Capital Requirements and Entrepreneurship*

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Abstract

Governments have a long history of regulating entrepreneurs' use of limited liability by mandating a minimum amount of paid-in equity. While such capital requirements pose a barrier to firm entry, they might still be beneficial by screening out financially unviable businesses. We exploit a Norwegian reform that lowered the capital requirement from $17,000 to $5,000 to study this quantity-quality tradeoff of entrepreneurship. Using detailed register data, we show that the reform doubled the number of incorporations. The large effect on firm entry is robust to only including incorporations done by new entrepreneurs, and is not driven by a substitution away from unincorporated entrepreneurship. We document that post-reform entrants are considerably smaller in terms of assets and revenues. However, they do not differ in terms of growth or survival rates, profitability, or productivity. Furthermore, the entrepreneurs that enter after the reform do not differ in terms of past income, age, or educational characteristics. Thus, while the reform led to an inflow of smaller firms, there is nothing to suggest that new entrepreneurs or their firms were of lower quality. In terms of mechanisms, we do not find any reduction in entrepreneur liquidity, pointing towards a limited role for liquidity constraints. To rationalize our findings, we set up a theoretical framework that allows for production function heterogeneity in returns to scale. In this framework, capital requirements prevent individuals from starting optimally small firms. We empirically confirm the relevance of this mechanism, by showing that post-reform entrants on average operate with more decreasing returns to scale production technologies.

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1 Introduction

Governments around the world have a long history of regulating the creation of new firms. An important building block of such regulations are capital requirements for incorporation, requiring a minimum amount of equity at incorporation. These requirements are likely to reduce entrepreneurial activity, which in turn can impede economic growth and innovation. However, capital requirements may still be beneficial if they protect stakeholders by screening out "unserious" or financially unviable businesses.

Despite its direct policy relevance, there is little empirical evidence on this potential quantity-quality tradeoff in businesses creation. Researchers face at least three key challenges in evaluating the impact of capital requirements for incorporation. First, reductions in capital requirements are often accompanied by comprehensive changes to business regulation, making it difficult to isolate the impact of lower capital requirements from other barriers to entry. Second, data availability is often limited to ex-post firm outcomes, which might themselves be affected by the reform. Third, and more fundamentally, capital constraints can limit firm entry through several different channels that have different predictions for the quantity-quality tradeoff. Which channel dominates is likely to vary with the relative strictness of the requirement, meaning that results are not necessarily generalizable across different settings.

In this paper, we study the effects of a 2012 Norwegian reform that lowered the required amount of equity from \$17,000 to \$5,000 and make two main contributions to the literature. First, our setting combines two key features that enable us to simultaneously address the main empirical challenges. The Norwegian reform was limited to a reduction in capital requirements, allowing us to isolate its effect from other barriers to firm entry. In addition, comprehensive register data allow us to study not only ex-post firm outcomes, but also a rich set of ex-ante entrepreneur characteristics, thereby alleviating concerns that our outcome variables are themselves affected by the reform. Second, we provide the first evidence on the impact of capital requirements in an emerged economy setting, in which the capital requirement relative to average household liquidity is relatively low. The existing literature considers emerging economies, and finds that capital requirements keep low-liquidity individuals from starting firms (Barwick, Chen, Li, and Zhang 2022, Cui and Wei 2022, Cheng, Ding, and Liu 2024). The liquidity constraint is unlikely to bind in emerged economies however, implying potentially different implications for the quantity-quality tradeoff.

Our results confirm that capital requirements reduce firm entry. However, we find no support for capital requirements being important in screening out excessively risky or low-quality firms. Our findings thus suggest that policy makers do in fact *not* face a quantity-quality tradeoff with respect to capital requirements. In terms of mechanisms, we confirm that the liquidity constraint does not bind in our setting. To further interpret our empirical results, we set up a theoretical framework in which we allow for heterogeneity in returns to scale in the entrepreneurial production

function. In the model, capital requirements deter individuals from starting *optimally small* firms, even in the absence of binding liquidity constraints. To empirically test our model predictions, we estimate industry specific return to scale parameters and confirm a reduction in average scalability post-reform.

In our analysis, we draw on data from a number of different registers. First, basic firm characteristics such as incorporation date are obtained from the national business register, while incorporated firms' financial characteristics are obtained from their tax returns. The firm data is merged with data from a role register, allowing us to identify a firm's proprietor, CEO, and board members. Information on the individuals tied to the firm is then collected from their individual tax filings, the central population register, and the national education database. Finally, the stockholder register allows us to identify all firm owners, enabling us to consider ownership shares and indirect ownership.

In order to identify the effect of lowering the capital requirement, we compare firm outcomes pre and post reform. We start with a visual comparison and proceed with a more formal regression discontinuity (RD) analysis around the reform date. The quarterly data allows us to identify sharp discontinuities at the time of the reform. Reassuringly, un-incorporated entreprenerus and high-equity incorporations are unaffected, making us confident that other macroeconomic or institutional shocks are not driving our results. The pre vs. post comparison identifies the total impact of the reform, which reflects both a change in firm composition and a potential change in firm outcomes for a fixed composition. In order to identify the former channel, that is, the difference between always-entrepreneurs and marginal entrepreneurs, we impose the assumption that always-entrepreneurs are unaffected by the reform – an assumption that is certain to hold for ex-ante entrepreneur attributes.

We start by documenting that the reform has a large effect on the number of incorporations. In the years following the capital requirement reduction, the annual number of newly incorporated firms is twice as high as in pre-reform years. This large effect on business creation is not driven by expanding conglomerates or by a substitution away from unincorporated entrepreneurship. We further consider several robustness tests to ensure that the increase in entry does not simply reflect a relabeling of existing activity. For instance, we do not find support for individuals reorganizing their existing side activity from individual income to firm income, nor do we find support for individuals transitioning from employees to contract labor in the same firm.

