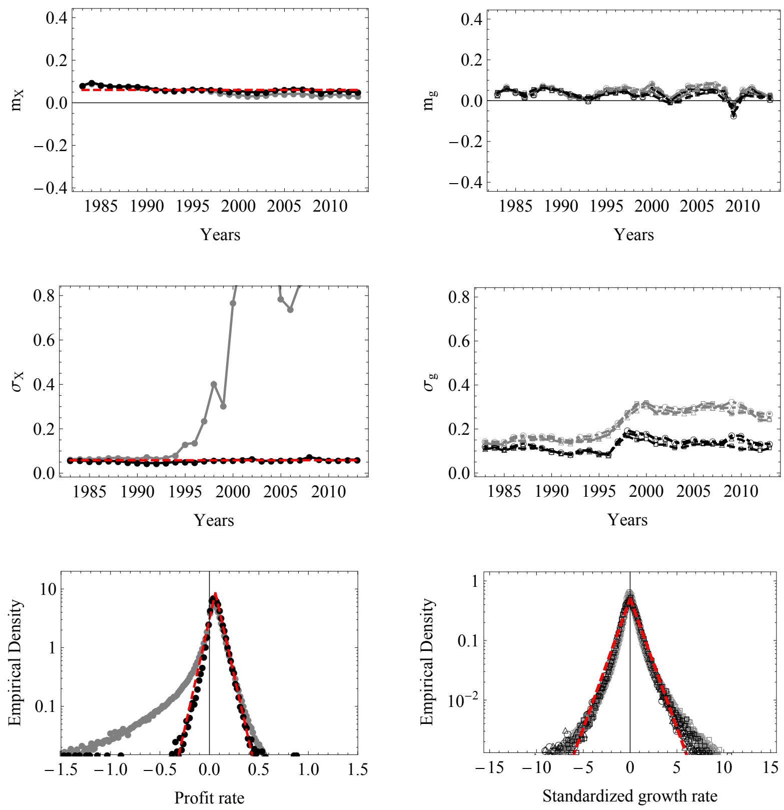


Figure 5.3: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the pooled subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

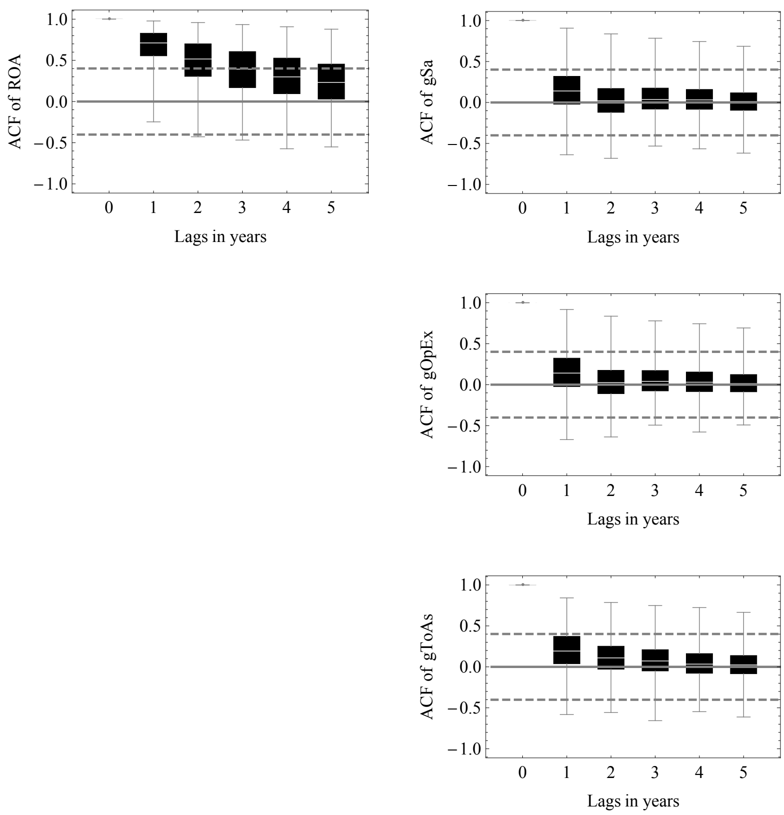


Figure 5.4: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

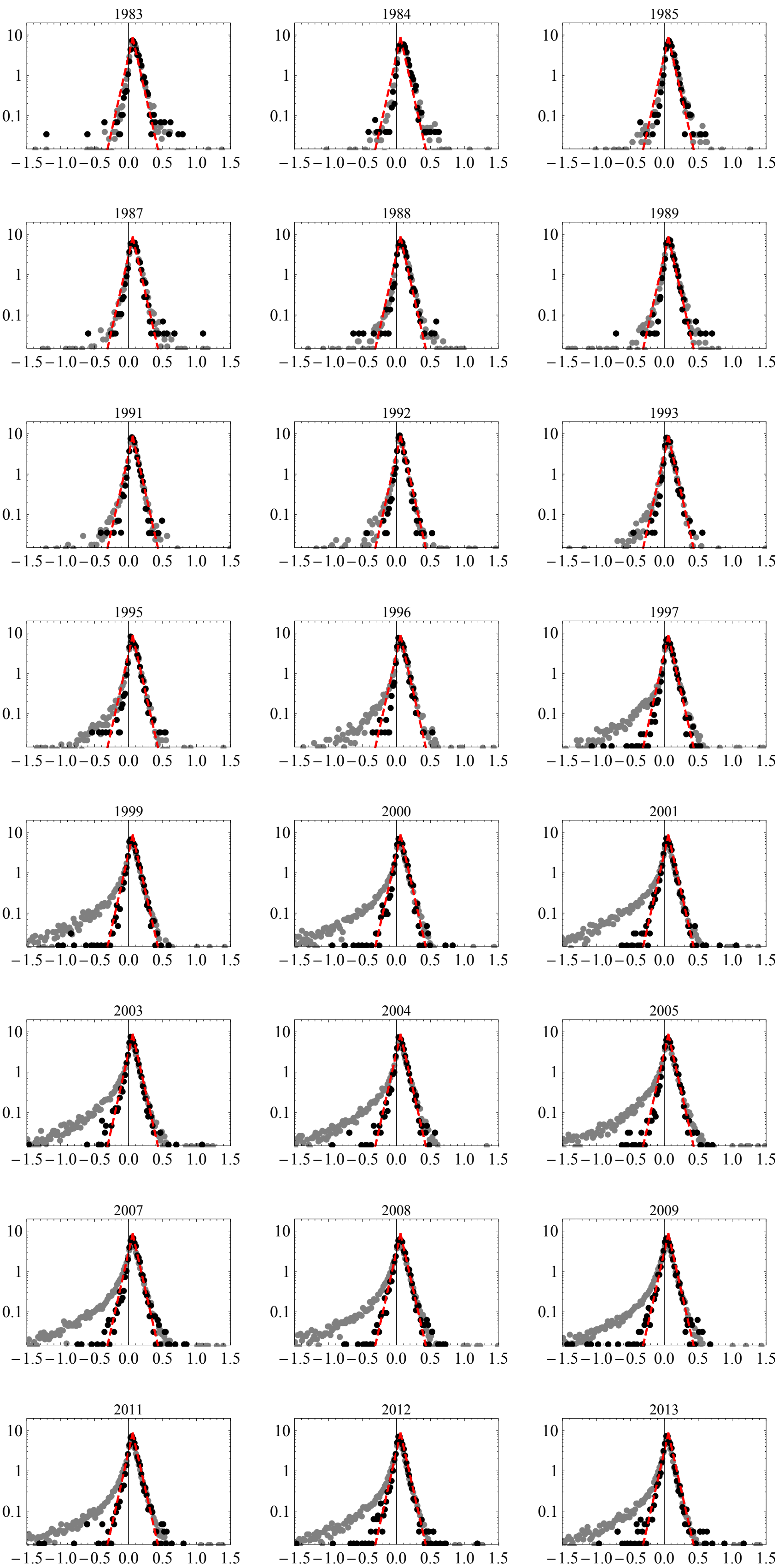


Figure 5.5: Empirical distribution of profit rates in the Datastream population (gray) and in the subsample of long-lived corporations (black) by year. Red dashed lines indicate the estimated Laplace distribution (m, σ) of the pooled subsamples of long-lived corporations.

While standardization is a necessary prerequisite in order to discover a regular distribution in growth rates, profit rates in our analysis come straight from the annual reports and still carry the full information woven into them. Figure 5.5 demonstrates the robustness of the distributional regularity by plotting the distribution of pooled profit rates for every year of the sample period. While the unbalanced panel displays an increasing asymmetry from the early 1990s onward, an issue we discuss in the next chapter, the balanced panel displays a symmetric and more importantly robust distribution of profit rates. Thereby, our findings on the statistical regularities in profit rates in balanced panels, particularly their stability in location, dispersion and their robust empirical distribution as well as their regular patterns of autocorrelation, so far measured up surprisingly well against the assumptions and implications of the model proposed in chapter 2.2. Therefore, we analyze further the statistical patterns in profit rates characteristic for balanced panels.

Figure 5.6 illustrates the location, dispersion and empirical density of the annual change in the profit rate, dX. Similar to the patterns found in profit rates, we observe stability in the location and dispersion of changes in profit rates in the balanced panel and stability in the location yet increasing dispersion in the unbalanced sample. Asymmetry is less of an issue, since the more violent changes in profit rates within the unbalanced panel go in either direction. The empirical distribution generally is symmetric around 0 and fat tailed, the latter even more so in the unbalanced panel. Thus, the average corporation neither gains nor looses profitability, or put differently, any gain in profitability by one firm seems to be matched by an equal loss of profitability by another firm in any given year. This observation resembles the idea of zero-sum competition, first formulated by Porter and Teisberg (2004) and Porter (2008), implying that within a competitive environment no corporation can improve its profitability without worsening the profitability of other corporations.

While profit rates are characterized by positive autocorrelation, we find no significant autocorrelation in the year-to-year changes in profit rates (see figure 5.7). Thus, the direction and scale of past fluctuations in a corporation's profit carry no information about its future fluctuations. An improvement in profitability in one year (e.g. through the launch of a successful new product), on average, does not guarantee continued improvements in subsequent years. This finding testifies once more the competitive character for a corporation's environment as continuous improvements in profitability are not evident in the data.

The competitive environment is traditionally demarcated on the level of the industry a company is active in or on the level of the product(s) a company is producing. This very fragmented view of the economy deems important industry and sector characteristics in explaining economic outcomes of individual companies. Consequently, the focus traditionally is on industry and country analyses peppered with individual case studies rather than on cross-

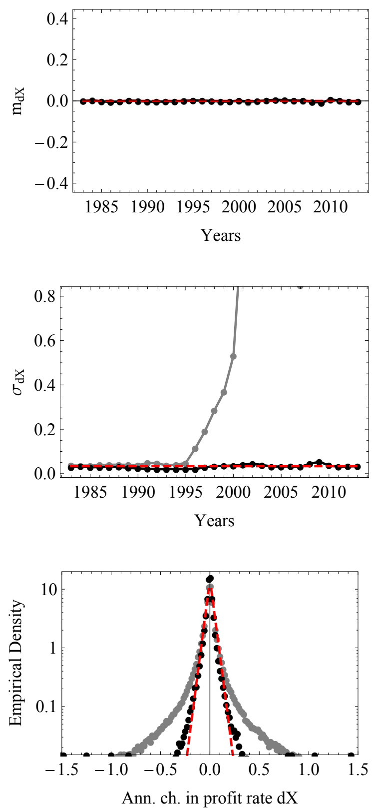


Figure 5.6: Time-series and cross-sectional statistical behavior of empirical changes in profit rates of the subsample of long-lived corporations in the years 1983-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (m, σ) of the pooled subsamples of long-lived corporations.

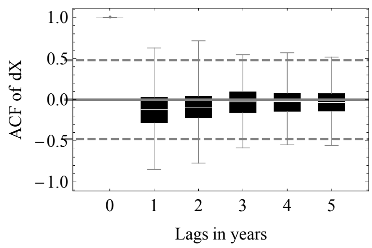


Figure 5.7: Time-series behavior of changes in profit rates in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

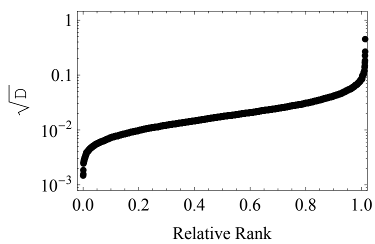


Figure 5.8: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

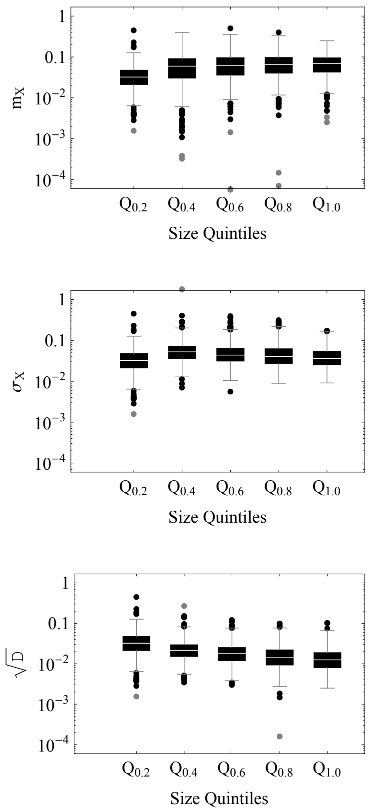


Figure 5.9: Box-Whisker plots of model parameter estimates for corporations in the balanced panels. From top to bottom: location m, dispersion σ, and noise level $\sqrt{D}$.

sector, cross-industry or even cross-country analyses. According to the *Standard Industrial Classification* (SIC) that we use, competition then would take place in eight broad industrial divisions (A-G and I) that themselves comprise more than 1,100 specific industrial sectors (or product categories). Our analysis demonstrates that corporations from very different countries and very different industrial divisions or sectors comprise a coherent population. In fact, the very different corporations appear to compete over the very same resource: capital.

The statistical equilibrium model proposed in chapter 2.2 takes up the idea of competition over capital as driven by a corporation's profitability. The only firm-specific model parameter is the diffusion coefficient D_i (or noise level $\sqrt{D_i}$). Figure 5.8 gives the relative rank of the 3,100 corporations of the balanced panel in increasing order of their respective noise levels $\sqrt{D}$. The rank plot for the international balanced panel resembles the one presented in Mundt et al. (2015) for US data (cf. Appendix E, Figure E.225). The median noise level of the balanced international panel is $\sqrt{D} = 0.018$ or 1.8% (and the diffusion coefficient is $D = 3.4x10^{-4}$), which is (almost) equal to the median noise level of the balanced US panel also given by $\sqrt{D} = 0.018$ (and the diffusion coefficient $D = 3.1x10^{-4}$). Despite the fact that we consider almost six times as many corporations as in the US example, we observe qualitatively and quantitatively similar statistical regularities in profitability and growth across countries.

Figure 5.9 reports the estimates of the model parameters m, σ, and D (or $\sqrt{D}$) for the 3,100 corporations of the balanced international panel by quintiles of the average firm size in terms of total assets[6]. In all but the first quintile ($Q_{0.2}$), the average corporation takes on similar values for m_X and σ_X, qualifying the assumption of economy-wide rather than firm-specific parameters. In contrast, the noise-level $\sqrt{D}$ of the average corporation varies markedly across size quintiles and is decreasing with increasing firm size. Thus, the noise level is indeed firm-specific rather than universal. So despite the fact that we mix corporations from very different countries, there appear to be coherent statistical regularities across countries that are qualitatively similar to statistical regularities within countries. At the same time, disaggregation by countries unveils quantitative differences in the location and dispersion of profit rates. These differences need explanation, especially in face of the expected equalizing force of capital reallocation on profit rates characteristic to the statistical equilibrium model proposed earlier. In the following chapter we will therefore analyze the profitability of corporations along different economic, social and institutional dimensions in order to explain quantitative variations across countries.

[6] Findings are robust w.r.t. alternative firm size measures, such as sales or operating costs.

5.4 *Country Variations and Potential Economic, Social and Institutional Explanations*

The pooled international data displays statistical regularities that qualitatively coincide with the statistical regularities identified earlier in national data (see Alfarano et al. (2012) for the US, Erlingsson et al. (2013) for Iceland, and the 45 country profiles provided in Appendix E), yet we find significant quantitative variation in the location and dispersion of profit rates of balanced panels of corporations across countries (see Figure 5.10). Location of the average country, measured by the median profit rate, is 6.0% but nationally varies between 2.1% in Portugal and 10.3% in South Africa; disper-

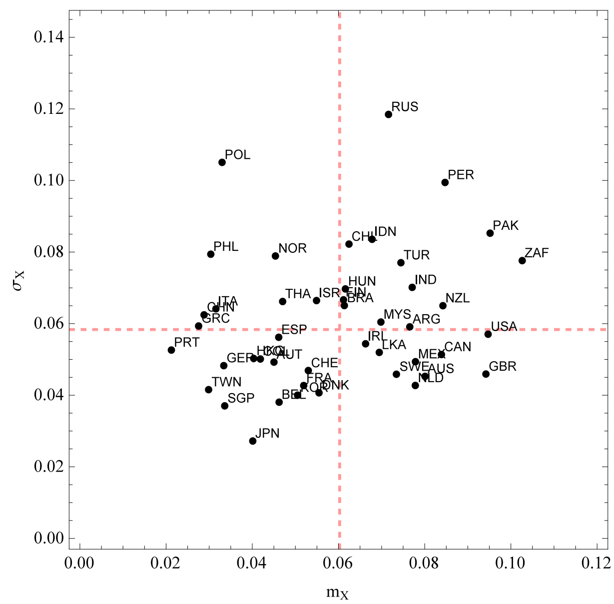


Figure 5.10: Scatter plot of location and dispersion of profit rates for balanced panels of corporations in 45 countries, 1983-2013. Red dashed lines indicate the location and dispersion of the pooled balanced panels ($m = 0.060$ and $\sigma = 0.058$).

sion, measured by the mean deviation from the median profit rate, is 5.8% in the pooled international sample but nationally varies between 2.7% in Japan and 11.8% in the Russian Federation. Furthermore, there is no apparent relation between location and dispersion as we observe all constellations of low/high location and low/high dispersion.[7] The pertinent literature discussed a plethora of possible explanations for profit rate differentials between countries (e.g. Adams, 1976). While the traditional view focused on the structure of a market a corporation acts in, alternative views focused on the more general legal-cultural environment that shapes both markets and corporate behavior or on differences in adapted accounting practices.

[7] Similarly, we could calculate a Sharpe ratio by dividing the location by the dispersion of profit rates. In our data, the average country displays a Sharpe ratio near 1; Poland marks the lower end with a ratio of 0.31 and the Netherlands the higher end with a ratio of 1.69.

Yet, if capital reallocation is to be effective in equalizing profit rates, as previously assumed on the company- and the country-level and suggested by the harmonious results for the pooled balanced panels, we would expect convergence in the location and in the dispersion of profit rates across countries.

In the following, we discuss two potential explanations for the persistent differences in the location and dispersion of profit rates across countries. The first takes up a traditional view within the industrial organization literature, were country differences in entry, exit and risk, or more general differences in the market structure, explain differences in economic outcomes. The second takes a more interdisciplinary view, were differences in the political and cultural framework, more specifically the legal origins of a country's economic order, explain differences in economic outcomes such as the level and variability of returns.

Market Structure (Traditional Hypothesis) The traditional hypothesis puts forward structural characteristics of the market a corporation acts in as potential explanations for differences in profitability. Yet, the demarcation of markets becomes a rather difficult task in a globalized economy with international and often diversified corporations. Therefore we analyze international markets described by broad industrial divisions that contain corporations from different countries. With national economies differing in their industrial compositions, differences in the profitability across international markets shall translate into differences in the profitability across countries.

Figure 5.11 displays the empirical distribution of profit rates for different industrial divisions. Distributions of profit rates in unbalanced panels visibly differ across industrial divisions; extreme losses occur most frequently in Divisions B (mining), followed by divisions I (services), D (manufacturing) and E (transportation, communications and utilities). Furthermore, Division B (mining) displays a bimodal distribution of profit rates in the unbalanced panel, which seems to be an artifact of the mining-intensive economies of Australia and Canada (cf. Appendix E.2, Figure E.6, bottom left and E.6, Figure E.26, bottom left). Thus, industrial divisions do display differences in their profitability that are likely to rest on the different nature of economic activities involved in the respective industries.

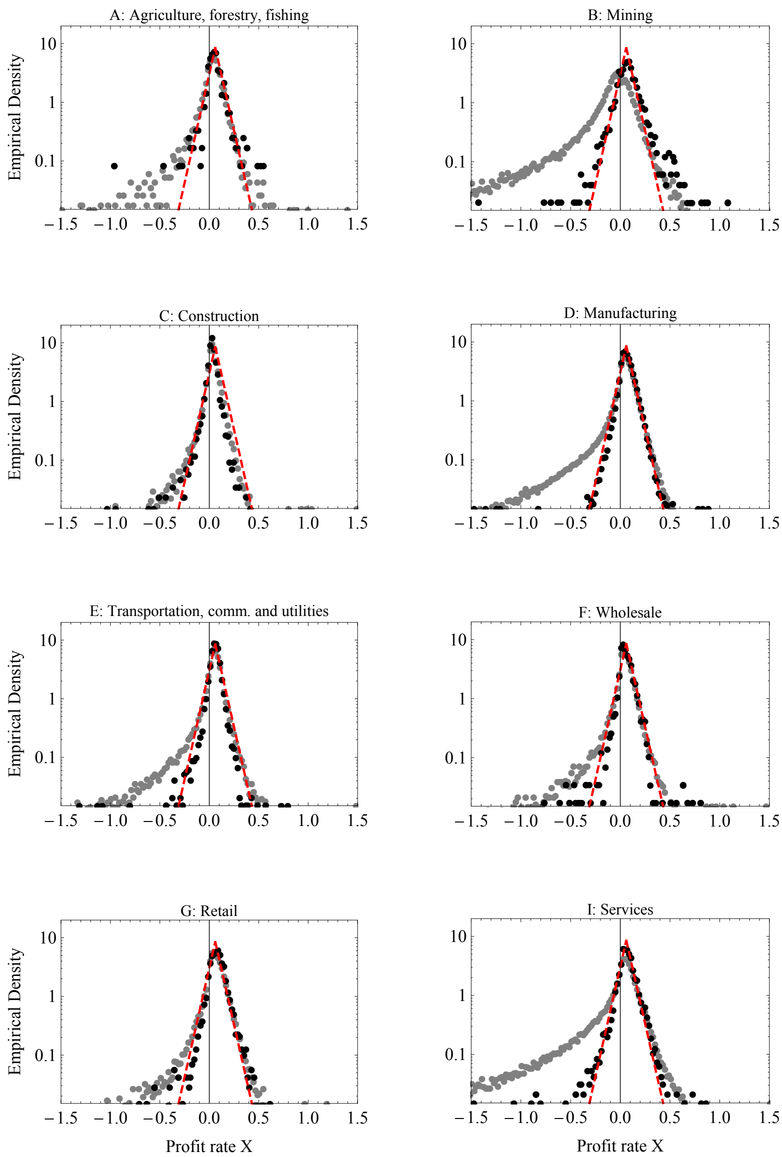


Figure 5.11: Empirical distribution of profit rates in the Datastream population (gray) and in the subsample of long-lived corporations (black) by industrial division. Red dashed lines indicate the estimated Laplace distribution (m, σ) of the pooled subsamples of long-lived corporations.

Yet, once we turn to balanced panels, these specificities vanish and distributions of profit rates fit the phenomenological distribution of the pooled data rather well across all divisions.

With no visible differences in the profitability across countries, differences in the market structure as captured by different industrial divisions are not able to explain cross-country differences.

Entry, Exit and Risk (Market Selection Hypothesis) Entry and exit impact on the composition of the corporate samples and, thus, may also impact on the empirical findings derived from these samples. Therefore, we control for the potential impact of entry and exit by comparing the findings for balanced panels with the findings for unbalanced and semi-balanced panels (cf. chapter 2.1). Figure 5.12 compares the pooled distribution of profit rates for balanced and unbalanced samples for both the short sample period 1997-2013 and the long sample period 1983-2013. Generally in both sample periods and specifically more extreme in the long sample period, we observe deviations from symmetry in the left tail of the distribution as there are more and more extreme losses in the unbalanced as compared to the balanced panel. The center and right tail of the distribution, however, remain largely unchanged by the admission of entry and exit and are similar for the unbalanced and balanced samples. In fact, the balanced samples themselves resemble the estimated symmetric Laplace distribution of the pooled data, pooled across all countries and sample periods. Thus, the distributional pattern for corporations that survive for a minimum of 17 years (1997-2013) and for corporations that survive for a minimum of 31 years (1983-2013) are surprisingly homogeneous.

Figure 5.13 replicates the previous distributional findings for semi-balanced panels, that is samples confined to corporations that survived for a minimum time span of T larger or equal to either 0, 5, 10, 15, 20, 25, and 31 years. A minimum survival period larger or equal to 0 coincides with the unbalanced panel, while a minimum survival period larger or equal to 31 coincides with the balanced panel of the long sample period 1983-2013. Since for the short sample period 1997-2013 we can track corporations for no more than 17 years, we cannot observe survival beyond a minimum survival period of $T \geqslant 17$, which makes $T \geqslant 15$ the closest replication to the respective balanced sample of the short sample period 1997-2013. The asymmetry in the left tail is indeed most salient for samples that include short-lived corporations and increasingly disappears with increasing minimum survival times T. In fact, the left tail is near symmetry around $T \geqslant 15$ for 1997-2013 samples and around $T \geqslant 25$ for 1983-2013.[8] Again, the center and right tail of the distribution remain remarkably close to the estimated symmetric Laplace distribution of the complete data of balanced panels pooled across all countries and sample periods.

[8] The temporal difference in convergence is likely to be an artifact of the allocation of countries between short and long samples. Considering the country profiles in Appendix E, the departure in the left tail is especially salient in Anglo-Saxon countries (e.g., Australia, Canada, New Zealand, United Kingdom and United States) and to a lesser extent in many Western European economies. Both these country groups are overly present in the long samples, as the corporate records of established/industrialized nations are more comprehensive. In contrast, developing/emerging economies often lack data for longer time horizons, thus, being overly present in the short samples.

Consequently, entry and exit mostly impacts the left tail of the distribution of profit rates that is losses, causing an asymmetry in the overall distribution. This asymmetry in turn causes a corruption of (non-robust) measures of location and dispersion; the location is pulled to the left and the dispersion is increased by the more frequent and more extreme losses among entering and exiting corporations. The increased dispersion in the left tail, thus, can be considered as an indicator of risk and market selection. In the unbalanced sample, market selection has not yet played its part, thus, leaving plenty of corporations in the sample that will be driven out of the market within a short period of time. In fact, in the 28 countries with records for the short period 1997-2013 only 1,699 out of 14,818 corporations, a mere 11.5%, survived for all 17 years; in the 17 countries with records for the long period 1983-2013 only 1,401 out of 39,840 corporations, a meager 3.5%, survived for all 31 years. The profitability of these surviving corporations, however, displays a surprisingly stable distributional outcome in the individual countries as well as in the international pool.

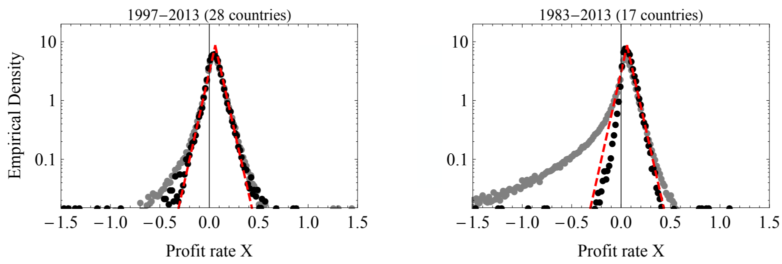


Figure 5.12: Distribution of profit rates for the balanced (black) and unbalanced samples (gray) for sample periods 1997-2013 (left) and 1983-2013 (right). Dashed red lines indicate the estimated Laplace distribution ($m = 0.060$, $\sigma = 0.058$) of the complete data, the balanced panels pooled across all countries and sample periods.

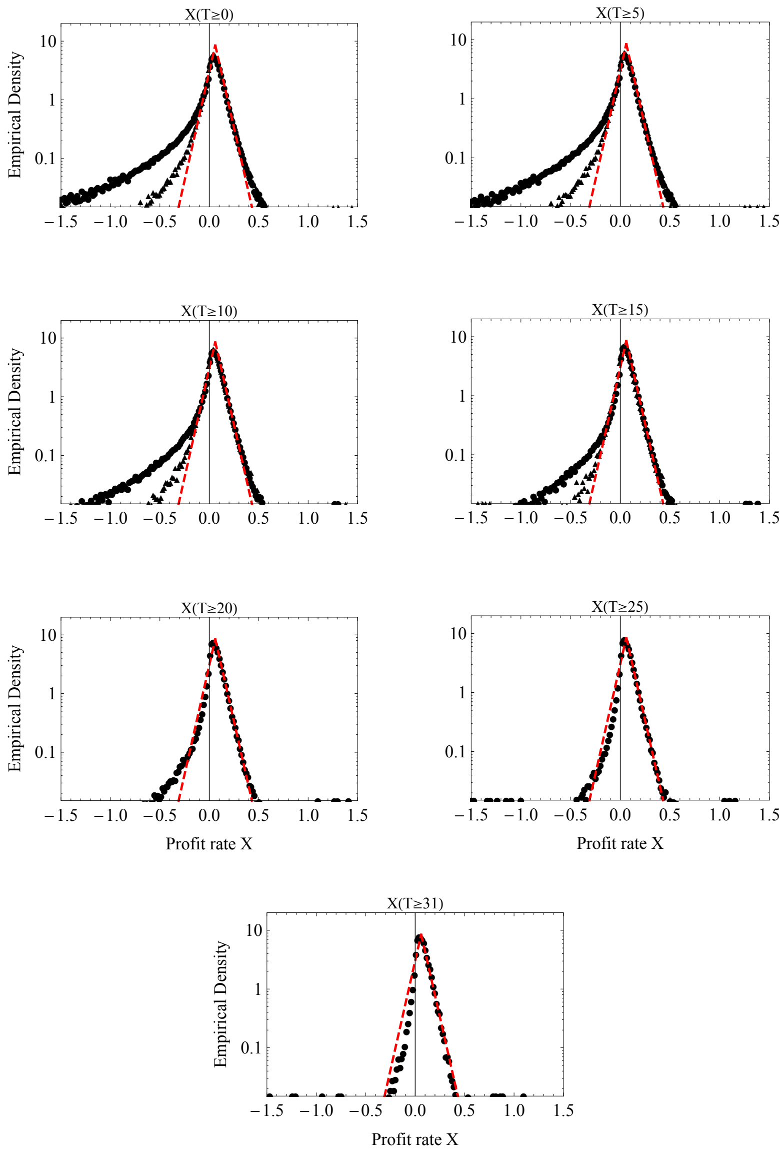


Figure 5.13: Distribution of profit rates for semi-balanced panels of minimum survival time T larger or equal to $0, 5, 10, 15, 20, 25,$ and 31 years. Plot markers indicate the length of the sample period (▲ for 1997-2013 and ● for 1983-2013). Dashed red lines indicate the estimated Laplace distribution ($m = 0.060$, $\sigma = 0.058$) of the complete data, the balanced panels pooled across all countries and sample periods.

To summarize, entry and exit work on the left tail of the profit rate distribution while the center and right tail largely remain unaffected and coincide with the estimated Laplace distribution of the complete data of balanced panels. Entry and exit then are able to explain asymmetries in the distribution, yet not the location (its center) or the dispersion (in the right tail). Once we increase the minimum survival time T and let market selection play its role for a sufficiently long (sample) period, the asymmetry in the distribution of profit

English	French	German	Scandinavian
Australia	Argentina	Austria	Denmark
Canada	Belgium	China	Finland
Hong Kong	Brazil	Germany	Norway
India	Chile	Japan	Sweden
Ireland	Colombia	Poland	
Malaysia	France	South Korea	
New Zealand	Greece	Taiwan	
Pakistan	Hungary		
Singapore	Indonesia		
South Africa	Israel		
Sri Lanka	Italy		
Thailand	Mexico		
United Kingdom	Netherlands		
United States	Peru		
	Philippines		
	Portugal		
	Russian Federation		
	Spain		
	Switzerland		
	Turkey		

Table 5.3: Countries in the sample, classified by the legal origins of their legal and regulatory framework. English Law represents the common-law system, French and German Law represent varieties of the civil-law system, and Scandinavian Law represents a mixture of both law systems. The classification is based on La Porta et al. (2008) and La Porta et al. (2017).

rates vanishes and gives way to symmetric distribution in the pooled data, qualitatively similar to the distributions on the country-level and despite of persistent quantitative differences in location and dispersion across countries.

Legal Origins of Corporate Law (Institutional Hypothesis) Legal and regulatory frameworks exert heavy influence on the economic and social outcomes of a country. Not only are corporations themselves a creation of Law, but their activities are also subject to laws and regulations, which themselves are subject to legal origins. La Porta et al. (1997) and La Porta et al. (1998) sparked the discussion on the *economic consquences of legal origins* that in its first ten years led to the very conclusion that *"legal origins — broadly interpreted as highly persistent systems of social control of economic life — have significant consequences for the legal and regulatory framework of the society, as well as for economic outcomes"* (La Porta et al., 2008, p. 326). Given the fact, that corporations are in all their aspects themselves a product of law, legal origins may serve as a powerful explanatory variable w.r.t. differences in the performance of corporations in different countries.

Table 5.3 classifies the 45 countries in our sample by the legal origins of their legal and regulatory frameworks. Along the lines of Djankov et al. (2002) and La Porta et al. (2008), we distinguish four broad legal traditions: English, French, German, and Scandinavian.[9] The English tradition is based on common law, a decentralized legislative system that relies on individual judicial decisions and precedents. The French and German tradition, in contrast, are based on civil law, a centralized legislative system that relies on cod-

[9] A fifth legal tradition is the socialist tradition. This legal tradition originated from the Russian revolution and spread to the Soviet Republics and Eastern Europe. Ever since the fall of communism and the USSR, this legal tradition has been in retreat; most countries returned to their pre-socialist traditions that in most cases were based on the civil-law, i.e., French and German traditions.

ified principles. Colonization and transplantation brought especially the English and French, and to a lesser extent the German tradition, to all parts of the world, so that these three traditions allow for a categorization of most countries around the world (see Glaeser and Shleifer, 2002). An exception is stated for the Scandinavian countries that form their own legal tradition. The Scandinavian tradition is based on a mixture of the other traditions, using elements from both common and civil law. Together, the four legal traditions allow for a complete categorization of the legal origins of all 45 countries.

Figure 5.14 shows the empirical distribution of profit rates in unbalanced and balanced samples for different legal origins. Across legal traditions, distributions of profit rates of the balanced samples coincide surprisingly well with the estimated Laplace distribution of the complete balanced data (with a minor exception of the German tradition). In case of unbalanced samples, the center part and right tail of the distributions of profit rates also fit well the estimated Laplace distribution, while the left tail varies across the different legal origins. English and Scandinavian law display substantially more frequent and more extreme losses than do the French and German law. The categorization by legal origins feeds the suspicion that the asymmetry in the empirical distribution of profit rates in unbalanced panels is a phenomenon inherent to common law countries which is (almost completely) absent in civil law countries. Yet again, the pooling of the data by legal traditions once more does omit the country differences in m and σ identified before. Therefore, we should compare the location and dispersion statistics for individual countries between different legal traditions.

Figure 5.15 shows the distribution of country-level location (m, left) and dispersion (σ, right) statistics of balanced panels, compared between the four major legal traditions. While dispersion is very similar between and within most legal traditions[10], German Law being a minor exception, location is more variable. English and German

[10] Based on a joint k-sample t test (t statistic 0.79, p-value 0.5050), we cannot reject the Null hypothesis that the average dispersion statistics of the four legal traditions are equal.

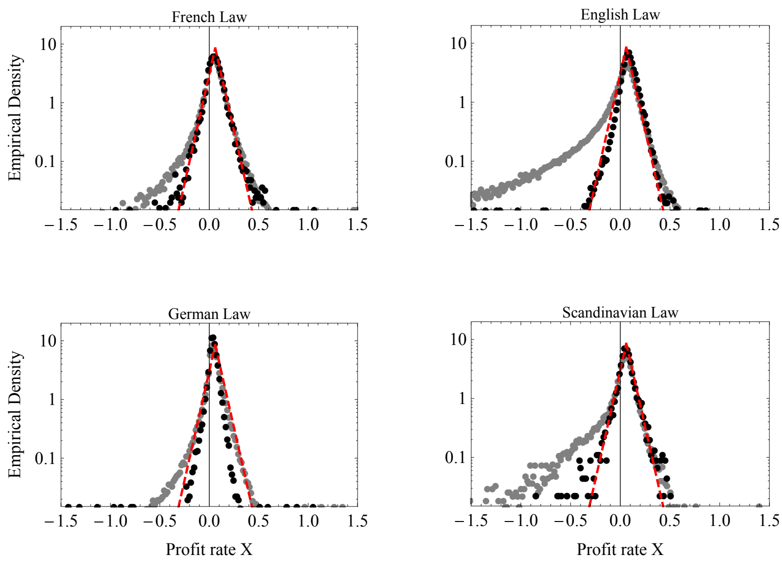


Figure 5.14: Distribution of profit rates for balanced (black) and unbalanced panels (gray) by legal origins. Dashed red lines indicate the estimated Laplace distribution ($m = 0.060$, $\sigma = 0.058$) of the complete data, the balanced panels pooled across all countries and sample periods.

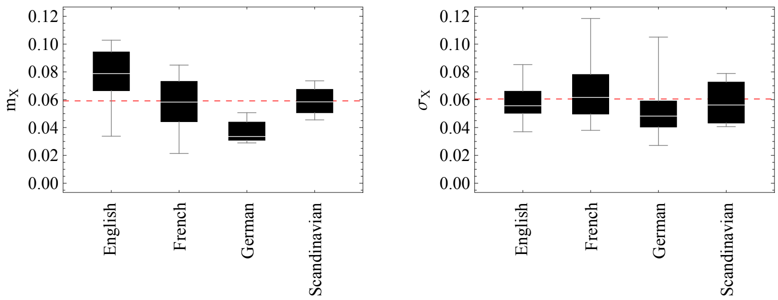


Figure 5.15: Distribution of location (μ) and dispersion (σ) parameters of profit rates in the balanced panels by legal origins. English Law represents common-law systems; French and German Law represent civil-law systems; Scandinavian Law represents mixed common- and civil-law systems. Dashed red lines indicate the parameter estimates of a Laplace distribution ($m = 0.060$, $\sigma = 0.058$) of the pooled balanced panels across all countries and sample periods.

Law mark the polar ends of the location spectrum, with countries of English Law displaying median profit rates significantly above and countries of German Law displaying median profit rates significantly below the phenomenological location of around 6.0%. In contrast, countries of French and Scandinavian Law display median profit rates around the phenomenological location.[11] Thereby, the data support the idea that legal origins have a profound impact on economic outcomes as the location of profit rates systematically and significantly varies between legal traditions.

[11] Based on a joint k-sample t test (t-statistic 6.81, p-value 0.0008), we can reject the null hypothesis that the average location statistics of the four legal traditions are equal at the 0.1% level.

The data suggest that the strong asymmetry in the unbalanced panel's distribution of profit rates is not only a rather recent phenomenon first emerging in the early 1990s, but also an artifact of English legal origins and common law systems. In this light, the generally higher profit rates of the average corporations in balanced panels for common law countries can be seen as a compensation for the increased presence of corporations generating (extreme) losses on their capital. Thereby, the substantive deregulation of capital markets throughout the 1980s and 1990s as well as the general capital market orientation characteristic to common law countries serve as an explanation for systematic deviations in the location and dispersion of profit rates among countries.

5.5 *Concluding Remarks*

In this chapter, we have analyzed the profitability and growth of more than 54,000 (non-financial) corporations from 45 countries around the world. Conventionally, data this extensive is broken down and prepared in country and sectoral (case) studies, yet we use the complete data covering all different sectors and countries for our analysis. Inspired by the statistical equilibrium model of competitive firms' profitability proposed by Alfarano et al. (2012), our global perspective unveiled the very same statistical regularities in profit and growth rates that previously had been observed for U.S. corporations.

Analyzing the unbalanced panel (all corporations) at first, the empirical distribution of profit rates pooled across years appeared to be asymmetric as losses occurred more frequently and were more extreme than gains. Plotting the empirical distribution year by year unveiled the asymmetry to develop throughout the 1990s and to persist thereafter. Once we analyzed the balanced panel (long-lived corporations), however, the empirical distribution appeared symmetric, independent of time, characterized by a stable median of about 6 percent p.a. (0.060) and an equally stable mean deviation (from the median) of about 5.8 percent (0.058), well approximated by a Laplace distribution. Thereby we find statistical regularities on the global level that are qualitatively identical to the ones previously shown for individual countries.

Differences in profitability between countries only occur quantitatively, with median profit rates and their mean deviations stable within, yet different across countries. While we find entry and exit of corporations to drive the asymmetry in the unbalanced sample, we find the legal origins of Corporate Law in a country to drive both, the asymmetry in the unbalanced panels and the quantitative differences in the balanced panels. Common law countries (English and to some extent Scandinavian Law) display an asymmetric while civil law countries (French and German Law) display an almost symmetric distribution of profit rates for the unbalanced panels. For the balanced panels, all four legal traditions display symmetric distributions, yet median profit rates are particularly low among German Law countries and particularly high among English Law countries with French and Scandinavian Law countries in between.

Our findings suggest that universal dynamics govern corporate profitability across very different sectors and countries. The dynamics are robust to quantitative differences in the level and dispersion of profitability between countries, which can largely be explained by the origins of a country's legal system. In this light, a narrow focus on carefully composed samples that is usually motivated by a limited comparability of accounting information between corporations, sectors and countries seems to be founded on a myth. In the end, the dynamics of corporate profitability are characterized by common statistical regularities and thus are universal rather than individual.

Appendices

A
Empirical Approximation of the Diffusion Coefficient D and the Noise Level $\sqrt{D}$

For a given firm, the reduced-form model for the difference in the profit rate (see equation 2.4) is given by

$$dX_t = \theta dt + \sqrt{D}\, dW_t \tag{A.1}$$

with $\theta = -\frac{D}{2\sigma} sign(X_t - m)$ being the drift term and $\sqrt{D}\, dW_t$ being the stochastic noise term. The binomial expansion of the square difference in the profit rate leads to

$$(dX_t)^2 = \theta^2 (dt)^2 + 2\theta dt \sqrt{D} dW_t + D(dW_t)^2 \tag{A.2}$$

which reformulated as expected values yields

$$E[(dX_t)^2] = \theta^2 (dt)^2 + 2\theta dt \sqrt{D} E[dW_t] + DE[(dW_t)^2] \tag{A.3}$$

with $E[dW_t] = 0$ and $E[(dW_t)^2] = dt$. Given the expected value of the Wiener increments, the second term of the sum, $2\theta dt \sqrt{D} E[dW_t]$, becomes equal to zero, we end up with

$$E[\frac{(dX_t)^2}{dt}] = \theta^2 dt + D. \tag{A.4}$$

In the limits, the expected values converge, leading to

$$\lim_{dt \to 1} E[(dX_t)^2] \quad \approx (dX_t)^2 \quad = D \tag{A.5}$$

so that the diffusion coefficient D can be approximated by the expected value of the square difference in the profit rate. Similarly, the noise level $\sqrt{D}$ can be approximated by the (absolute) difference in the profit rate.

Given a corporate time series, the expected value corresponds to the average (mean) realization of the time series. Thus we can infer the value of the diffusion coefficient D (the noise level $\sqrt{D}$) by taking the mean of the (square) change in the profit rate, so for any firm i we get

$$D_i = \frac{\sum_{t=1}^{T}(dX_{i,t})^2}{T} \tag{A.6}$$

$$\sqrt{D_i} = \frac{\sum_{t=1}^{T}|dX_{i,t}|}{T} \tag{A.7}$$

where T is the length of the time series.

B

Additional Sample Information

B.1 Corporation Samples for the United States (1863-1893, 1923-1953 and 1983-2013)

Lists B.1.1 to B.1.3 provide an overview of the companies included in the U.S.samples. In order to keep company names short, we use the abbreviations *Co.* for *Company*, *Corp.* for *Corporation*, *Inc.* for *Incorporated*, and *RR* for *Railroad*.

List B.1.1 **Sample 1863-1893** (30 corporations)

Baltimore & Ohio RR (Main Stem)
Boston & Albany RR
Boston & Maine RR
Central RR of New Jersey
Chicago & Alton RR
Chicago, Burlington, & Quincy RR
Chicago, Rock Isl& & Pacific RR
Cincinnati, Hamilton, & Dayton RR
Clevel& & Pittsburg RR
Connecticut River RR
Delaware, Lackawanna & Western RR
Erie RR
Fitchburg RR
Illinois Central RR
Lehigh Valley RR
Long Isl& RR
Louisville & Nashville RR
Maine Central RR
Michigan Central RR
New London Northern RR
New York Central & Hudson River RR
Northern (N.H.) RR
Northern Central RR
Old Colony RR
Pennsylvania RR
Philadelphia & Erie RR
Philadelphia & Reading RR
Philadelphia, Wilmington & Baltimore RR
Pittsburg, Fort Wayne & Chicago RR
Terre Haute & Indianapolis RR

Data sources: Poor, H. V. (1868-1894): *Poor's Manual of the Railroads of the United States for ...*, New York; Interstate Commerce Commission (1888-1894): *Annual Report on the Statistics of Railways in the United States for the Year Ending ...*, Washington.