We proceed by exploring firm-level outcomes. We find that post-reform entrants are considerably smaller. At time of incorporation, they have about $100,000 less in total book assets. Consistent with sharp differences in asset size, post-reform entrants also have lower revenues. However, the *growth rates* of pre- and post-reform entrants are virtually identical. In addition, post-reform entrants are not more likely to fail or be subject to debt forgiveness than pre-reform firms. We further find no evidence that pre- and post-reform firms differ in terms of profitability

or different proxies for productivity.

Next, we investigate the impact on ex-ante entrepreneur characteristics. The motivation is twofold. First, ex-post firm outcomes may be affected by the reform, whereas pre-determined entrepreneur characteristics are not. Second, studying the entrepreneurs themselves gives us more information about who the marginal entrepreneur is, that is, what type of individuals choose to incorporate only when the capital requirement is lowered. We find no difference in average ex-ante liquidity of pre and post-reform entrants, suggesting a limited role for liquidity constraints in our setting. We further find no evidence that relaxing the capital requirement selects on ex-ante characteristics typically associated with lower ability or outside options. New entrants are similar in terms of past income, high-school grades and comportment scores, as well as educational attainment. New entrants are also similar in terms of age, suggesting that the reform did not simply accelerate entry into entrepreneurship.

Taken together, our firm and entrepreneur level results indicate that lowering the capital requirement did not lead to an influx of excessively risky or low-quality firms. While that has been the main argument in favor of such regulation, there might exist other welfare losses. For instance, post-reform entrepreneurs might be sourced from more productive firms, potentially leading to labor misallocation. However, we find no evidence in support of this hypothesis, as previous employers of entrepreneurs are similar in terms of profitability, value-added margins, and proxies for total factor productivity. We also consider whether post-reform entrants engage in less financially rewarding entrepreneurship from the perspective of the individual, by implementing an event study on comprehensive income around incorporation. Comprehensive income includes wage and salary income, dividends, and retained earnings in private firms that are apportioned by ownership shares. Our analyses reveal no indication that entering into entrepreneurship after the reform is less financially rewarding.

In summary, our empirical findings suggest that marginal entrepreneurs are not of lower ability nor do they create less profitable or less productive firms. They simply create smaller firms. We show that our findings can be rationalized by a simple enrichment of the canonical selection model of Evans and Jovanovic (1989). In the model, entrepreneurial profits are a concave function of capital and linear in ability. We enrich the model by introducing a capital requirement and allowing for heterogeneity in returns to scale, i.e., in the concavity of the production function. Allowing some firms to operate with more decreasing returns to scale makes them optimally smaller, irrespective of entrepreneurial ability or liquidity. As a result, the capital requirement creates two sets of constrained entrepreneurs. First, liquidity constrained individuals with insufficient capital to meet the minimum requirement, and second, size constrained individuals who – due to the shape of their production function – want to start smaller firms than the minimum capital requirement allows for.

Reducing the capital requirement allows for increased entry by both liquidity constrained agents

and size constrained agents. The liquidity constraint channel implies a reduction in average ex-ante liquidity, which is inconsistent with our empirical findings. We thus infer that size constraints are important in our setting. To test this prediction, we estimate output elasticities with respect to capital (that is, the returns to scale parameter) at the four digit industry level based on pre-reform data. We then assign each firm their industry level returns to scale parameter, regardless of establishment year. We document a significant decline in the estimated parameters at the time of the reform, suggesting that post-reform firms operate with on average more decreasing returns to scale production technologies. Taken together, the model and data thus indicate that the reform allowed more individuals to start optimally small firms.

Literature. Several papers find that regulatory easing, including the reduction of capital requirements, encourages firm entry (Djankov, La Porta, Lopez-de Silanes, and Shleifer 2002, Bertrand and Kramarz 2002, Klapper, Laeven, and Rajan 2006, Djankov 2006, Ciccone and Papaioannou 2007, Fisman and Allende 2010, Kaplan, Piedra, and Seira 2011, Tazhitdinova 2020, Fang, Li, Wu, and Zhang 2023). A smaller set of papers use micro data to also investigate the impact on firm quality. Branstetter, Lima, Taylor, and Venâncio (2014) study a reduction in registration times and fees in Portugal, whereas Barwick, Chen, Li, and Zhang (2022) study a regional pilot program in China, encompassing both a reduction in capital requirements and a large simplification of registration procedures. The two papers closest to ours are Cui and Wei (2022) and Cheng, Ding, and Liu (2024), both of which consider a 2014 reduction in capital requirements in China.

We make two main contributions to the literature. First, data availability often precludes the study of ex-ante entrepreneur characteristics.[1] In contrast, our rich register data allow us to evaluate firm quality by considering both a broad set of ex-post firm outcome as well as ex-ante entrepreneur characteristics. Considering entrepreneurs' attributes is important for two reasons. First, in contrast to ex-post firm outcomes, ex-ante characteristics are by definition not affected by the reform itself. Second, information about entrepreneurs' attributes provides us with insight about the marginal entrepreneur which is crucial for understanding the mechanism through which capital requirements affect firm composition and entrepreneurial activity. To our knowledge, we are the first to study the impact on ex-ante entrepreneurial liquidity in this context, allowing us to rule out liquidity constraints in explaining the large increase in firm entry following the reform. In addition, we consider a rich set of proxies for entrepreneurs' ability and outside options, such as prior income and different dimensions of educational attainment.