List B.1.2 **Sample 1923-1953** (137 corporations)

Alaska Juneau Gold Mining Co.
Allied Chemical & Dye Corp.
American Locomotive Co.
American Radiator Co.
American Ship Building Co.
American Sugar Refining Co.
American Telephone & Telegraph Co.
American Tobacco Co.
Atchinson, Topeka & Santa Fe RR
B F Goodrich Co.
Babcock & Wilcox Co.
Baldwin Locomotive Works
Baltimore & Ohio RR
Bangor & Aroostook RR
Beatrice Creamery Co.
Borden Co.
Buckeye Pipe Line Co.
Burroughs Adding Machine Co.
Caterpillar Tractor Co.
Century Ribbon Mills

Cerro de Pasco Copper Corp.
Chesapeak & Ohio RR
Chicago & Northwestern RR
Chicago Pneumatic Tool Co.
Chicago Yellow Cab Co.
Chicago, Burlington & Quincy RR
Chicago, Rock Isl& & Pacific RR
Cincinnati & Suburban Bell Telephone Co.
Cluett, Peabody & Co.
Coca Cola Co.
Connecticut Light & Power Co.
Consolidated Cigar Corp.
Continental Can Co.
Continental Motors Corp.
Cook Paint & Varnish Co.
Copper Range Co.
Cresson Cons. Gold Mining & Milling Co.
Crucible Steel
Cuban Tobacco Co.
Cudahy Packing Co.
Curtis Publishing Co.
Deere & Co.
Detroit Edison Co.
DuPont De Nemours & Co.
Duquense Light Co.
Durham Hosiery Mills
Eastman Kodak Co.
Erie RR
Fair Co.
Firestone Tire & Rubber Co.
Fuller Brush Co.
General Electric
General Motors
Giant Portl& Cement Co.
Great Northern RR
Hammermill Paper Co.
Hart, Schaffner & Marx
Hershey Chocolate Co.
Howe Sound Co.
Humble Pipe Line Co.
Illinois Central RR
Illinois Pipe Line Co.
Ingersoll-R& Co.
Interlake Steamship Co.
International Harvester Co.
International Paper Co.
Julius Kayser & Co
Lee Rubber & Tire Corp.
Louisville & Nashville RR
Mack Trucks
Magnolia Pipe Line Co.
Merck & Co
Missouri Pacific RR
Montgomery Ward Co.
Motor Products Corp.
Motor Wheel Corp.
National Biscuit Co.
National Cash Register Co.
National Dairy Products
National Transit Co.
New York & Honduras Rosario Mining Gr.
New York Central RR
New York, New Haven & Hartford RR
New York Transit Co.
Norfolk & Western RR
Northern Pacific RR
Northern Pipe Line Co.
Packard Motor Car Co.
Pennsylvania RR
Procter & Gamble
Public Service Co. of Oklahoma
Pullman Copmany
Quaker Oats Co.
R H Macy & Co
Radio Corp. of America
Remington R& Inc.
Reo Motor Car Co.
Reynolds Spring Co.
Robbins & Myers
S H Kress & Co.
S S White Dental Manufacturing Co.
Savannah Sugar Refining Corp.
Seiberling
Sharon Steel Hoop Co.
Shell Union Oil Corp.
Sinclair Pipe Line Co. Southern RR
Southern Bell Telephone & Telegraph Co.
Southern California Edison Co.
Southern Pacific RR
Southwestern Bell Telephone Co.
Standard Oil Co. (of Ohio)
Stanley Works
Superior Oil Co.
Texas Power & Light Co.
Texas Pipe Line Co.
Tide-Water Pipe Company
Timken Detroit Axle Co.
Timken Roller Bearing Co.
Tuscaora Oil Co. (Ltd.)
Underwood Corp.
Union Pacific RR
Union Sugar
United States Steel
US Playing Card Co.
US Smelting Refining & Mining Co.
US Tobacco Co.
Universal Leaf Tobacco Co.
Waldorf System Inc.
Washington Water Power Co.
Western Electric Co.
Western Union Telegraph Co.
Westinghouse Electric & Manufacturing Co.
Wheeling Steel Co.
Wilson & Co., Inc.

Wisconsin Public Service Corp.
W M Wrigley Jr Co.
Yale & Towne Manufacturing Co.

Data sources: Various corporations (1923-1954): *Annual Report for the Year Ending ...*; *Annual Report on the Statistics of Railways in the United States for the Year Ending ...*, 1923-1953, Washington; *The Commercial & Financial Chronicle*, 1923-1935, New York.

List B.1.3 **Sample 1983-2013** (562 corporations)

3M Co.
A. O. Smith Corp.
AAR Corp.
Aaron's, Inc.
Abbott Laboratories
Abm Industries Inc.
Acco Br&s Corp.
Aceto Corp.
ACME United Corp.
Advanced Micro
AEP Industries Inc.
Agilysys Inc.
AGL Resources Inc.
AIR Products & Chemicals Inc.
Airgas Inc.
Alaska Air Group Inc.
Alcoa Inc.
Alico, Inc.
Allete, Inc.
Alliant Energy Corp.
Allied Motion Technology
Altria Group Inc.
Ameren Corp.
American Airlines
American Electric
American Greetings
American Software
American States Wate
American Water Works
Ametek Inc.
Ampco-pittsburgh
Amrep Corp.
Analog Devices, Inc.
Analogic Corp.
Apache Corp.
Apogee Enterprises
Apple Inc.
Applied Industrial Technology
Applied Materials
Aqua America Inc.
Archer Daniels Midl.
Arden Group, Inc.
Arrow Electronics
Ashl& Inc.
Astronics Corp.
AT& T Inc.
Atrion Corp.
Atwood Oceanics Inc.
Automatic Data Proc
AV Homes
Avery Dennison Corp.
Avista Corp.
Avnet Inc.
Avon Products Inc.
Baker Hughes Inc.
Ball Corp.
Barnes Group Inc.
Bassett Furniture Baxter International
Beam Suntory Inc.
Becton, Dickinson
Bel Fuse
Belo Corp.
Bemis Co. Inc.
Bio-Rad Laboratories
Black Hills Corp.
Blount International
Bob Evans Farms, Inc.
Boeing Co.
Bowl America Inc.
Briggs & Stratton
Brinker Int'l
Brink's Co.
Bristol-Myers Squibb
Brown Forman Corp.
Brown Shoe Co.
Brunswick Corp.
C R Bard Inc.
CA Inc.
Cabot Corp.
Cambrex Corp.
Campbell Soup Co.
Carlisle Companies
Carpenter Technology
Castle (A.M.) & Co.
Caterpillar Inc.
CDI Corp.
Centerpoint Energy
Centurylink
CH Energy Group, Inc.
Checkpoint Systems
Chemed Corp.
Chemtura Corp.
Chevron Corp.
Chiquita Br&s Intl

Church & Dwight Co.
Chyronhego Corp.
Cinccinnati Bell
Cintas Corp.
Clarcor Inc.
Cleco Corp.
Cliffs Natural
Clorox Co.
CMS Energy Corp.
Cobra Electronics
Coherent, Inc.
Colgate-Palmolive Co.
Comarco, Inc.
Comcast Corp.
Comdisco Holding Co.
Commercial Metals Co.
Communications Computer Sciences
Computer Task Group
Conagra Foods Inc.
Connecticut Water
Conocophillips
Consolidated Edison
Constellation Br&s
Continental Material
Con-Way Inc.
Cooper Companies Inc.
Cooper Tire & Rubber
Corning Incorporated
Costa Inc.
Courier Corp.
Cracker Barrel
Crane Co.
Crown Holdings, Inc.
CSS Industries Inc.
CSX Corp.
CTS Corp.
Cubic Corp.
Culp, Inc.
Cummins Inc.
Curtiss-Wright Corp.
CVS Caremark
Dana Holding Corp.
Danaher Corp.
Data I/O Corp.
Dawson Geophysical
Deere & Co.
Delta Air Lines, Inc.
Deluxe Corp.
Diebold, Inc.
Dillard's Inc.
Dixie Group Inc.
Dollar General Corp.
Dominion Resources
Donaldson Co Inc.
Dover Corp.
Dow Chemical Co.
DPL Inc.
Drew Industries Inc.
DTE Energy Co.
Ducommun Inc.
Duke Energy Corp.
Dynamics Research
E I Du Pont De
Eastern Co.
Eastman Kodak Co.
Ecolab Inc.
Edison International
Electro Rent Corp.
Electro Scientific
Elxsi Corp.
Emerson Electric Co.
Emerson Radio Corp.
Empire District Elec
Emulex Corp.
Energen Corp.
Ennis Inc.
Entergy Corp.
Enzo Biochem Inc.
EQT Corp.
Equifax Inc.
Espey Manufacturing & Electronics
Esterline Tech Evans & Sutherl&
Exelon Corp.
Exxon Mobil Corp.
Family Dollar Stores
FBI Wind
Federal Signal Corp.
Federal-Mogul Holding
Fedex Corp.
Ferro Corp.
Firstenergy Corp.
Flexsteel Industries
Flow International
Flowers Foods Inc.
Flowserve Corp.
Fluor Corp.
FMC Corp.
Foot Locker, Inc.
Ford Motor Co.
Forest Labs Inc.
Franklin Electric Co.
Friedman Industries
Frisch's Restaurants
Frontier Commun
Frozen Food Express
Furmanite Corp.
G& K Services Inc.
Gannett Co Inc.
Gap Inc.
GATX Corp.
Gencorp Inc.
General Dynamics
General Electric Co.
General Mills, Inc.

Genesco Inc.
Genuine Parts Co.
Giga-Tronics Inc.
Goodyear Tire
Gorman-Rupp Co.
GP Strategies Corp.
Graco Inc.
Graham Holdings
Grainger (W.W.), Inc.
Great Northern Iron
Great Plains Energy
Greif Inc.
H & R Block Inc.
H.J. Heinz Co.
Hallador Energy Co.
Halliburton Co.
Hallwood Group
H&y & Harman Ltd
Harbinger Group Inc.
Harris Corp.
Harris Teeter Super
Harsco Corp.
Hasbro Inc.
Haverty Furniture
Hawaiian Electric
HB Fuller Co.
Hecla Mining Co.
Heico Corp.
Helmerich & Payne
Herman Miller Inc.
Hershey Co.
Hess Corp.
Hewlett-Packard Co.
Hexcel Corp.
Hill-Rom Holdings
Hillshire Br&s Co.
HNI Corp.
Hollyfrontier
Home Depot, Inc.
Honeywell Internatnl
Hormel Foods Corp.
Hovnanian Enterprise
Hubbell Inc.
Idacorp, Inc.
Illinois Tool Works
Insteel Industries
Integrated Device
Integrys Engy Grp
Intel Corp.
Intelligent Systems
Interface, Inc.
International Paper
Interpublic Group
International Business Machines
International Flavors & Fragrances
International Lottery & Tot
International Rectifier
International Shipholding
J B Hunt Transport
J C Penney Co.
J M Smucker Co.
Jaclyn Inc.
Jacobs Eng Group Inc.
John Wiley & Sons
Johnson & Johnson
Johnson Controls
Johnson Outdoors
Joy Global, Inc.
Kaman Corp.
Kansas City Southern
Kate Spade & Co.
Katy Industries
Kaydon Corp.
Kellogg Co.
Kelly Services, Inc.
Kennametal Inc.
Key Tronic Corp.
Keystone Consol
Kid Br&s
Kimball Int'l Inc.
Kimberly-Clark Corp.
Kirby Corp.
Kla-tencor Corp.
Kroger Co.
L Br&s Inc.
L S Starrett Co.
L B Foster Co.
Laclede Group Inc.
Lawson Products, Inc.
La-Z-Boy Inc.
Lee Enterprises Inc.
Leggett & Platt Inc.
Lennar Corp.
Lilly (Eli) & Co.
Louisiana-Pacific
Lowe's Companies Inc.
LSI Corp.
Luby's, Inc.
Lumara Health Inc.
Lydall, Inc.
M D C Holdings, Inc.
Manitowoc Co.
Marathon Oil Corp.
Marcus Corp.
Masco Corp.
Mastec, Inc.
Materion Corp.
Matson
Mattel, Inc.
McCormick & Co Inc.
McDermott International Inc.
McDonald's Corp.
McGraw Hill
McKesson Corp.

McRae Industries
MDU Resources Group
Meadwestvaco Corp.
Mechanical Tech Inc.
Media General Inc.
Medtronic, Inc.
Mentor Graphics Corp.
Merck & Co Inc.
Meredith Corp.
Mestek, Inc.
Methode Electronics
Micron Technology
Microsemi Corp.
Middlesex Water Co.
Molex Inc.
Molson Coors Brew
Moody's Corp.
Moog Inc.
Motorola Solutions
MSA Safety Inc.
MTS Systems Corp.
Murphy Oil Corp.
Myers Industries
Mylan Inc.
Nacco Industries
Nash-fInc.h Co.
National Fuel Gas Co.
National Presto Industries
Nature's Sunshine
Navistar International Corp.
New Jersey Resources
New York Times Co.
Newell Rubbermaid
Newmarket Corp.
Newmont Mining Corp.
Newport Corp.
Nextera Energy
Nike Inc.
Nisource Inc.
NL Industries Inc.
Noble Energy, Inc.
Nordson Corp.
Nordstrom, Inc.
Norfolk Southern
Northeast Utilities
Northrop Grumman
Northwest Nat. Gas
Northwestern Corp.
Nucor Corp.
Occidental Petroleum
Officemax Inc.
OGE Energy Corp.
Oil-Dri Corp.
Olin Corp.
Omnicare, Inc.
Omnicom Group Inc.
Oneok, Inc.
Oracle Corp.
Oshkosh Corp.
Otter Tail Corp.
Overseas Shipholding
Owens & Minor, Inc.
Owens Corning
Oxford Industries
P H Glatfelter
Paccar Inc.
Pall Corp.
Par Technology Corp.
Park Electrochemical
Parker Drilling Co.
Parker-Hannifin Corp.
Patrick Industries
Paychex Inc.
Penford Corp.
Penn Virginia Corp.
PEP Boys-Manny
Pepco Holdings, Inc.
Pepsico, Inc.
Perkinelmer Inc.
Pfizer Inc.
PG & E Corp.
Phi, Inc.
Piedmont Natural Gas
Pier 1 Imports, Inc.
Pinnacle West Capital
Pitney Bowes Inc.
PNM Resources, Inc.
PPG Industries Inc.
PPL Corp.
Precision Castparts
Procter & Gamble
Public Service Entrpr Gr
Puget Energy Inc.
Pultegroup
PVH
Quaker Chemical Corp.
Quality Systems, Inc.
Quanex Building
Quantum Corp.
Questar Corp.
Radioshack Corp.
Raven Industries Inc.
Raytheon Co.
Reading International
Regal-Beloit Corp.
Rex American
Rite Aid Corp.
Rockwell Automation
Rogers Corp.
Rollins, Inc.
RPM International
RR Donnelley & Sons
Ruby Tuesday Inc.
Ryder System, Inc.

Ryl& Group Inc.
Scana Corp.
Schawk Inc.
Schlumberger Limited
Schulman A Inc.
Scientific Games
Sealed Air Corp.
Sears Holdings Corp.
Sensient Techlg Corp.
Service Corp. International
Sherwin-Williams Co.
Sigma-Aldrich Corp.
SJW Corp.
Skyline Corp.
Skyworks Solutions
SL Industries, Inc.
Snap-On Inc.
Snyder's-Lance, Inc.
Softech Inc.
Sonoco Products Co.
South Jersey Industries
Southern Co.
Southwest Airlines
Southwest Energy Co.
Southwest Gas Corp.
Sparton Corp.
Sprint Nextel Corp.
SPX Corp.
St Jude Medical Inc.
St&ard Microsystem
St&ard Motor
St&ard Pacific
St&ard Register Co.
St&ex International Corp.
Stanley Black
Stryker Corp.
Sturm, Ruger & Co.
Sunlink Health Sys
Superior Industries
Supervalu Inc.
Supreme Industries
Swift Energy Co.
Synalloy Corp.
Sysco Corp.
Syst
Target Corp.
Teco Energy Inc.
Tecumseh Products
Teleflex Inc.
Telephone & Data Sys
Tenet Healthcare
Tennant Co.
Tenneco Inc.
Teradyne Inc.
Tesoro Corp.
Texas Industries
Texas Instruments
Textron Inc.
The Coca-Cola Co.
The Valspar Corp.
Thermo Fisher
Tidewater Inc.
Timken Co.
TJX Companies Inc.
Tootsie Roll Industries
Toro Co.
Total System Service
TRC Companies, Inc.
Trecora Resources
Tribune Media Co.
Trinity Industries
Twenty-First
Twin Disc Inc.
Tyco International
Tyler Technologies
Tyson Foods, Inc.
UGI Corp.
UIL Holdings Corp.
Unifirst Corp.
Union Pacific Corp.
Unisys Corp.
Unit Corp.
United Continental
United Stationers
United Technologies
Universal Corp.
Universal Health Svc
UNS Energy Corp.
URS Corp.
US Ecology Inc.
USG Corp.
Valero Energy Corp.
Valmont Industries
Varian Medical Syst
Verizon Communicatns
VF Corp.
Viad Corp.
Vishay Intertech
Vulcan Materials Co.
W. R. Grace & Co.
Walgreen Co.
Wal-Mart Stores Inc.
Walt Disney
Wausau Paper Corp.
WD-40 Co.
Weis Markets, Inc.
West Pharmaceutical
Westar Energy, Inc.
Westmorel& Coal Co.
Weyco Group, Inc.
Weyerhaeuser Co.
WGL Holdings, Inc.
Whirlpool Corp.
Williams Companies

Williams-Sonoma
Winnebago Industries
Wisconsin Energy
WMS Industries Inc.
Wolverine World Wide
Worthington Industries
Xcel Energy Inc.
Xcerra Corp.
Xerox Corp.
YRC Worldwide Inc.

Data sources: Thomson Reuters (2014): *Datastream Worldscope Database*, Online Resource.

B.2 Corporation Sample for Germany (1919-1944)

List B.2.2 provides an overview of the companies included in the German sample. In order to keep company names short, we use the abbreviations *GmbH* for *limited liability company* (Gesellschaft mit beschränkter Haftung) and *AG* for *publicly-traded corporations* (Aktiengesellschaft).

List B.2.2 **Sample 1919-1944** (738 corporations)

A. Nachod & Haebler AG
A. Nachod & Haebler AG
A. Riebeck'schen Montanwerke
Aachener Lederfabrik
Accumulatoren-Fabrik AG
Actien Bauverein Passage
Actien-Brauerei Neustadt-Magdeburg
Actien-Brauverein zu Plauen
Actien-Gesellschaft der Gerresheimer Glashüttenwerke
Actiengesellschaft für Bleicherei, Färberei, Appretur & Druckerei
Actien-Gesellschaft für Cartonnagen-Industrie
Actien-Verein des zoologischen Gartens zu Berlin
Adler Deutsche Portland-Cement-Fabrik AG
Adlerbrauerei Balingen AG
Adlerwerke vorm. H. Kleyer AG
Aktien-Brauerei Cöthen
Aktienbrauerei Eisenach
Aktienbrauerei Kaufbeuren AG
Aktienbrauerei Wulle
Aktienbrauerei zum Hasen
Aktienbrauerei-Mönchsbrau-Helmbrechts AG
Aktien-Färberei Münchberg vorm. Knab & Linhardt
Aktien-Gesellschaft Brauerei Ponarth
Aktiengesellschaft Eiserfelder Steinwerke
Aktiengesellschaft für Bauten
Aktiengesellschaft für chemische Industrie
Aktien-Gesellschaft für Glasfabrikation, vorm. Gebrüder Hoffmann
Aktiengesellschaft für Grob- und Feinkeramik
Aktien-Gesellschaft für Lithoponefabrikation
Aktiengesellschaft für pharmazeutische Bedarfsartikel vorm. Georg Wenderoth
Aktiengesellschaft Glashüttenwerke Adlerhütten
Aktiengesellschaft Johannes Jeserich
Aktiengesellschaft Norddeutsche Steingutfabrik
Aktiengesellschaft Reederei Norden-Frisia
Aktiengesellschaft Sächsische Werke
Aktiengesellschaft Sturm Dachziegelwerke
Aktien-Maschinenfabrik Kyffhäuserhütte
Aktien-Ziegelei, Münchnen-Wien
Alex Zink Filzfabrik AG
Alexanderwerk AG
Allgäuer Baumwollspinnerei und Weberei Blaichach vorm. Heinrich Gyr
Allgemeine Elektricitäts-Gesellschaft (AEG)
Allgemeine Häuser- und Industriebau-AG
Allgemeine Hoch- und Ingenieurbau-AG
Allgemeine Lokalbahn- und Kraftwerke-AG
Alsen'sche Portland-Cement Fabriken
Amag-Hilpert-Pegnitzhütte AG
Ammendorfer Papierfabrik AG
Andreae-Noris Zahn AG
Anhaltische Kohlenwerke
Anker-Werke AG
Annaburger Steingutfabrik AG
Annawerk Schamotte- und Tonwarenfabrik AG, vormals J.R. Geith
Annweiler Email-und Metall-Werke, vormals Franz Ullrich Söhne AG
Aschaffenburger Zellstoffwerke AG
Aschinger's AG
Astrawerke
Atlas-Werke AG
Aug. Nowack Karosseriewerk AG
Augsburger Kammgarn-Spinnerei AG
Augsburger Localbahn
Badische Maschinenfabrik und Eisengießerei
Bahnhofplatz-Gesellschaft Stuttgart AG
Bamag-Megiun AG
Bamberger Mälzerei Aktiengesellschaft vormals Carl J.Dessauer
Basalt-Actien-Gesellschaft
Bast AG
Bastfaserkontor Aktiengesellschaft
Baugesellschaft für die Residenzstadt Dresden AG

Baumwollindustrie Erlangen-Bamberg AG (ERBA)
Baumwollspinnerei Falkenau AG
Baumwollspinnerei Gronau AG
Baumwollspinnerei Kolbermoor
Bavaria-St. Pauli-Brauerei AG
Bayerische Aktien-Bierbrauerei
Bayerische Braunkohlen-Industrie AG
Bayerische Motorenwerke (BMW)
Bayerische Spiegelglasfabriken AG
Bayerische Stickstoff-Werke AG
Bayerische Wolldecken-Fabrik Bruckmühl AG
Bayreuther Bierbrauerei AG
Benno Schilde Maschinenbau AG
Benzol-Verband Gmbh
Bergbau AG Lothringen
Bergbau- und Hütten AG Friedrichshütte
Bergedorf-Geesthachter Eisenbahn Aktien-Gesellschaft
Bergedorf-Geesthachter Eisenbahn Aktien-Gesellschaft
Bergmann-Elektricitäts-Werke AG
Berliner Hafen und Lagerhaus AG
Berliner Holz-Kontor AG
Berliner Kindl Brauerei AG
Berliner Maschinenbau AG, vorm. Schwartzkopff
Berlin-Gubener Hutfabrik Actiengesellschaft, vorm. A. Cohn
Berlinische Boden-Gesellschaft
Berlin-Neuroder Kunstanstalten AG
Beton- und Monierbau AG
Bielefelder Aktien-Gesellschaft für Mechanische Weberei
Bielefelder Maschinenfabrik Dürrkopp
Bierbrauerei Durlacher Hof AG, vorm. Hagen
Bilfinger & Berger Bau AG
Bill-Brauerei AG
Bleicherei, Färberei u. Apprenturanstalt Stuttgart
Bleistift-Fabrik vorm. Johannes Faber AG
Bochum-Gelsenkirchener Straßenbahnen AG
Bonner Portland Zementwerk AG
Borsigwerk Aktiengesellschaft in Oberschlesien
Boswau & Knauer AG
Brau und Brunnen AG
Brauerei C. W. Naumann AG
Brauerei Englisch Brunnen
Brauhaus Nürnberg AG
Brauhaus Regensburg AG
Brauhaus Würzburg (Würzburger Hofbräu)
Braunkohlen- und Brikett-Industrie AG
Braunkohlen- und Brikettwerke Roddergrube AG
Braunkohlenindustrie AG Zukunft
Braunschweigische AG für Jute- und Flachs-Industrie
Braunschweigische Kohlen-Bergwerke
Breitenburger Portland-Cement-Fabrik AG
Bremen-Besigheimer Oelfabriken
Bremen-Vegesacker Fischerei Gesellschaft
Bremer Straßenbahn AG
Bremer Vulkan Schiffbau und Maschinenfabrik
Bremer Woll-Kämmerei AG
Breslauer Actien-Malzfabrik
Brohlthal-Eisenbahn-Gesellschaft
Bronzefarbenwerke AG vorm. Carl Schlenk
Brown, Boveri & Cie
Brunsviga-Maschinenwerke Grimme, Natalis & Co. AG
Buderus'sche Eisenwerke
Burgeff & Co Sektkellereien
Bürgerliches Brauhaus AG Insterburg
Bürgerliches Brauhaus Ingolstadt
Byk-Guldenwerke Chemische Fabrik AG
C. Graesers Ww. & Sohn AG
C. Müller Gummiwarenfabrik AG
C.H. Knorr AG
C.J. Vogel Draht- und Kabelwerke AG
Capito & Klein AG
Carl Lindström AG
Charlottenburger Wasser- und Industriewerke AG
Chemische Düngerfabrik Rendsburg
Chemische Fabrik Grünau Landshoff & Meyer AG
Chemische Fabrik Helfenberg AG vorm. Eugen Dietrich
Chemische Fabrik in Billwärder, vorm. Hell & Sthamer AG
Chemische Fabrik von Heyden
Chemische Werke Brockhues AG
Chemische Werke vorm. H. & E. Albert
Christoph & Unmack AG
Concordia Spinnerei und Weberei AG
Conrad Scholtz AG
Continental Gummi Werke
Conventgarten AG
Crefelder Baumwoll-Spinnerei
D. Stempel AG
Daimler Benz
Dampfschifffahrts-Gesellschaft Neptun
David Richter AG Tüllfabrik-Maschinenfabrik
Demag AG
Dessauer Werke für Zucker- und Chemische Industrie AG
Deutsch-Amerikanische Petroleum-Gesellschaft (DAPG)
Deutsch-Atlantische Telegraphengesellschaft
Deutsche Ammoniak Verkaufs-Vereinigung GmbH
Deutsche Asphalt-Aktien-Gesellschaft der Limmer und Vorwohler Grubenfelder
Deutsche Babcock & Wilcox Dampfkesselwerke
Deutsche Continental Gas-Gesellschaft
Deutsche Dampfschifffahrts-Gesellschaft Hansa
Deutsche Eisenbahn-Betriebs-Gesellschaft
Deutsche Eisenbahn-Gesellschaft
Deutsche Erdöl AG
Deutsche Gasolin AG
Deutsche Gold- und Silber-Scheideanstalt (DEGUSSA)
Deutsche Jurgens-Werke AG
Deutsche Kabelwerke AG
Deutsche Linoleum-Werke
Deutsche Maizena Werke
Deutsche Niles-Werke AG
Deutsche Ost-Afrika-Linie AG
Deutsche Post- und Eisenbahn-Verkehrswesen-AG

Deutsche Spiegelglas-Actien-Gesellschaft
Deutsche Spiegelglasfabriken AG
Deutsche Steinzeugwarenfabrik für Kanalisation und Chemische Industrie
Deutsche Telephonwerke und Kabelindustrie AG
Deutsche Ton-und Steinzeug-Werke Aktiengesellschaft
Deutsche Vacuum Oel Aktiengesellschaft
Deutsche Werft AG
Deutsche Werkstätten
Deutsche Wollenwaren Manufaktur AG
Deutsche Zündholzfabriken AG
Deutscher Eisenhandel AG
Didier Werke AG
Dittersdorfer Filz-und Kratzentuchfabrik
Diwag Chemische Fabriken
Dolerit Basalt AG
Doornkaat Aktiengesellschaft
Dortmunder Actien-Brauerei AG
Dortmunder Ritterbrauerei
Dr. Hugo Remmler AG
Dresdener Nähmaschinenzwirn-Fabrik
Dresdner Gardinen- und Spitzenmanufaktur M & S Schröder
Dürener Dampfstraßenbahn AG
Dürener Metallwerke AG
Dyckerhoff-Portland-Zementwerke
Dynamit-AG (vrmls Alfred Nobel)
E. Gundlach AG
E.F. Ohle's Erben
E.ON Wasserkraft
Eduard Lingel Schuhfabrik
Einbecker Brauhaus
Eisen- und Hüttenwerke AG
Eisenbahn-Verkehrsmittel AG
Eisenwerk-Gesellschaft Maximilianshütte
Eiswerk und Kühlhaus Huxmann AG
Elbe-Dampfschiffahrts-Actiengesellschaft
Elblagerhaus AG
Elbschloß-Brauerei
Elektrische Licht- und Kraftanlagen AG
Elektrizitäts-Aktiengesellschaft vorm. Schuckert & Co
Elektrizitätswerk Sachsen-Anhalt
Elektrizitätswerk Unterelbe
Elmshorn-Barmstedt-Oldesloer Eisenbahn AG
Emil Busch AG, Optische Industrie
Engelhardt-Brauerei AG
Enzinger Union Werke AG
Erdmannsdorfer AG Flachsgarn-Maschinen-Spinn und Weberei
Erste Deutsche Fein-Jute-Garn-Spinnerei AG
Erste Kulmbacher Actien-Exportbier-Brauerei
Essener Steinkohlenbergwerke AG
Export-Schlachterei und Schmalz-Raffinereie AG
Expresswerke AG
F. Reichelt AG
Falkensteiner Gardinen-Weberei und Bleicherei
Färberei Glauchau Aktiengesellschaft
Farbwerke Franz Rasquin AG
Feist-Sektkellerei AG
Feldmühle Papier- und Zellstoffwerke AG
Felten & Guilleaume Carlswerk
Ferd. Rückforth Nachfolger AG
Ferdinand Schuchhardt Berliner Fernsprech- und Telegraphenwerk AG
Flensburger Schiffsbau-Gesellschaft
Fr. Hensel & Haenert AG
Fr. Hesser Maschinenfabrik AG
Frankfurter Hof AG (später Steigenberger)
Frankfurter Lokalbahn AG
Frankonia Schokoladenwerke
Franz Braun Aktiengesellschaft
Franz Clouth Rheinische Gummiwarenfabrik AG
Franz Seiffert & Co.
Freiherrlich von Tucher'sche Brauerei AG
Fried. Krupp AG
Fried. Krupp Grusonwerk AG
Friedr. Remy Nachfolger AG
Friedrich Wasmuth AG für Baustoffhandel und Industrie
Fritz Häuser AG
Fritz Schulz jun. AG
Fürstenberger Porzellanfabrik
Gardinenfabrik Plauen AG
Gebhard & Co. AG
Gebr. Krüger & Co. AG
Gebr. Schüller AG Venusberg-Spinnerei
Gebrüder Adt AG
Gebrüder Fahr AG
Gebrüder Goedhart Aktiengesellschaft
Gebrüder Junghans AG
Gebrüder Stollwerck AG
Gebrüder Unger AG
Geraer Strickgarnfabrik Gebrüder Feistkorn
Germanischer Lloyd AG
Gernrode-Harzgeroder Eisenbahn-Gesellschaft
Gesellschaft für Markt- und Kühlhallen
Getreide AG vorm. P. Kruse - Chr. Sieck
Gilde Brauerei AG
Gladbacher Wollindustrie AG vorm. L. Josten
Glasfabrik AG Brockwitz
Glasurit-Werke M. Winkelmann AG
Glückauf-Brauerei AG
Gorkauer Sozietäts-Brauerei AG
Görlitzer Aktien-Brauerei
Gottfried Lindner AG
Graphit Kropfmühl AG
Griebel'sche Brauerei AG
Großenhainer Webstuhl- und Maschinen-Fabrik AG
Großkraftwerk Franken AG
Großkraftwerk Stettin AG
Grube Leopold AG
Grüner-Bräu AG
Gruschwitz Textilwerke AG
Gustav Genschow & Co. AG
Gutehoffnungshütte

H. Berthold, Messinglinienfabrik und Schriftgiesserei AG
H. Fuchs Waggon-Fabrik AG
H. Maihak AG
H. Meinecke AG
H. W. Appel Feinkost AG
Habermann & Guckes AG
Hackerbräu
Hackethal Draht- und Kabelwerke AG
Hafen-Dampfschiffahrt AG
Halberstadt-Blankenburger Eisenbahn Gesellschaft mbH
Halle-Hettstedter Eisenbahn-Gesellschaft
Hallesche Maschinenfabrik und Eisengießerei
Hallesche Röhrenwerke AG
Hamburg-Amerika Linie - HAPAG
Hamburger Getreide-Lagerhaus AG
Hamburger Hochbahn AG
Hamburger Wasserwerke GmbH
Hamburg-Südamerikanische Dampfschifffahrts-Gesellschaft
Hammonia Stearin Fabrik
Handelsvereinigung Dietz & Richter - Gebrüder Lodde AG
Hanfwerke Füssen-Immenstadt AG
Hannoversche Maschinenbau AG vorm. Georg Egestorff (HANOMAG)
Hannoversche Papierfabriken Alfeld-Gronau, vorm. Gebr. Woge
Hanseatische Stuhlrohrfabriken Rümcker & Ude AG
Harburger Eisen- und Bronzewerke AG
Harpen AG
Hartmann & Braun AG
Hartwig & Vogel AG
Haunstetten Textil AG
Hedwigshütte Kohlen- und Kokswerke AG
HeidelbergCement AG
Heidelberger Druckmaschinen AG
Heidelberger Straßen- und Bergbahn AG
Heidenauer Papierfabrik AG
Heilmann & Littmann Aktiengesellschaft
Hein, Lehmann & Co. AG
Heine & Co. AG
Heinrich Kämper Motorenfabrik AG
Henninger Bräu AG
Hermann Meyer & Co
Hermann Stärker AG
Hermann Wronker AG
Herrenmühle vorm. C. Genz AG
Hessische und Herkules-Bierbrauerei AG
Hibernia AG
Hildebrandsche Mühlenwerke AG
Hilgers AG
Hindrichs-Auffermann AG
Hochofenwerk Lübeck
Hochseefischerei Nordstern AG
Hochtief
Hoesch AG
Hofer Bierbrauerei AG
Hoffmann's Stärkefabriken
Hohburger Quarz-Porphyr-Werke AG
Holsten-Brauerei AG
Holzstoff- und Lederpappen-Fabriken vorm. Gebr. Fünfstück AG
Howaldtswerke
Hugo Schneider AG
Hürnerbräu AG
HUTA Hoch- und Tiefbau AG
IG Farben
Ilse Bergbau-Actiengesellschaft in Grube Ilse Nieder-Lausitz
INAG (Industrie-Unternehmungen AG)
Industrie für Holzverwertung AG
Industriewerke AG
Internationale Baumaschinenfabrik AG
Isaria Zählerwerke AG
Isola AG
IWKA AG
J. A. John AG
J. Brünning & Sohn AG
J. Pohlig AG
Jacob Ravené Söhne & Co. AG
Jodquellen AG
Joh. Braun Konservenfabrik AG
Johannes Haag Zentralheizungen AG
Joseph Vögele AG
Jota-Werk Gebr. Funke
Julius Berger Tiefbau-Aktiengesellschaft
Jute-Spinnerei und Weberei Bremen
Jute-Spinnerei und Weberei Kassel
Kabel Rheydt AG
Kabelwerk Duisburg
Kaffee-Hag AG
Kaiserhof Hotel AG
Kaiser-Keller AG
Kammerich Werke AG
Kammgarn-Spinnerei Bietigheim AG
Kammgarn-Spinnerei Düsseldorf
Kammgarnspinnerei Meerane AG
Kammgarnspinnerei Schedewitz AG
Kammgarnspinnerei zu Leipzig AG
Kampnagel AG
Kartonpapierfabriken AG
Kasseler Verkehrs-Gesellschaft AG
Kattowitzer AG für Bergbau und Eisenhüttenbetrieb
Keramische Werke AG
Kieler Verkehrsaktiengesellschaft
Klein, Schanzlin & Becker AG (KSB AG)
Klöckner-Werke AG
Kochs Adlernähmaschinen Werke A.-G.
Koehlmann-Werke
Kohle Aktiengesellschaft
Kohlenberg & Putz Seefischerei AG
Köln-Düsseldorfer Deutsche Rheinschiffahrt AG
Kommunale Elektrizitäts-Lieferungs-Gesellschaft AG
Königs Malzfabrik AG

Königsbacher Brauerei AG
Königsberg-Cranzer-Eisenbahn
Königsberger Kühlhaus und Kristall-Eis-Fabrik AG
Königsberger Lagerhaus AG
Königstadt AG für Grundstücke und Industrie
Königs-Wusterhausen-Mittenwalde-Töpchiner Kleinbahn-Gesellschaft
Kötitzer Ledertuch- und Wachstuch-Werke
Krauss-Maffei Wegmann GmbH & Co. KG
Kreis Ruhrorter Strassenbahn AG
Kronprinz AG für Metallindustrie
Kühlhaus Lübeck AG
Kühlhaus Zentrum AG
Kulmbacher Brauerei AG
Kulmbacher Mönchshof-Bräu GmbH
Küppersbusch AG
KWS Saat AG
Lahmeyer AG für Energiewirtschaft
Land- und Seekabelwerke AG
Langbein-Pfanhauser-Werke AG
Lederer Bräu
Lederfabrik Heinrich Knoch AG
Lederwerke Wieman AG
Lehnkering & Cie
Leipziger Baumwollspinnerei
Leipziger Bierbrauerei zu Reudnitz, Riebeck
Leipziger Immobiliengesellschaft
Leipziger Messe GmbH
Leipziger Trikotagenfabrik AG
Leipziger Wollkämmerei
LEONI AG (vrmls. Leonische Werke Roth-Nürnberg)
Liegnitz-Rawitscher Eisenbahn-Gesellschaft
Lingner-Werke AG
Lloyd Dynamowerke
Localbahn AG
Losenhausenwerk
Löwenbräu AG
Löwenbrauerei - Böhmisches Brauhaus
Lübeck-Büchener Eisenbahn-Gesellschaft
Lübecker Maschinenbau-Gesellschaft
Ludwigshafener Walzmühle
Lugauer Kammgarn-Spinnerei
Magdeburger Strassen-Eisenbahn Gesellschaft
Malzbierbrauerei Groterjan & Co. AG
Mannesmannröhren-Werke AG
Mansfeld AG für Bergbau und Hüttenbetrieb
Maschinenbau AG Balcke
Maschinenfabrik Augsburg-Nürnberg AG (MAN)
Maschinenfabrik Esslingen AG
Maschinenfabrik Esterer AG
Mechanische Baumwoll-Spinnerei & Weberei in Kaufbeuren
Mechanische Treibriemenweberei und Seilfabrik Gustav Kunz AG
Mechanische Weberei AG
Mechanische Weberei Sorau vorm. F.A. Martin & Co
Meissner Ofen- und Porzellanfabrik AG, vorm. C. Teichert
Metall-Industrie Schönebeck AG
Metallpapier-Bronzefarben-Blattmetallwerke AG
Metallwarenfabrik vorm. H. Wissner AG
Meyer Kauffmann Textilwerke AG
MIAG Mühlenbau und Industrie
Mineralöl-Raffinerie vorm. Aug. Korff AG
Mitropa
Mix & Genest
Moenus Textilmaschinen AG
Motoren-Werke Mannheim AG
Münchener Export-Malzfabrik
Nähmaschinenfabrik Karlsruhe vorm. Haid & Neu
Nähmaschinen-Teile AG (Würker & Knirsch)
Nationale Automobil-Gesellschaft AG
Natronzellstoff- und Papierfabriken AG
Neu Guinea Compagnie
Neue Augsburger Kattunfabrik
Neue Baumwoll-Spinnerei und Weberei Hof AG
Neue Deutsch-Böhmische Elbeschiffahrt AG
Neukölln-Mittenwalder Eisenbahn-Gesellschaft
Neuwalzwerk AG
Niederbarnimer Eisenbahn AG
Niederlausitzer Kohlenwerke
Nitag Deutsche Treibstoffe AG
Nitritfabrik AG
Nordcement AG
Norddeutsche Affinerie AG
Norddeutsche Eiswerke AG
Norddeutsche Hütte AG
Norddeutsche Kabelwerke AG
Norddeutsche Kohlen- und Cokes-Werke AG
Norddeutsche Lederwerke AG (vrmls. Adler & Oppenheimer AG)
Norddeutsche Woll- und Kammgarn-Industrie
Norddeutscher Lloyd
Nordhausen-Wernigeroder Eisenbahn-Gesellschaft
Nordhäuser Aktienbrauerei AG
Nordhäuser Tabakfabriken AG
Nordwestdeutsche Kraftwerke
NSU-Werke
Nürnberger Hercules-Werke AG
Oberbayerische AG für Kohlenbergbau
Oberhütten, Vereinigte Oberschlesische Hüttenwerke AG
Oberrheinische Eisenbahn-Gesellschaft AG
Oberschlesische Eisenbahn-Bedarfs-AG
Ohlauer Hafenbahn und Lagerei AG
OLEX Deutsche Benzin & Petroleum GmbH
Orenstein & Koppel
Osnabrücker Kupfer- und Drahtwerk
Ostpreußenwerk AG
Ottensener Eisenwerk
Otto Stumpf AG
Papierfabrik Großenhain AG
Papierfabrik Krappitz AG
Park- und Bürgerbräu AG
Patentpapierfabrik zu Penig

Peipers & Cie. AG
PESAG AG
Pfälzische Lederwerke
Pfälzische Mühlenwerke
Pfeilring Werke AG
Phänomen-Werke Gustav Hiller AG
Philipp Holzmann AG
Pittler Werkzeugmaschinenfabrik AG
Planeta Druckmaschinenwerk AG
Pongs & Zahn Textilwerke AG
Poppe & Wirth
"Portland Cement-Fabrik ""Stadt Oppeln"" AG"
Portlandcement- und Kalkwerke ELSA AG
Portland-Cement-Fabrik AG
Portland-Cementfabrik Germania AG
Porzellanfabrik C.M. Hutschenreuther AG
Porzellanfabrik Kahla
Porzellanfabrik Lorenz Hutschenreuther
Porzellanfabrik Rosenthal AG
Porzellanfabrik Tettau AG
Porzellanfabrik Waldsassen Bareuther & Co AG
Porzellanfabrik zu Kloster Veilsdorf
Prangmühlen AG
Press Stanz- und Ziehwerke Rud. Chillingworth AG
Pressluftwerkzeug- und Maschinenbau AG
Pressspanfabrik Untersachsenfeld AG vorm. M. Hellinger
Preussag AG
Preussengrube AG
Preußisch-Rheinische Dampfschiffahrts-Gesellschaft
R. Stock AG
Radeberger Exportbierbrauerei
Ravensberger Spinnerei AG
Reichelt-Metallschrauben AG
Reis- & Handels-AG
Reudener Ziegelwerke AG
Rheinische AG für Braunkohlenbergbau und Brikettfabrikation
Rheinische Chamotte- und Dinas-Werke
Rheinische Elektricitäts- und Kleinbahnen AG
Rheinische Elektricitäts- und Kleinbahnen AG
Rheinische Stahlwerke
Rheinische Textilfabriken AG
Rheinisch-Westfälische Kalkwerke
Rheinmetall AG
Rhein-Sieg Eisenbahn AG
Rheinstahl AG
Rhenania-Ossag Mineralölwerke AG
Riquet & Co. AG
Robert Bosch GmbH
Rockstroh-Werke AG
Rodi & Wienenberger AG für Bijouterie- und Kettenfabrikation
Rositzer Zucker-Raffinerie
Rotophot AG für graphische Industrie
Ruberoidwerke AG
Rudolph Karstadt
Rütgers AG
Saarfürst-Brauerei
Saccharin-Fabrik AG vorm. Fahlberg, List & Co
Sachsenwerk, Licht- und Kraft-Aktiengesellschaft
Sächsisch-Böhmische Dampfschiffahrts-Gesellschaft
Sächsische Elektrizitätswerk- und Straßenbahn AG
Sächsische Emaillier- und Stanzwerke vorm. Gebr. Gnüchtel AG
Sächsische Gußstahlfabrik
Sächsische Tüllfabrik AG
Sächsische Webstuhlfabrik AG
Sächsische Werkzeugmaschinenfabrik Bernhard Escher AG
Saline Lüneburg und Chemische Fabrik
Salzdetfurth AG
Samlandbahn AG
Samson Apparatenau AG
Sandlerbräu AG
Sanitas Actien-Gesellschaft
Sarotti Chokoladen- & Cacao-Industrie AG
Sartorius AG
Scheidemandel-Motard-Werke AG
Schermbecker Thon- und Falzziegelwerke AG
Schiess AG
Schlegel-Scharpenseel-Brauerei AG
Schlesische AG für Bergbau und Zinkhüttenbetrieb
Schlesische Bergwerks- und Hütten AG
Schlesische Dampfer-Compagnie - Berliner Lloyd AG
Schlesische Mühlenwerke AG
Schloß-Brauerei Chemnitz AG
Schloß-Brauerei Chemnitz AG
Schloßgartenbau AG
Schoeller'sche Kammgarnspinnerei Eitorf
Schöfferhof-Binding-Brauerei AG
Schramm Lack- und Farbenfabriken AG
Schubert & Salzer Maschinenfabrik AG
Schüle-Hohenlohe AG
Schultheiss-Brauerei
Schwabenbräu AG
Schwartauer Werke
Schwebebahn Vohwinkel-Elberfeld-Barmen
Schwerter Profileisenwalzwerk AG
Seidel & Naumann AG
Siegersdorfer Werke vorm. Fried. Hoffmann AG
Siemens & Halske
Siemens-Glas AG
Siemens-Reiniger-Werke AG
Siemens-Schuckertwerke
Sinalco AG
Sinner AG
Societätsbrauerei Waldschlösschen AG
SOMAG Sächsische Ofen- und Wandplattenwerke AG
Speicherei- und Speditions AG
Spinnerei und Weberei Kottern
Spinnerei und Weberei Offenburg
Stader Lederfabrik AG
Stahlwerke Brüninghaus AG

Steatit-Magnesia AG
Steffens und Nölle AG
Steingutfabrik Colditz AG
Stettiner Bergschloß-Brauerei AG
Stettiner Brauerei-AG Elysium
Stettiner Oderwerke AG für Schiff- und Maschinenbau
Stettiner Oelwerke AG
Stettiner Papier und Pappenfabrik AG vorm. Schrödter & Rabbow
Stettiner Portland-Cement-Fabrik
Stettin-Rigaer Dampfschiffs-Gesellschaft Th. Gribel
Stickereiwerke Plauen AG
Stöhr & Co. AG
Stolberger Zink AG
Strassenbau-AG (STRABAG)
Stuttgarter Straßenbahnen AG
Süddeutsche Baumwolle-Industrie AG
Südwestdeutsche Salzwerke AG
Südzucker AG
Telephonfabrik Berliner AG
Tellus AG für Bergbau und Hüttenindustrie
Tempelhofer Feld, AG für Grundstücksverwertung
Terra Aktiengesellschaft für Samenzucht
Th. Goldschmidt AG
Thüringer Electricitäts-Lieferungs-Gesellschaft
Thüringer Wollgarnspinnerei
Tiefbau- und Kälteindustrie vorm. Gebhardt & Koenig
Tilsiter Actien-Brauerei
Torpedo-Werke AG Fahrräder und Schreibmaschinen
Trachenberger Zuckersiederei
Transport-Actien-Gesellschaft, vormals J. Hevecke
Triumph Werke Nürnberg
Tüll- und Gardinen-Weberei AG
Tüllfabrik Flöha AG
Tüllfabrik Mehltheuer AG
Überlandwerk Unterfranken AG
Union Baugesellschaft auf Actien
Union Leipziger Preßhefefabrik und Brennerei AG
Union, Fabrik chemischer Produkte
Universum-Film AG
Varziner Papierfabrik
Veltag, Veltener Ofen und Keramik AG
Vereinigte Altenburger und Stralsunder Spielkarten-Fabriken
Vereinigte Aluminium-Werke
Vereinigte Bautzner Papierfabriken
Vereinigte Berliner Mörtelwerke
Vereinigte Deutsche Nickelwerke AG
Vereinigte Filzfabriken
Vereinigte Fränkische Schuhfabriken AG
Vereinigte Glanzstoff-Fabriken AG
Vereinigte Gothania-Werke AG
Vereinigte Großalmeroder Thonwerke AG
Vereinigte Harzer Portlandzement- und Kalkindustrie AG
Vereinigte Holzstoff- und Papierfabriken AG
Vereinigte Industrie-Unternehmungen
Vereinigte Jute-Spinnereien und Webereien AG
Vereinigte Kapselfabriken Nackenheim-Beyerbach Nachfolger AG
Vereinigte Kleinbahnen AG
Vereinigte Königs- und Laurahütte AG für Bergbau und Hüttenbetrieb
Vereinigte Lausitzer Glaswerke
Vereinigte Malzfabriken Goldene Aue
Vereinigte Märkische Tuchfabriken AG
Vereinigte Metallwaarenfabriken A.G. vormals Haller & Co
Vereinigte Ost- und Mitteldeutsche Zement AG (ehem. Schlesische Portland-Cement-Industrie AG Oppeln)
Vereinigte Pinsel-Fabriken
Vereinigte Schmirgel- und Maschinen-Fabriken AG
Vereinigte Smyrna-Teppich-Fabriken AG
Vereinigte Strohstoff-Fabriken AG
Vereinigte Ultramarinfabriken AG vorm. Leverkus, Zeltner & Consorten
Vereinigte Werkstätten für Kunst im Handwerk
Vereinsbrauerei Herrenhausen
Vereinsbrauerei Mecklenburgische Wirte AG
Veritas Gummiwerke AG
Victoria Werke AG
Vogtländische Spitzenweberei
Vogtländische Tüllfabrik
Voigt & Haeffner AG
Voltohm Seil- und Kabelwerke AG
W. A. Scholten Stärke- und Syrup-Fabriken AG
W. Krefft AG
Waggon- und Maschinenbau AG Görlitz-(WUMAG)
Waggonfabrik Jos. Rathgeber
Waggonfabrik L. Steinfurt
Waggonfabrik Rastatt
Waggon-Fabrik Uerdingen AG
Wanderer-Werke vorm. Winklhofer & Jaenicke AG
Warsteiner und Herzoglich Schleswig-Holsteinische Eisenwerke AG
Wasserwerk für das nördliche westfälische Kohlenrevier
Wayss & Freytag AG
Wegelin & Hübner Maschinenfabrik und Eisengießerei AG
Weigelwerk AG
Wendt's Cigarrenfabriken AG
Werschen-Weissenfelsen-Braunkohle-Aktien-Gesellschaft
Westdeutsche Handelsgesellschaft AG
Westfälische Drahtindustrie
Westfälische Kupfer- und Messingwerke AG vorm. Casp. Noell
Westfälische Landes-Eisenbahn AG
Westfälische Transport AG
Wezel & Naumann AG
Wickrather Lederfabrik AG
Wicküler-Küpper-Brauerei
Wieland-Werke AG
Winterhuder Bierbrauerei
Wintershall AG

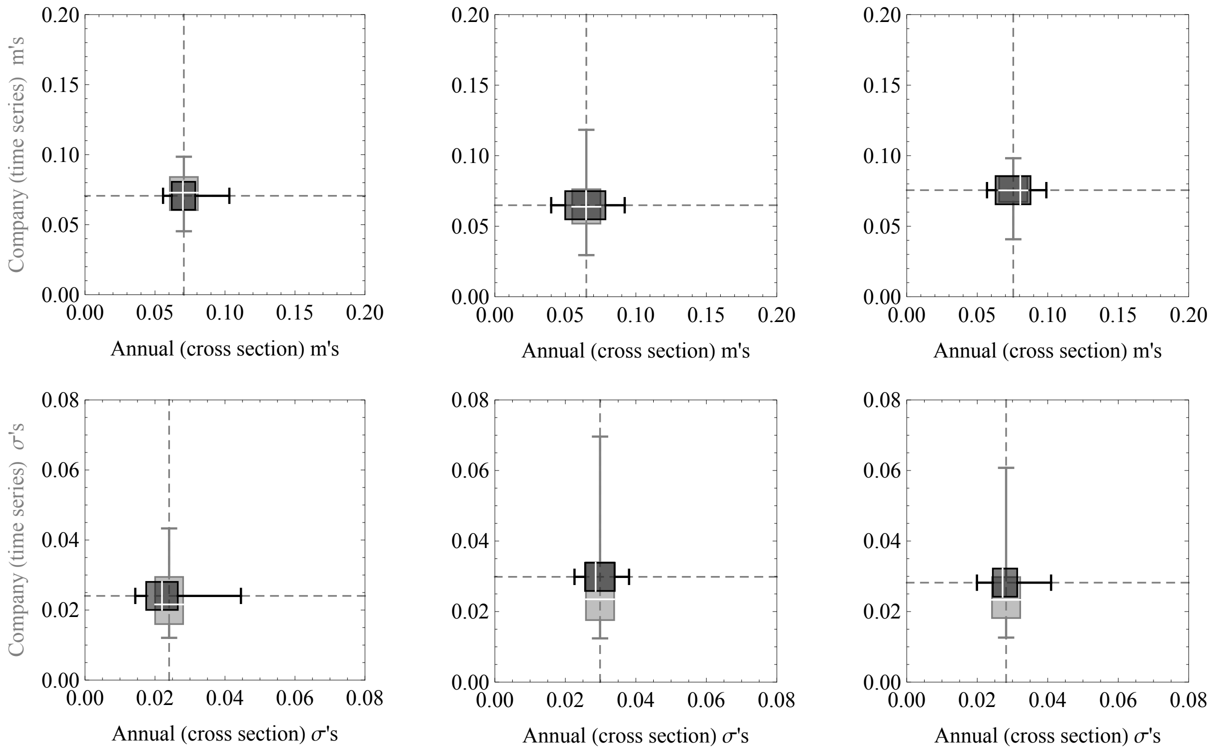
Wollwaarenfabrik Mercur
Woll-Wäscherei und Kämmerei in Döhren
Wotan- und Zimmermann Werke AG
Württembergische Baumwoll-Spinnerei und -Weberei
Württembergische Cattunmanufaktur
Württembergische Elektrizitäts-AG
Würzburger Bürgerbräu AG
Zahnräderfabrik Augsburg vorm. Joh. Renk AG
Zeiss Ikon AG
Zeitzer Eisengiesserei und Maschinenbau AG
Zellstofffabrik Waldhof AG
Zigarettenfabrik Richard Greiling AG
Zschipkau-Finsterwalder Eisenbahn
Zuckerfabrik Alt-Jauer AG
Zuckerfabrik Fraustadt AG
Zuckerfabrik Froebeln AG
Zuckerfabrik Glauzig
Zuckerfabrik Rastenburg AG
Zuckerfabrik Rheingau AG
Zuckerraffinerie Genthin AG
Zuckerraffinerie Halle

Data sources: *Hamburgisches Welt-Wirtschafts-Archiv (HWWA)* and archive of the *Institut für Weltwirtschaft (IfW)*, various annual reports for the years 1919-1944.

C

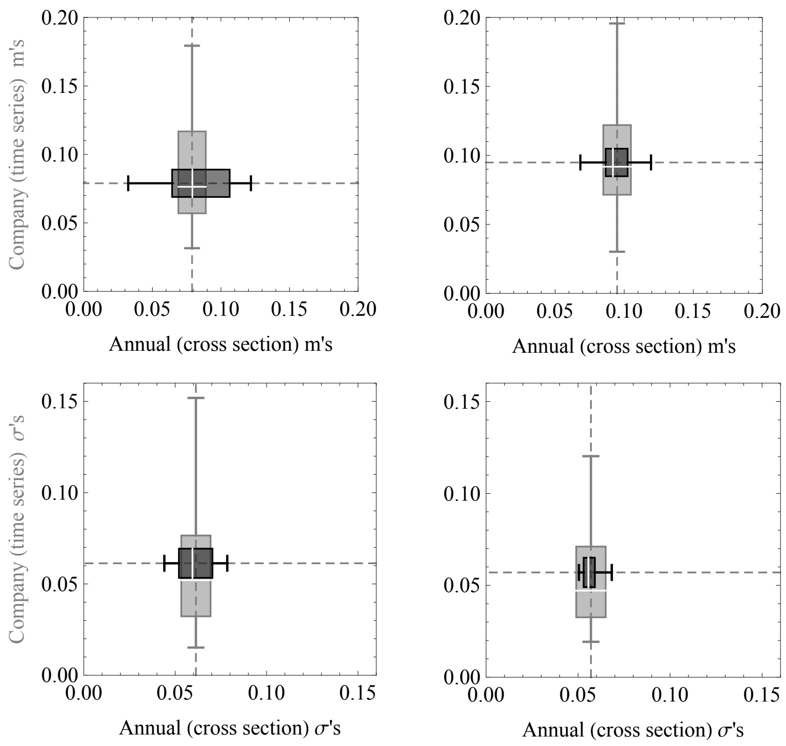
Double Box-Whisker-Plots on the Location and Dispersion of Profit Rates of U.S. Corporations in 1863-1893, 1923-1953 and 1983-2013

Figures C.1 and C.2 show Double Box-Whisker plots of m and σ estimates for company time series (vertical) and pooled annual samples (horizontal) for utility corporations and non-financial corporations. Box-Whiskers are centered around the phenomenological (pooled data) estimates of m and σ, indicated by the dashed lines; company (annual) samples deviate from the phenomenological values if the vertical (horizontal) Box-Whiskers' median deviates from



a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure C.1: Double Box-Whisker Plots of cross section and time series m's (upper panel) and σ's (lower panel) of utility corporations for periods (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013. Vertical Box-Whiskers illustrate company (time series) measures while horizontal Box-Whiskers illustrate annual (cross section) measures. Dashed lines indicate the phenomenological estimates for m and σ of the pooled data, around which the Boxes and Whiskers are centered. Whiskers indicate the 5th and 95th percentile.



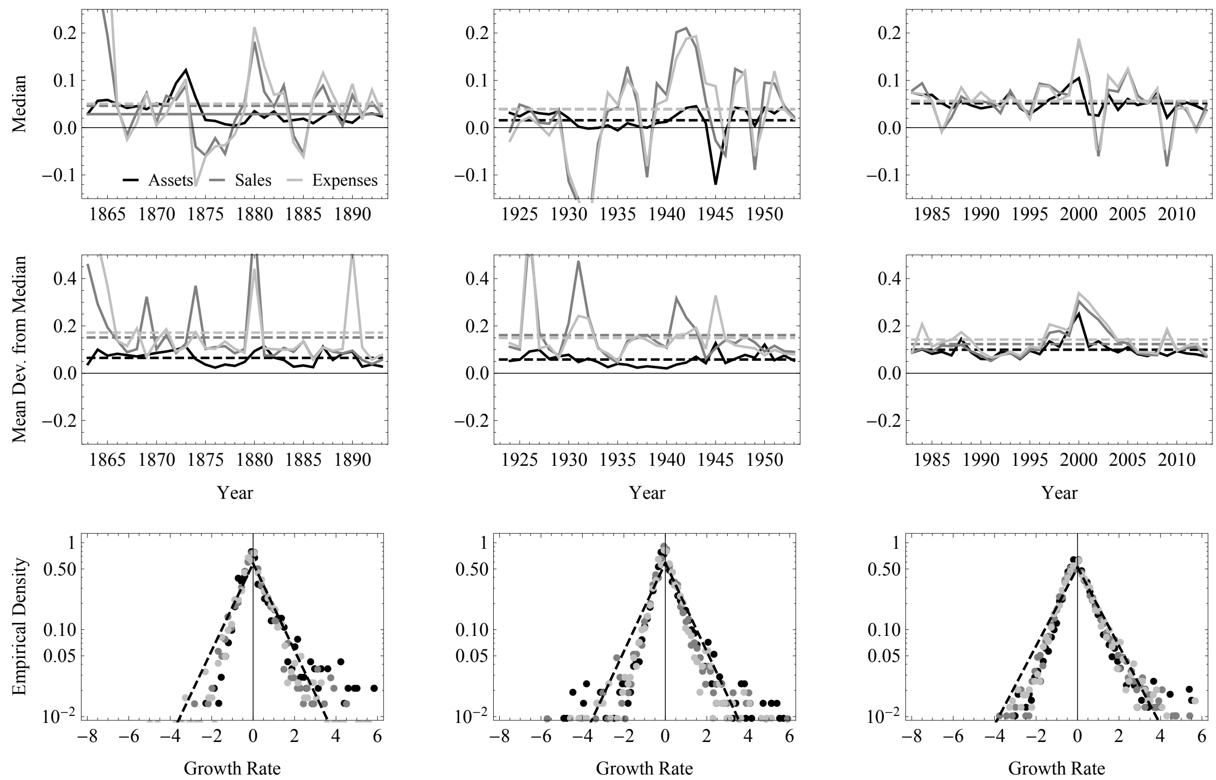
a) 1923-1953 b) 1983-2013

Figure C.2: Double Box-Whisker Plots of the distributions of annual and company m's (upper panel) and σ's (lower panel) of non-financial corporations for periods (a) 1923-1953 and (b) 1983-2013. Dashed lines indicate the phenomenological estimates for m and σ for the pooled data, around which the Boxes and Whiskers are centered. Whiskers indicate the 5th and 95th percentile.

the horizontal (vertical) dashed line. While there are significant differences in the dispersion of company and annual sample m's and σ's, indicated by different lengths of the whiskers, their median realizations fall close to the phenomenological values of the pooled data, indicated by the intersection of the dashed lines. Thus, the median and dispersion of profit rates across companies and years are close to the values of the pooled distribution, supporting the idea of a commonly underlying, company- and time-independent data generating process.

D

U.S. Corporate Growth during 1863-1893, 1923-1953 and 1983-2013: A Preliminary Statistical Analysis

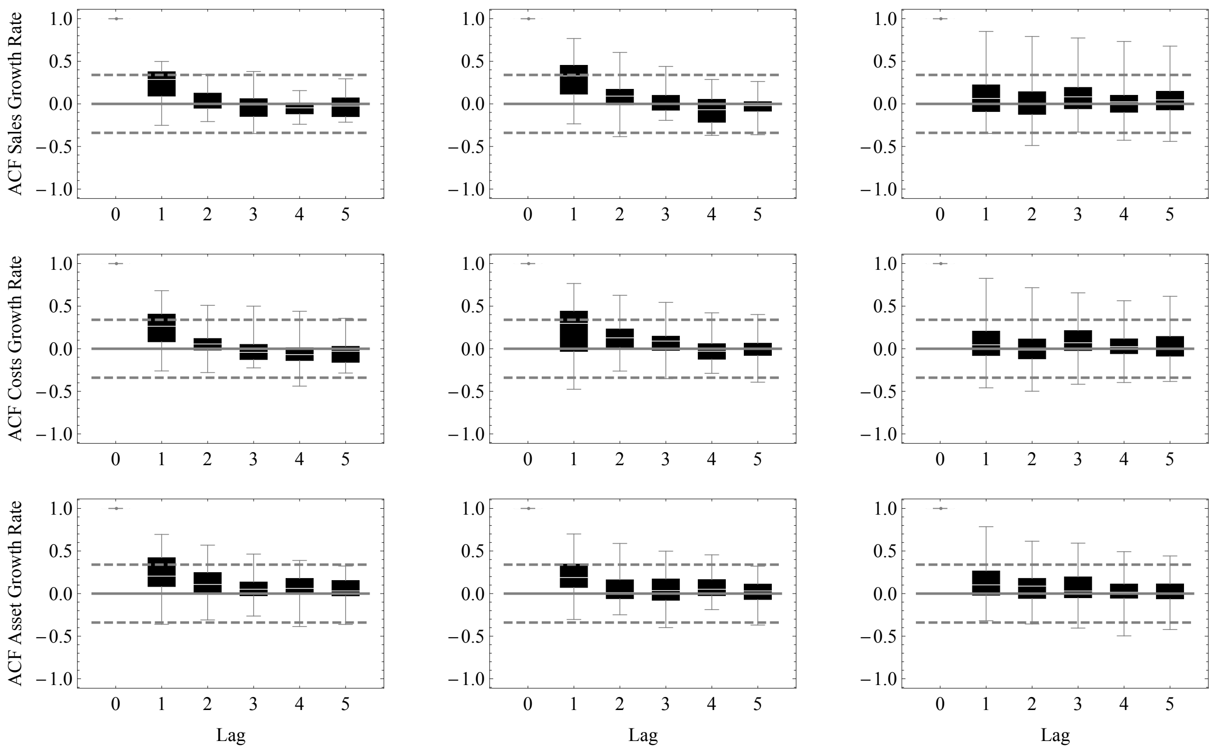


a) 1863-1893

b) 1923-1953

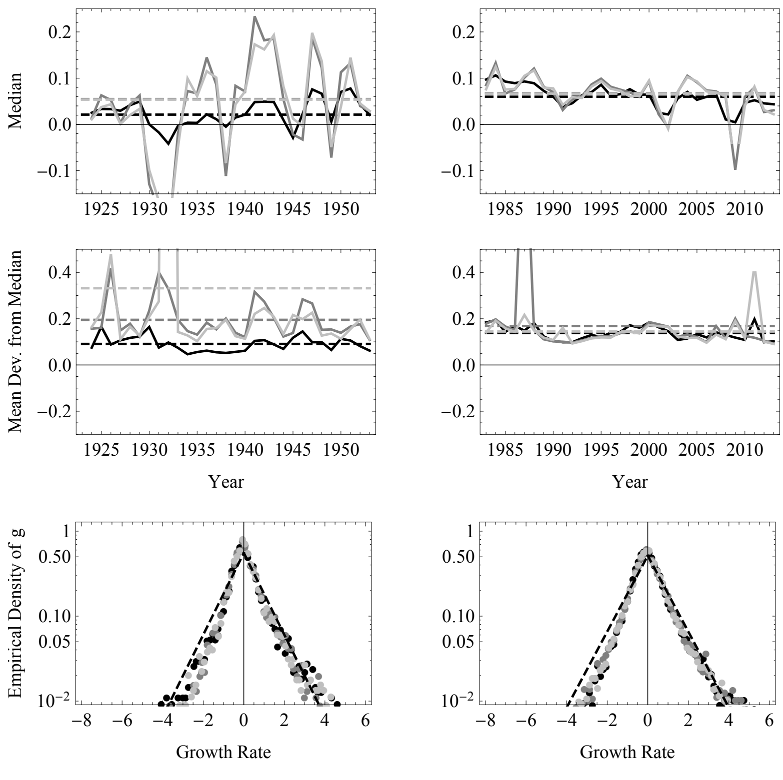
c) 1983-2013

Figure D.1: Cross-sectional statistical behavior of growth rates of utility corporations. From top to bottom, time evolution of the annual median and mean deviation from the median assets growth rate (black), sales growth rate (light gray) and cost growth rate (dark gray) with long-run values (dashed) for sample periods (a) 1863-1893 (30 companies, 892 observations), (b) 1923-1953 (43 companies, 1,298 observations) and (c) 1983-2013 (98 companies, 3,030 observations).



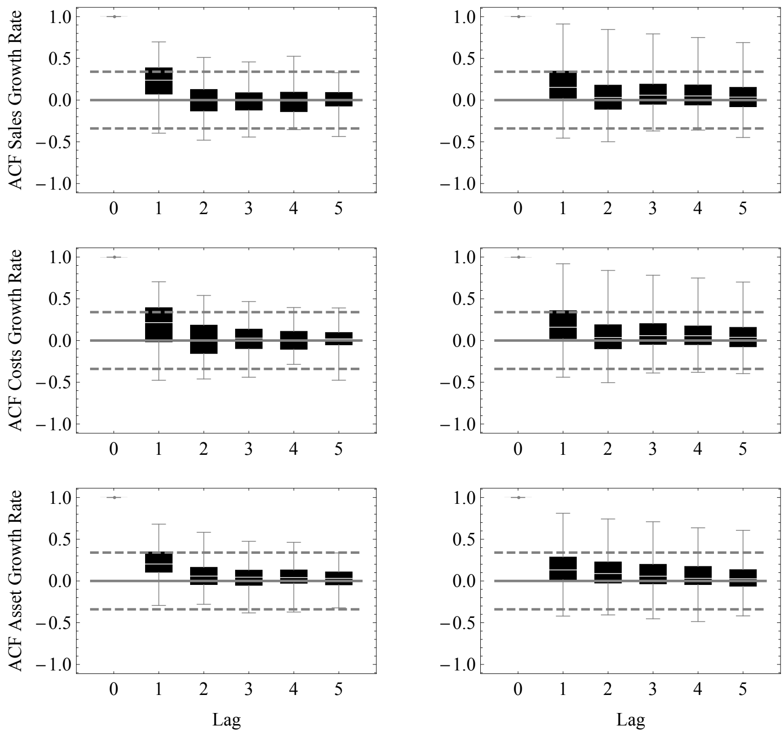
a) 1863-1893 b) 1923-1953 c) 1983-2013

Figure D.2: Time-series behavior of growth rates of utility firms. From top to bottom Box-Whisker Plots of the autocorrelation functions (ACF) of sales, costs and asset growth rates. Sample periods are (a) 1863-1893, (b) 1923-1953 and (c) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).



a) 1923-1953 b) 1983-2013

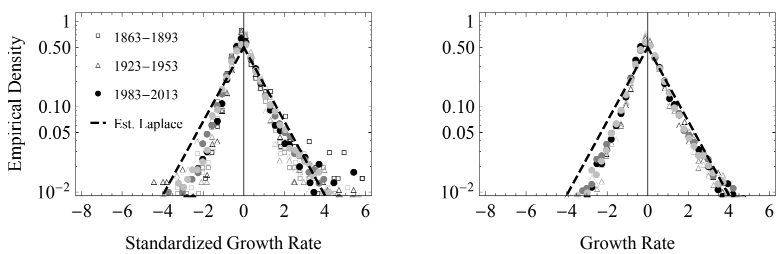
Figure D.3: Cross-sectional statistical behavior of growth rates of non-financial corporations. From top to bottom, time evolution of the annual median and mean deviation from the median asset growth rates (black), sales growth rate (dark gray) and cost growth rate (light gray) with long-run values (dashed) for sample periods are (a) 1923-1953 (136 companies, 3,967 observations) and (b) 1983-2013 (562 companies, 17,147 observations).



a) 1923-1953

b) 1983-2013

Figure D.4: Time-series behavior of growth rates of all firms. From top to bottom Box-Whisker Plots of the autocorrelation functions (ACF) of sales, costs and asset growth rates. Sample periods are (a) 1923-1953 and (b) 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation ($\pm 1.96/\sqrt{T}$ with T being the length of time series of 31 years.).



a) Utilities

b) Non-Financials (incl. Utilities)

Figure D.5: Cross-sectional statistical behavior of standardized growth rates. Empirical density of growth rates for (a) utility corporations and (b) non-financial corporations for sample periods 1863-1893, 1923-1953, and 1983-2013. Dashed lines indicate a Standard Laplace distribution $(0, 1)$.

E
Country Profiles

The following country profiles are inspired by the global statistical analysis of profitability and growth provided in chapter 5.2. In other words, we replicate the global findings on the country-level for each country. Thus, we report in the order of appearance in the global analysis (i) the time evolution of the location (m), dispersion (σ), and empirical distribution of profit and growth rates (cf. Figure 5.3), (ii) the respective autocorrelation functions for the first five lags (cf. Figure 5.4), (iii) the time evolution of the location, dispersion, and empirical distribution of annual changes in profit rates (cf. Figure 5.6), (iv) the respective autocorrelation function for the first five lags (cf. Figure 5.6), and (v) the empirical distribution of the square root of firm-specific diffusion parameters D (cf. Figure 5.8). . (i) and (ii) are standard in the analysis of both, profit and growth rates, shedding light on the baseline cross-sectional and time-series statistics. In contrast, (iii) to (v) apply to an in-depth analysis of only profit rates, inspired by the reduced-form diffusion model of corporate profitability discussed in chapter 2.2. 54,000 corporations (about 3,200 long-lived[1]) from 45 countries, describing the dynamics of corporate profitability and growth on a global level. On the following pages, we replicate the same visualizations of the same cross-sectional and time-series statistics for each country.

[1] Different length of time-series, 1983-2013 and 1997-2013

E.1 Argentina

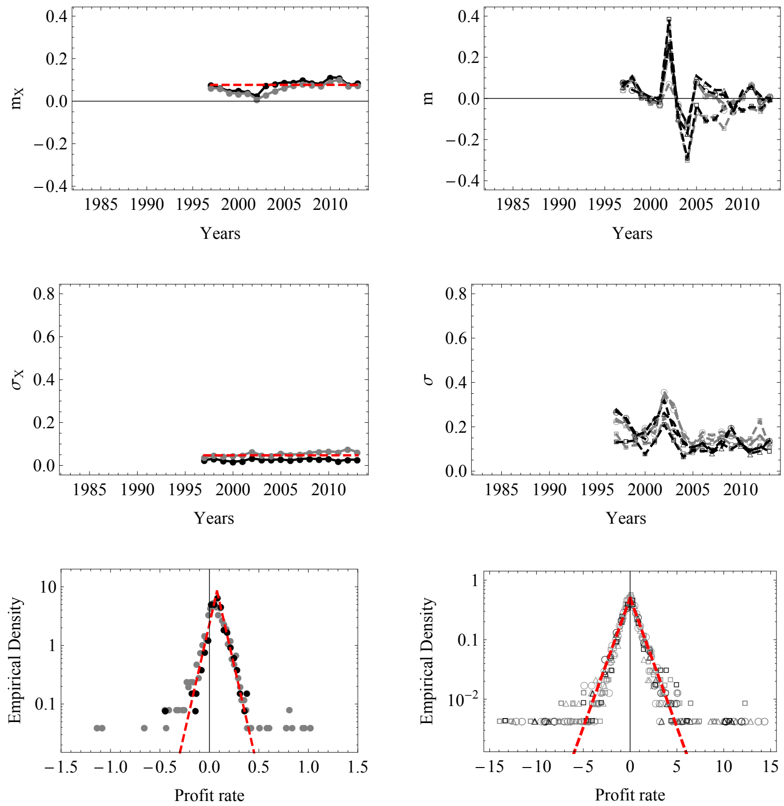


Figure E.1: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) for the unbalanced panel (gray) and balanced panel (black) for Argentina in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (μ_X, σ_X) of the balanced panel; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