Our second main contribution is to study a reduction in capital requirements in an emerged economy setting. The Chinese capital requirement, studied in Barwick et al. (2022) and Cui and Wei (2022), equaled 200% of GDP per capita. In contrast, the Norwegian requirement equaled

[1]Two notable exceptions are Branstetter et al. 2014 and Barwick et al. 2022, who consider ex-ante characteristics such as age and education. However, these papers do not consider prior liquidity or income of entrepreneurs, and they also study a general easing of business regulation rather than a capital requirement reduction in isolation.

only 16% of GDP per capita. This difference turns out to be crucial, as the evidence from China suggests that the marginal entrepreneur was likely liquidity constrained, whereas the marginal entrepreneur in our setting is not. Instead, we document that the reform allowed the entry of optimally small firms that operate with a more decreasing returns to scale production technology. To the best of our knowledge, we are the first to document this mechanism in the context of capital requirements.[2] Hence, while previous studies provide valuable insights from a setting with binding liquidity constraints, we argue that our paper speaks more directly to the effects in emerged economies, with more developed financial markets and wealthier potential entrepreneurs. Many such countries still have sizable capital requirements in place.[3]

More broadly, our paper is also related to the large literature on entrepreneurship and financial frictions (see, e.g., Herkenhoff, Phillips, and Cohen-Cole 2021, Hvide and Møen 2010, Fracassi, Garmaise, Kogan, and Natividad 2016, Cespedes, Huang, and Parra 2019, Andersen and Nielsen 2012, Adelino, Schoar, and Severino 2015, Ring 2023, Schmalz, Sraer, and Thesmar 2017, Hurst and Lusardi 2004, Kerr, Kerr, and Nanda 2015, Corradin and Popov 2015, Chodorow-Reich, Nenov, Santos, and Simsek 2023), which typically considers an increase in individual wealth. It is important to note that increasing entrepreneurs' liquidity is *not* equivalent to decreasing the capital requirement. In fact, we use our theoretical framework to explicitly show that the marginal entrepreneurs in these two scenarios are not the same. Increasing individual wealth relaxes the constraint for individuals with insufficient liquidity to produce a surplus as entrepreneurs. Lowering the capital requirement, on the other hand, relaxes the constraint for individuals who want to start optimally small firms. Evidence from studies that consider increased individual wealth, therefore, is not directly applicable to the case of lowering capital requirements.[4]

Our paper proceeds as follows. Section 2 discusses the reform and data. Section 3 provides the reduced-form results and Section 4 the formal regression discontinuity design estimates on how the marginal entrepreneurs that entered following the reform differ from existing entrepreneurs. Section 5 introduces the conceptual framework and empirically tests the main model prediction. Section 6 concludes.

2 Data and empirical setting

2.1 Institutional setting

Minimum capital requirements for incorporating firms are common across the world. Currently, one third of World Bank member countries specify a minimum amount of paid-in capital that is

[2] Clymo and Rozsypal (2023) introduce heterogeneity in returns to scale to analyze firms' sensitivity to business cycles by age and size. Gavazza, Mongey, and Violante (2018) make use of the mechanism to create small financially unconstrained firm and study aggregate recruiting intensity.

[3] For instance, the minimum requirements to incorporate standard LLCs are €10,000 in Italy, €25,000 in Germany, and €35,000 in Austria.

[4] Relatedly, Hombert, Schoar, Sraer, and Thesmar (2020) study how lower downside risk affects entrepreneurship. Again, the marginal entrepreneur in this case is likely different from the case of reduced capital requirements.

required to incorporate a limited liability company. These requirements range from €1 in France, €3,000 in Spain, and €10,000 in Italy to €25,000 in Germany and €35,000 in Austria (DLAPiper, 2023).[5]

Since the first securities law in 1910, the Norwegian authorities require that a minimum amount of equity must be injected into any limited liability company upon incorporation.[6] The original purpose was to protect creditors' interests (GOV, 2011). Between 1997 and 2011, the Norwegian equity requirement was NOK 100,000 ($17,000 using the 2012 exchange rate). This requirement was lowered to NOK 30,000 ($5,000) effective January 2012, and the change was formally proposed by the ministry of justice in September 2011 (GOV, 2011). The government argued that the current requirement was unlikely to be effective in protecting creditors' interests and likely constituted a barrier to entry into sectors where limited liability is important. In addition, the government wished to offer competitive economic conditions relative to, e.g., the U.K. which did not have a capital requirement.[7]

To our knowledge, there are no other changes to institutional economic conditions surrounding firm creation during 2012. The closest reform is the removal of an auditing requirement for small firms in the beginning of 2011. To address the concern that this reform is affecting our results, we will study the change in entry rates around the capital requirement reform at the quarterly level, effectively separating the two reforms in the data.

2.2 Data

We draw on comprehensive Norwegian register data that allows us to link firm and entrepreneur characteristics. Data from the business register ("Virksomhets- og foretaks register") provide a panel of firm characteristics such as the date when a unique organization number was assigned, i.e., when the firm was incorporated. Data from the role register ("Rolleregisteret") provide a panel of (de-identified) identifiers for a firm's proprietor, CEO, and board members. Using the stockholder register ("Aksjonærregisteret"), we see anonymized identifiers of all shareholders – both individuals and other firms –, allowing us to link firms with their owners. We obtain data on incorporated firms' financial characteristics from their tax returns ("Næringsoppgave 2"). The firm data primarily cover the years 2004–2018. All data are de-identified by Statistics Norway but can be linked through anonymized firm and person identifiers.

We obtain individual characteristics, such as year of birth, from the central population register. Data on educational attainment as of 2010 come from the national education database. Financial

[5] These requirements refer to incorporating standard limited liability companies. In some countries, similar or alternative corporate forms exist that have different requirements.

[6] There are no specific restrictions on the source of the equity, which may come from the entrepreneurs' own assets or from outside investors. There are no rules against entrepreneurs financing their equity injection with personal debt.

[7] Following new EU rules in the early 2000s, firms in EU–EEA countries were free to incorporate in other EU–EEA countries. Becht, Mayer, and Wagner (2008) show that this led to substantial increases in U.K. incorporation originating from high-capital-requirement countries.

information, e.g., past incomes and wealth, come from individuals' tax returns.

2.3 Definitions and sample selection

To be classified as the entrepreneur behind an incorporated firm, a person must be the CEO and own more than 1% of the shares. Considering only CEO's ensures that the individual has an active role in the firm. We allow for indirect ownership both through spouses and other firms (see Appendix A.1). In some parts of our analyses, we use the entrepreneurs behind sole-proprietorships, partnerships, and foreign-incorporated firms as comparison groups (see Appendix A.2).

We identify the founding date from when the organization was assigned a unique organization identifier in the business register ("Virksomhets- og foretaksregister"). Our data contain 327,125 (domestic) incorporation events during 2004–2018. Since we are interested in potentially economically active firms, we drop (i) incorporation events of firms that belong to industry codes typically used by financial holding companies, leaving us with 232,116 incorporations.[8] We then drop (ii) incorporation events for which we cannot assign an individual as the entrepreneur due to, e.g., separation of ownership and control. This leaves us with 132,052 incorporation events. In some specifications, we further restrict our sample to (iii) the 47,566 events in which the incorporating entrepreneur was (in the prior year) neither owner-CEO of an incorporated firm, a sole-proprietor, a CEO or board-member partner in a partnership, nor the CEO of a foreign-incorporated firm.

To limit the impact of outliers when we consider firm-level data in levels, we winsorize revenues, wage costs, and assets to be non-negative and below their 95th percentiles. Profits are winsorized at the 5th and 95th percentiles.

3 Reduced-form results

In this section, we provide evidence on the impact of lowering the capital requirement on firm creations, firm outcomes, and ex-ante entrepreneur characteristics by comparing the composition of firms and entrepreneurs before and after 2012. That is, we study the change in *average* firm and entrepreneur characteristics. In Section 4, we will introduce a regression-discontinuity design methodology that allows us quantify how the reform affected *marginal* entrepreneurs, i.e., those who would not have entered in absence of the reform.

[8] Two-digit NACEs codes 64 and 66 (financial and financial services), three-digit nace codes 681, 682, and 701 (real estate investments, real estate leasing and rental, and headquarter services).

3.1 The effect on firm creations

Panel A of Figure 1 shows the number of firm creations over time.[9] Directly after the reform, the number of incorporations double and stays at this higher level for the duration of our sample. The immediate response is reasonable, as entrepreneurs who are building a new firm will want to incorporate in order to expense start-up costs for tax purposes: that is, incorporating is likely one of the first steps in the process of establishing a new business. Reassuringly, Appendix Figure OA.1 shows that there is no effect on the amount of high-capital corporations, that is, firms with paid-in-capital in excess of NOK 100,000. Moreover, we find a sharp increase exactly when the capital requirement was reduced (first quarter of 2012) but no noticeable increase at the start of 2011, when small firms no longer needed to engage an auditor. These patterns suggest that the increase in firm entry at the time of the reform is not driven by other changes to the economic environment.

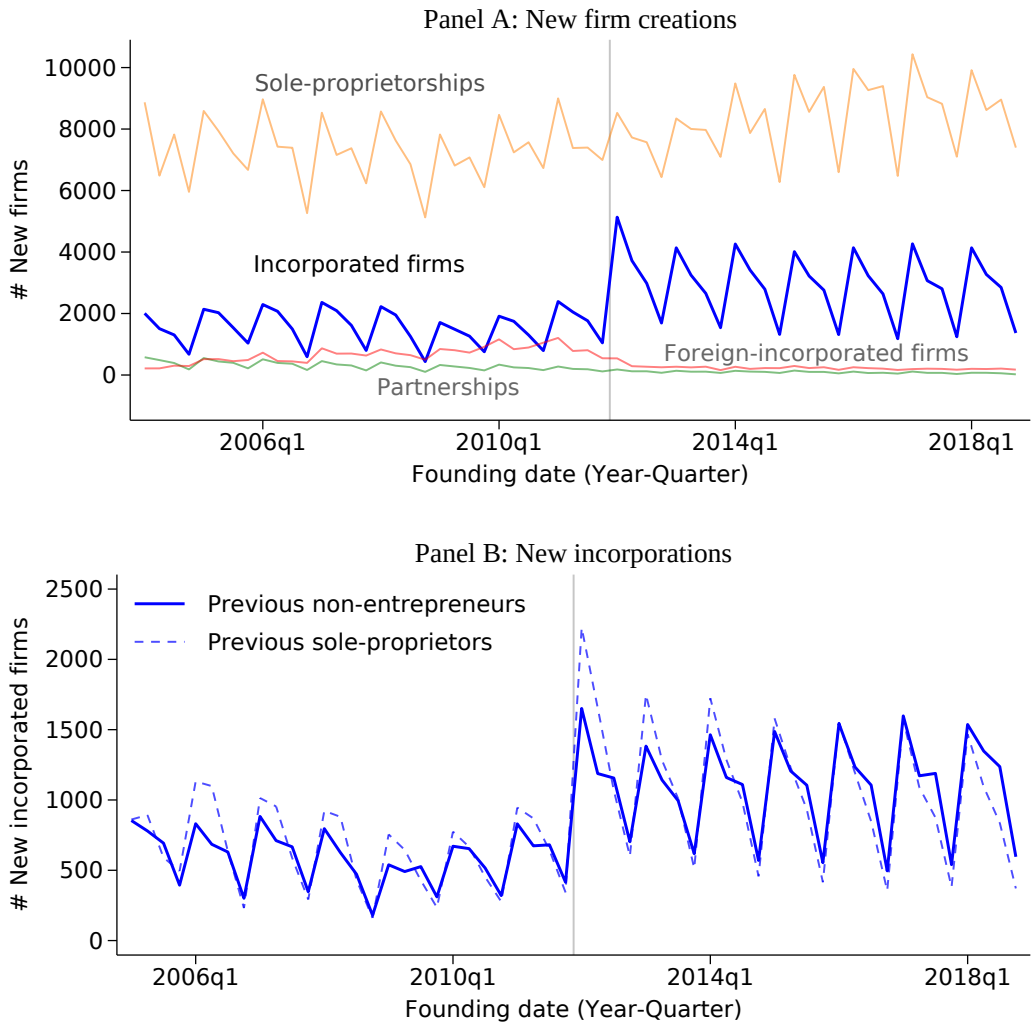
Since the reform only affected incorporation requirements, and not requirements for establishing a sole-proprietorship, one might expect a substitution away from sole-proprietorships. However, Panel A shows that, while incorporation rates double, there is no discernible reduction in the amount of new sole-proprietorships. This result is in line with Levine and Rubinstein (2017) who hypothesize that "true" entrepreneurs either incorporate or do not become entrepreneurs. Consistent with this hypothesis, we further find no effect on partnerships, which also do not benefit from limited liability.