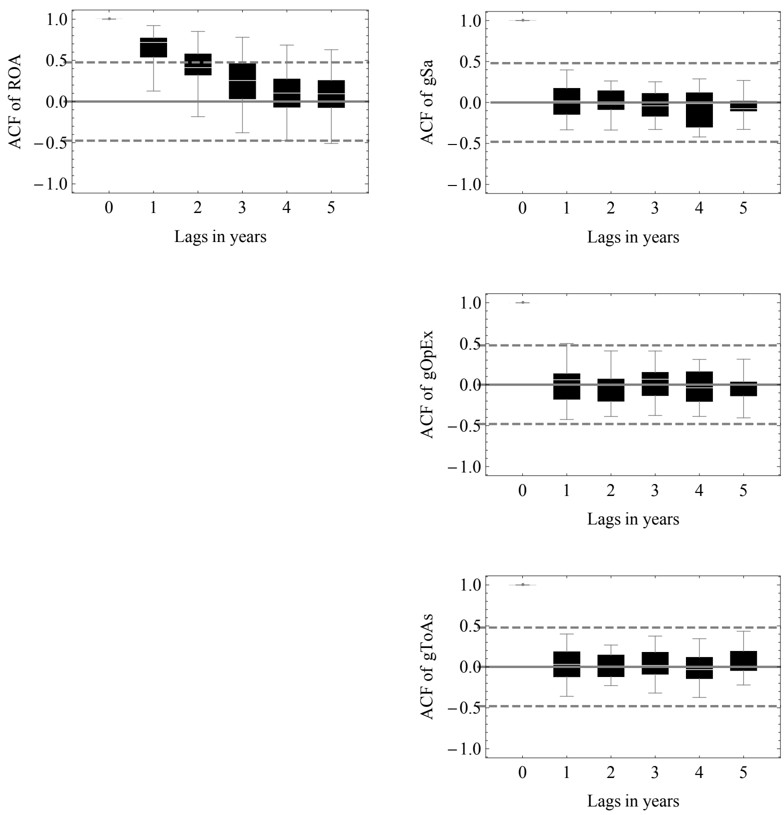


Figure E.2: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

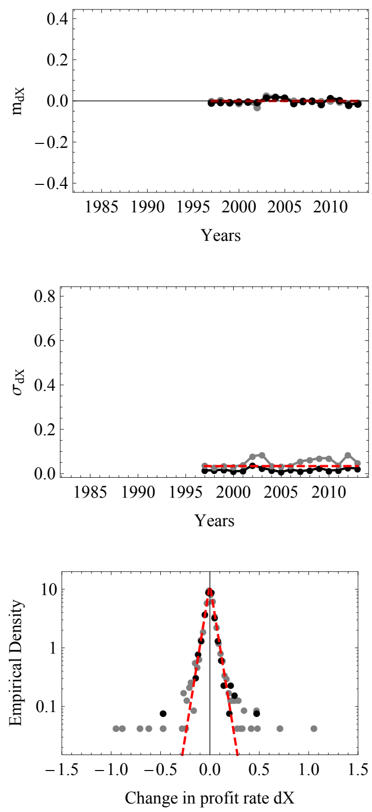


Figure E.3: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

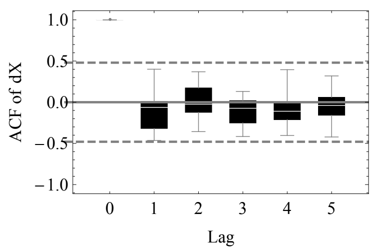


Figure E.4: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

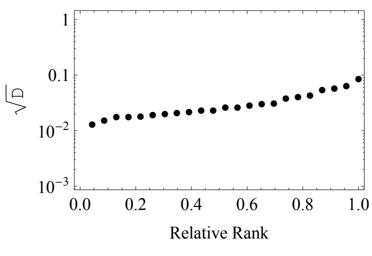


Figure E.5: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.2 Australia

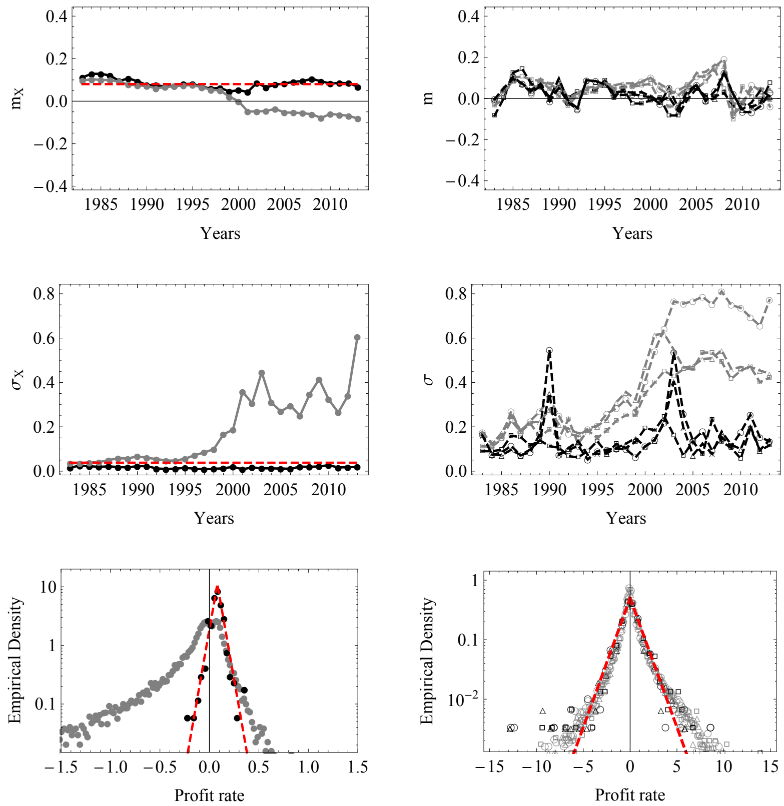


Figure E.6: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

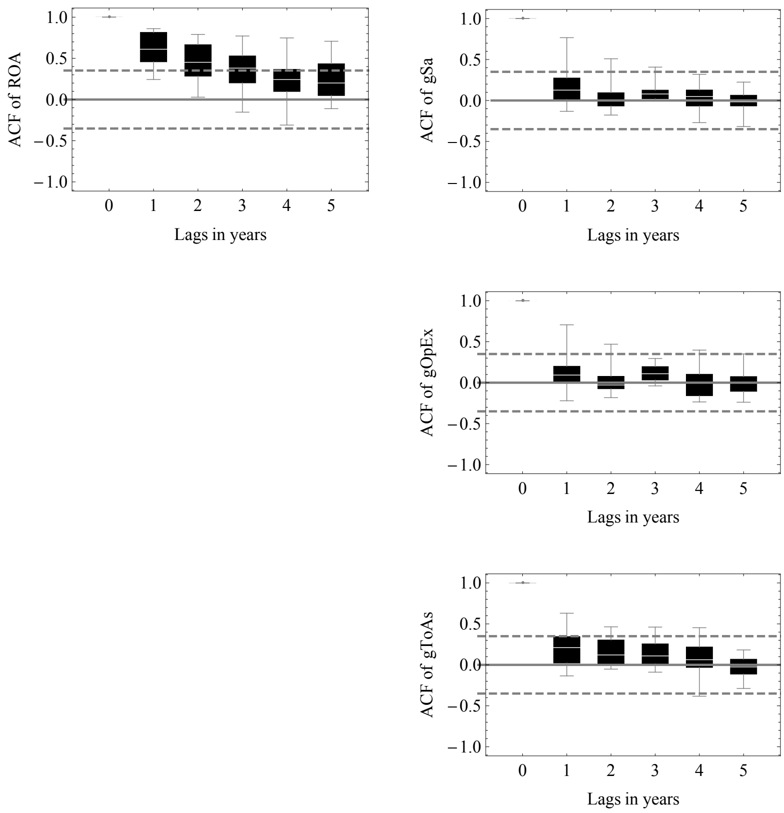


Figure E.7: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

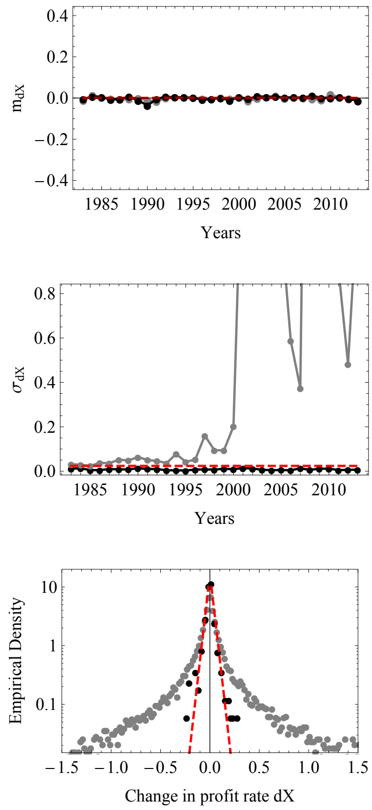


Figure E.8: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

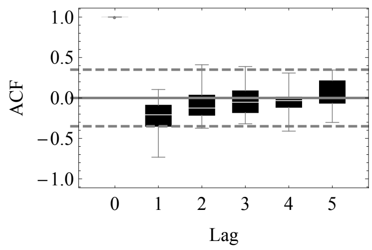


Figure E.9: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

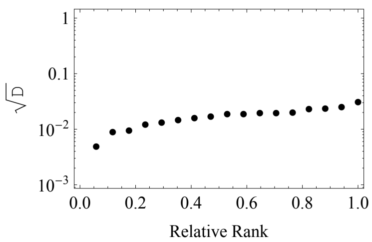


Figure E.10: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.3 Austria

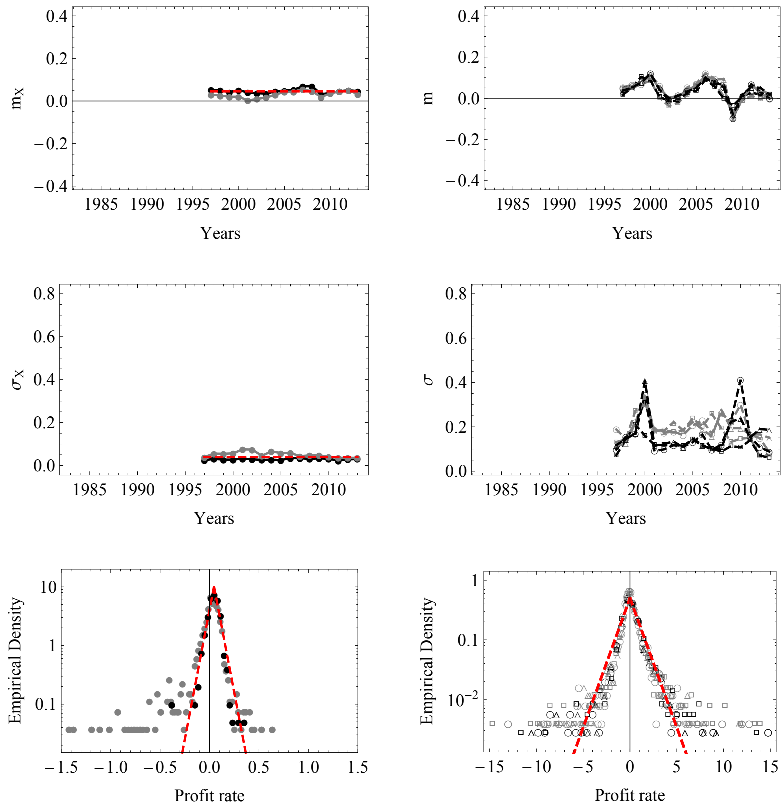


Figure E.11: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

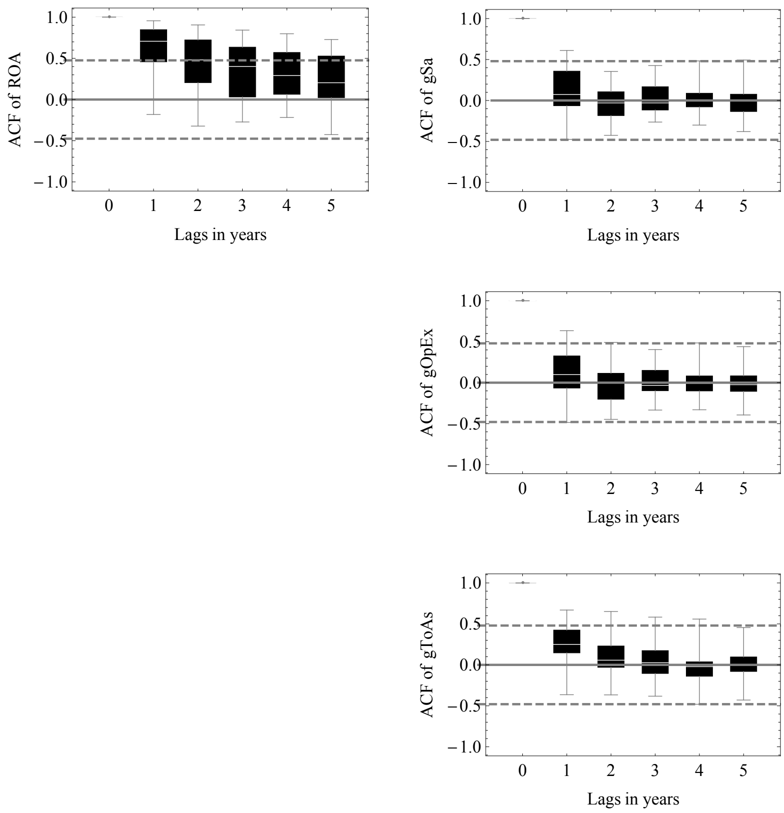


Figure E.12: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

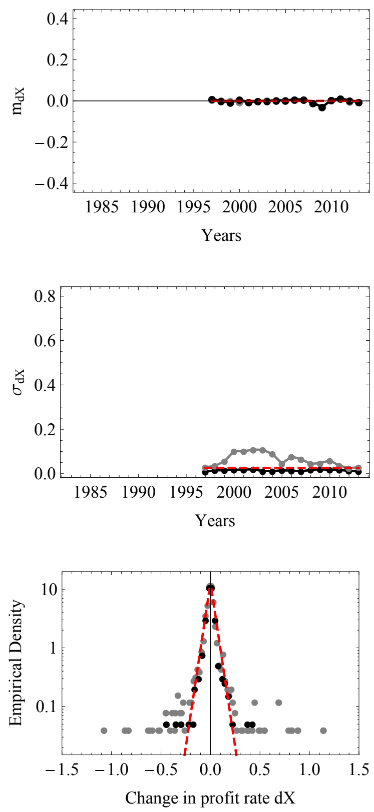


Figure E.13: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

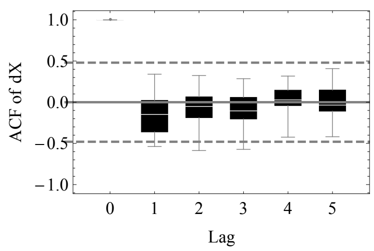


Figure E.14: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

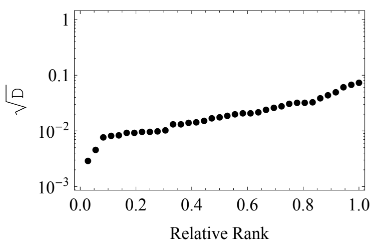


Figure E.15: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.4 Belgium

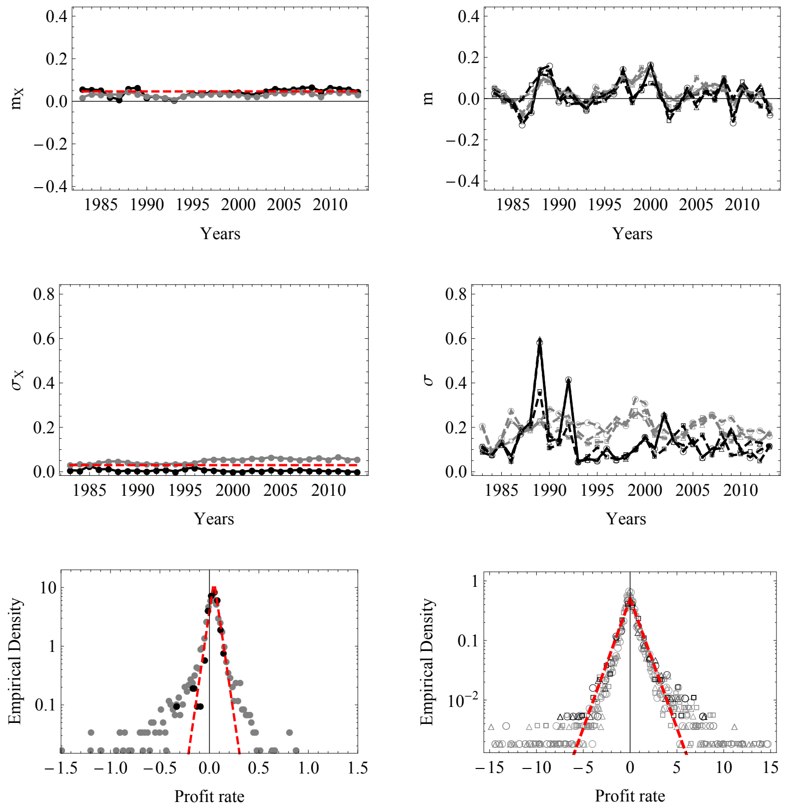


Figure E.16: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

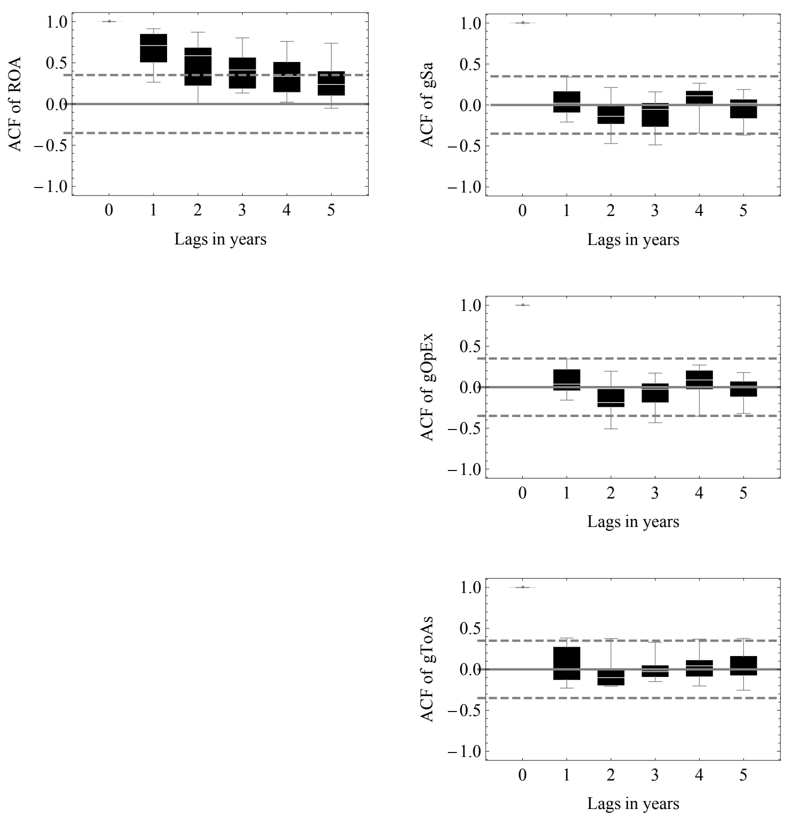


Figure E.17: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

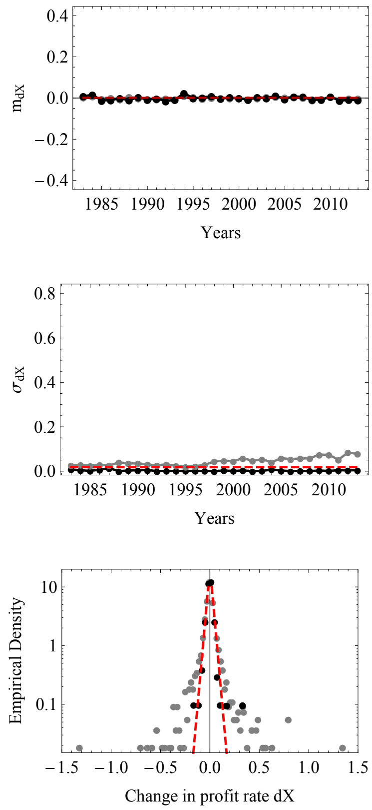


Figure E.18: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

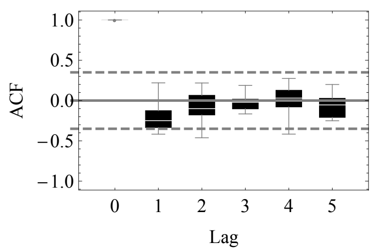


Figure E.19: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

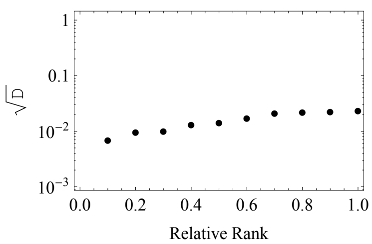


Figure E.20: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.5 Brazil

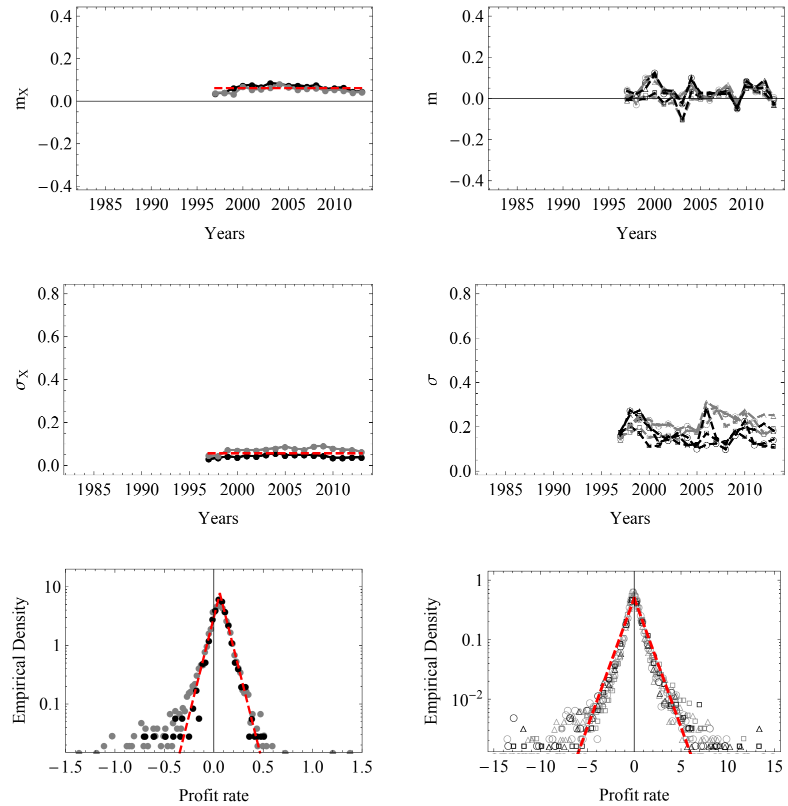


Figure E.21: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

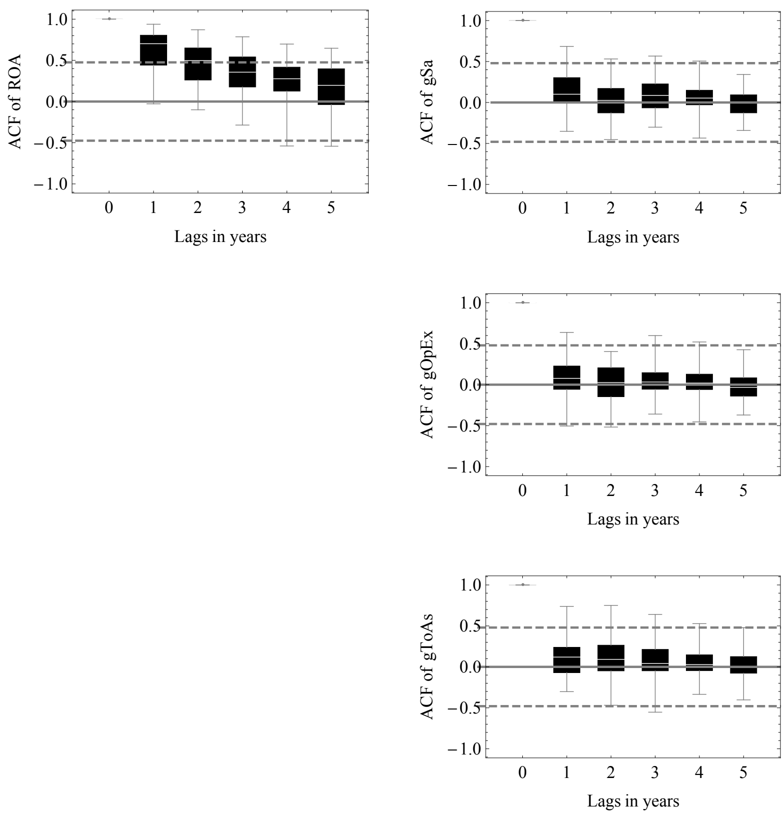


Figure E.22: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

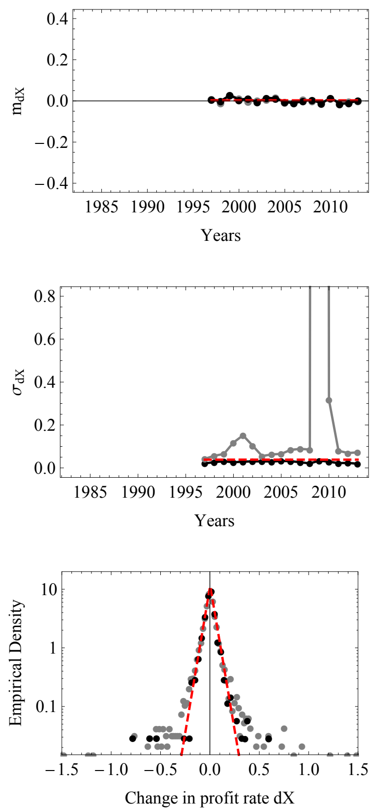


Figure E.23: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

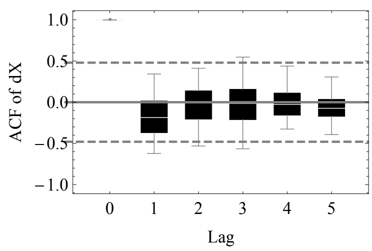


Figure E.24: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

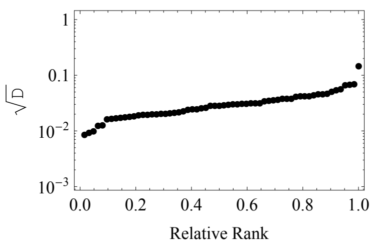


Figure E.25: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.6 Canada

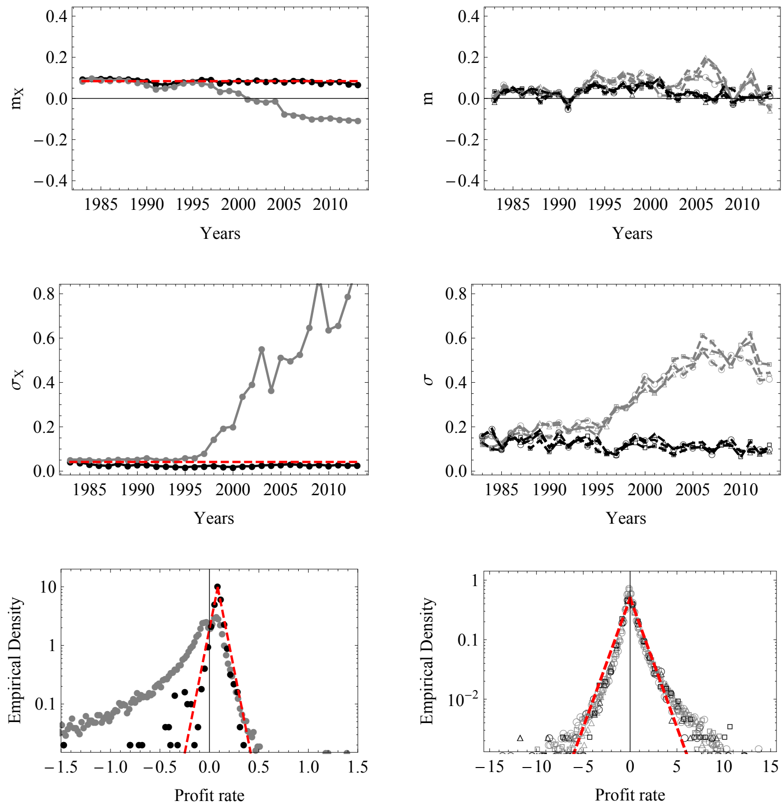


Figure E.26: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

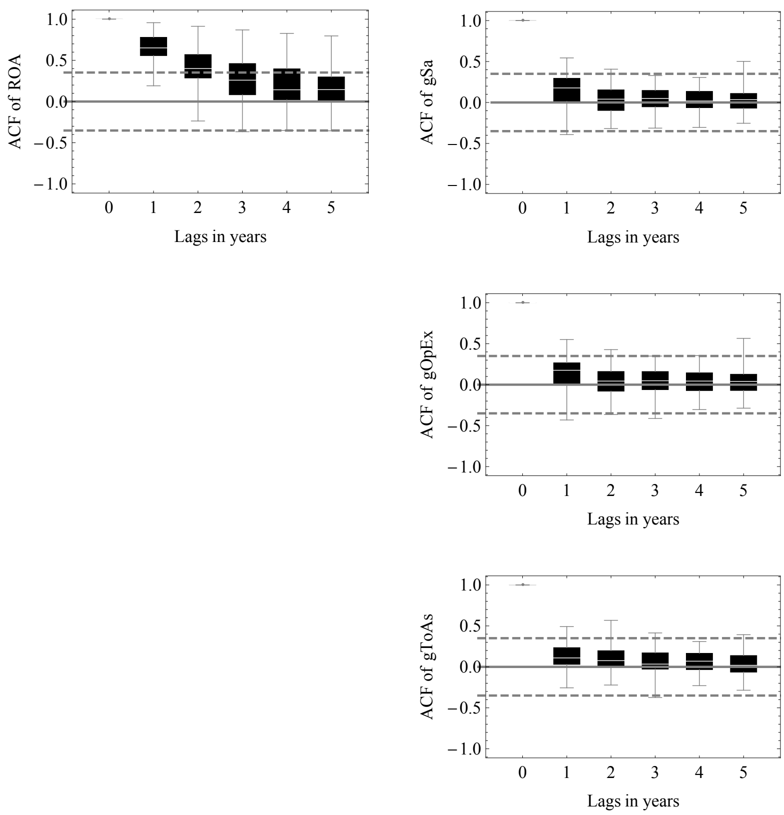


Figure E.27: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

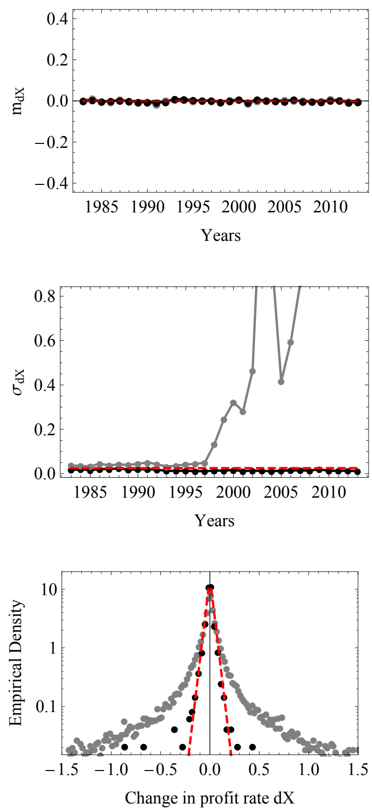


Figure E.28: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

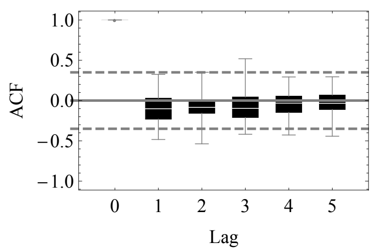


Figure E.29: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

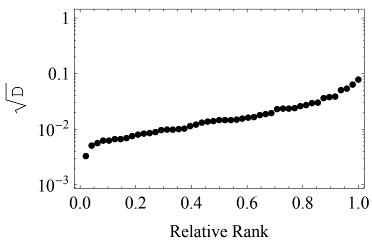


Figure E.30: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.7 Chile

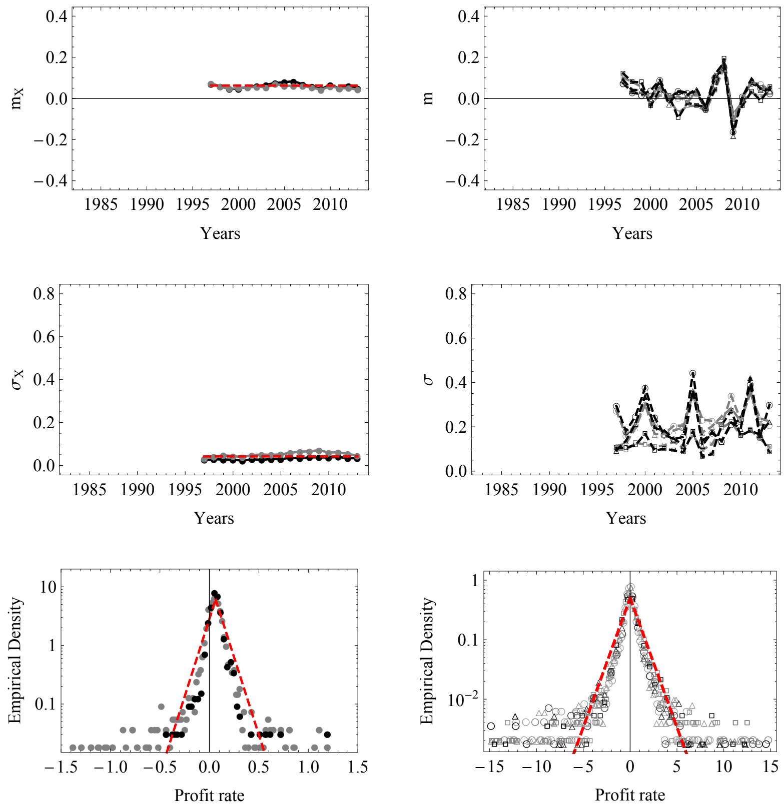


Figure E.31: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

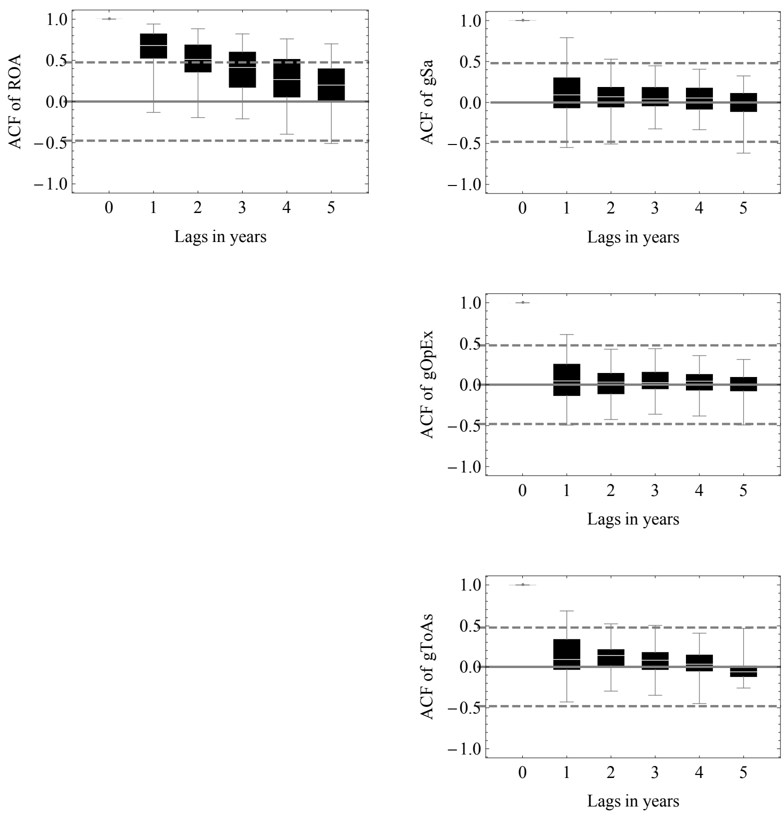


Figure E.32: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

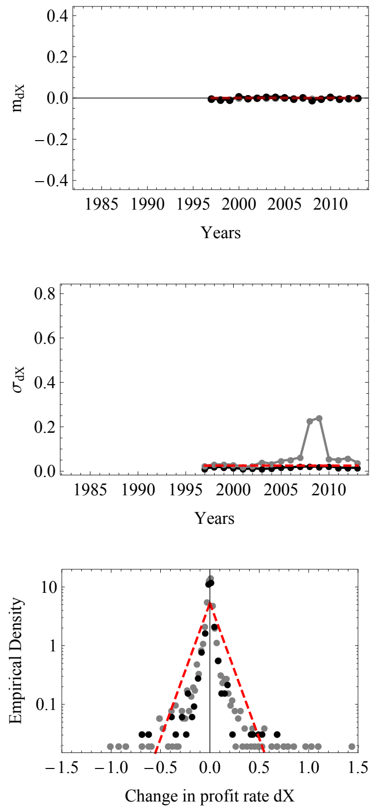


Figure E.33: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

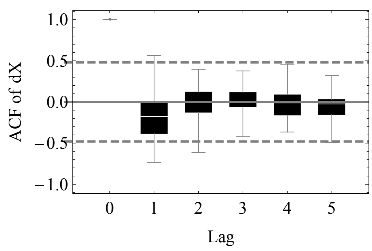


Figure E.34: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

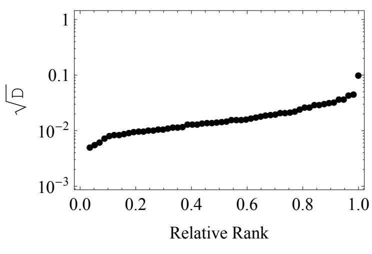


Figure E.35: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.8 China

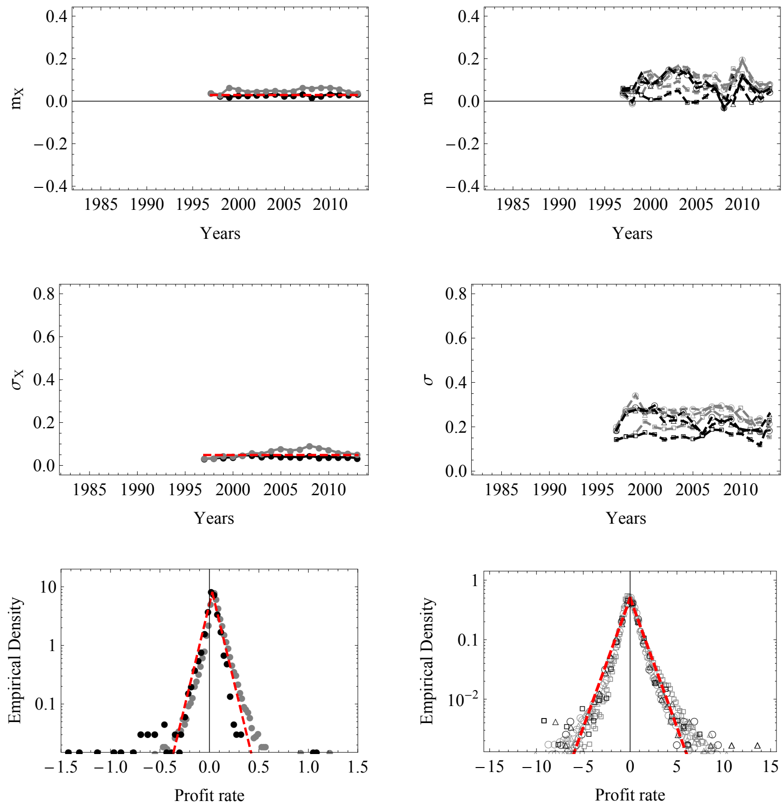


Figure E.36: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

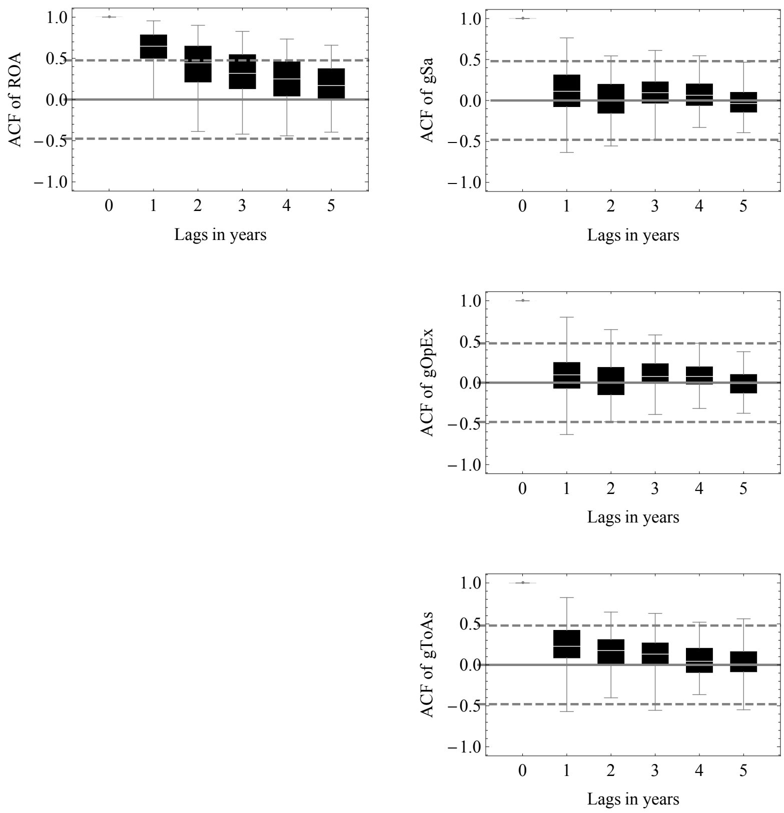


Figure E.37: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

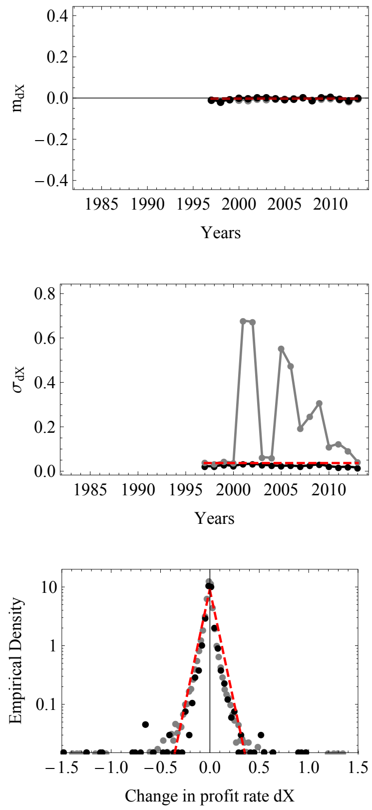


Figure E.38: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

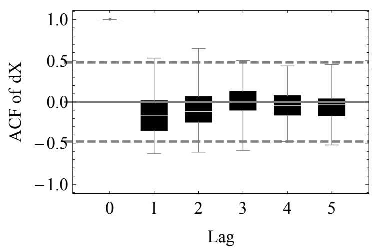


Figure E.39: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

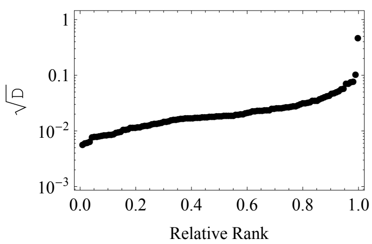


Figure E.40: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.9 Colombia

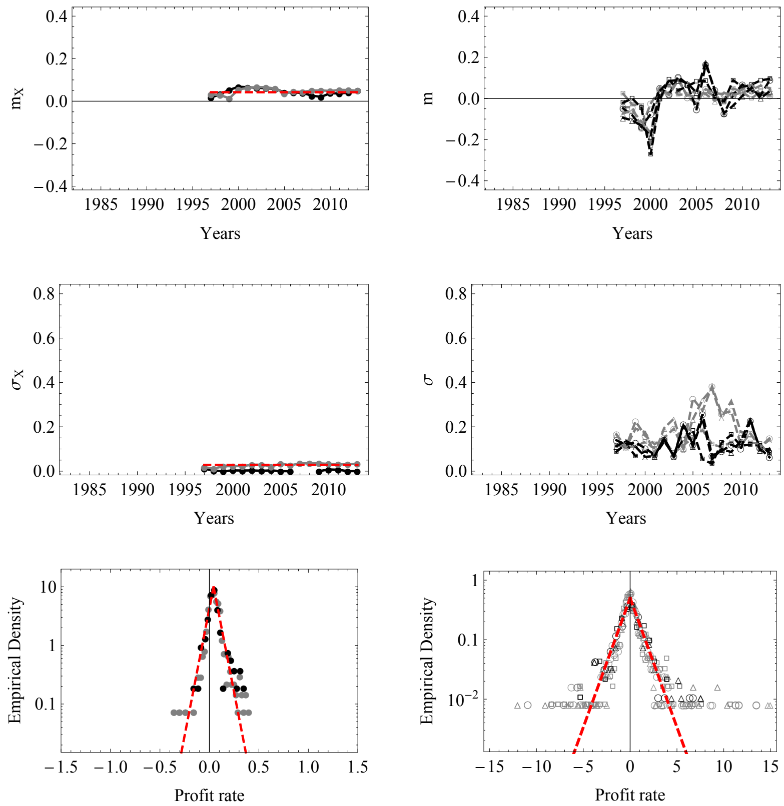


Figure E.41: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

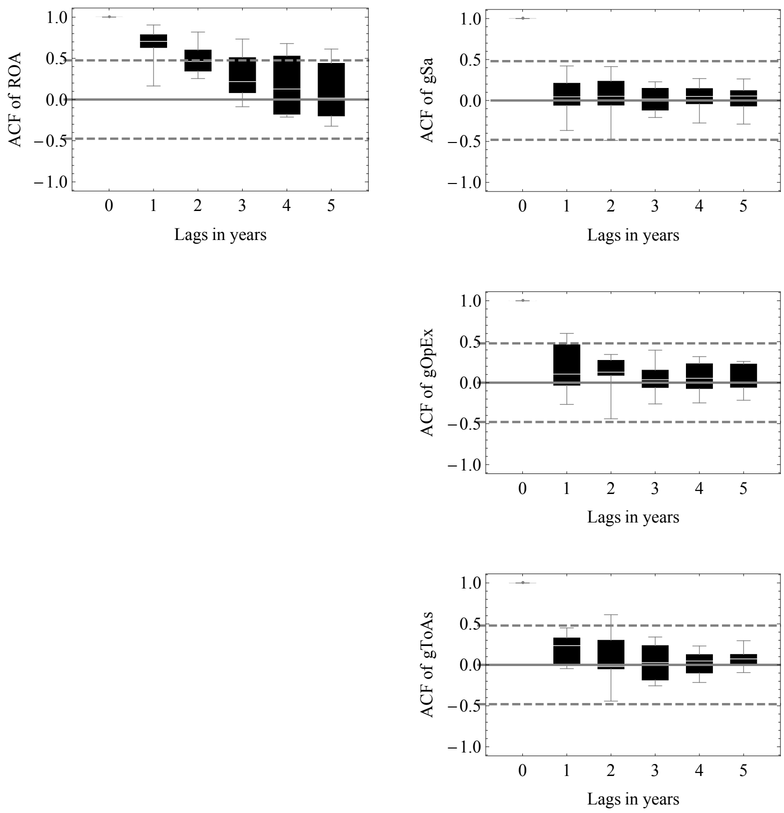


Figure E.42: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

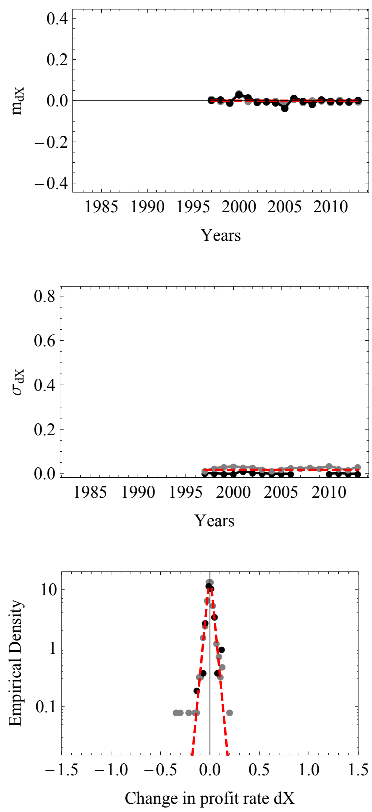


Figure E.43: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

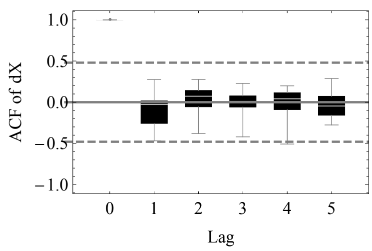


Figure E.44: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

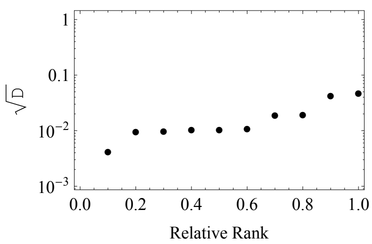


Figure E.45: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.10 Denmark

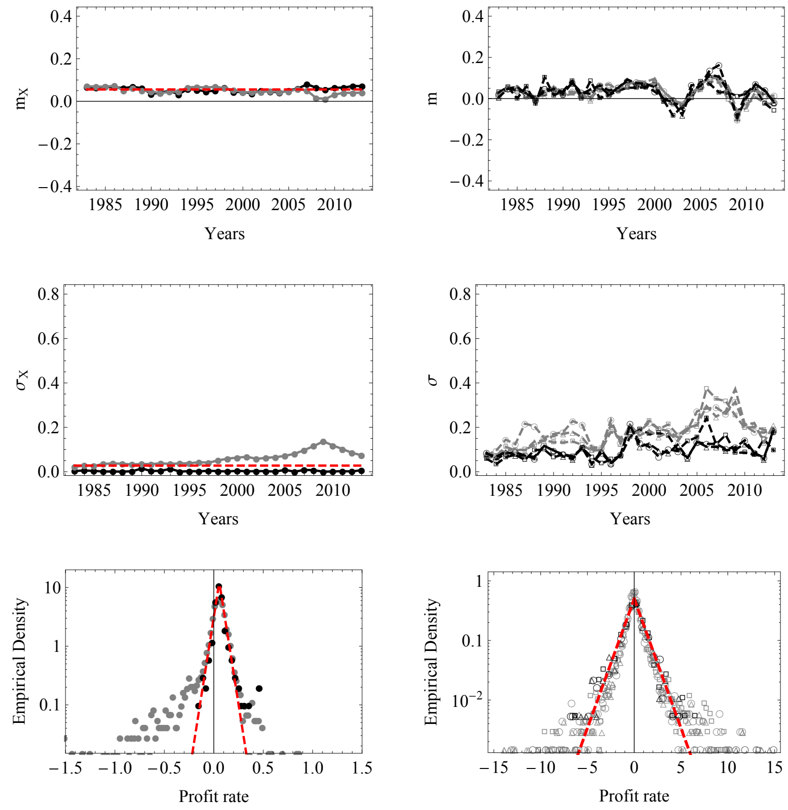


Figure E.46: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

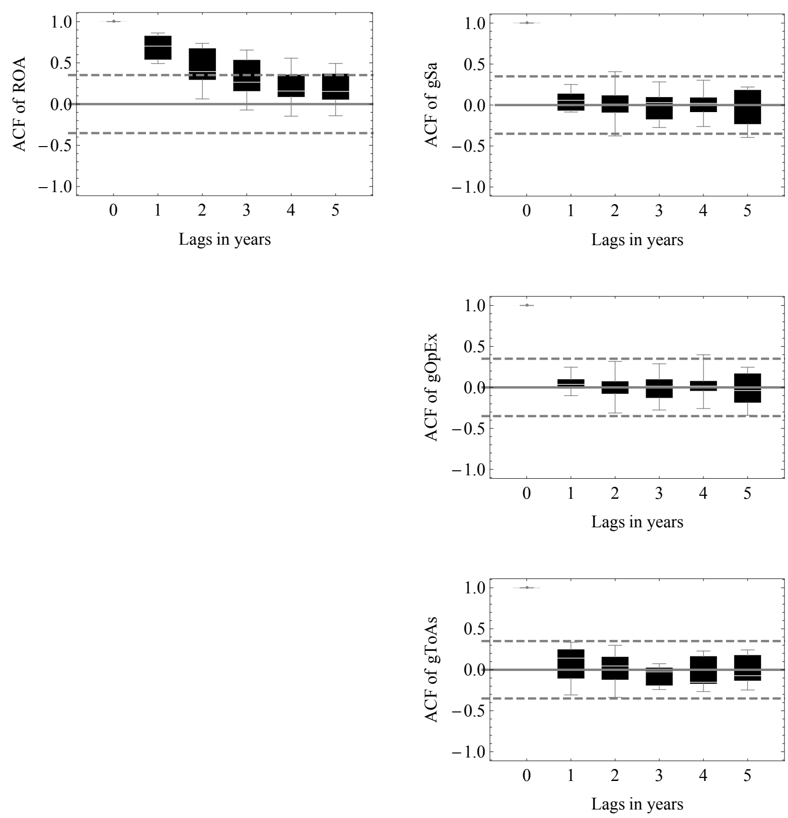
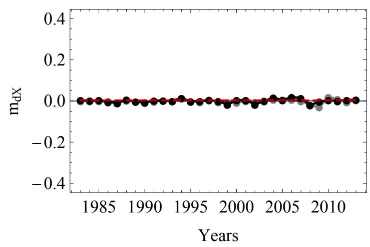
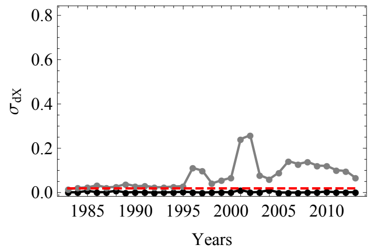


Figure E.47: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).