As seen from Panel A, there is a reduction in the registration rates of foreign-incorporated firms. Prior to 2012, one way to achieve the benefits of limited liability without having to put up the required amount of equity was to incorporate a limited liability company abroad – often in the U.K., where there were no capital requirement – and then register this company as a foreign-incorporated company ("NUF") in Norway. There were no rules prohibiting firms from taking this approach, even if their business activity was solely based in Norway. Accordingly, as the capital requirement is lowered in 2012, we see a reduced entry of foreign-incorporated firms. This reduction, however, is much too small and arises too early to explain the increase in domestic incorporation rates.

The increase in incorporations documented in Panel A could be driven by entrepreneurs who are simply expanding their conglomerates by incorporating new subsidiaries. To understand whether there was in fact an increase in *entry* into incorporated entrepreneurship, Panel B focuses on firms started by individuals who were not already entrepreneurs in the previous year, that is, they were neither incorporated entrepreneurs (AS), sole-proprietors (ENK), CEO-partner of a partnership (ANS, DA), or CEO of a foreign-incorporated firm (NUF). While this sample restriction reduces the overall number of incorporations, we still find that incorporation rates double after 2012, indicating a substantial effect on entrepreneurial entry.

[9] In Panel A, we consider firm creations of individuals irrespectively of whether they engaged in entrepreneurial activity in the previous year. That is, we implement filters (i) and (ii) described in section 2.3, but not filter (iii).

Figure 1: Firm Creation Before and After the Reform



Notes: In Panel A, we condition on being able to assign an entrepreneur to the firm creation (excluding, e.g., subsidiaries of listed companies). That is, we implement filters (i) and (ii) described in section 2.3. In Panel B, the solid blue line considers only incorporations done by individuals who were not previously entrepreneurs: neither incorporated (AS), sole-proprietor (ENK), CEO-partner of a partnership (ANS, DA), or CEO of a foreign-incorporated firm (NUF). That is, Panel B implements sample filters (i)–(iii) in section 2.3. The dashed blue line instead considers incorporations done by individuals who were (solely) sole-proprietor entrepreneurs in the previous year (which is a strictly weaker filter than (iii)).

There is also a large increase in incorporated entrepreneurship for individuals who were previously sole-proprietors (dashed blue line in Panel B). Hence, while reducing frictions to incorporation does not reduce entry rates into sole-proprietorships (Panel A), it does cause exits – in the sense that some existing sole-proprietors choose to incorporate.

The increase in entry is relatively broad across industries. Appendix Figure OA.4 decomposes the increase in incorporations into different four-digit NACE-code industries. The top contributor to the increase is engineering and technical consulting, followed by management consulting.

Beyond these industries, construction and related industries (plumbing, joinery) play a central role. This heterogeneity is largely intuitive, with incorporations in less capital-intensive industries being more sensitive to capital requirement reductions.

Robustness. We consider several robustness tests to confirm that the increase in firm entry rates represents new entrepreneurship, and is not just an expansion of existing firms or a relabeling of existing economic activity.

First, because we want to identify new entrepreneurship, we confirm that our results are robust to dropping any incorporations by individuals who were previously *non-CEO* owners in a limited liability company (i.e., non-CEOs in the previous year who own $\geq 1\%$ of the shares) – see Appendix Figure OA.2. Our results are also robust to only considering firms that were economically active, indicated by positive revenues or wage bills in the year of incorporation, – see Appendix Figure OA.3. Further, since our data is at the firm-level, we verify that our findings are robust to only counting one incorporation per entrepreneur – see Appendix Figure OA.5.

Reducing the capital requirement could lead to more entrepreneurs choosing to fully own their own firm, instead of co-founding a firm with a partner. In this case, the increase in firm entry could reflect that what before would have been one single firm, now counts as two separate firms. Defining co-founding as owning exactly 50% of the shares, we do not see any decrease in this measure post-reform – see Appendix Figure OA.6 (Panel B). We do however see an increase in the share of entrepreneurs with 100% ownership – see Appendix Figure OA.6 (Panel A), indicating that prior to the reform, some entrepreneurs diluted their ownership stakes, potentially in order to satisfy the capital requirement.

We interpret the increase in firm entry to entail new economic activity. However, one could imagine scenarios where the increase instead reflects a relabeling of existing activity. For instance, individuals could quit their existing job, and then become contract workers at their previous employer through a limited liability company, performing the same tasks as before.[10] While we cannot rule this possibility out completely, we show in Appendix E that there is no increase in the likelihood of starting a firm in the same sector as your previous employer. Another scenario is that individuals have some minor, income generating side activity, which they choose to organize within a limited liability company post-reform. In that case, we would expect to see an increase in the share of entrepreneurs for whom labor earnings are relatively more important. However, we find no increase in labor earnings relative to total personal income plus retained earnings for post-reform entrants – see Appendix Figure OA.7. Further, note that if the increase in firm entry was mainly driven by relabeling, we would expect a temporary increase in entry, and not the sustained higher level documented in Figure 1.

[10]The main benefit of such relabeling is that it would allow the (prior) employee to retain earnings within the firm, which could be reinvested without capital gains tax, and delay any taxation until the business is sold or dividends are paid out. While the incorporated contractor would pay corporate income tax, this tax is roughly half the top marginal income tax rate. Another tax incentive is the ability to deduct expenses.

Finally, we note that the doubling in firm entry rates observed in our setting is larger than estimates previously found in the literature. For instance, Barwick et al. 2022 find an increase of 25%, while Cui and Wei 2022 find an increase of 33%. However, Ruohonen, Vahtera, Jaakkola, and Saukkola 2022 investigate a reduction in the Finnish capital requirement from a law perspective, also documenting close to a doubling of firm entry rates. Based on publicly available data from Sweden, we document roughly a doubling also there – see Appendix Figure OA.8. Hence, the large entry effects documented here do not seem unreasonable when compared to other emerged economy settings.

To summarize, reducing the capital requirement from $17,000 to $5,000 led to a doubling of incorporation rates, and no reduction in sole proprietor entry rates. We find no indication that this large and sustained increase in firm entry is driven by expanding conglomerates or by a relabeling of existing economic activity. We now move on to addressing the main argument in favor of capital requirements, that is, that they are an important tool in filtering out excessively risk taking or low-quality firms. We first investigate the impact on ex-post firm outcomes, before considering ex-ante entrepreneur characteristics.

3.2 Firm-level outcomes

We start by comparing the size of firms that incorporated right before and right after the reform. Figure 2 depicts paid-in-capital at time of incorporation and shows that most firms enter with paid-in-equity equal to the minimum requirement. As a result, reducing the capital requirement has a sharp effect, practically shifting the vast majority of new entrants from the old to the new minimum requirement.

Figure 2: Distribution of Equity

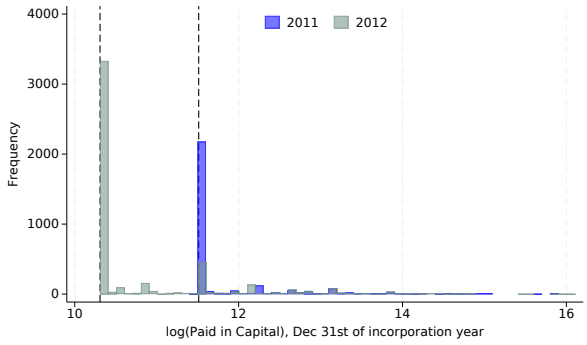
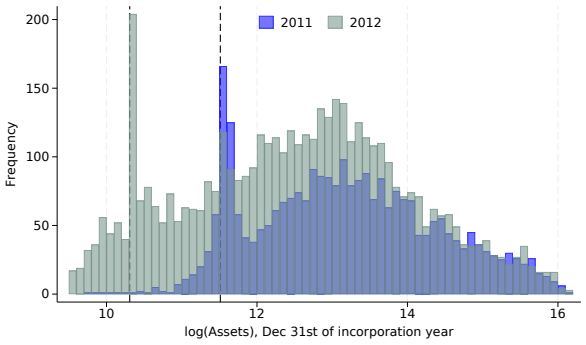


Figure 3: Distribution of Assets



Notes: We plot the distribution of (log) paid-in-capital and (log) total assets in the year of incorporation for firms established in 2011 and 2012, truncated to restrict the x-axis. The vertical lines indicate the capital requirements for 2012 (NOK 100,000 = 11.5 log points) and 2011 (NOK 30,000 = 10.3 log points), respectively. Note that it is possible to have less assets than (paid-in-capital) equity in the incorporation year, due to, e.g., negative retained earnings.

Figure 3 plots the distribution of firm assets at the time of incorporation. A visible mass of firms

have assets equal to the minimum capital requirement, implying no debt financing. However, most firms have assets that exceed the minimum capital requirement. Moreover, some firms have total assets below the minium capital requirement, which is possible due to retained earnings during the incorporation year. The right tail of the asset distribution appears unchanged from 2011 to 2012, suggesting that large firms are unaffected by the reform. There is, however, an increase in the number of new firms with low or moderate amounts of assets. Hence, the reduction in paid-in-capital was not fully counteracted by an increase in debt financing.

Firm performance. We proceed by examining whether post-2012 incorporated firms differ in terms of financial characteristics measured in 2018, the end of our sample period. Comparing firm outcomes in 2018 ensures that all firms face the same macroeconomic conditions. However, our results are robust to measuring outcomes three years after incorporation, instead of fixing a specific calender year. See Appendix Figure OA.9 for details.

We estimate the following regression equation:

$$y_{f,2018} = \alpha_t + \varepsilon_f, \tag{1}$$

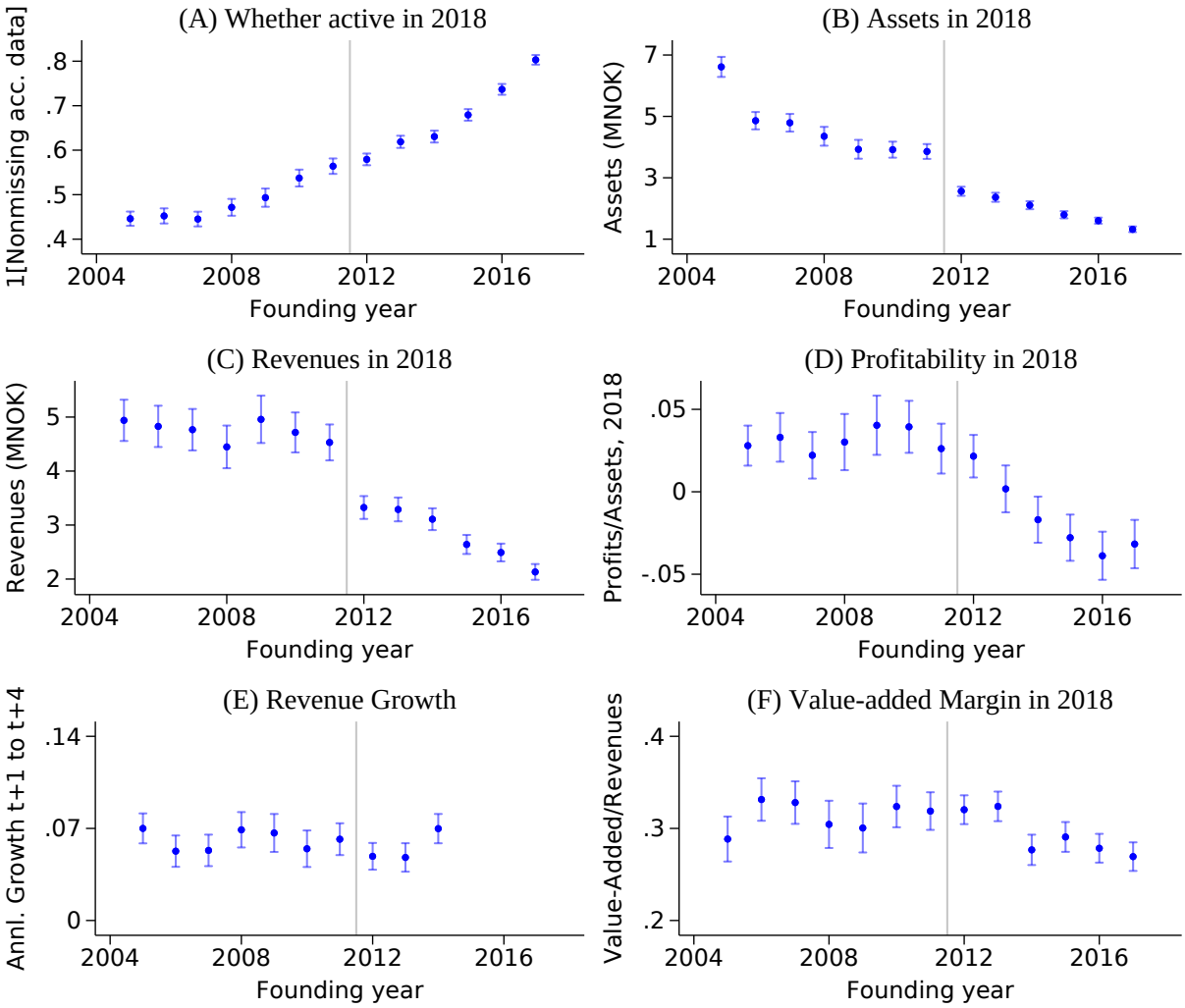
where $y_{f,2018}$ is the outcome variable of interest measured in 2018, α_t are incorporation-year fixed effects, and ε_f is the error term. We drop firms incorporated in 2018 to ensure that all firms were active for the entire year that the outcome variable was recorded.

The estimated incorporation-year fixed effects are depicted in Figure 4. Given the large increase in entry rates, any differences between pre and post reform entrants should show up as sharp discontinuities in 2012. Consider first Panel A, which measures whether a firm is active in 2018, i.e. whether it has non-missing accounting data. We find no indication that post-2012 firms are less likely to be economically active in 2018, suggesting similar survival rates among entrants before and after the reform.

Panel B considers total book assets in 2018. Here, we find a sharp difference between pre and post reform entrants. Firms that incorporated after 2012 have about $200,000 (NOK 1,250,000) less assets. This difference is considerably larger than the reduction in the equity requirement from $17,000 to $5,000, which partially reflects that the reform not only reduced firm equity, but also other liabilities. Appendix Figure OA.10 verifies that the observed size difference occurs at incorporation, by redoing the analysis on assets in the year of incorporation – in line with the results presented in Figure 3. At the end of their founding year, post-reform firms are about $100,000 (NOK 600,000) smaller in terms of assets.

Panel C of Figure 4 shows that marginal firms are also smaller in terms of revenues. The difference between pre and post-reform entrants is approximately $170,000 (NOK 1,000,000). Consistent with post-reform firms being smaller in terms of assets and revenues, they are also smaller in terms of employment. Appendix Figure OA.11 shows that post-reform entrants have

Figure 4: Firm outcomes, contrasting pre- and post-reform entrants



Notes: All panels condition on firms incorporated by individuals who were not entrepreneurs in the prior year. Panel A considers whether the firm has nonmissing accounting data in 2018. Panel B considers the total book assets (winsorized at the 95th percentile) and panel C considers the total revenues (also winsorized at the 95th percentile), and panel D considers profitability. Profitability is measured as the ratio of operating income to assets, censored to be in $[-1, 1]$. Revenue Growth is the growth in revenues between $t+1$ to $t+4$, censored to lie in $[-1, 1]$ and annualized by dividing by 3. Value-added Margin is the ratio of of operating income plus wage bill to revenues, censored to lie in $[-1, 1]$. Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level.

around 350,000 NOK ($60,000) lower employment costs than pre-reform entrants.

Panel D of Figure 4 considers profitability (operating income divided by book assets) in 2018. We find no indication that firms who entered after the capital requirement reduction are less profitable. Panel E considers the average revenue growth rate in the three years following incorporation.[11] Post-reform entrants do not expand at smaller rates. Appendix Figure OA.12 shows that the same pattern applies to the growth rate of total book assets.

[11] We define revenue growth as $\frac{1}{3} \times \frac{Revenues_{t+4}}{Revenues_{t+1}}$, where the cumulative growth rate is censored to be in $[-1, 1]$.