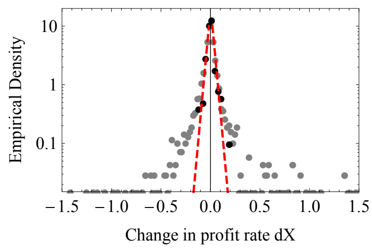


Figure E.48: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

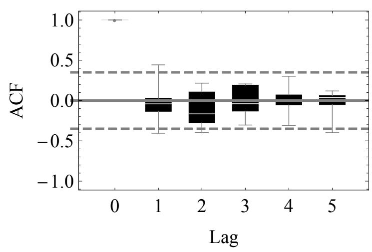


Figure E.49: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

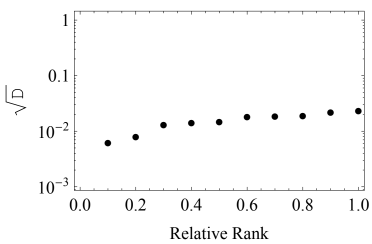


Figure E.50: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.11 Finland

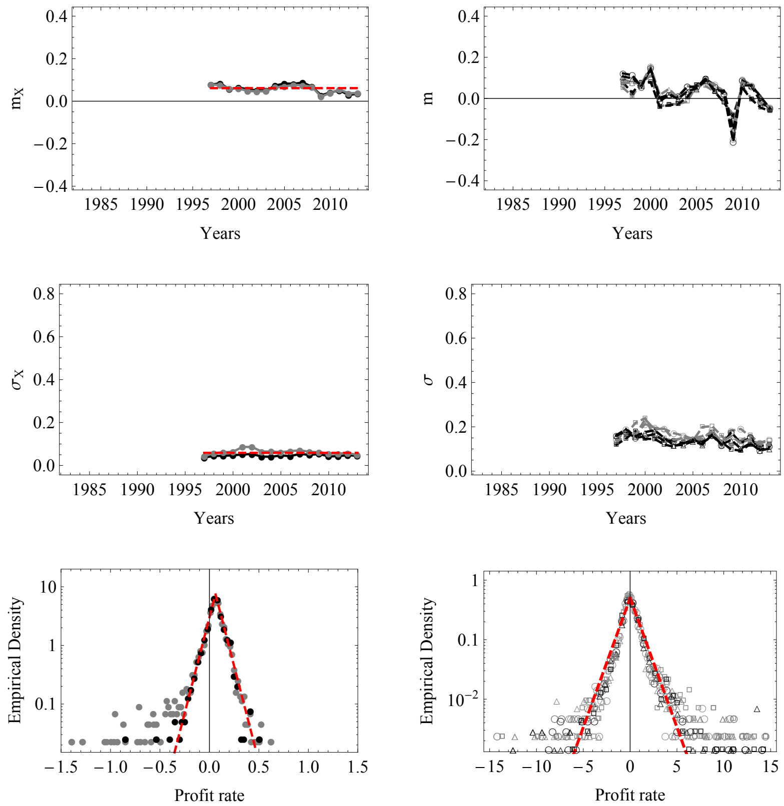


Figure E.51: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

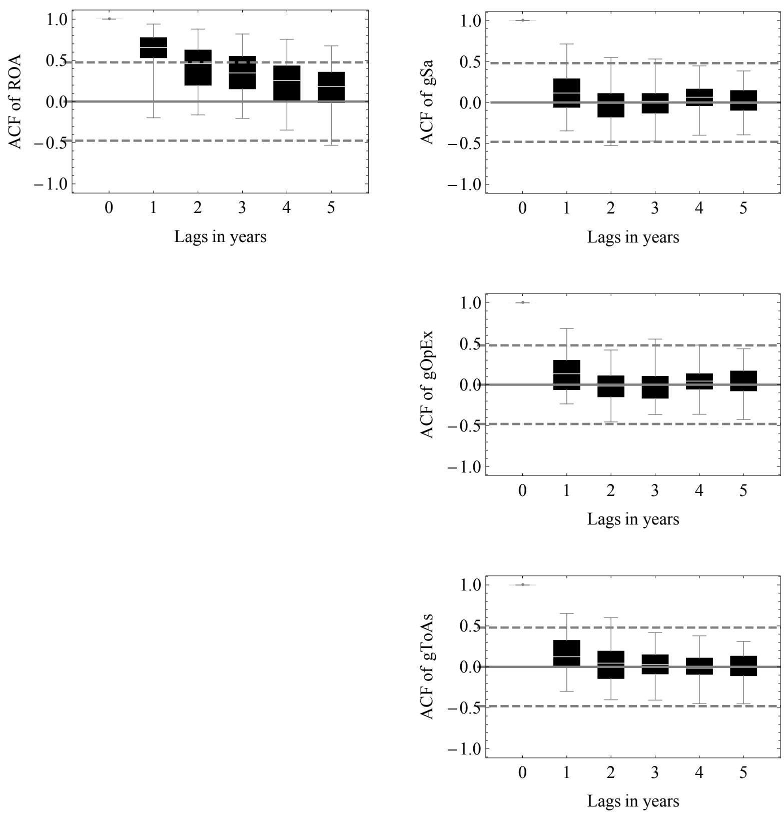


Figure E.52: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

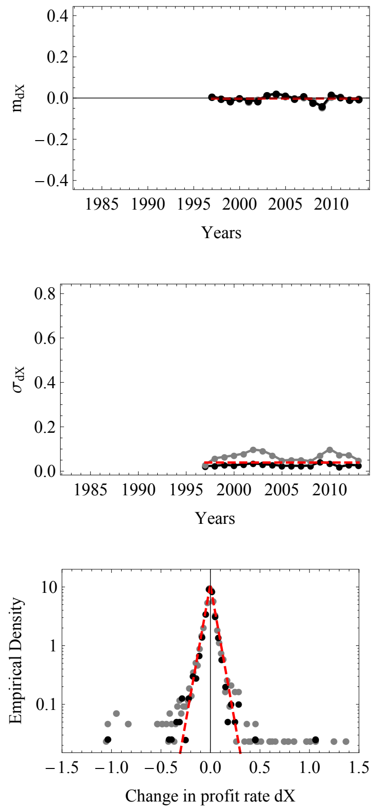


Figure E.53: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

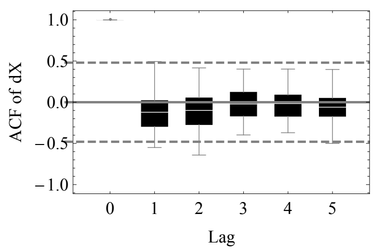


Figure E.54: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

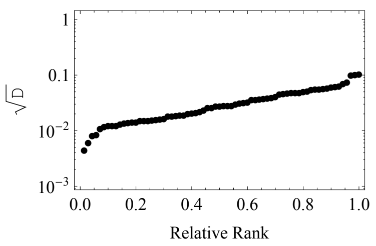


Figure E.55: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.12 *France*

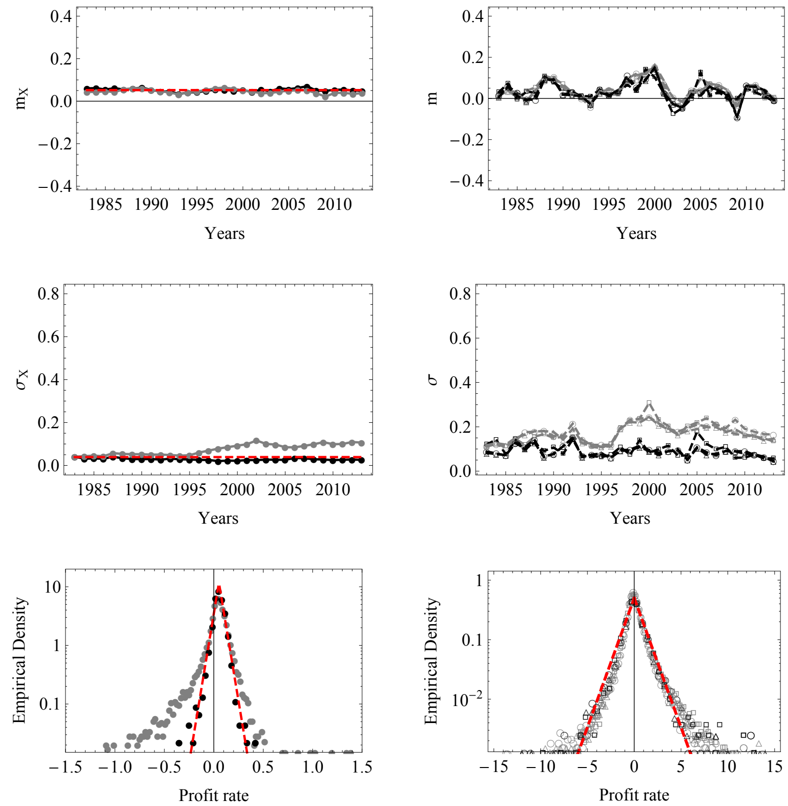


Figure E.56: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

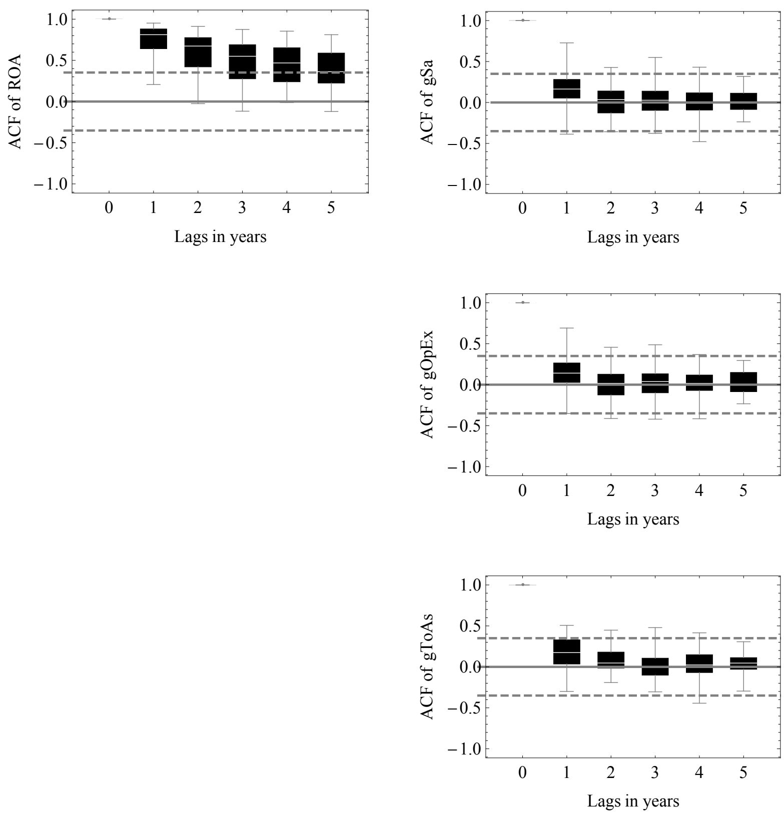


Figure E.57: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

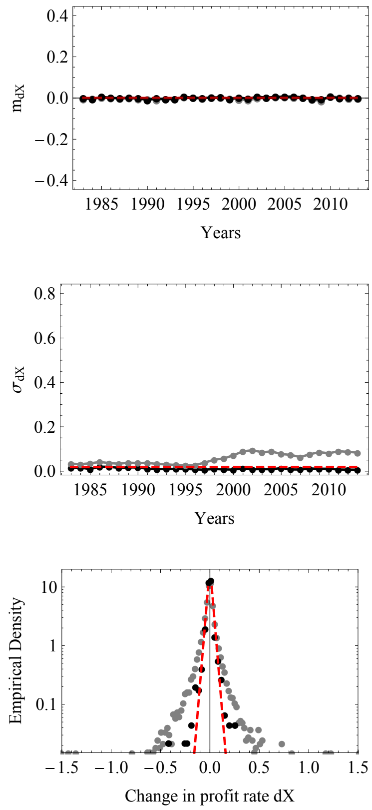


Figure E.58: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

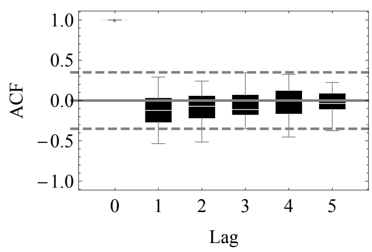


Figure E.59: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

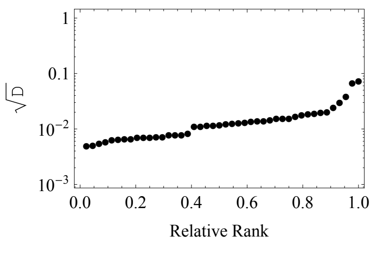


Figure E.60: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.13 Germany

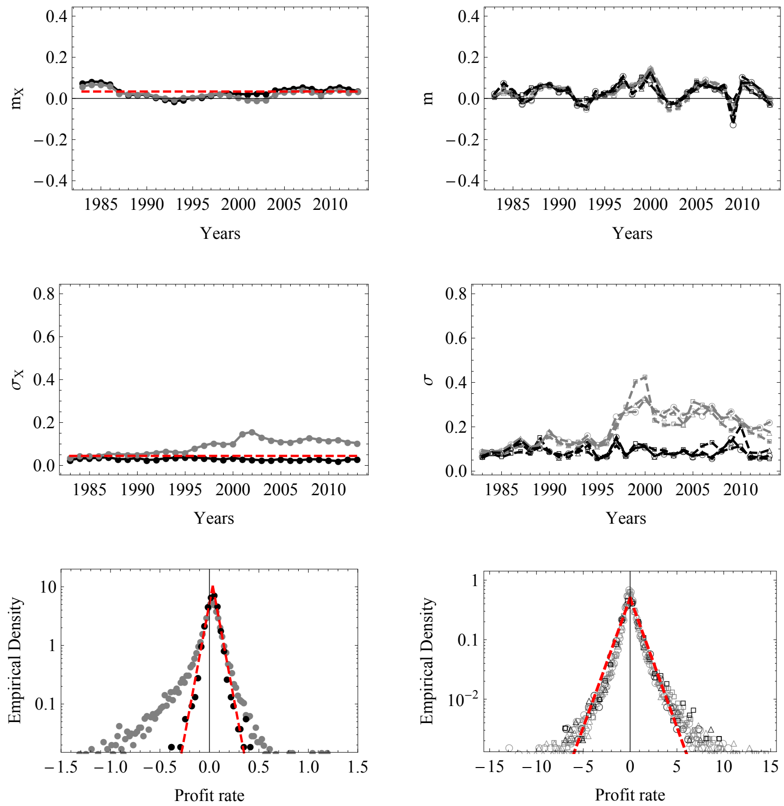


Figure E.61: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

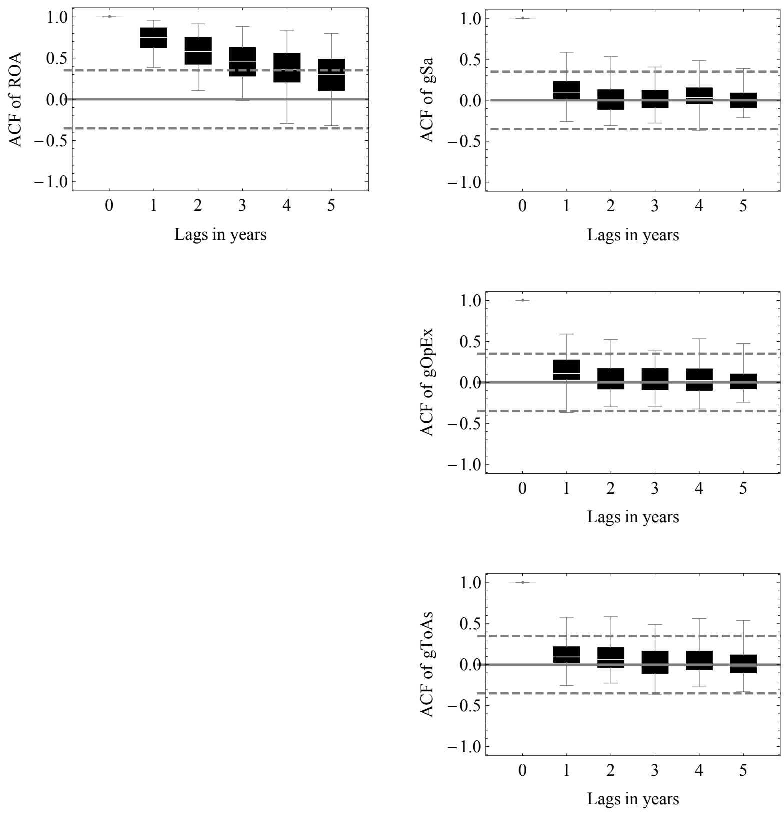


Figure E.62: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

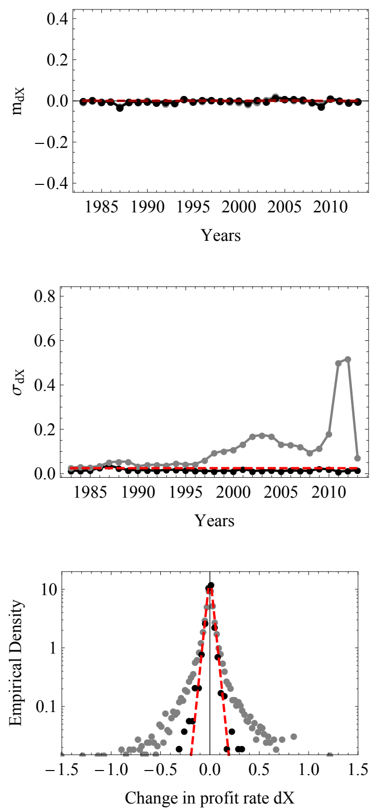


Figure E.63: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

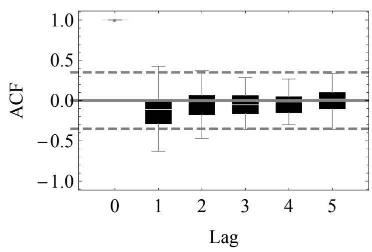


Figure E.64: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

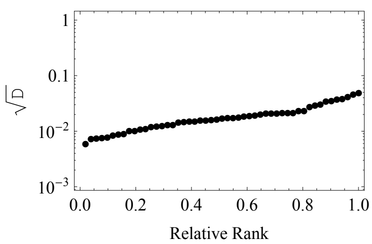


Figure E.65: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.14 Greece

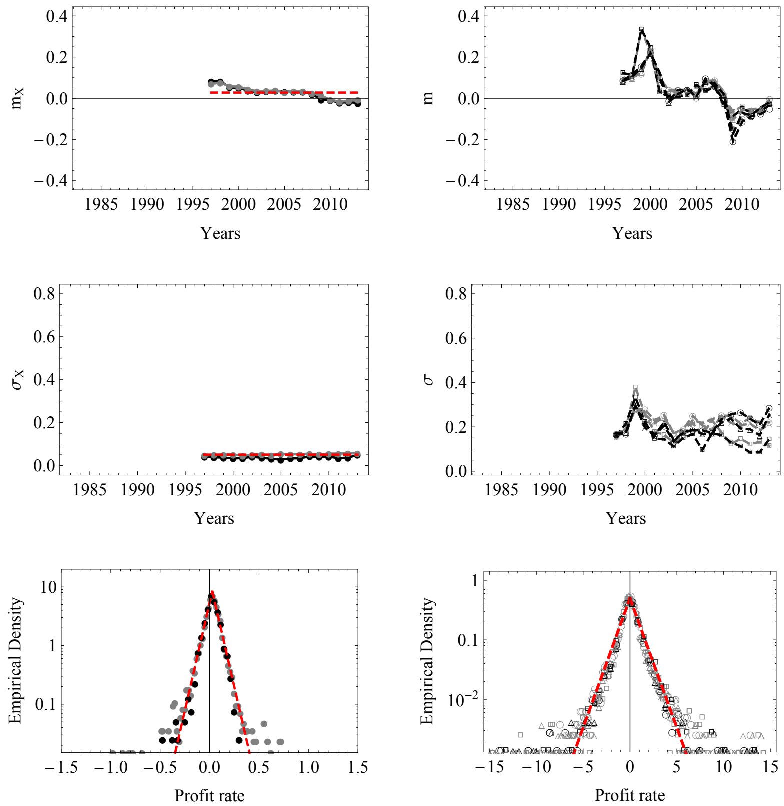


Figure E.66: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

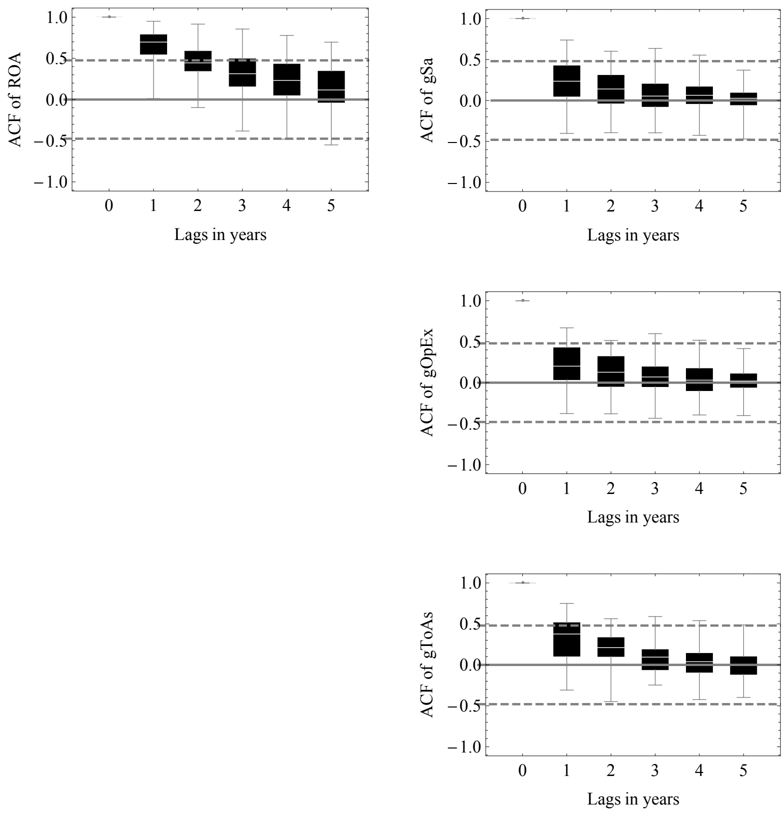


Figure E.67: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

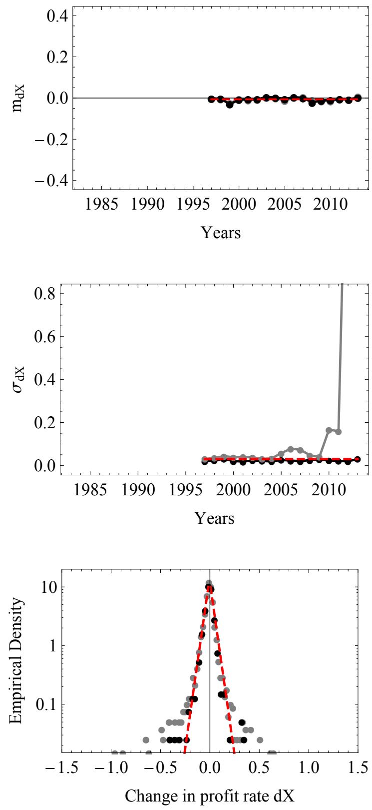


Figure E.68: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

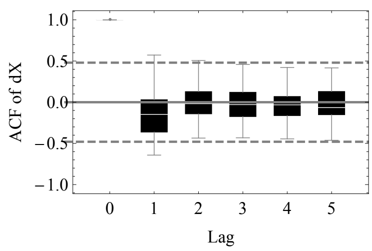


Figure E.69: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

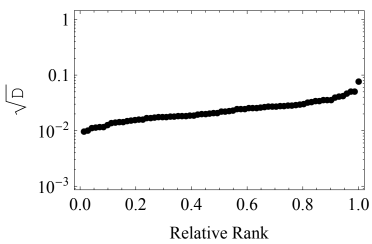


Figure E.70: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.15 Hong Kong (China)

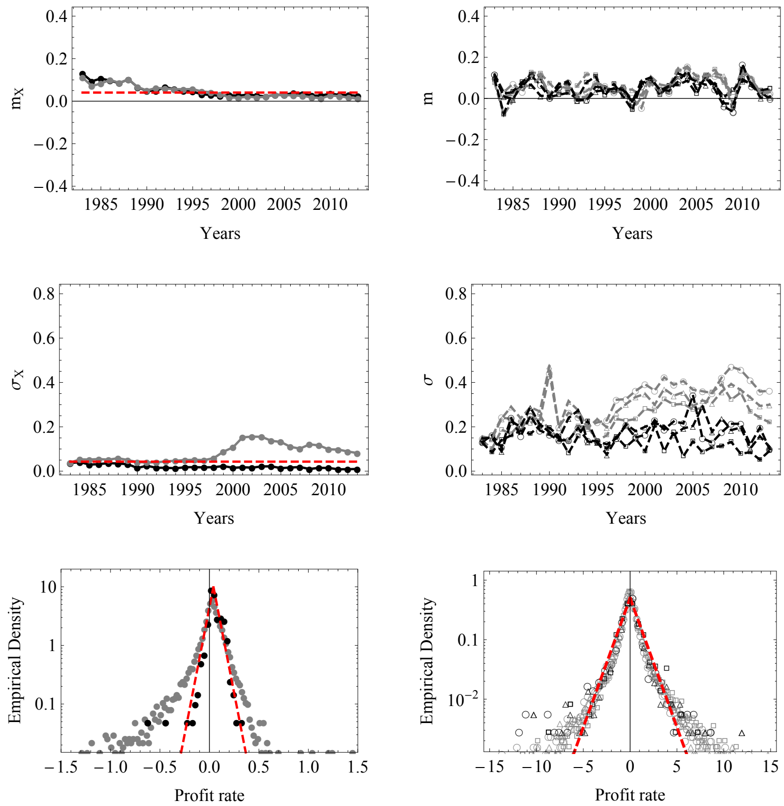


Figure E.71: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

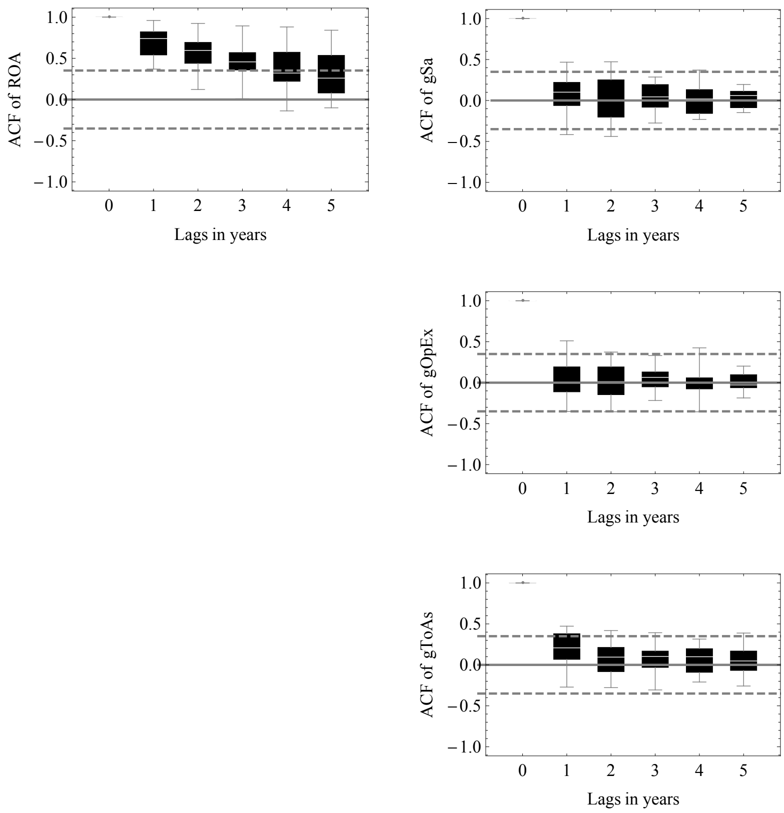


Figure E.72: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

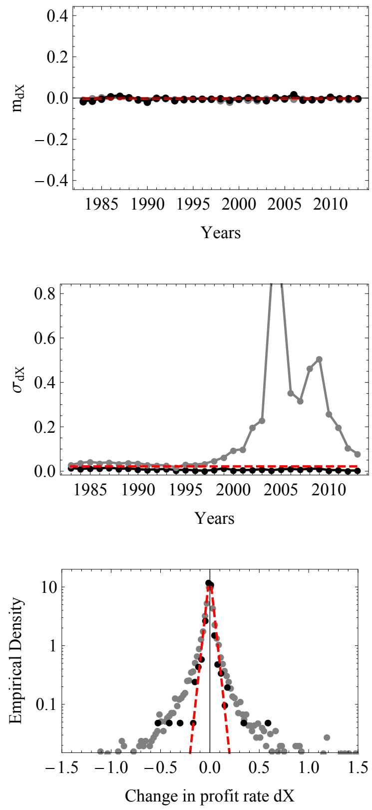


Figure E.73: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

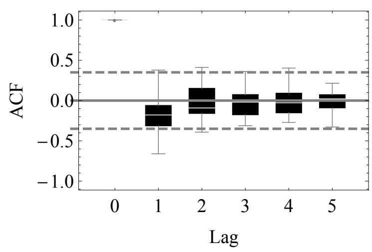


Figure E.74: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

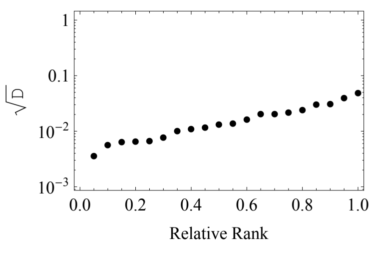


Figure E.75: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.16 Hungary

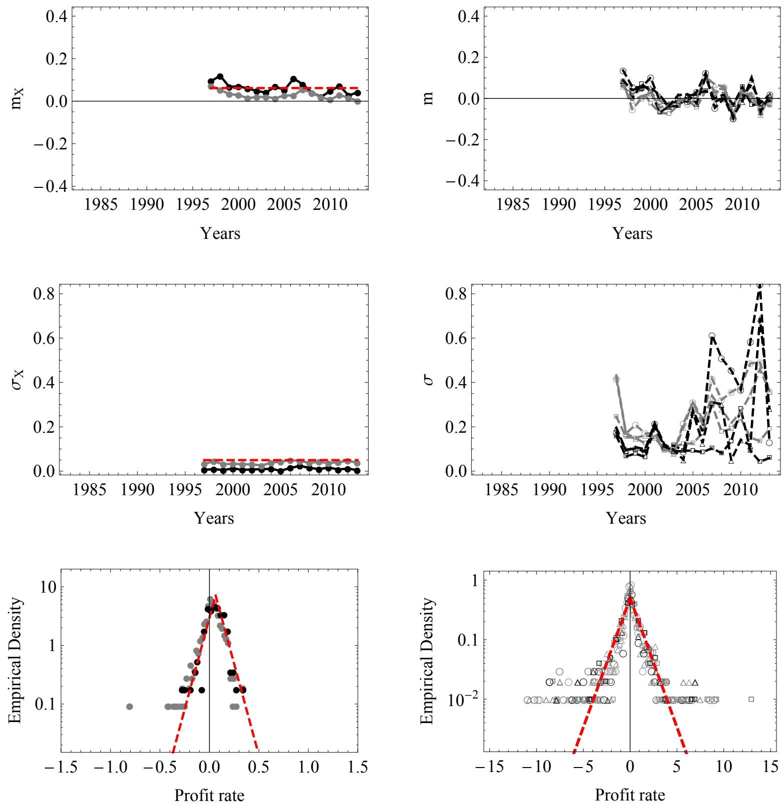


Figure E.76: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

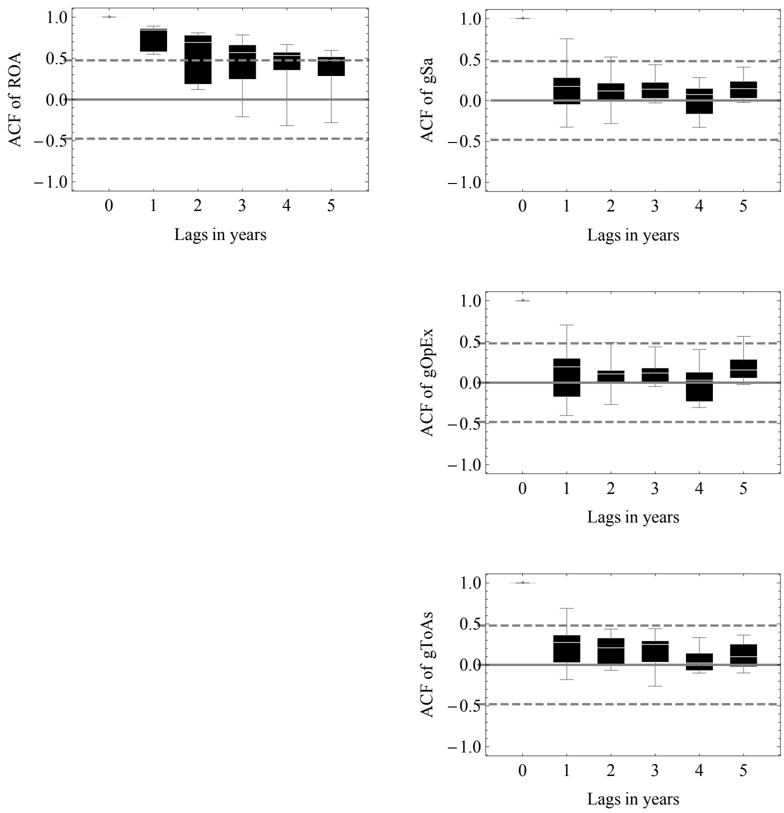


Figure E.77: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

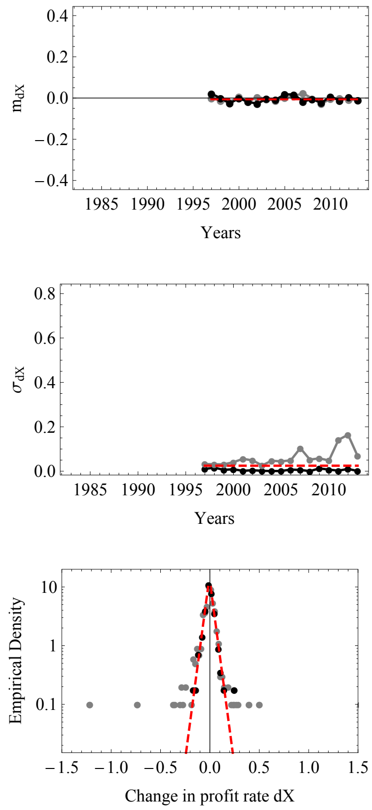


Figure E.78: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

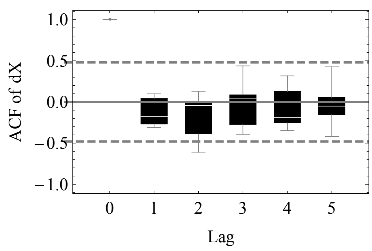


Figure E.79: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

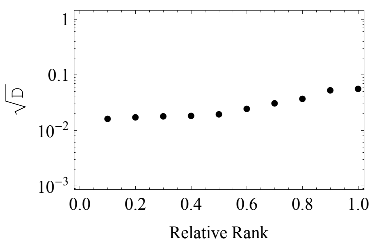


Figure E.80: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.17 India

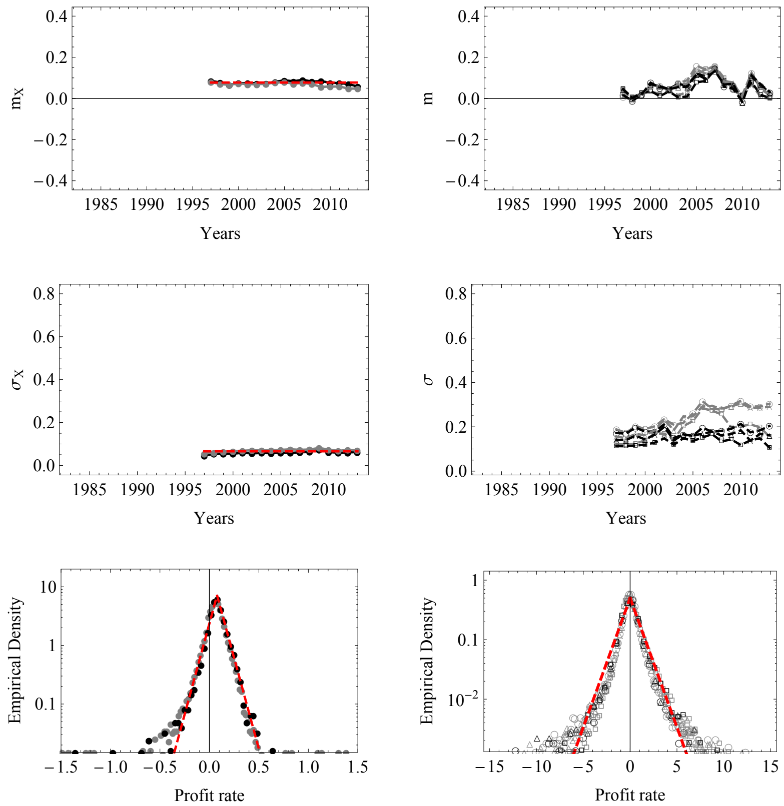


Figure E.81: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

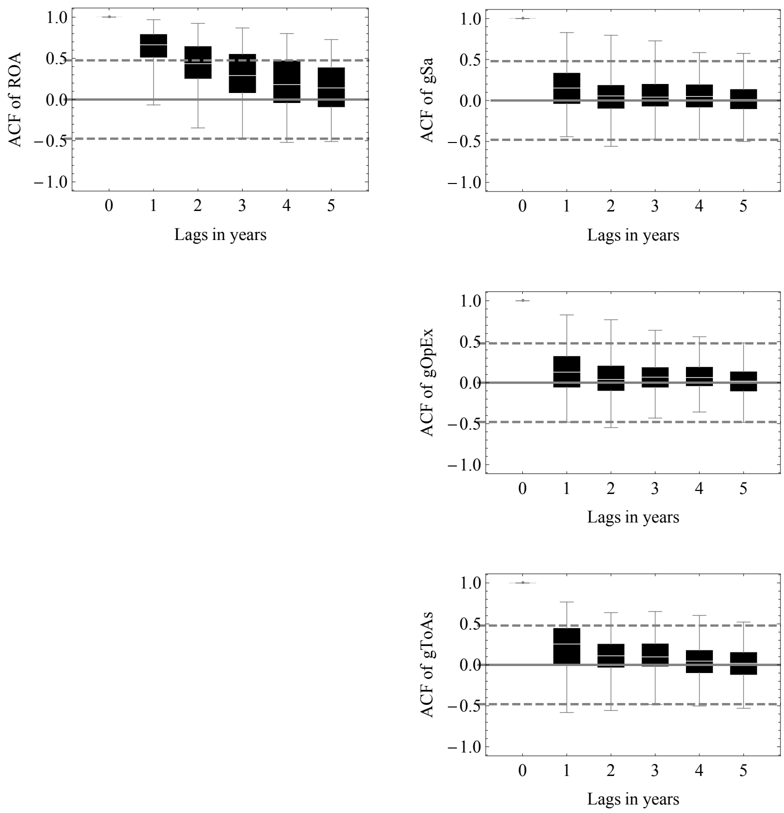


Figure E.82: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

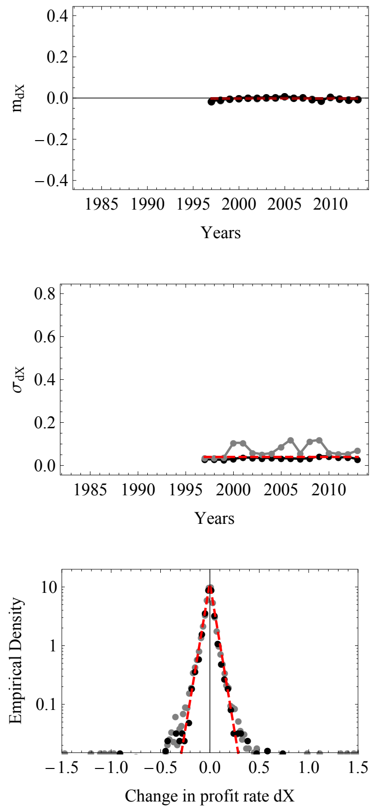


Figure E.83: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

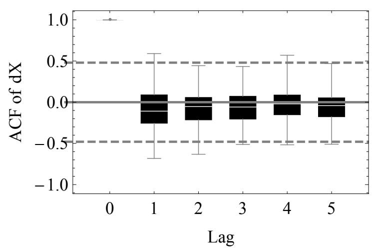


Figure E.84: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

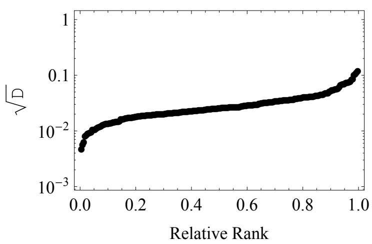


Figure E.85: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.18 Indonesia

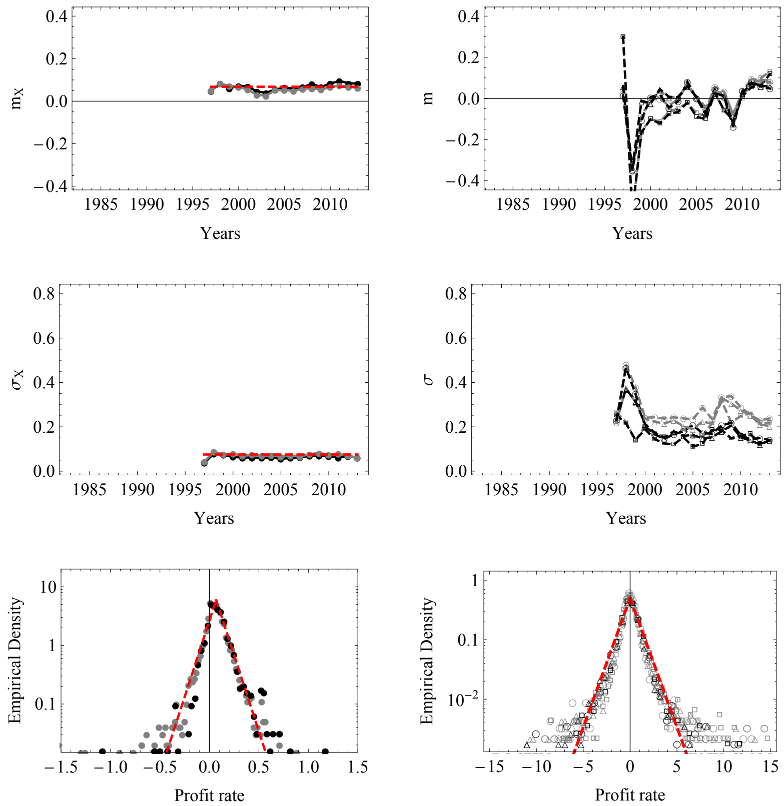


Figure E.86: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

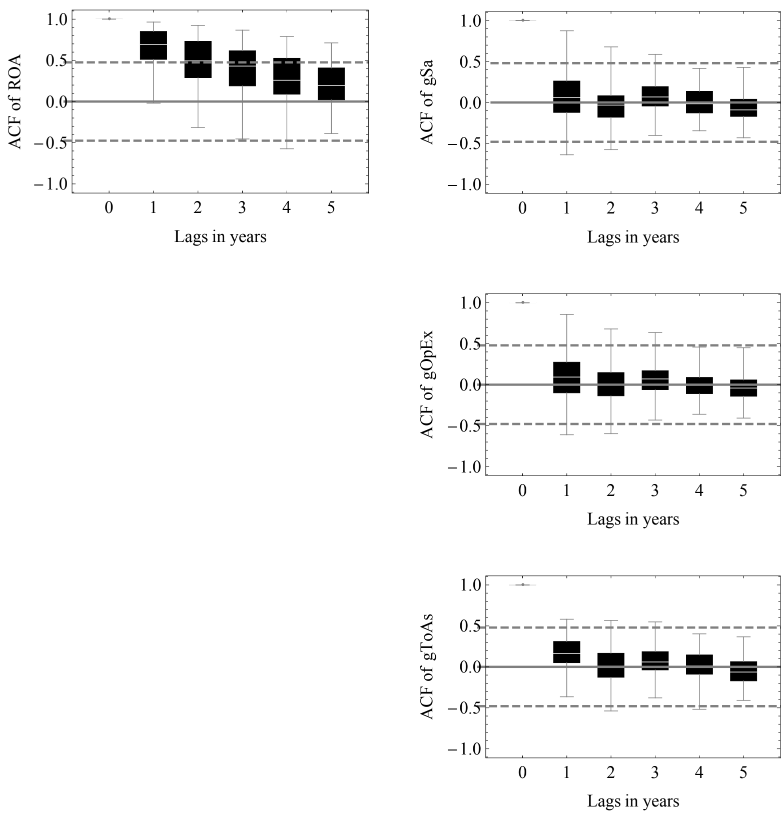


Figure E.87: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

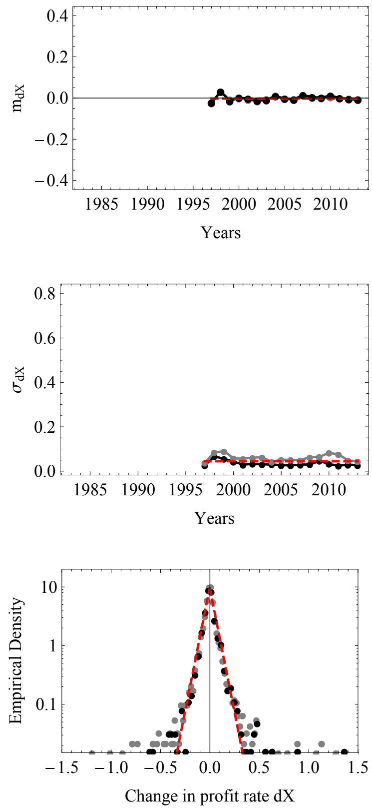


Figure E.88: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

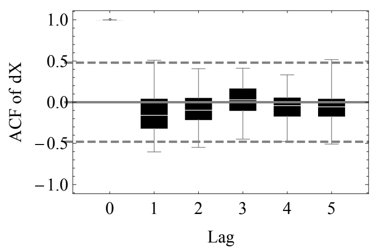


Figure E.89: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

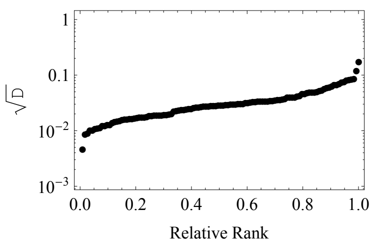


Figure E.90: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.19 Ireland

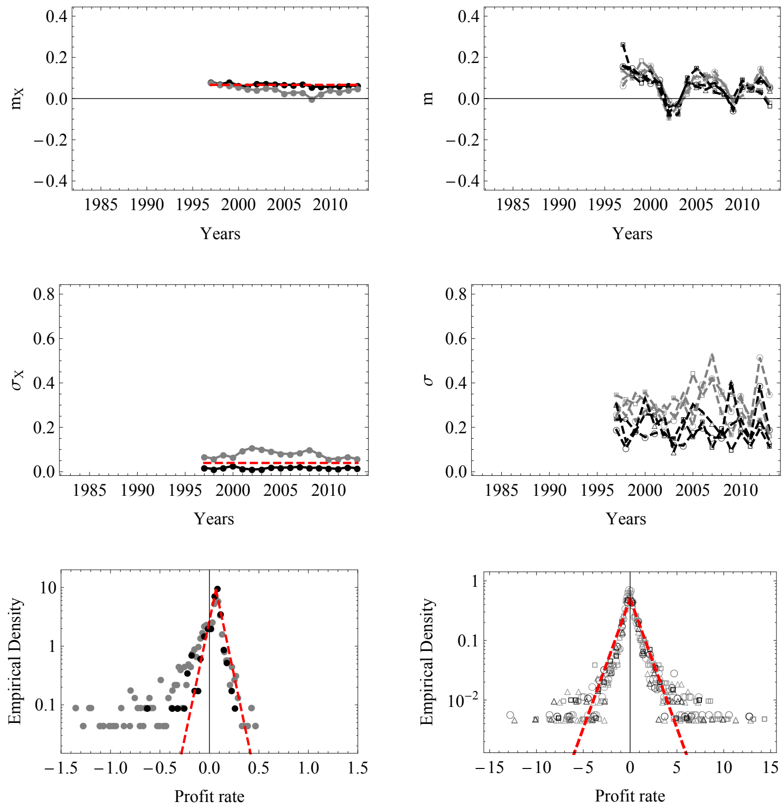


Figure E.91: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

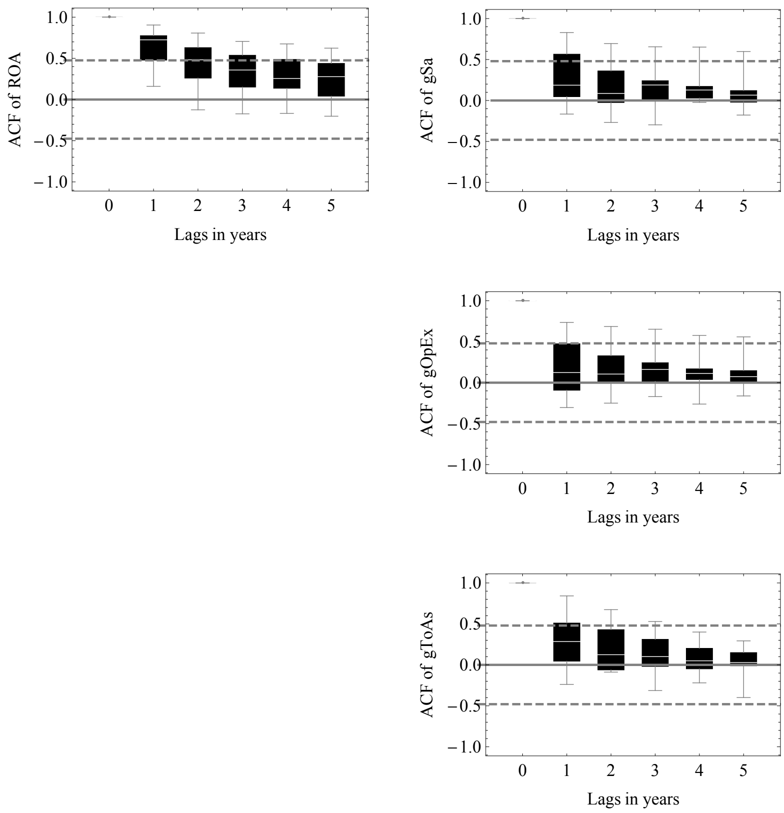


Figure E.92: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

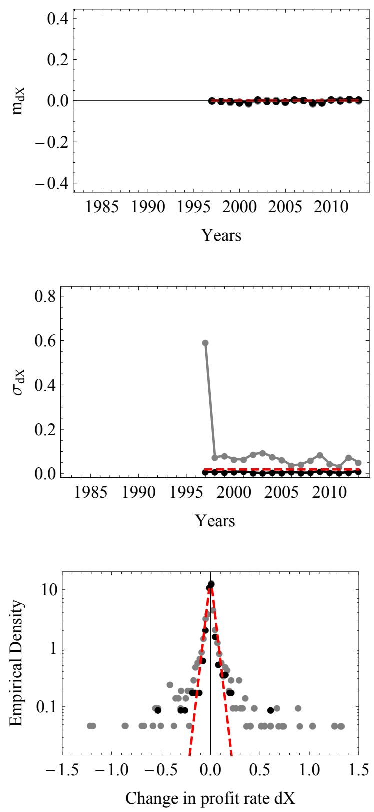


Figure E.93: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

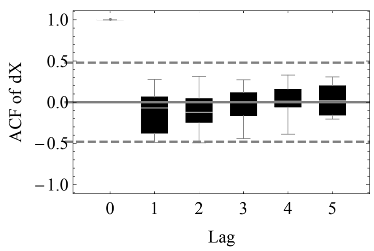


Figure E.94: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

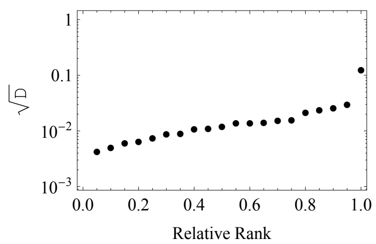


Figure E.95: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.20 Isreal

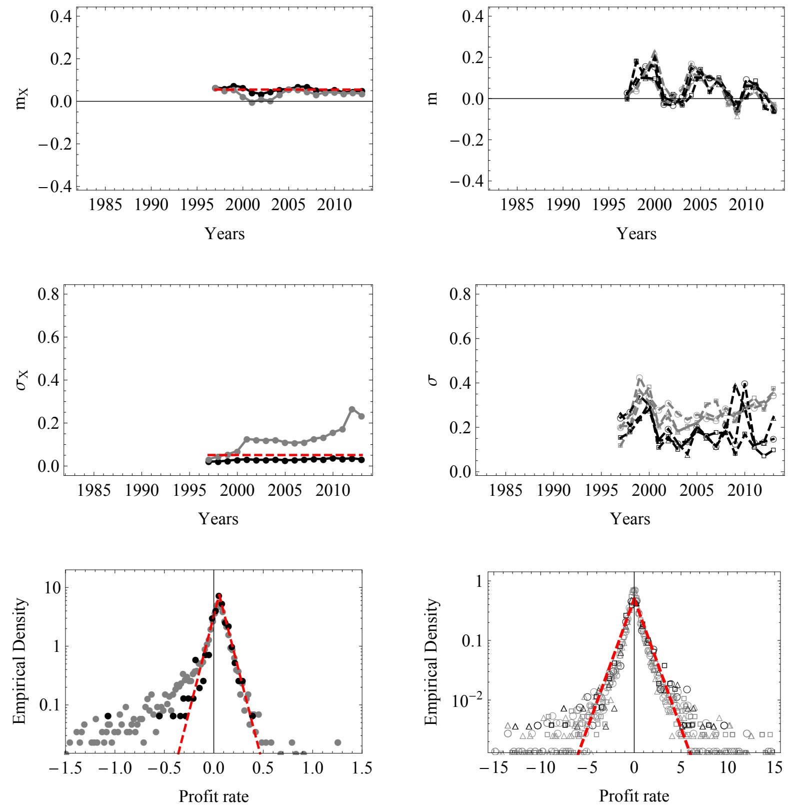


Figure E.96: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

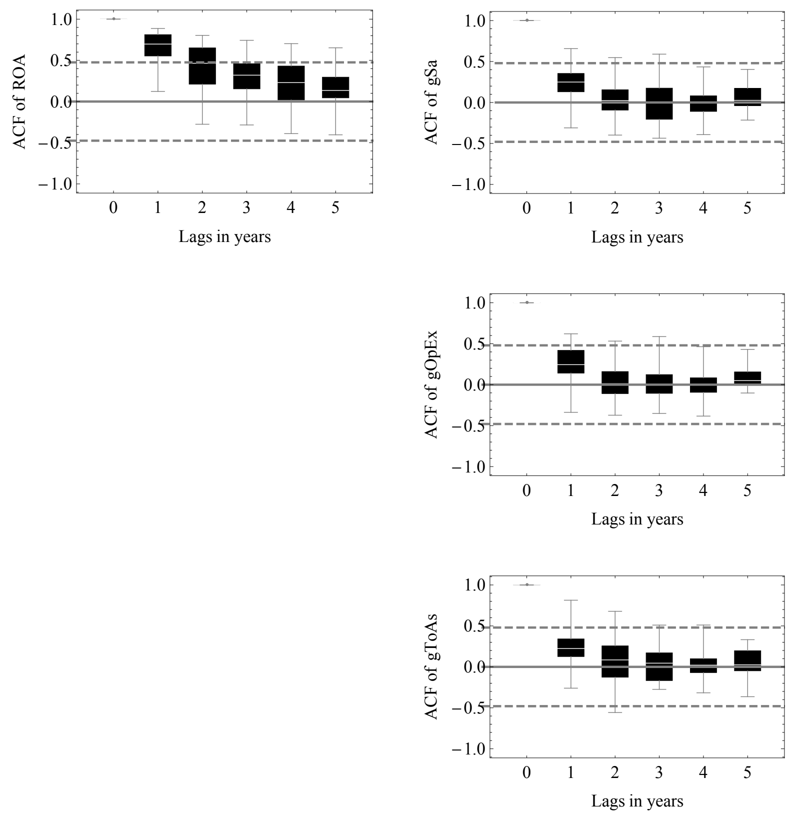


Figure E.97: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

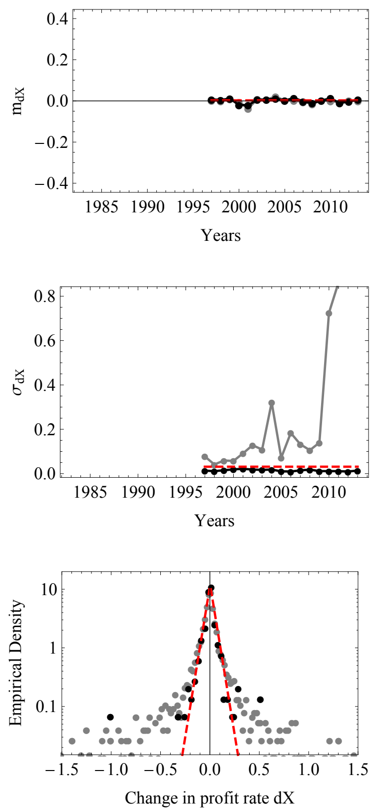


Figure E.98: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

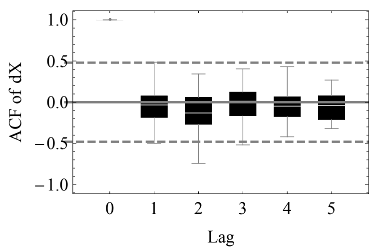


Figure E.99: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

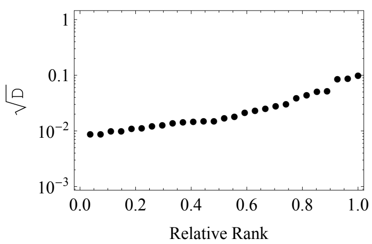


Figure E.100: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.21 Italy

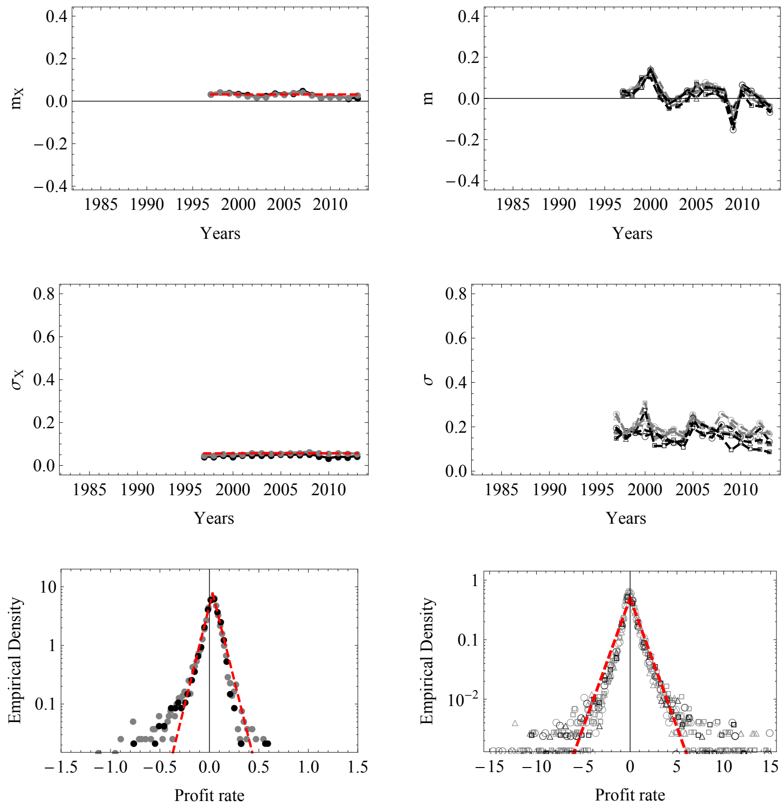


Figure E.101: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

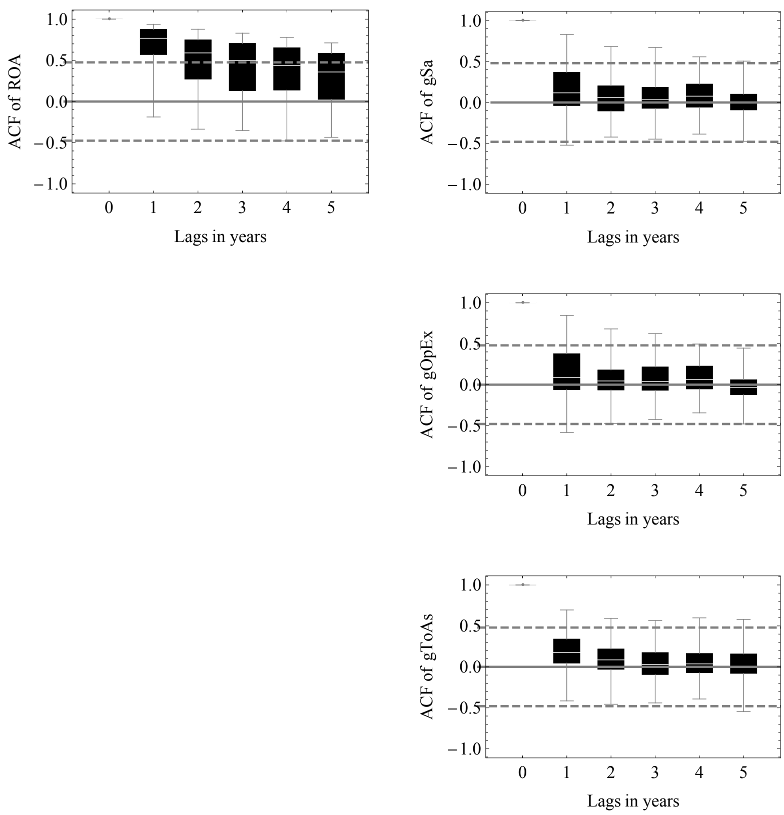


Figure E.102: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

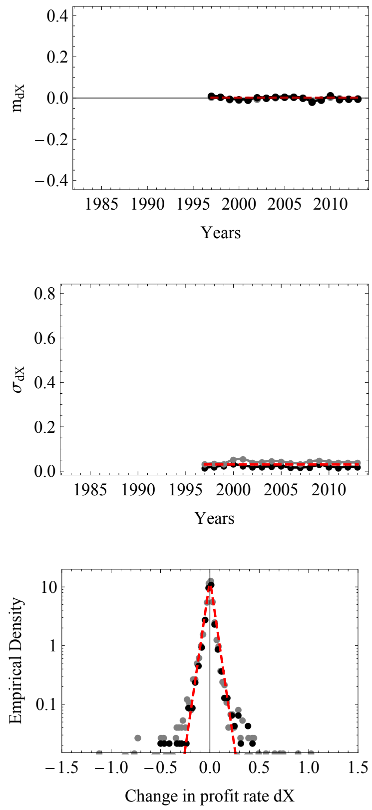


Figure E.103: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

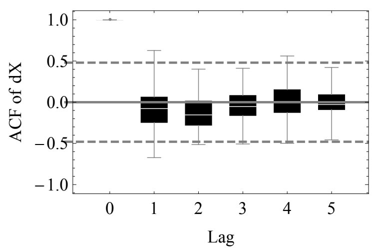


Figure E.104: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

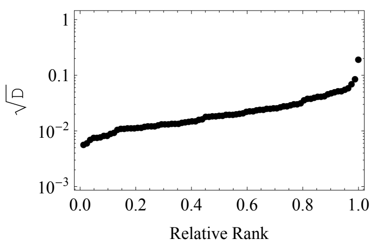


Figure E.105: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.22 Japan

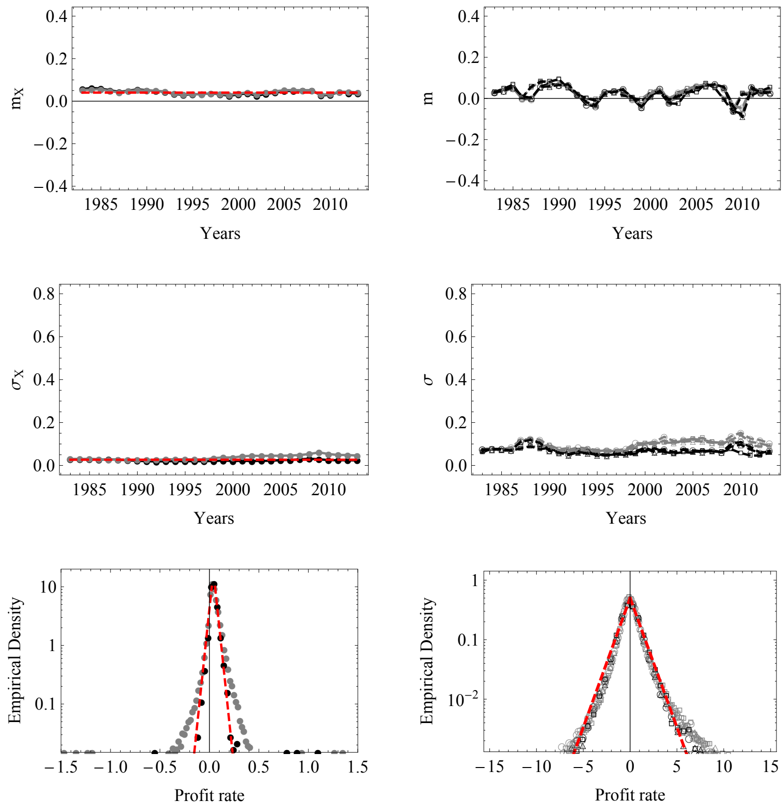


Figure E.106: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

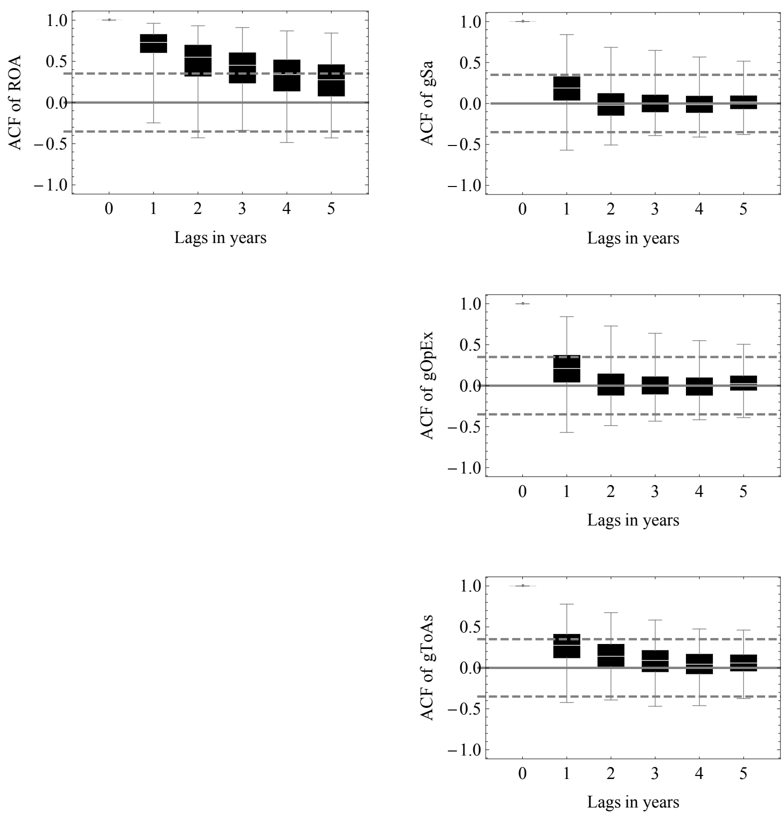


Figure E.107: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

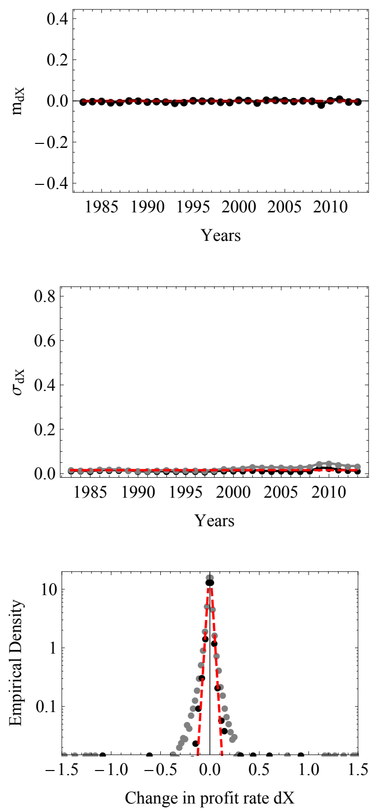


Figure E.108: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

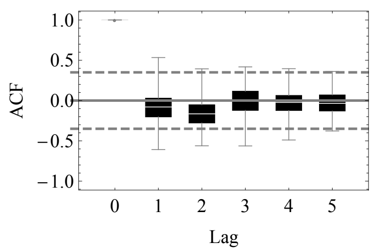


Figure E.109: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

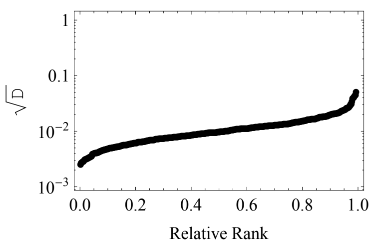


Figure E.110: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.23 Malaysia

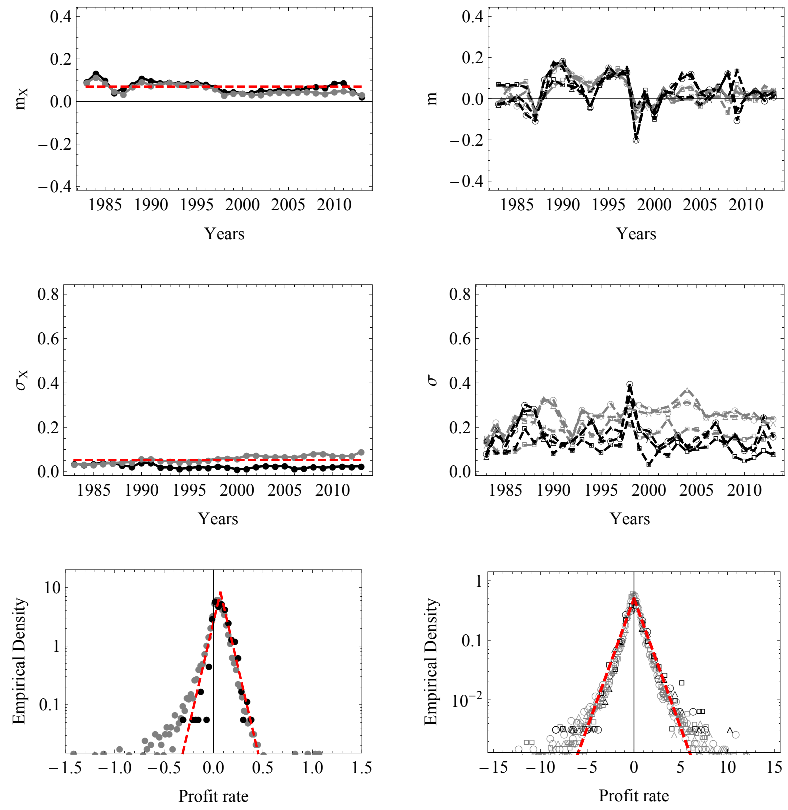


Figure E.111: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

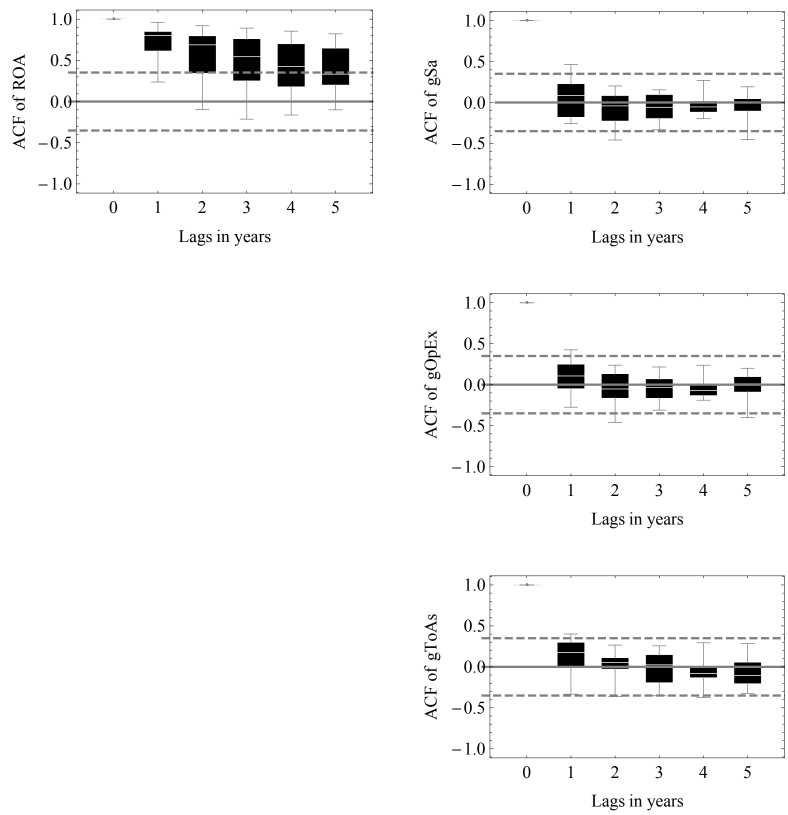


Figure E.112: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

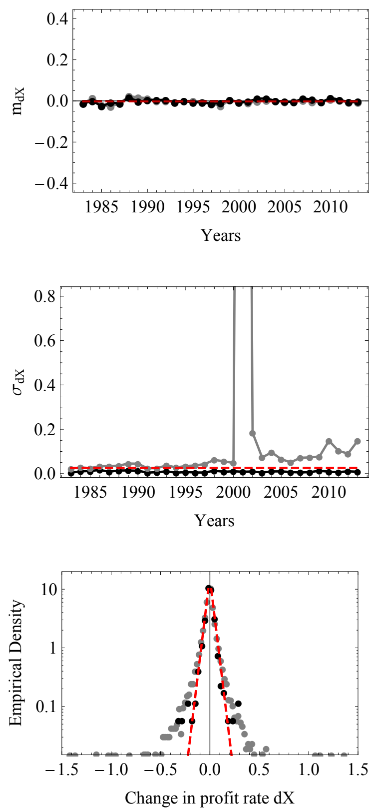


Figure E.113: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

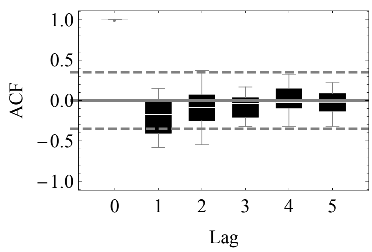


Figure E.114: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

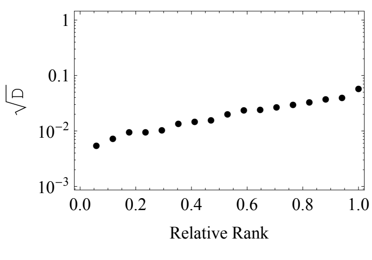


Figure E.115: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.24 Mexico

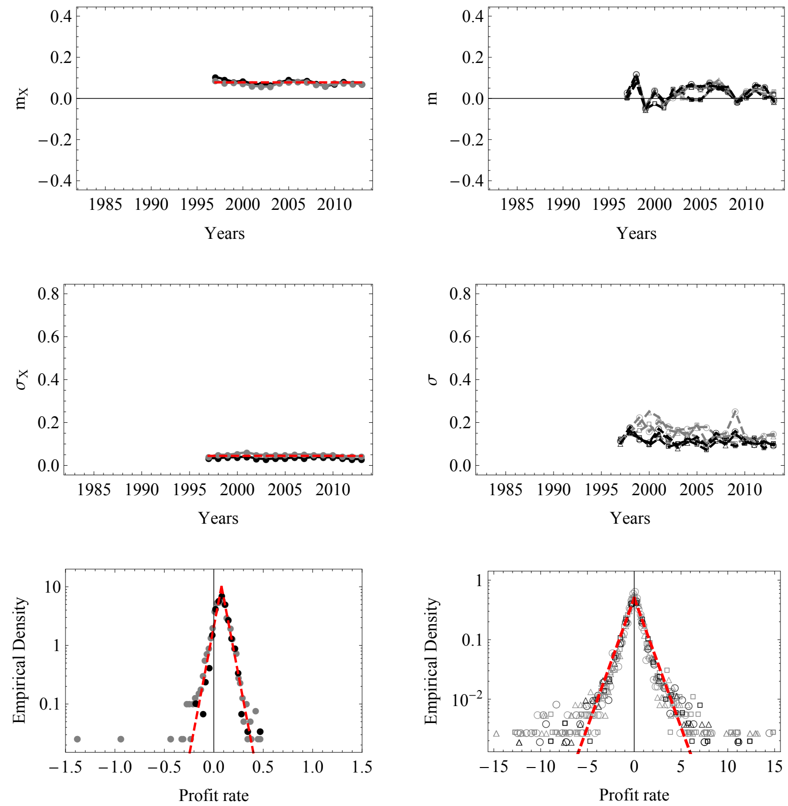


Figure E.116: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

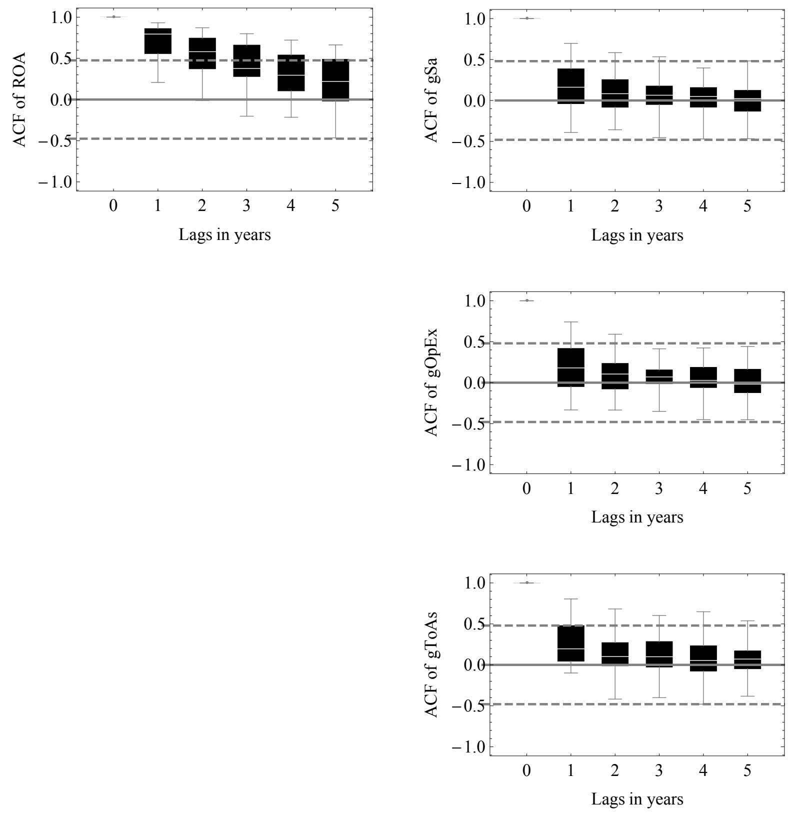


Figure E.117: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

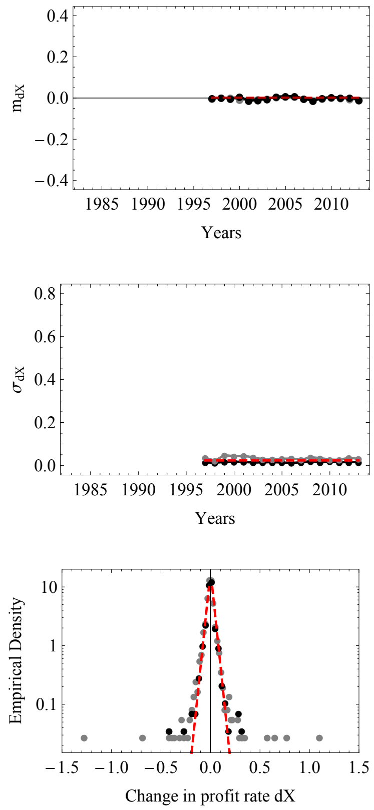


Figure E.118: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

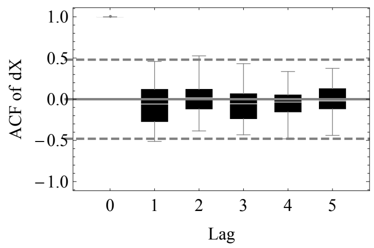


Figure E.119: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

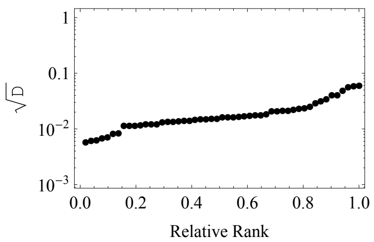


Figure E.120: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.25 Netherlands

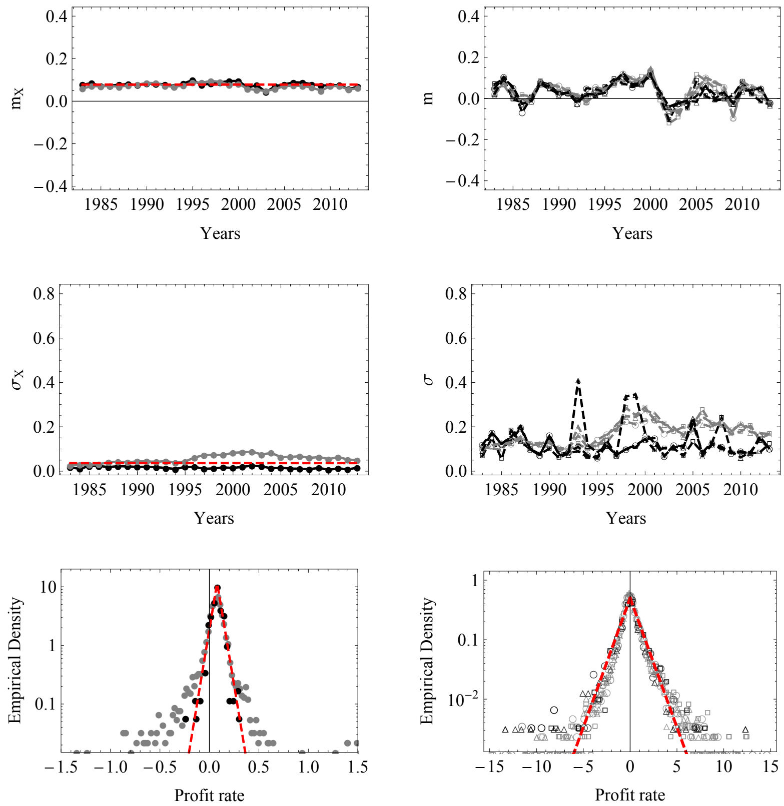


Figure E.121: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

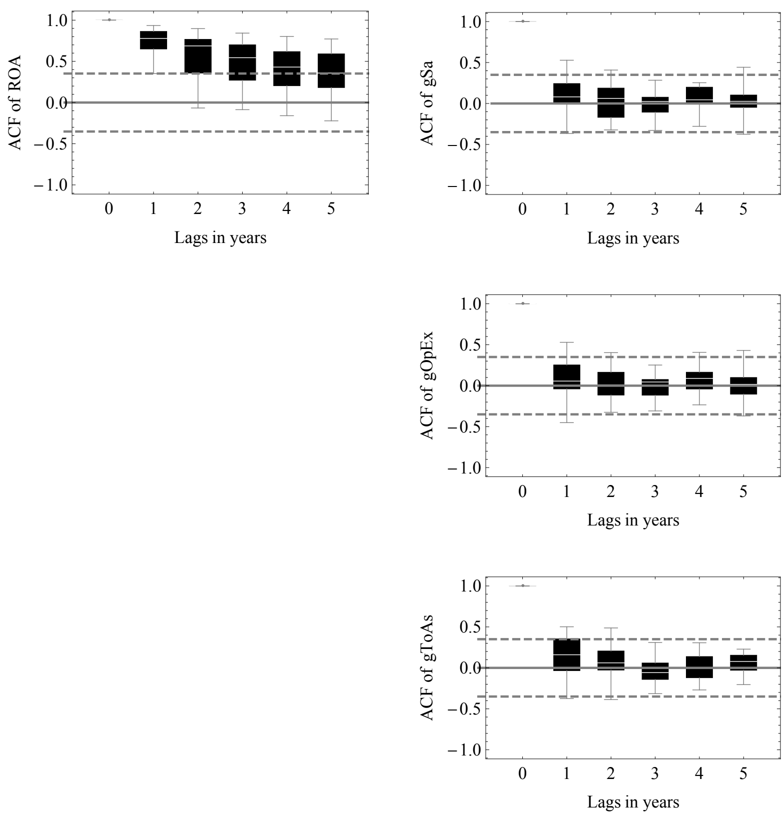


Figure E.122: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

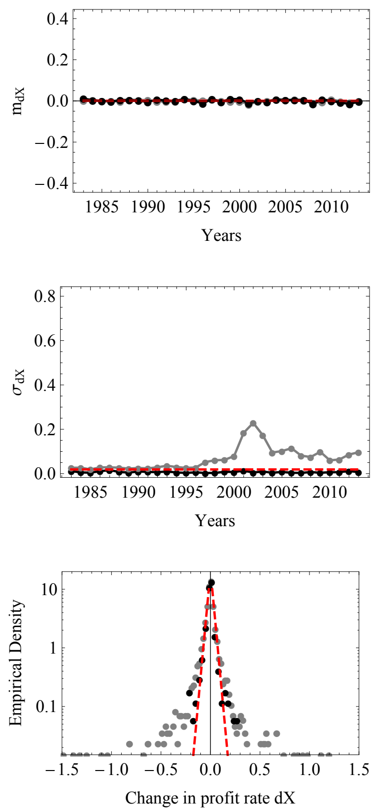


Figure E.123: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

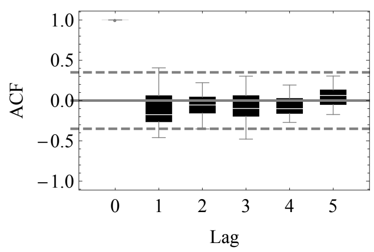


Figure E.124: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

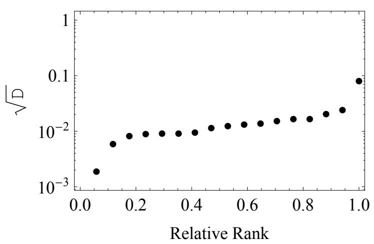


Figure E.125: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.26 New Zealand

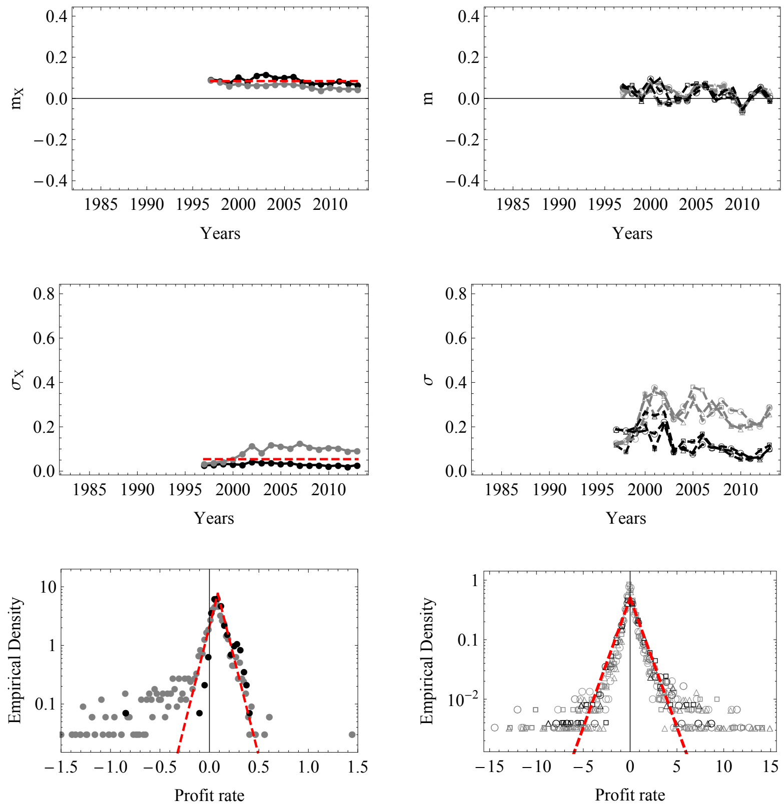


Figure E.126: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

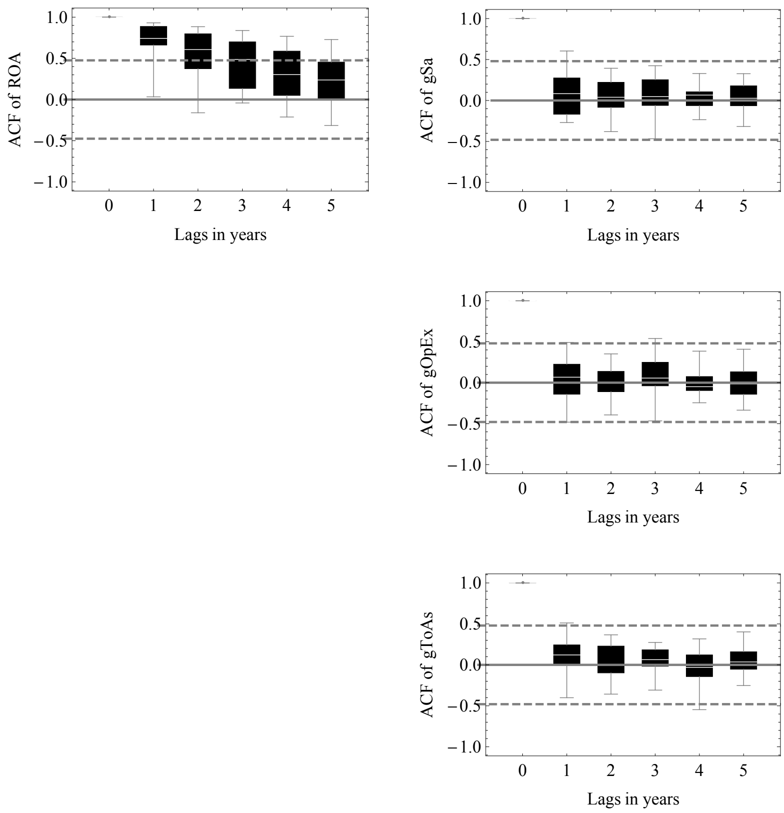


Figure E.127: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

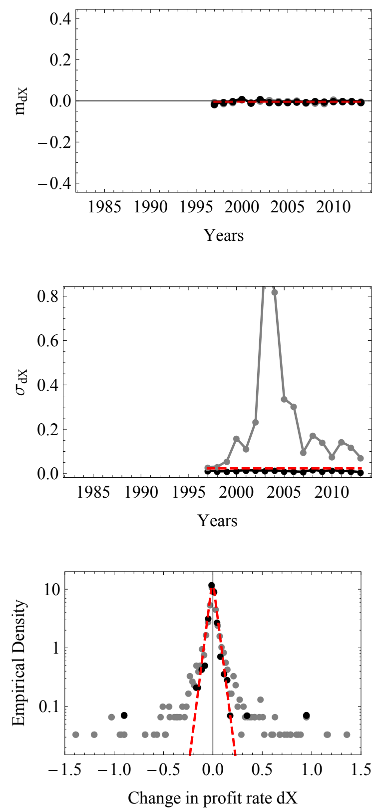


Figure E.128: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

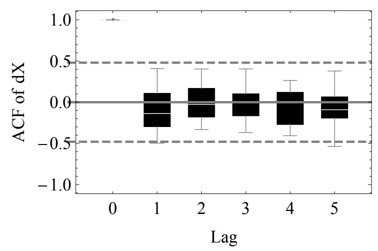


Figure E.129: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

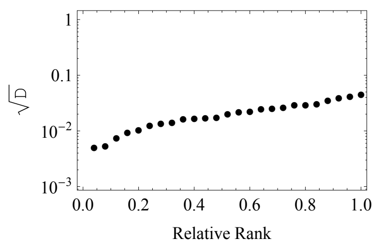


Figure E.130: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.27 Norway

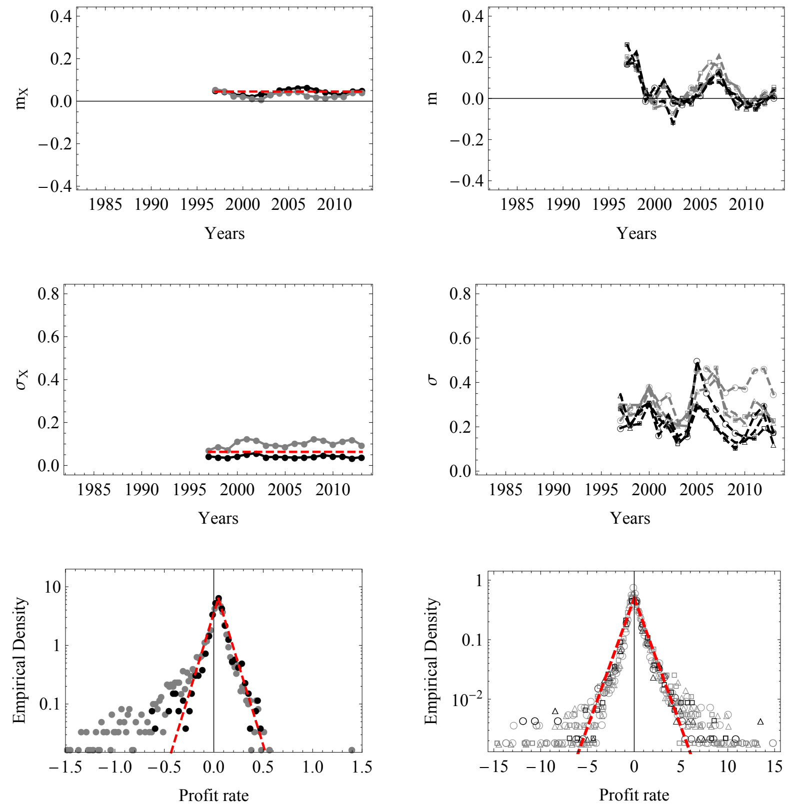


Figure E.131: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

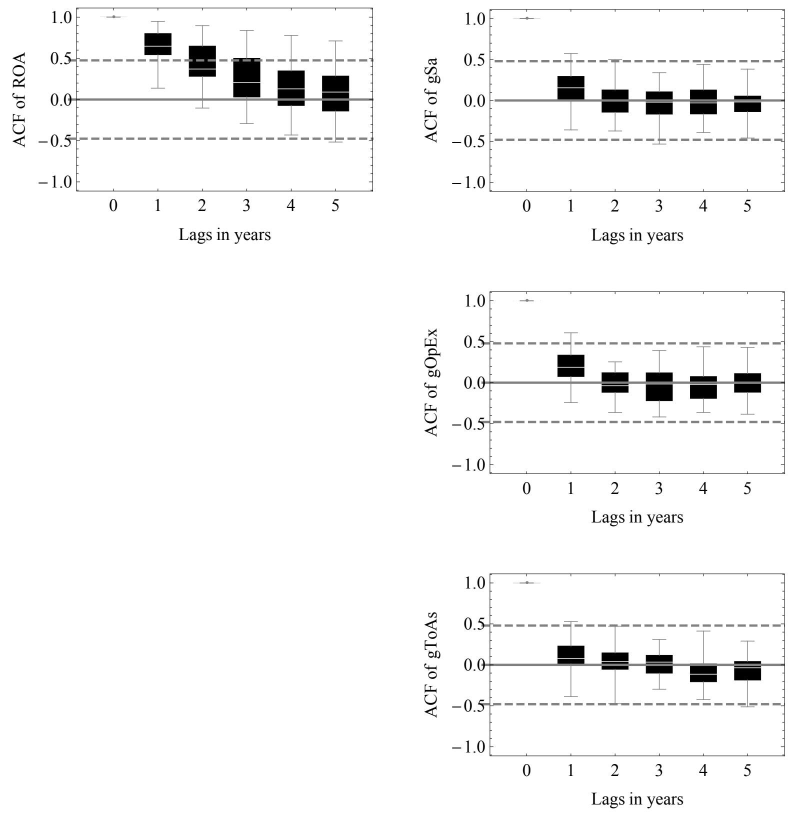


Figure E.132: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

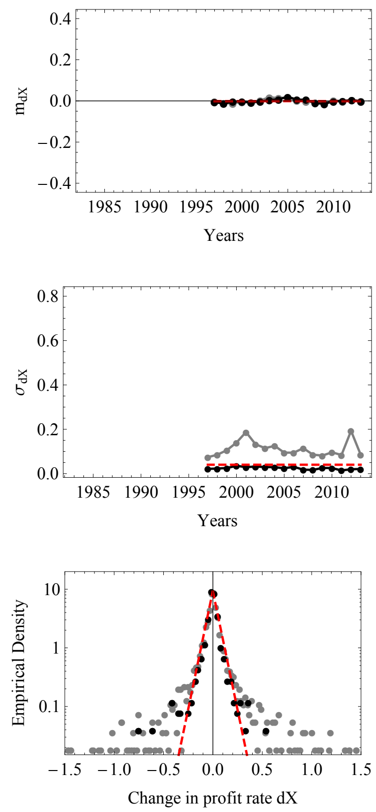


Figure E.133: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

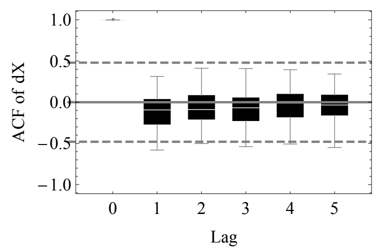


Figure E.134: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

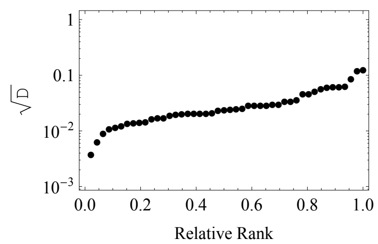


Figure E.135: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.28 Pakistan

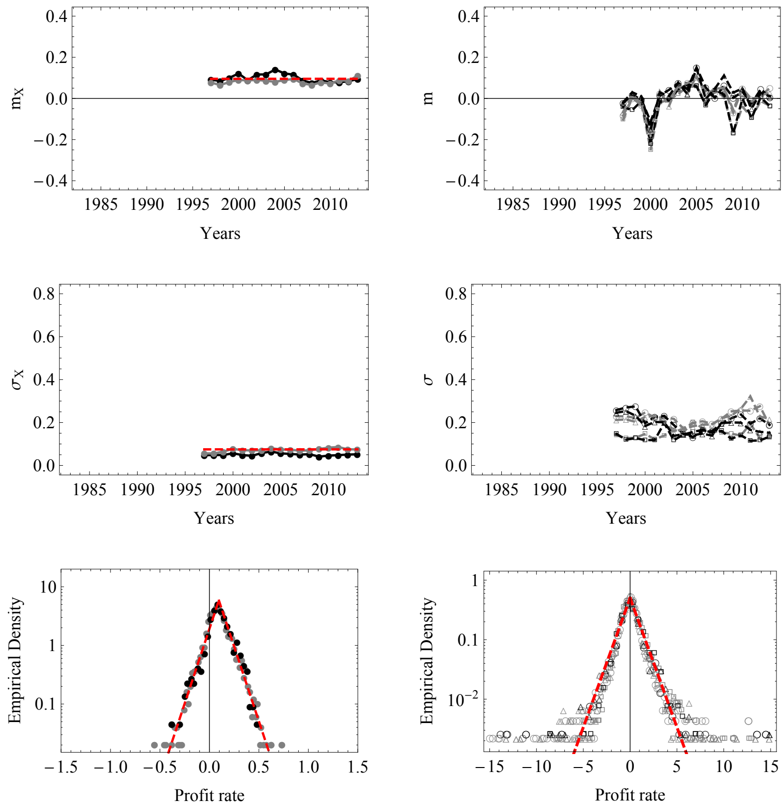


Figure E.136: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

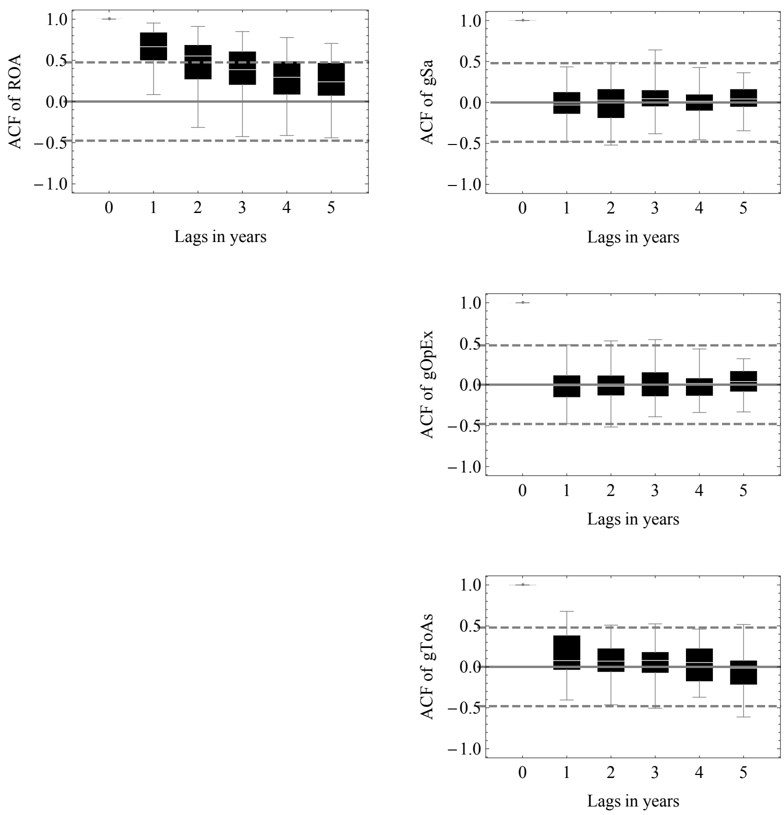


Figure E.137: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

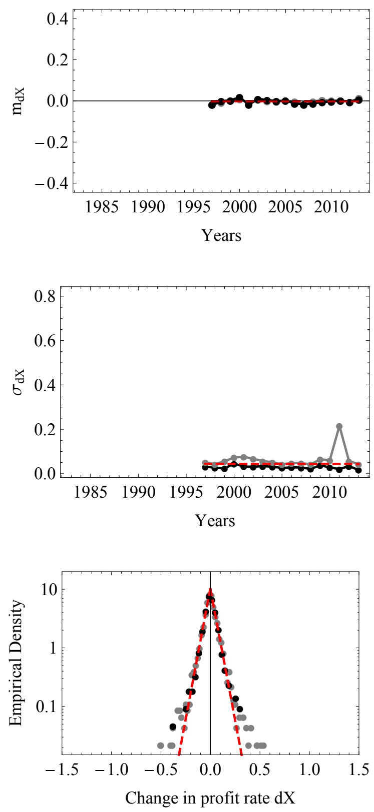


Figure E.138: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

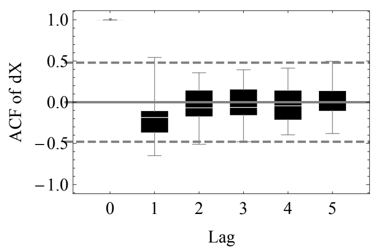


Figure E.139: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

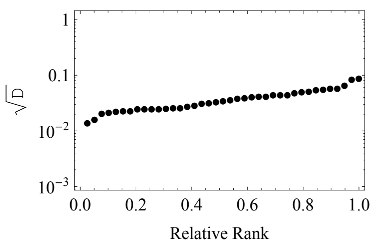


Figure E.140: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.29 Peru

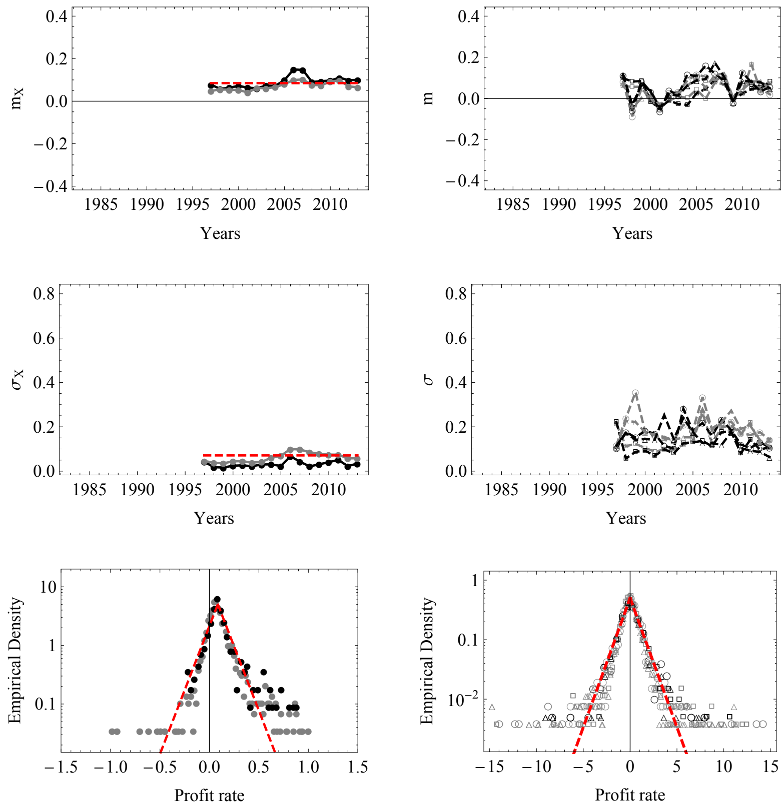


Figure E.141: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

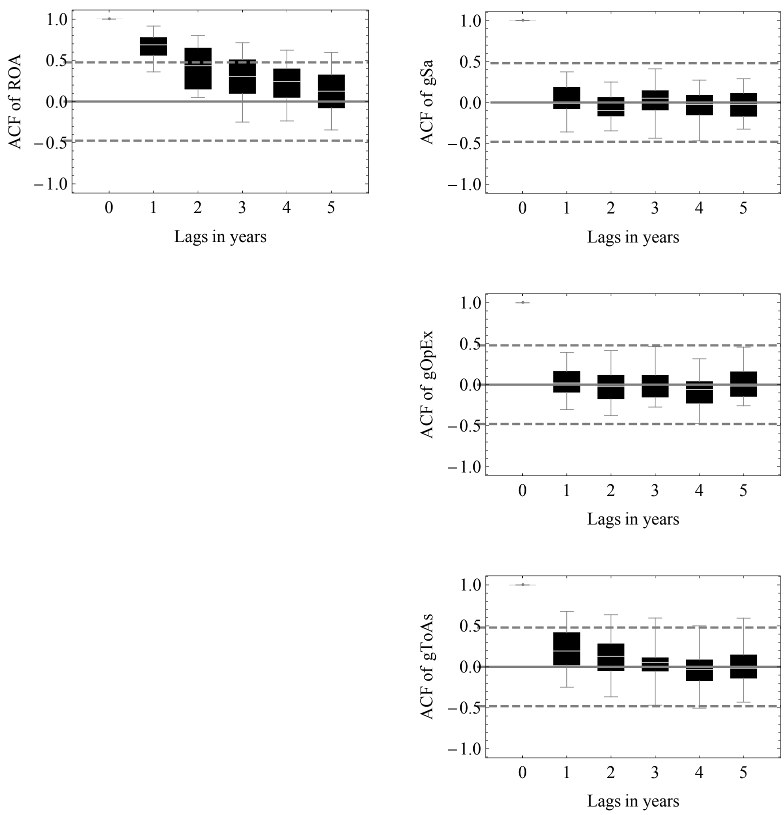


Figure E.142: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

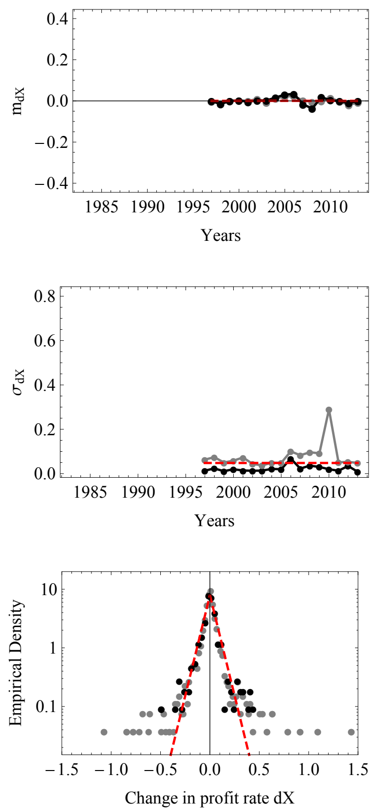


Figure E.143: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

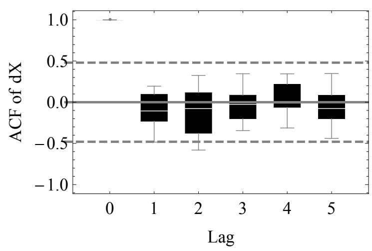


Figure E.144: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

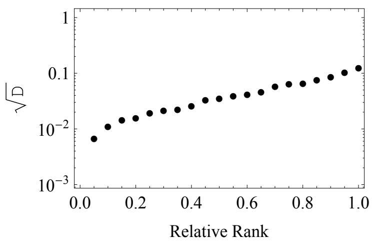


Figure E.145: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.30 Philippines

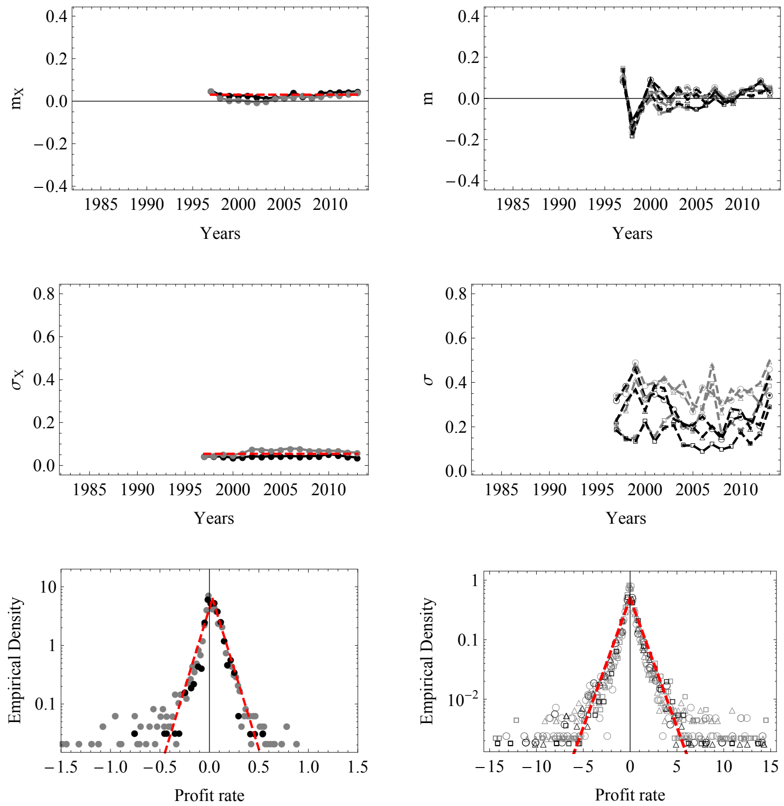


Figure E.146: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

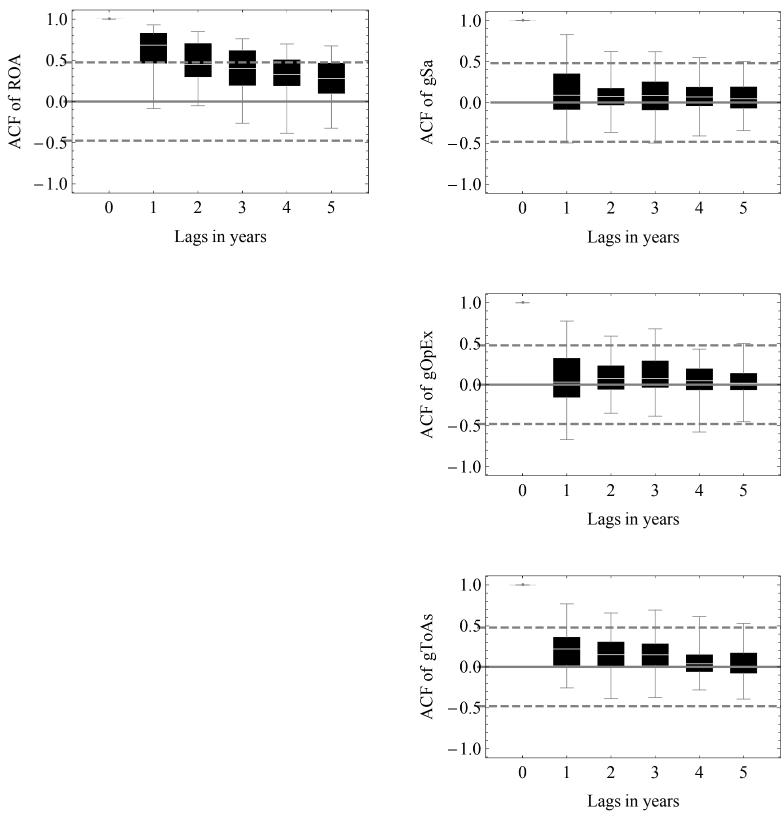


Figure E.147: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

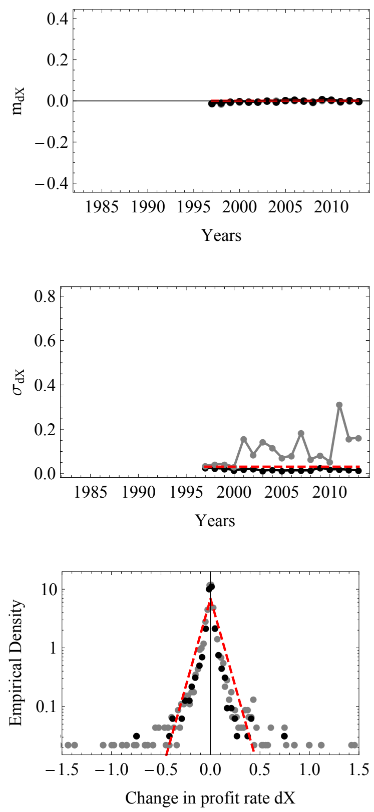


Figure E.148: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

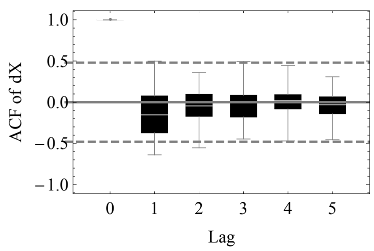


Figure E.149: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

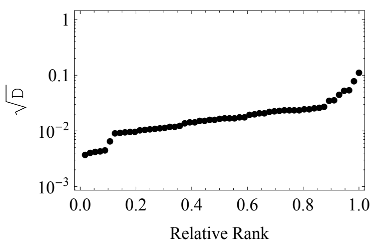


Figure E.150: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.31 Poland

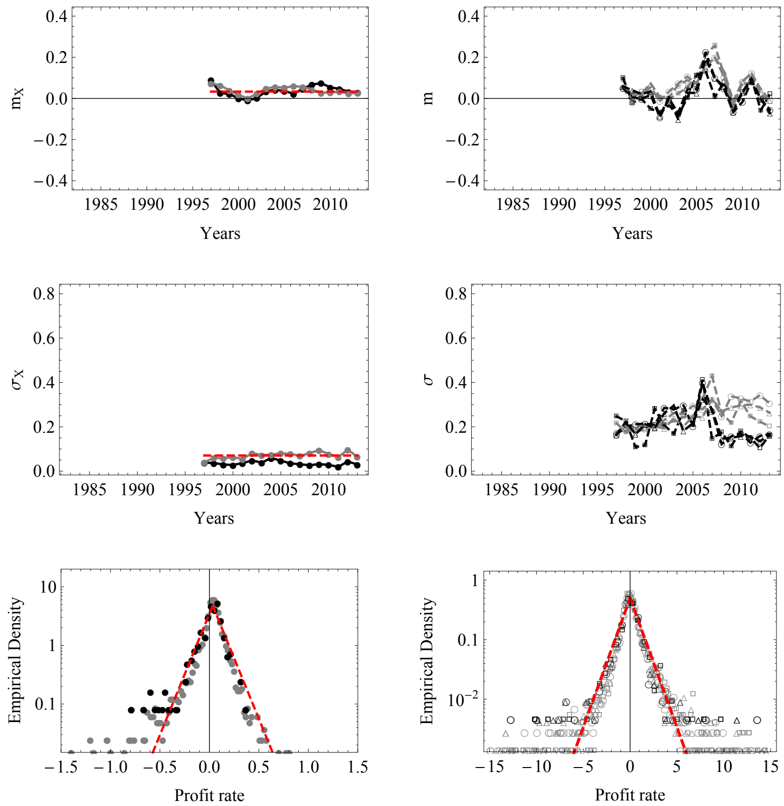


Figure E.151: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

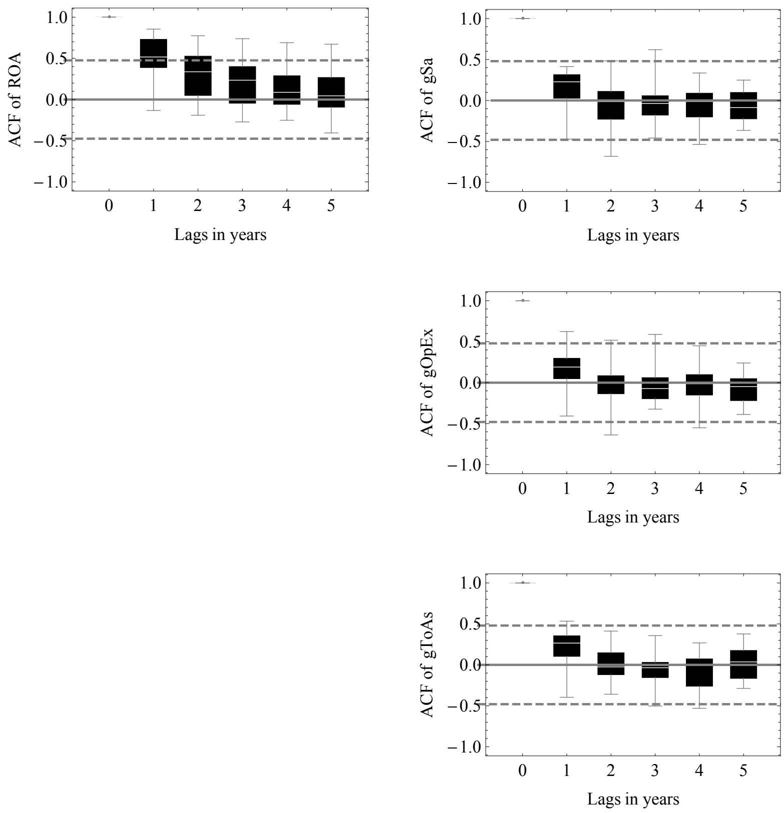


Figure E.152: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

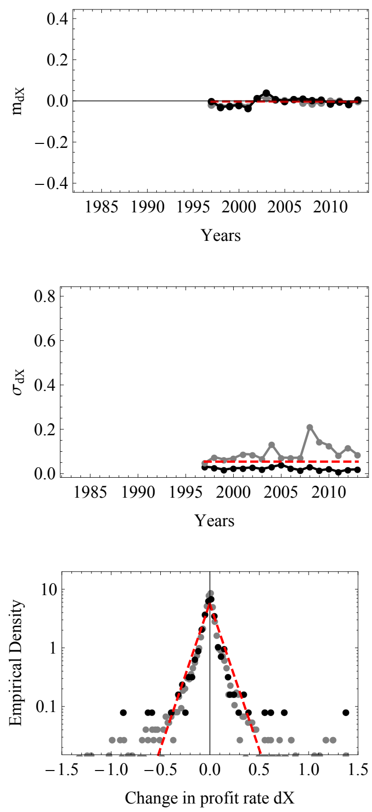


Figure E.153: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

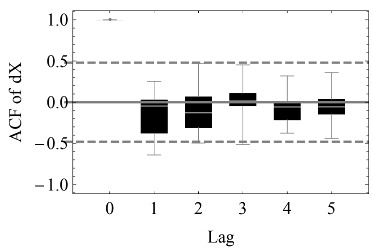


Figure E.154: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

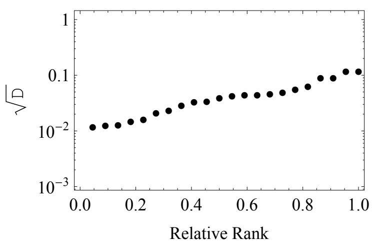


Figure E.155: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.32 Portugal

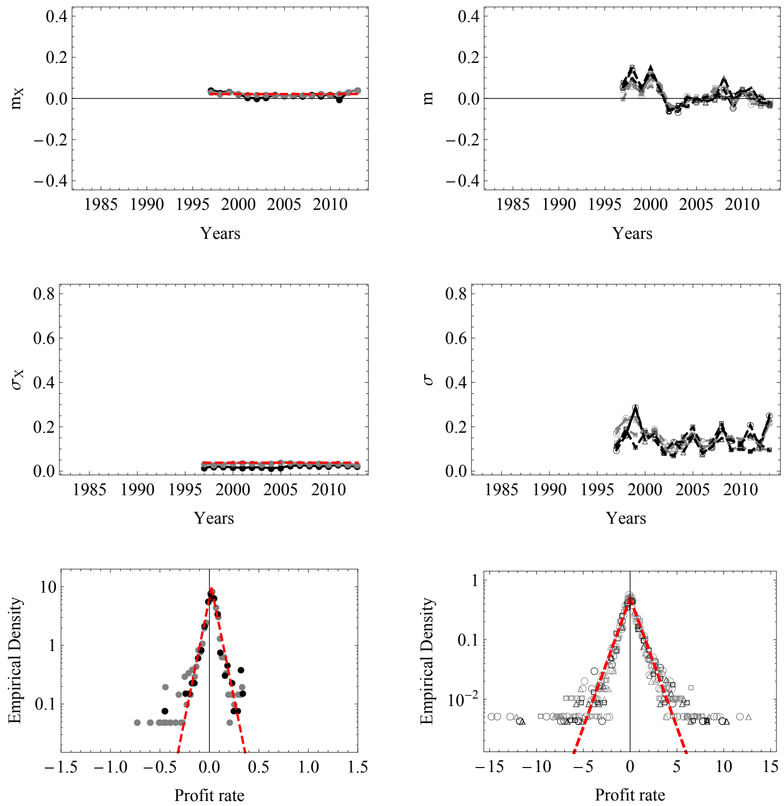


Figure E.156: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

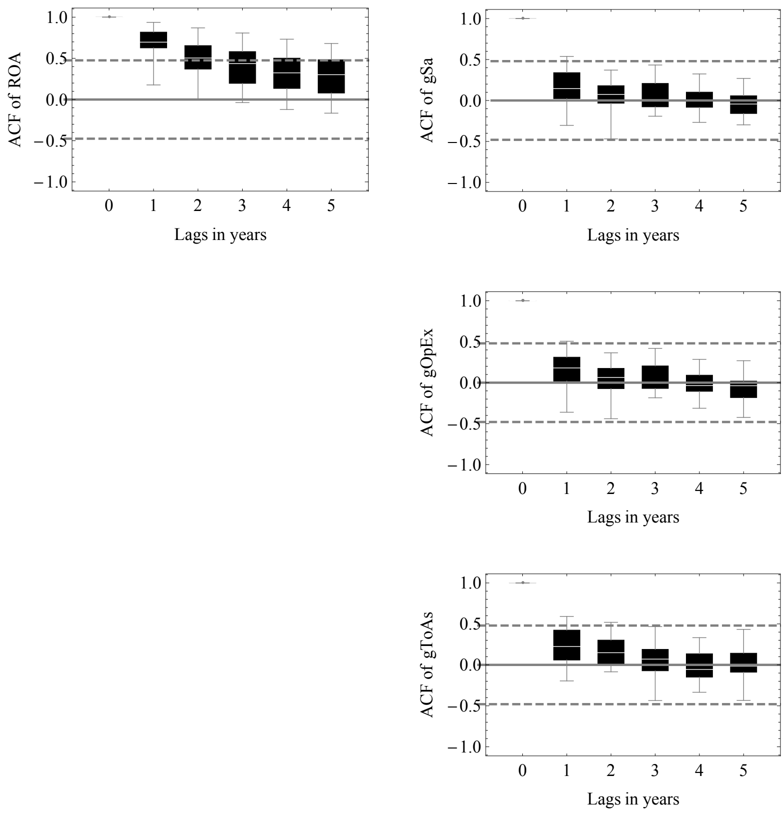


Figure E.157: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

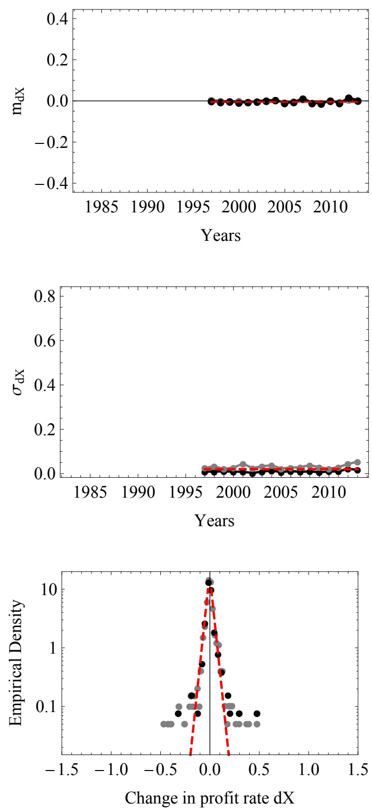


Figure E.158: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

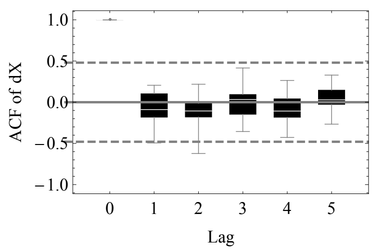


Figure E.159: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

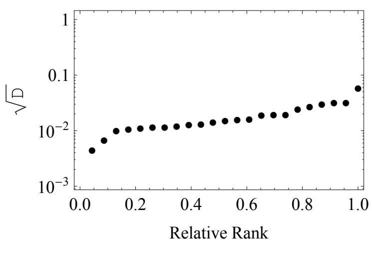


Figure E.160: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.33 Russian Federation

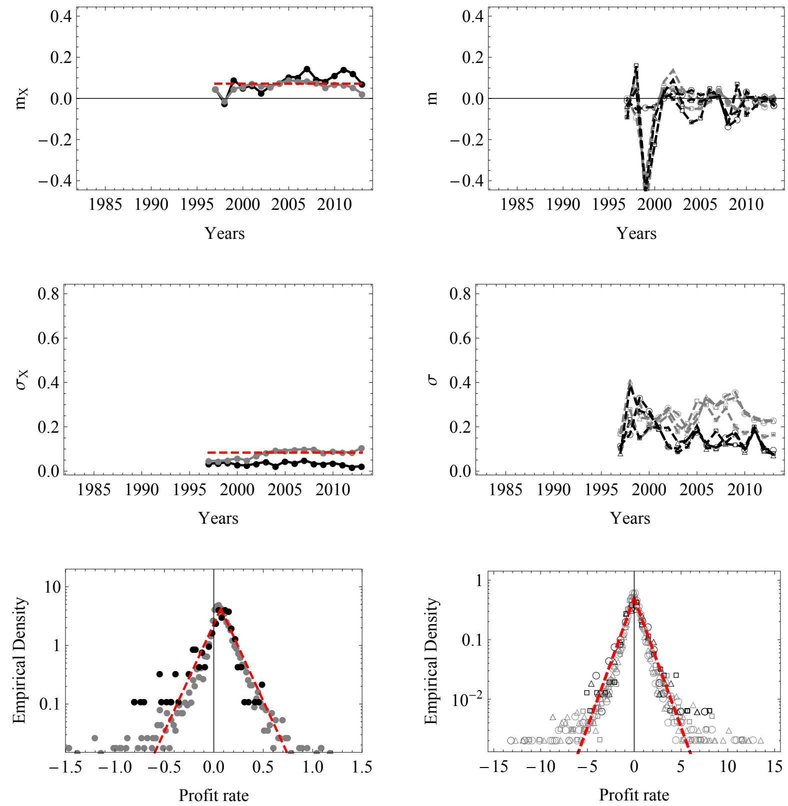


Figure E.161: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

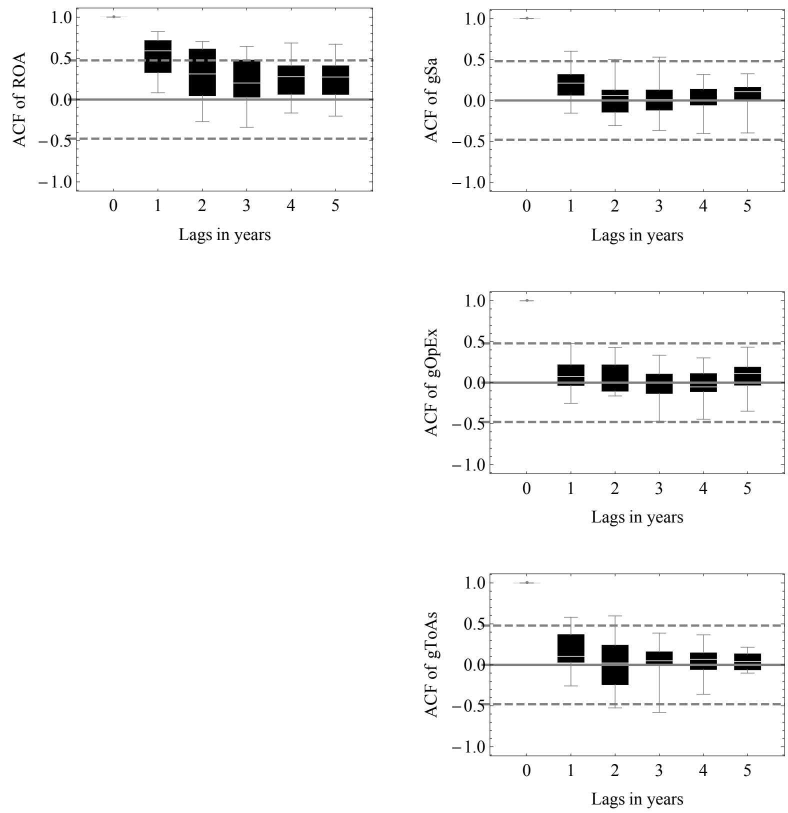


Figure E.162: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

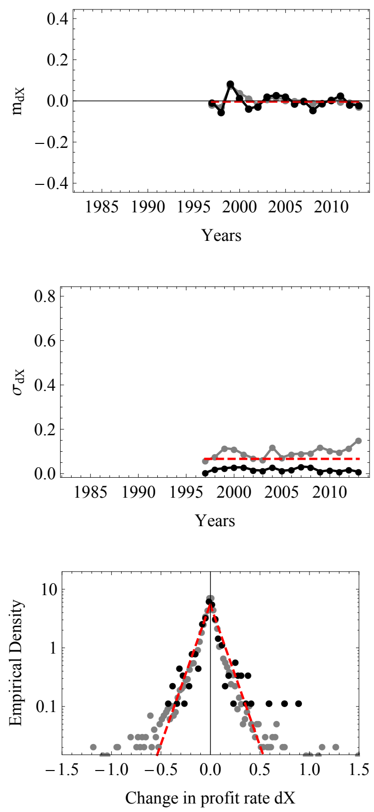


Figure E.163: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

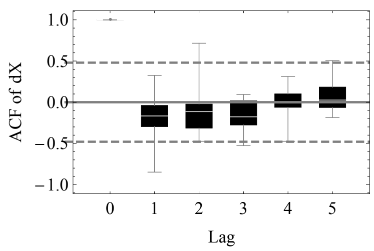


Figure E.164: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

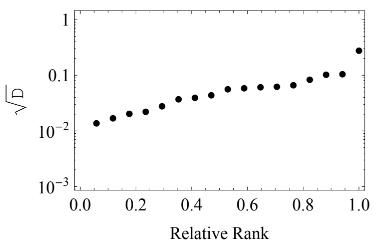


Figure E.165: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.34 Singapore

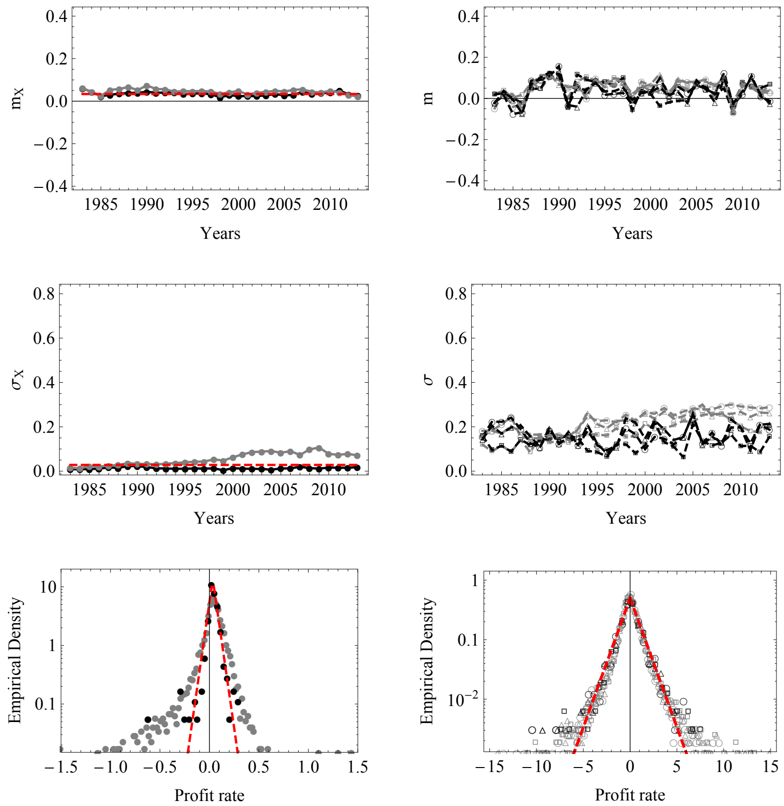


Figure E.166: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

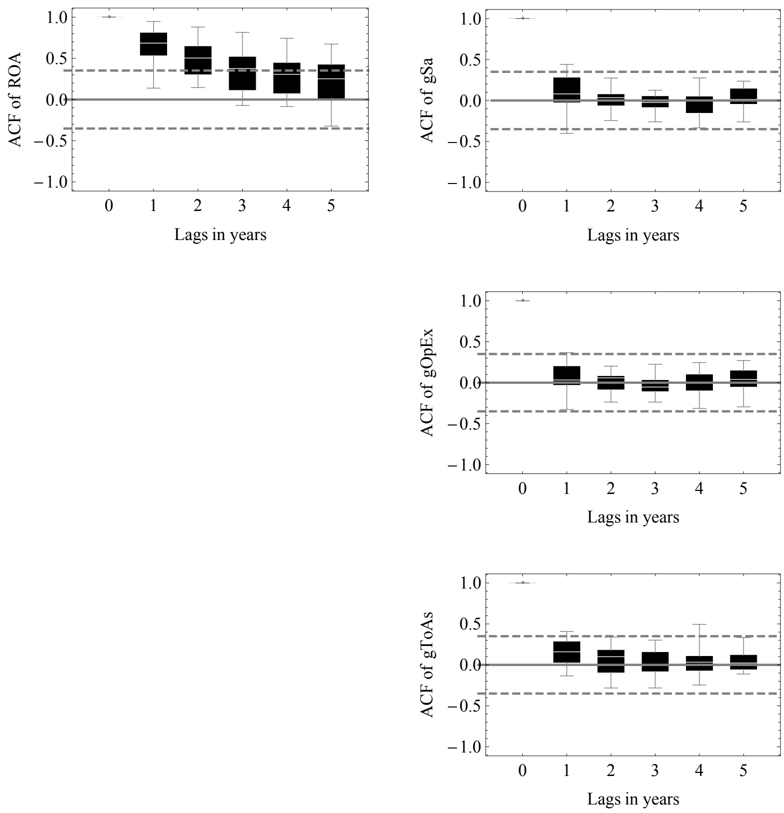


Figure E.167: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

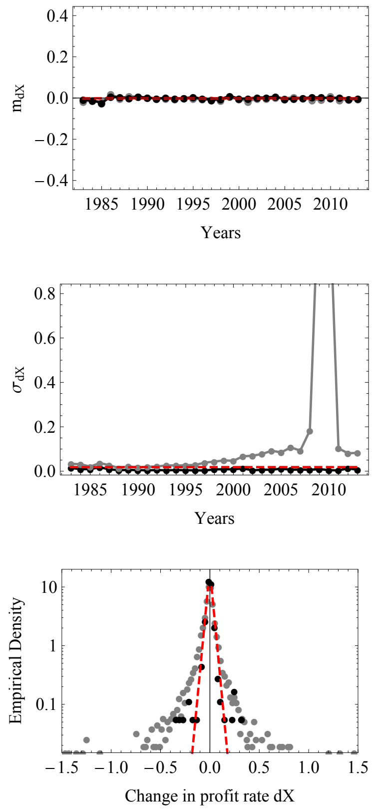


Figure E.168: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

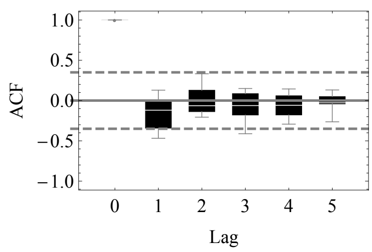


Figure E.169: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

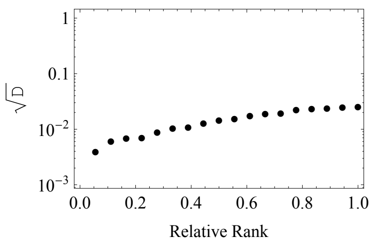


Figure E.170: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.35 South Africa

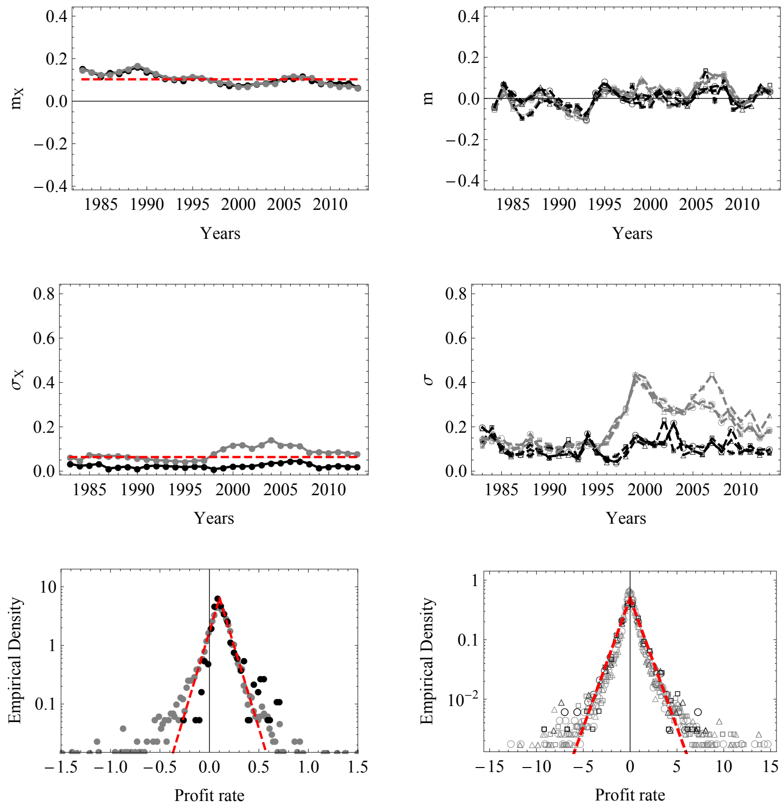


Figure E.171: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

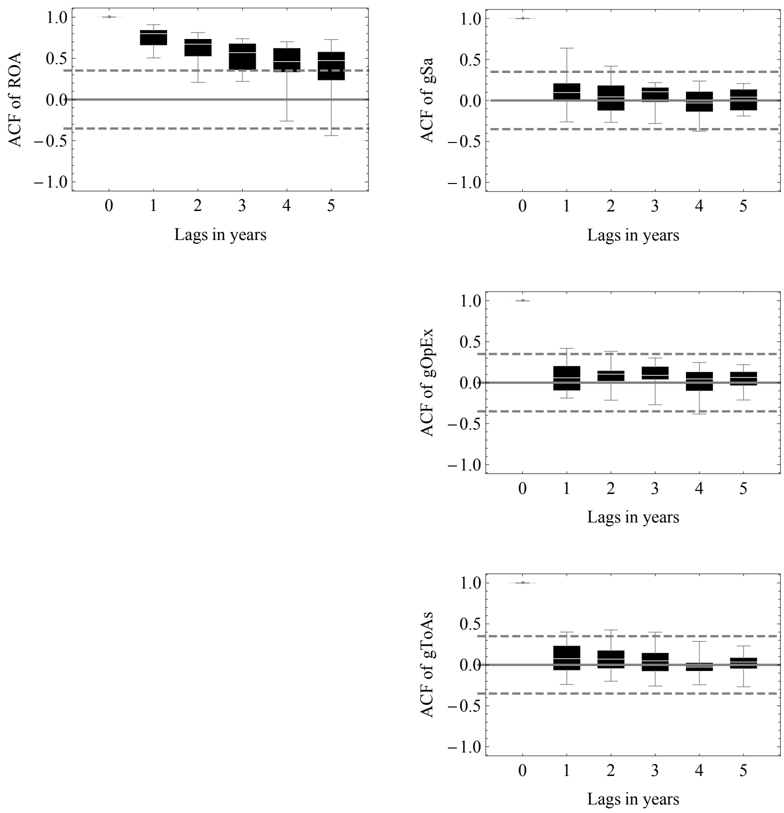


Figure E.172: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

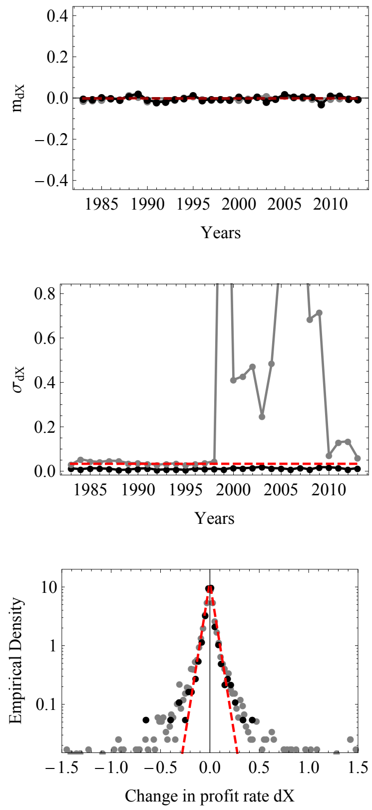


Figure E.173: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

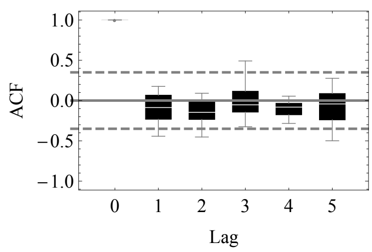


Figure E.174: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

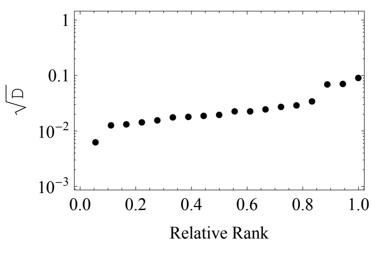


Figure E.175: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.36 South Korea

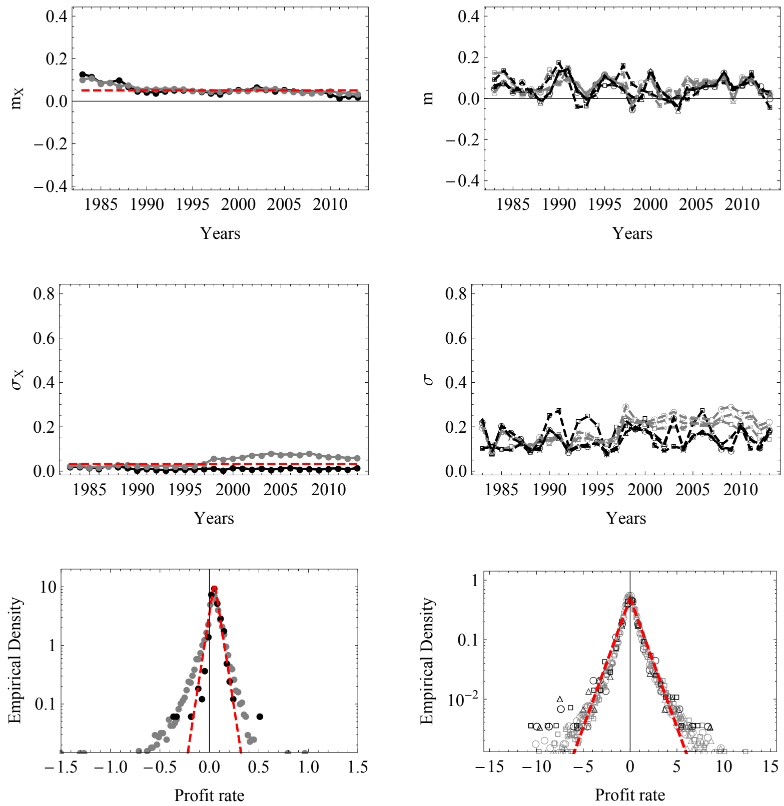


Figure E.176: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

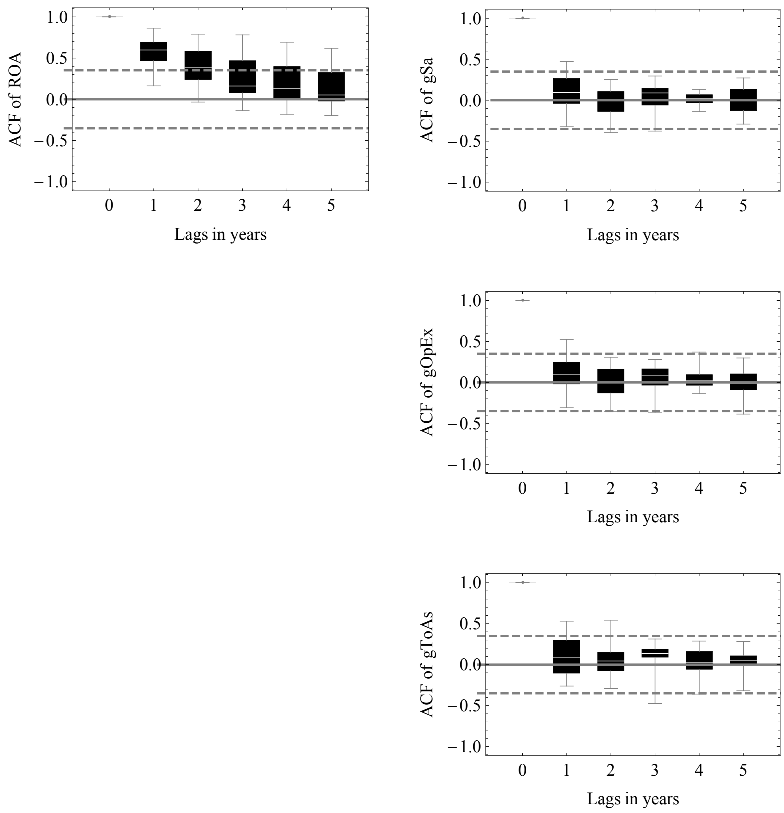


Figure E.177: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

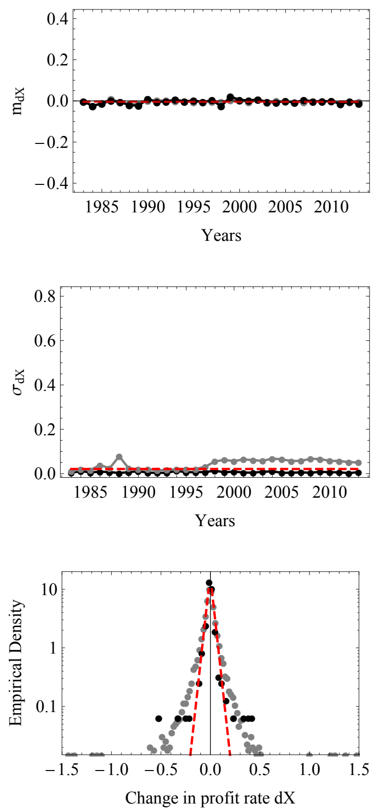


Figure E.178: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

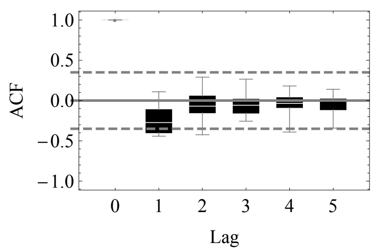


Figure E.179: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm /\sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

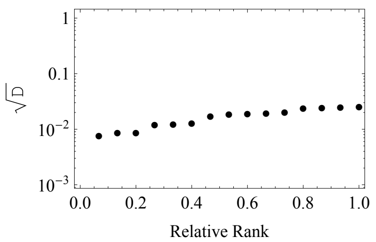


Figure E.180: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.37 Spain

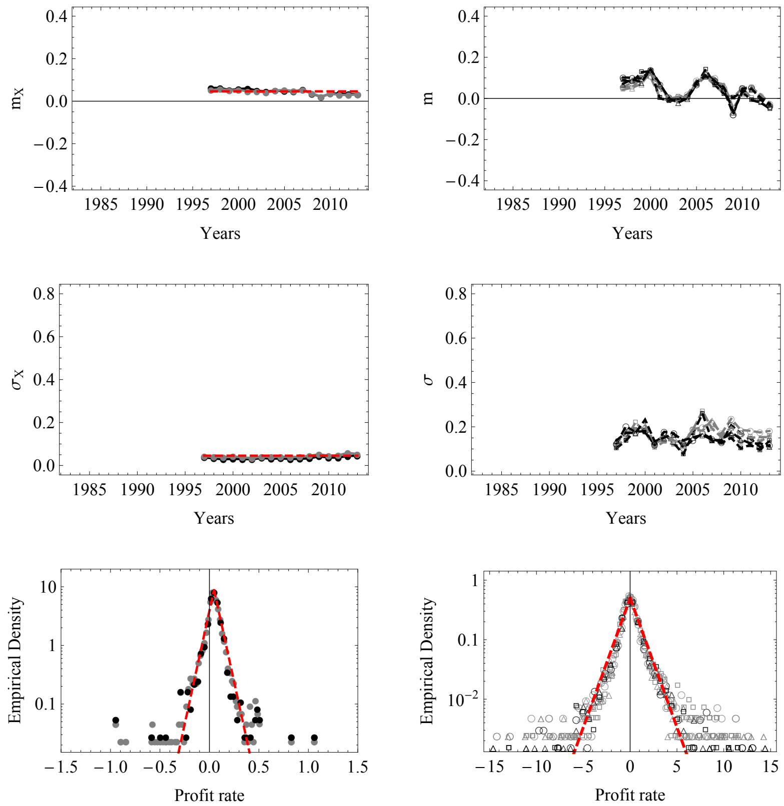


Figure E.181: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

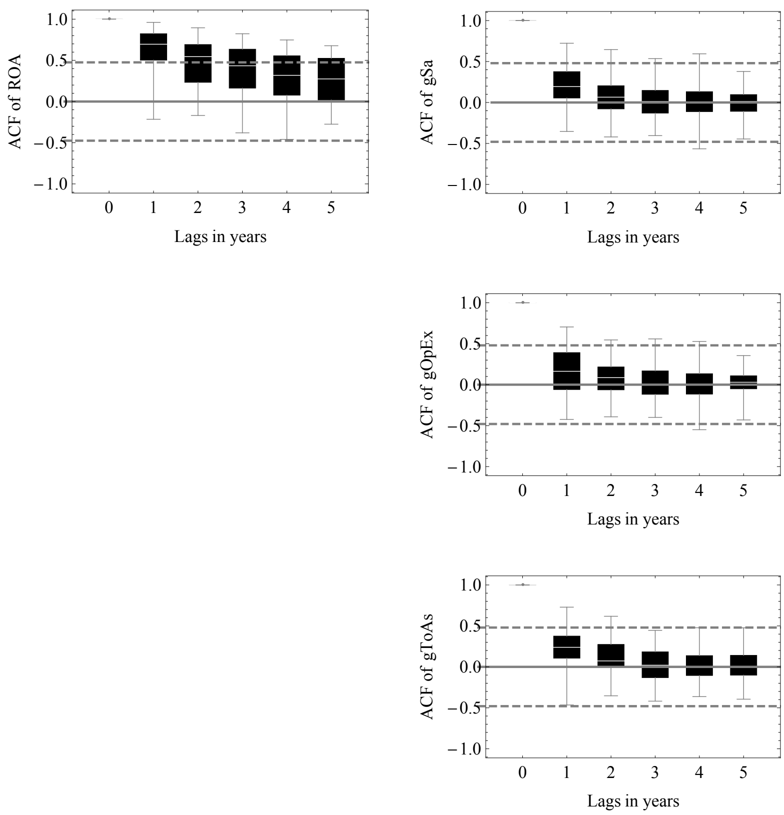


Figure E.182: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

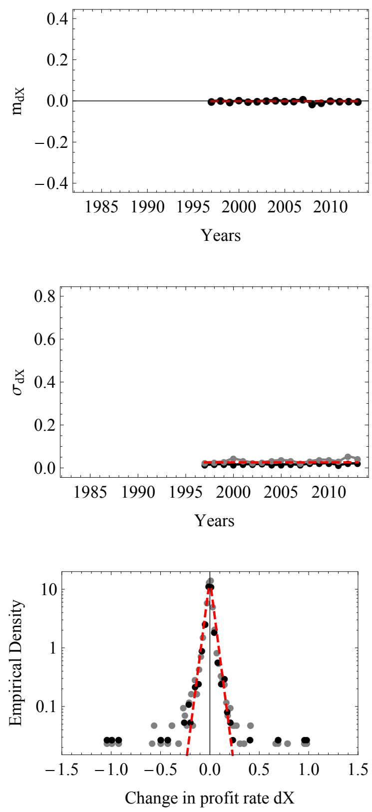


Figure E.183: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

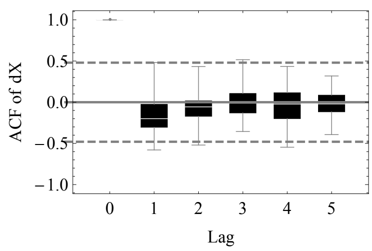


Figure E.184: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

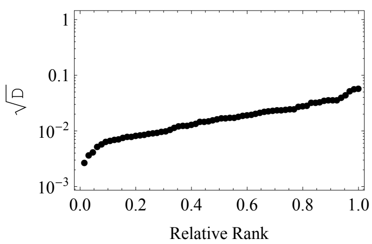


Figure E.185: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.38 Sri Lanka

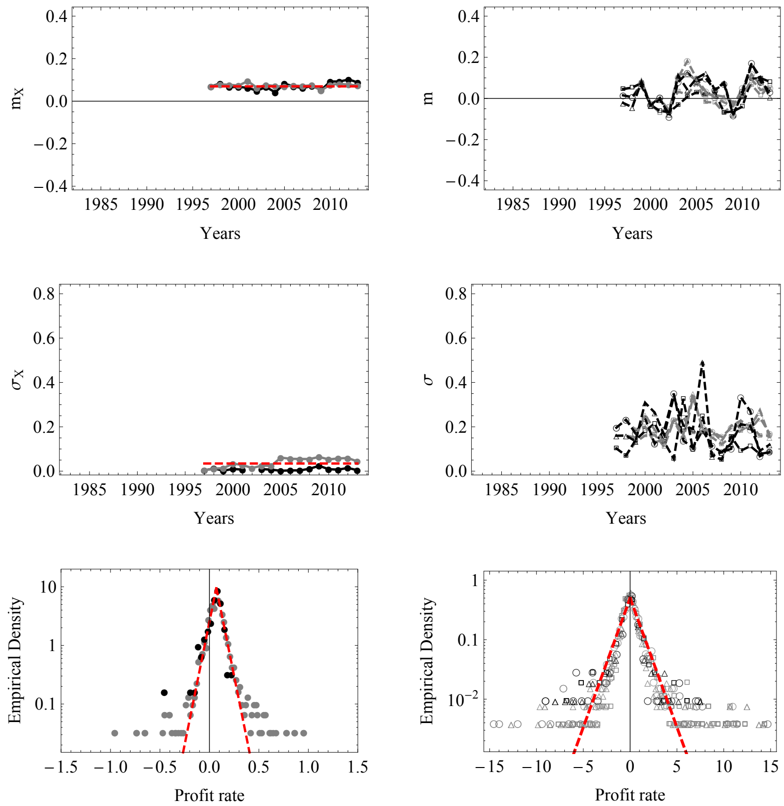


Figure E.186: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

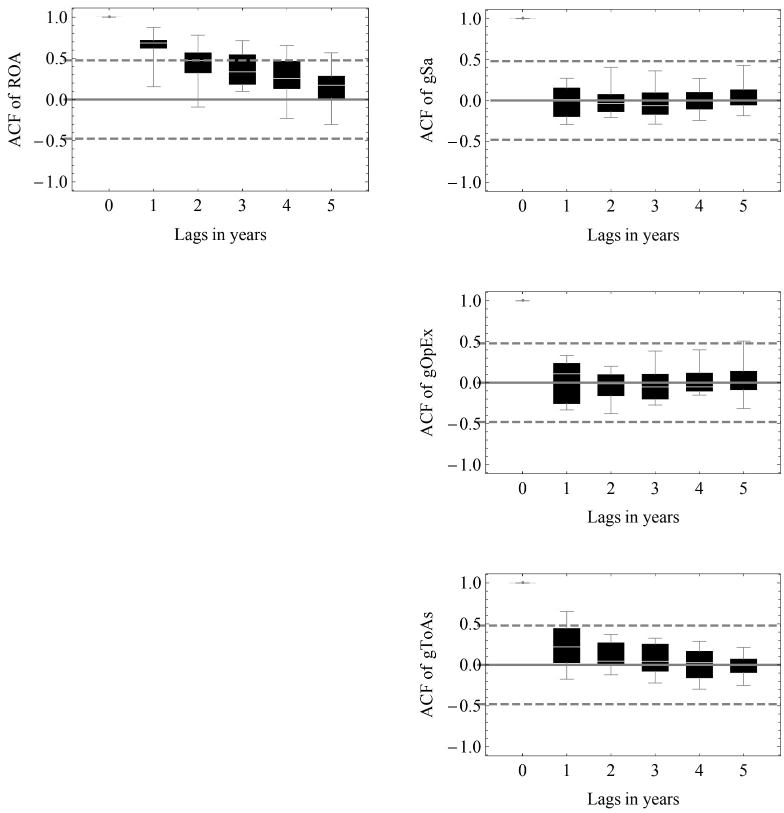


Figure E.187: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

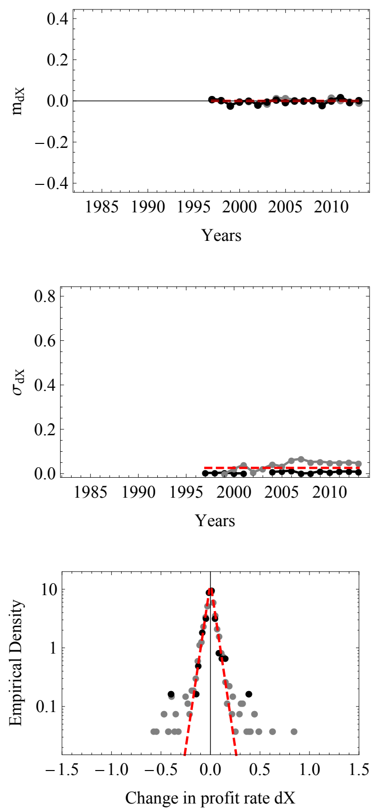


Figure E.188: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

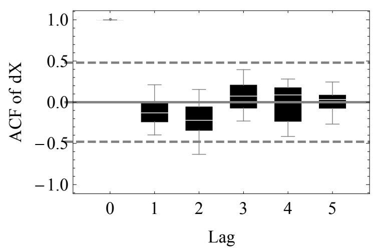


Figure E.189: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm /\sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

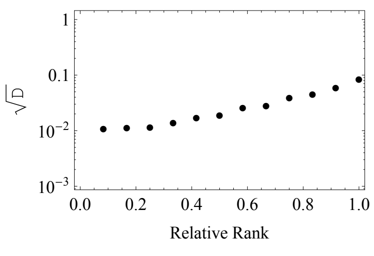


Figure E.190: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.39 Sweden

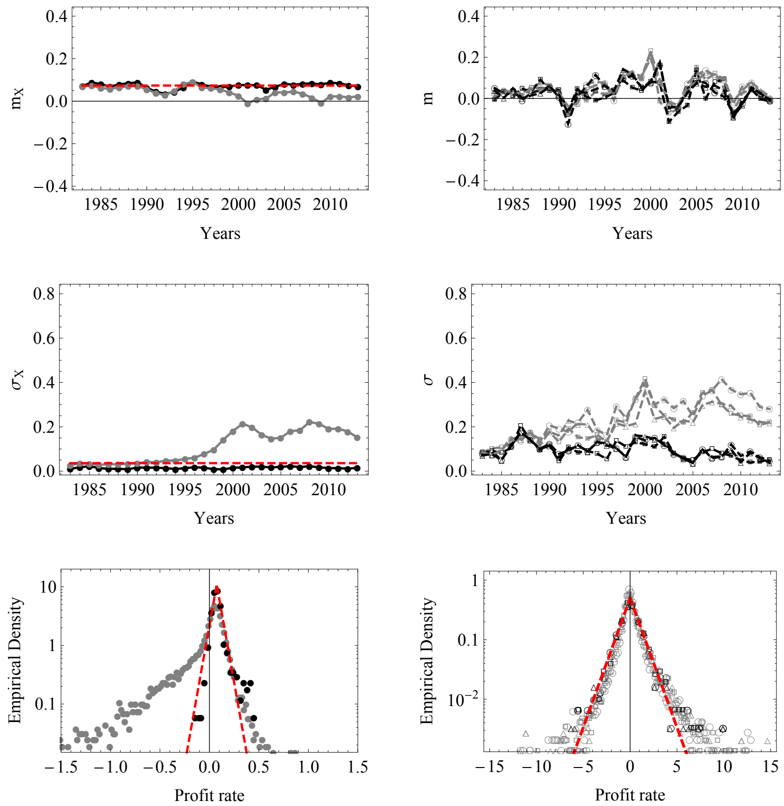


Figure E.191: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

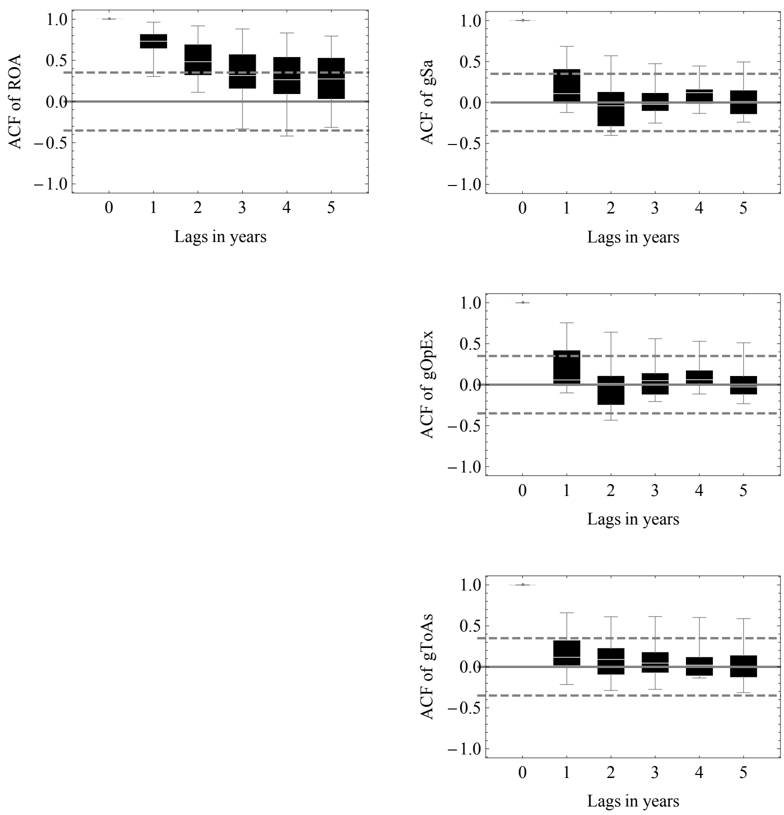


Figure E.192: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

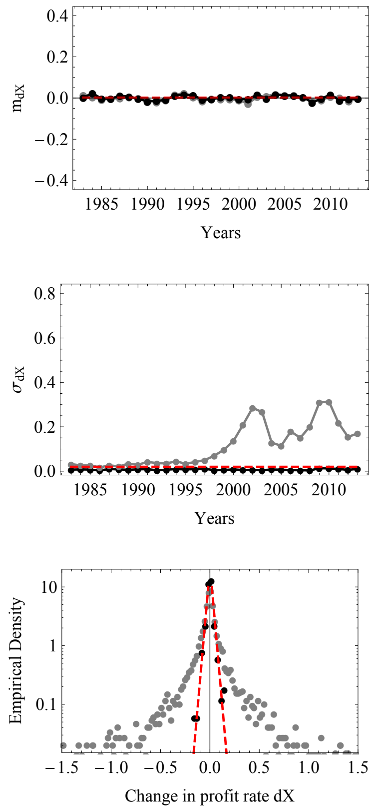


Figure E.193: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

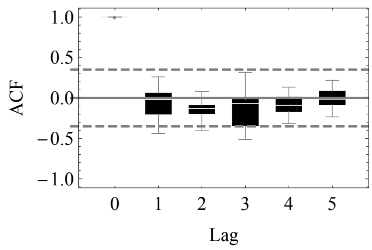


Figure E.194: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

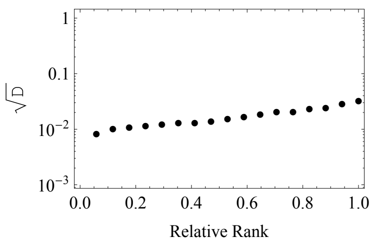


Figure E.195: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.40 Switzerland

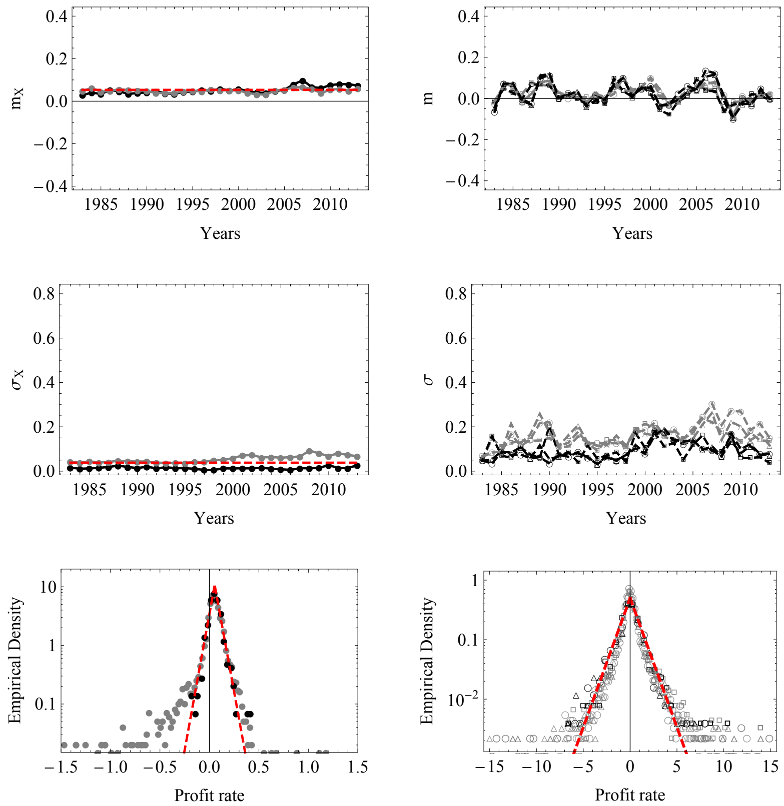


Figure E.196: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

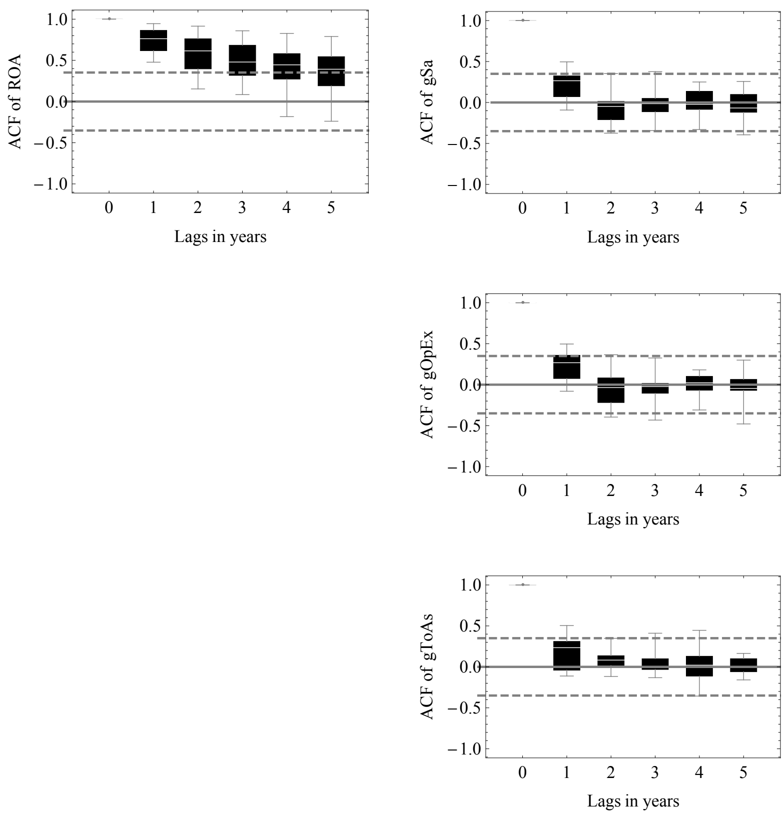


Figure E.197: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

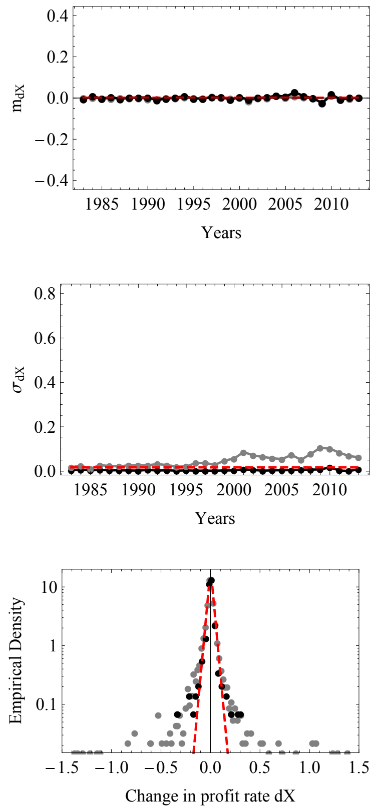


Figure E.198: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX}, σ_{dX}) for the balanced panel.

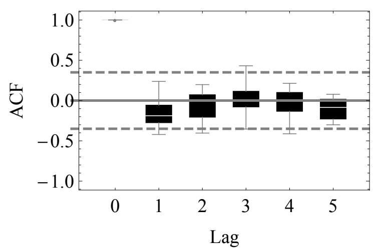


Figure E.199: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

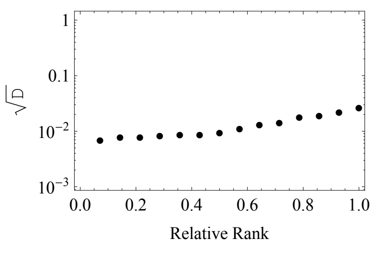


Figure E.200: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.41 Taiwan

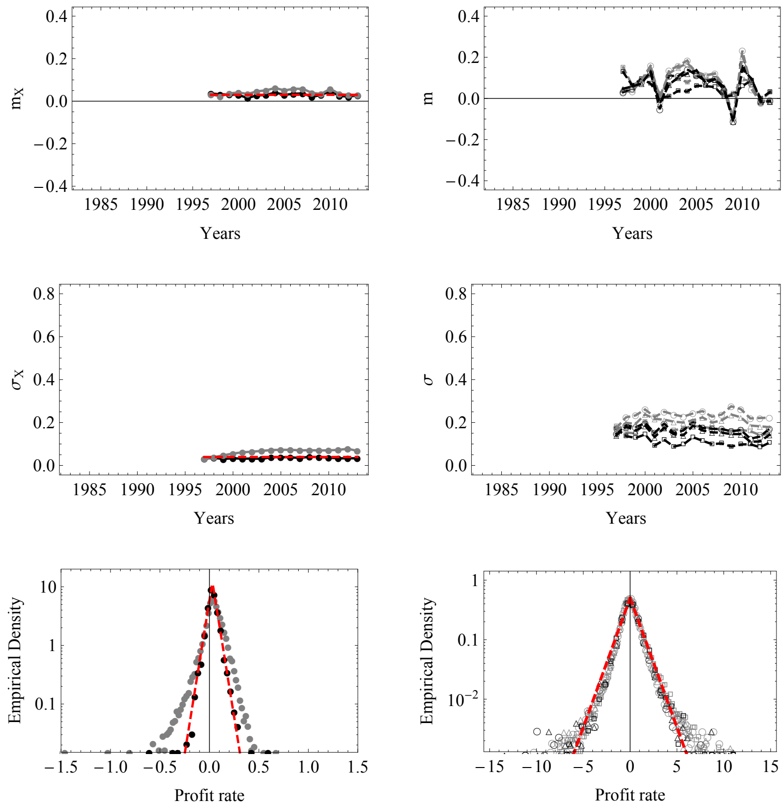


Figure E.201: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

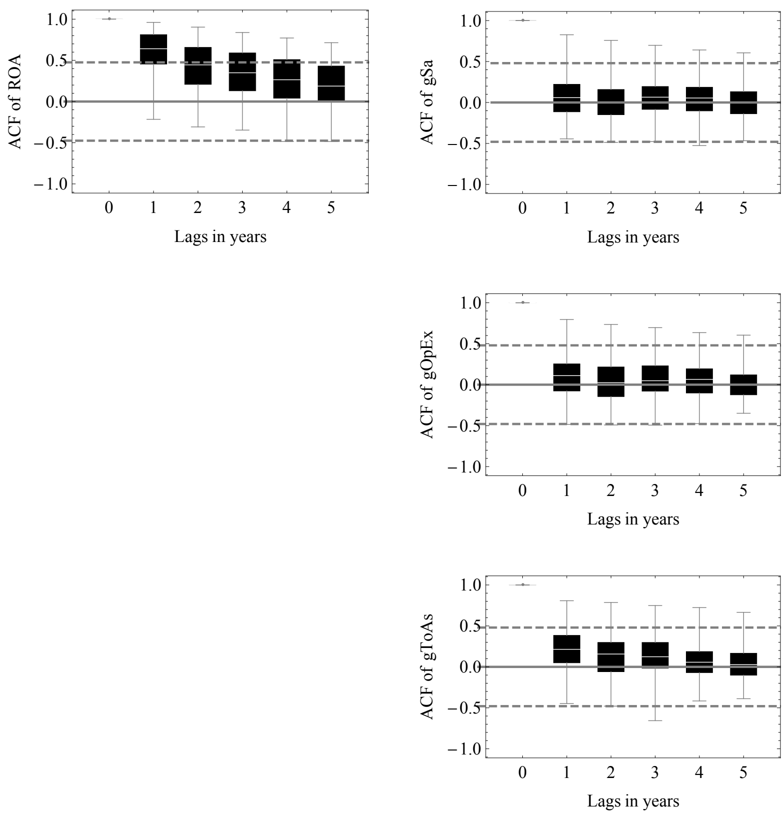


Figure E.202: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

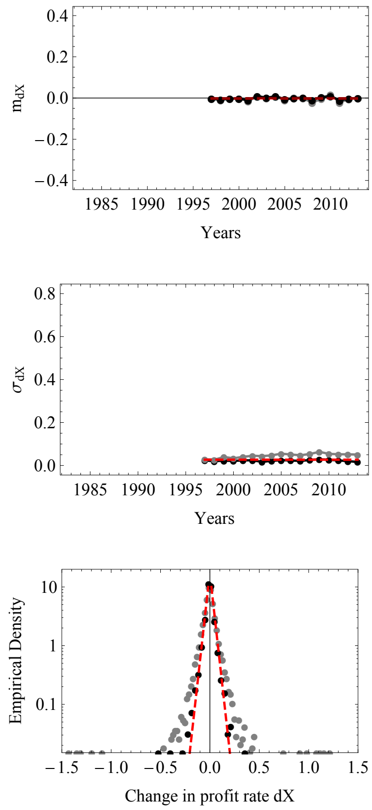


Figure E.203: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

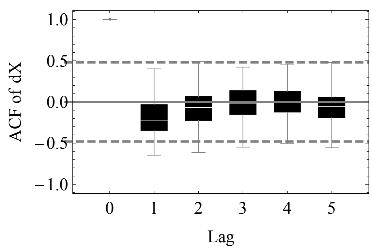


Figure E.204: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

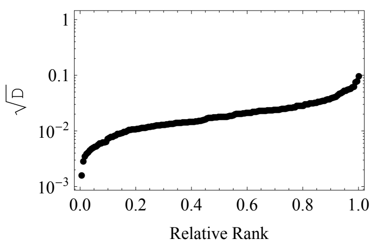


Figure E.205: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.42 Thailand

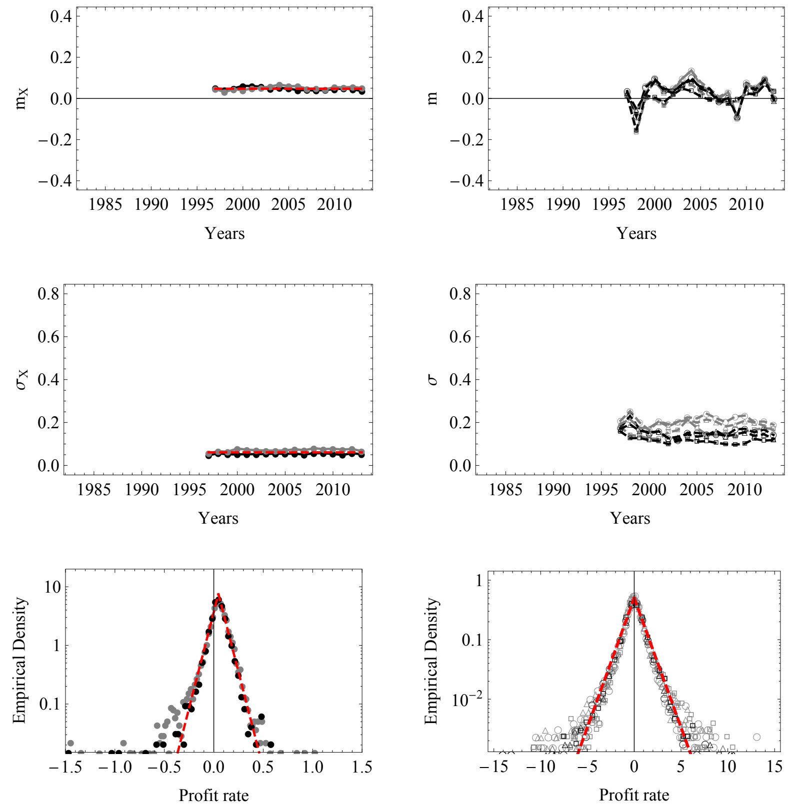


Figure E.206: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

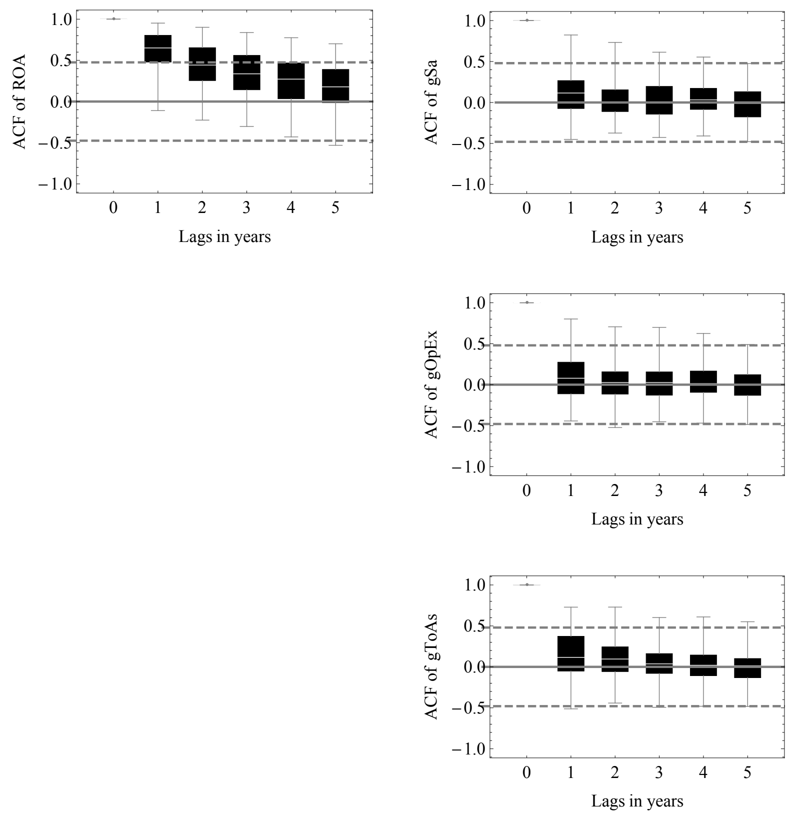


Figure E.207: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

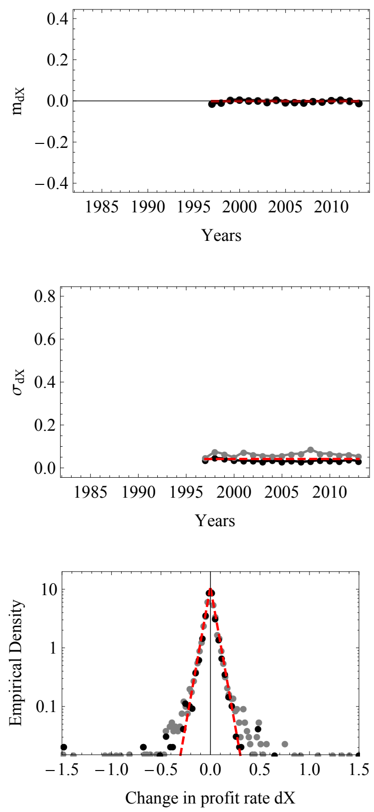


Figure E.208: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

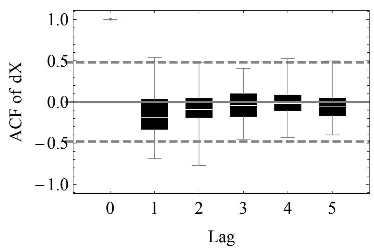


Figure E.209: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm /\sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

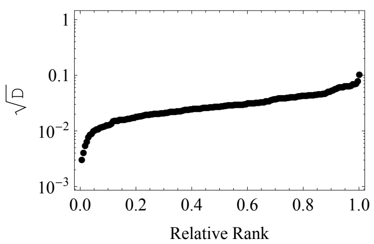


Figure E.210: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.43 Turkey

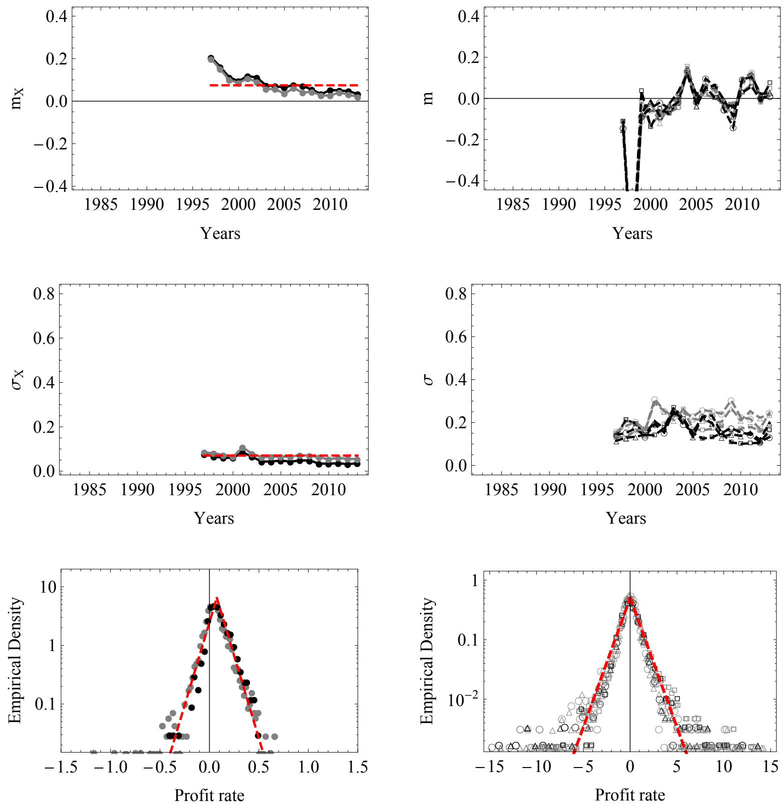


Figure E.211: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1997-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

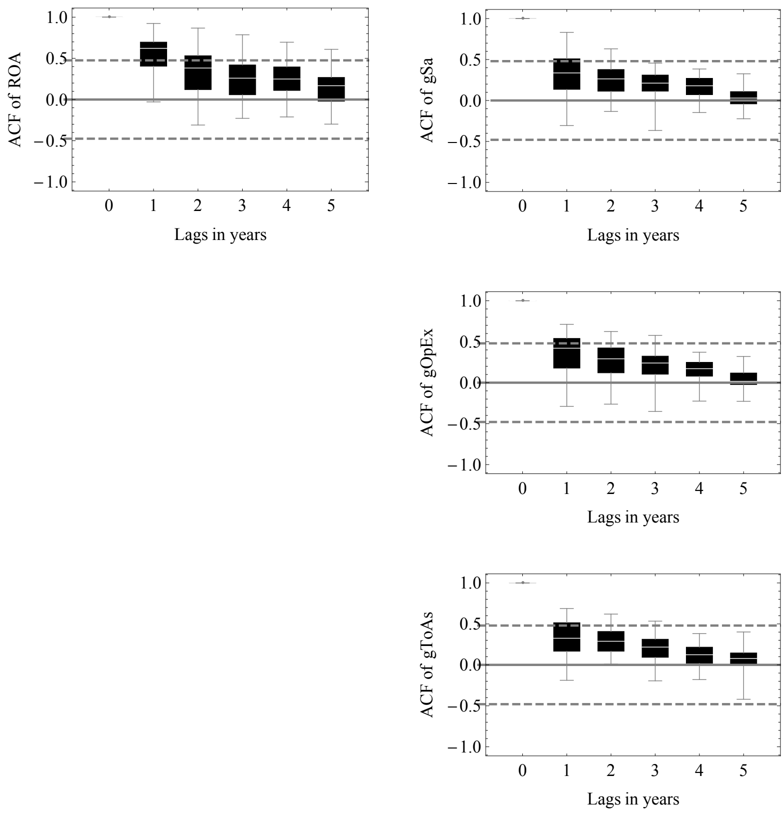


Figure E.212: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1997-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

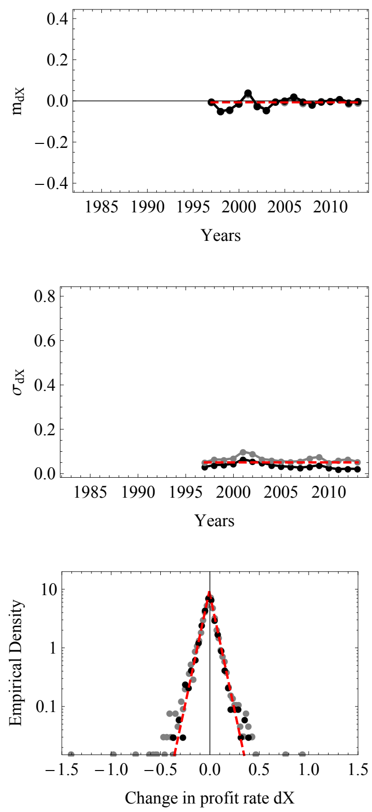


Figure E.213: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

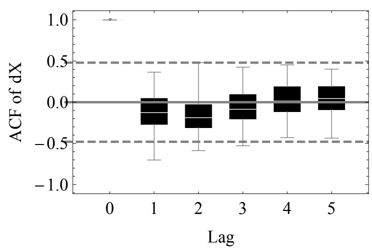


Figure E.214: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

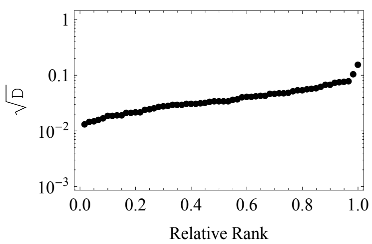


Figure E.215: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.44 United Kingdom

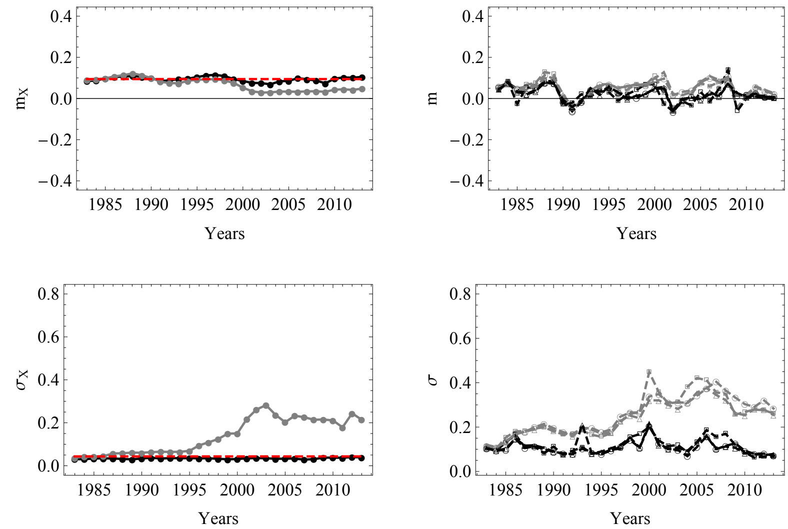


Figure E.216: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

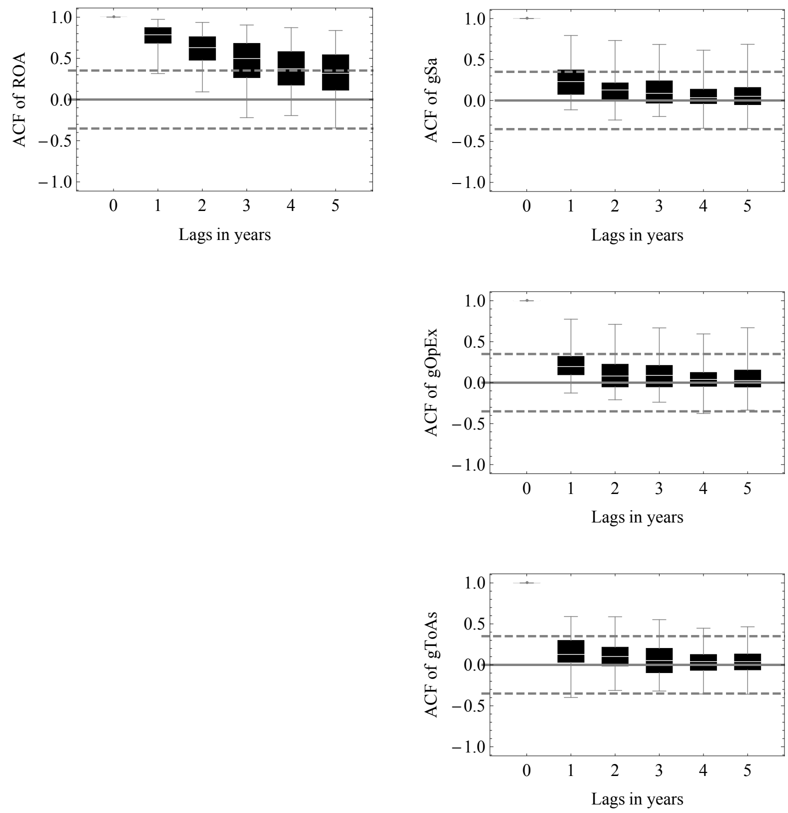


Figure E.217: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

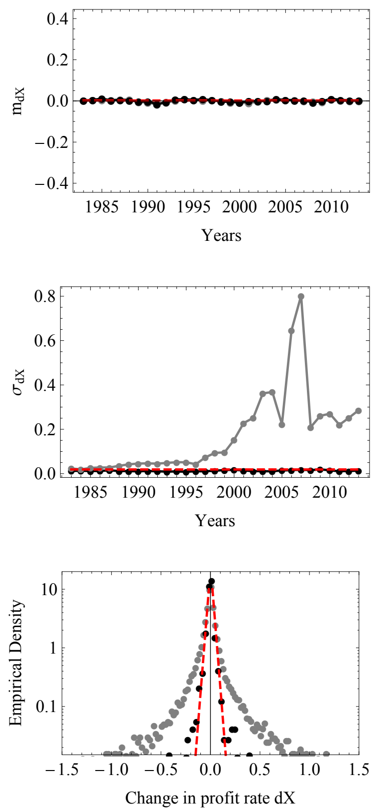


Figure E.218: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

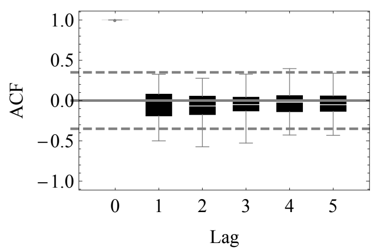


Figure E.219: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

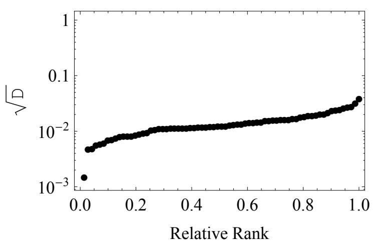


Figure E.220: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

E.45 United States

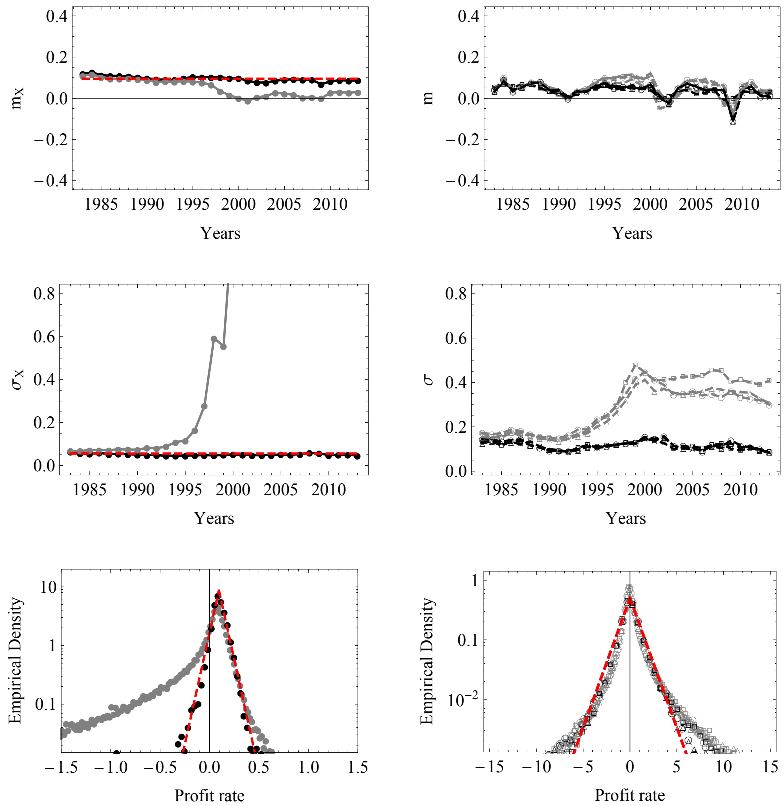


Figure E.221: Time-series and cross-sectional statistical behavior of empirical profit (left) and growth rates (right) of the Datastream population (gray) and the subsample of long-lived corporations (black) in the years 1983-2013. Plotmarkers indicate different variables. From top to bottom, we see the time evolution of the median rate, the time evolution of the mean deviation from the median rate, and the pooled distribution of rates. For profit rates, red dashed lines indicate the estimated Laplace distribution (m, σ) of the subsamples of long-lived corporations; for growth rates, red dashed lines indicate a standard Laplace distribution (0,1).

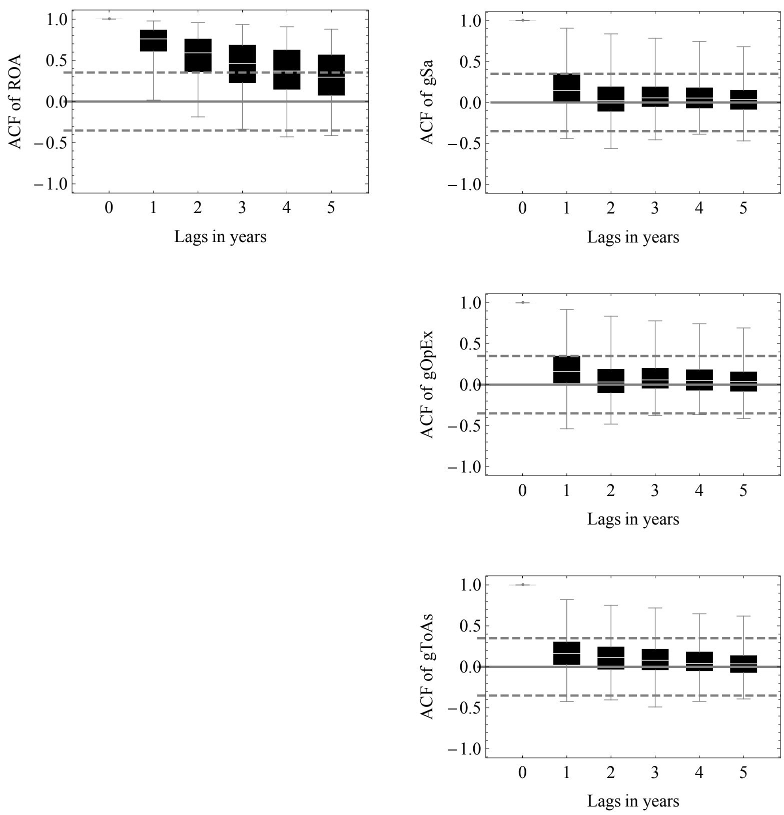


Figure E.222: Time-series behavior of empirical profit (left) and growth rate time-series (right, from top to bottom: sales, operating expenses and total assets) in the pooled subsample of long-lived corporations 1983-2013. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (weighted average of $\pm/\sqrt{T}$ with T being the length of the time series (31 years for 1983-2013 and 17 years for 1997-2013).

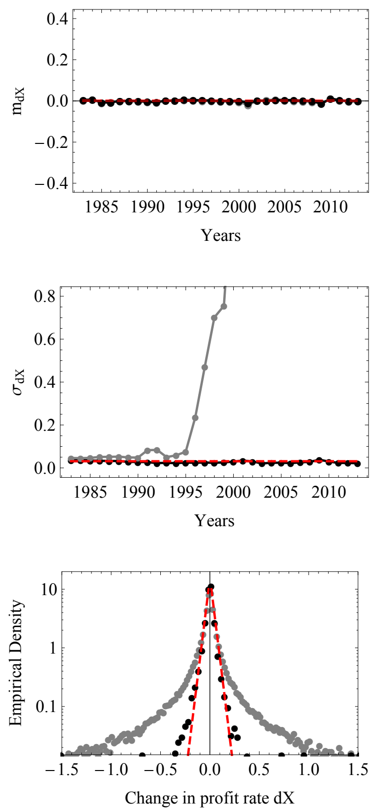


Figure E.223: Time-series and cross-sectional statistical behavior of annual changes in profit rates of the unbalanced panel (gray) and the balanced panel (black) for Argentina in the years 1997-2013. From top to bottom, we see the time evolution of the median change, the time evolution of the mean deviation from the median change, and the pooled distribution of annual changes in the profit rate. Red dashed lines indicate the estimated Laplace distribution (μ_{dX},σ_{dX}) for the balanced panel.

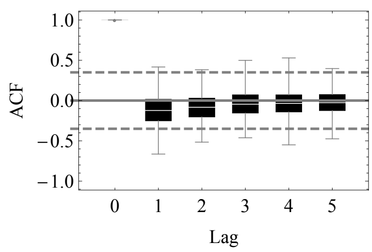


Figure E.224: Time-series behavior of annual changes in the profit rate in the balanced panel. Dashed lines indicate the 95% confidence interval under the null hypothesis of zero autocorrelation (given by $1.96 \pm / \sqrt{T}$ with T being the length of the time series of 17 years for 1997-2013).

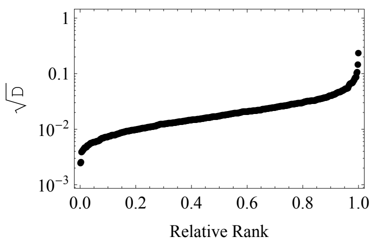


Figure E.225: Relative rank plot of company specific-diffusion coefficients $\sqrt{D_i}$ for balanced panel.

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