Panel F of Figure 4 considers the value-added margin, measured as the ratio of operating income plus wage bill divided by revenues, following Hombert, Schoar, Sraer, and Thesmar 2020. We find no evidence of lower value added among post-reform entrants. As an alternative measure of productivity, we follow Lichtenberg and Siegel 1990, Bertrand and Mullainathan 2003, and Giroud and Mueller 2015, and estimate the amount of revenue that cannot be explained by firm inputs. The results again indicate no difference in productivity between pre and post reform entrants. See Appendix D.1 for estimation details. In addition to profitability measures, we also find not change in the in the probability of applying for a patent around the timing of the reform, as displayed in Appendix Figure OA.13.

Finally, Appendix Figure OA.14 repeats the analyses while including 5-digit NACE industry code fixed effects in Equation (1). The results are quantitatively similar, with only modestly smaller declines in assets and revenues. We thus conclude that the reduction in firm size is not driven by an industry composition effect.

Our findings so far – based on ex-post firm outcomes – suggest that reducing the capital requirement led to an inflow of smaller, but otherwise similar, firms. We now move on to studying ex-ante entrepreneur characteristics. The motivation is twofold. First, ex-post firm outcomes might be subject to a treatment effect not working through firm composition. For instance, forcing a risk-averse entrepreneur to put up more equity may cause their firm to undertake fewer high-return high-risk projects. The same firm might therefore behave differently pre- and post reform. Predetermined entrepreneur characteristics however, will by definition not react to the reform. Second, ex-ante entrepreneur characteristics are useful in determining the mechanism behind the large increase in firm entry.

3.3 The ex-ante characteristics of new entrepreneurs

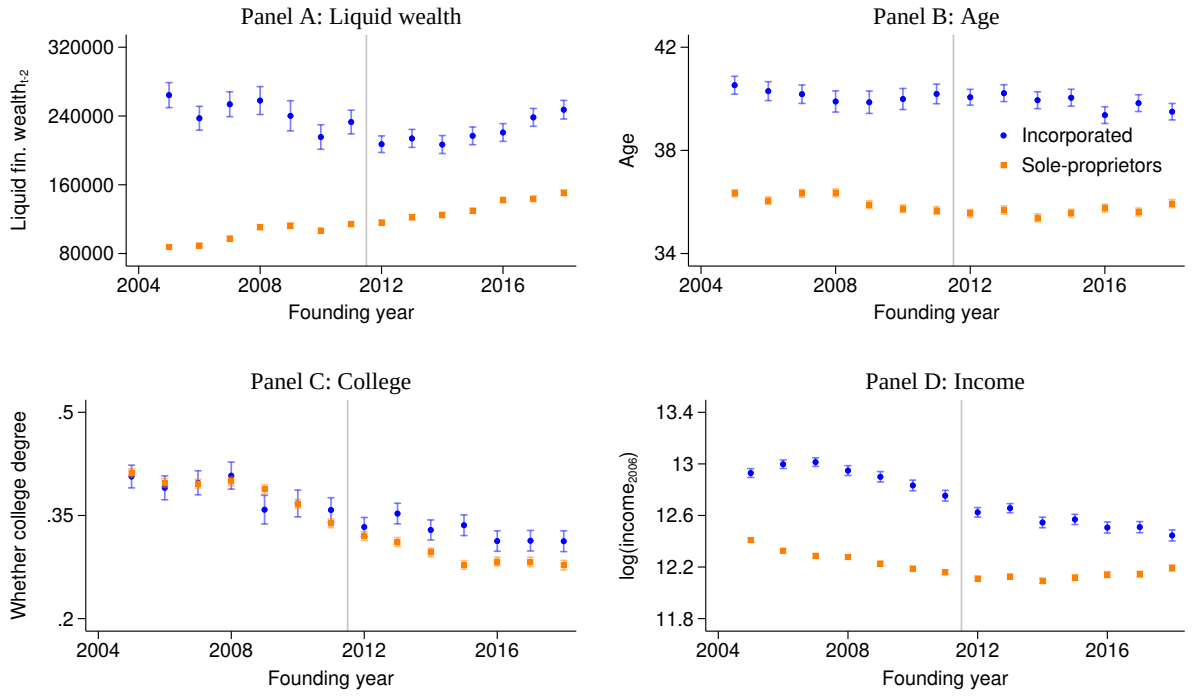
In this section, we provide evidence on how ex-ante characteristics differ across pre and post-reform incorporations. We plot the mean characteristics of entrepreneurs by estimating the following regression equation:

$$y_{i,s} = \alpha_{t,n} + \varepsilon_i, \tag{2}$$

where $y_{i,s}$ is some characteristic of person i, measured in year s, who is not an entrepreneur in year $t-1$ but is an entrepreneur in year t. $\alpha_{t,n}$ are founding year (t) $\times$ firm-type (corporation or sole-proprietorship) fixed effects. ε_i is the error term. We include sole-proprietors in the sample as a placebo group since the change in the capital requirements does not apply to unincorporated entrepreneurship, and we did not see any change in sole proprietorship entry rates. Note that including sole-proprietors was not possible in the previous section, as firm-level outcomes are not available for sole proprietorships because they are not a separate legal entity. .

Figure 5 shows how the characteristics of new entrepreneurs changed around the time of the reform by plotting the estimated founding year fixed effects. Panel A considers liquid financial

Figure 5: (No) Differences in the Ex-ante Characteristics of Pre- and Post-Reform Entrants



Notes: All panels condition on firms created by individuals who were not entrepreneurs in the prior year. Panel A considers liquid financial wealth (stocks, mutual funds, bonds, deposits) of the entrepreneur two years prior. Panel B considers age at the year of incorporation. Panel C considers a dummy for whether an individual has obtained at least a college degree as of 2010. Panel D considers income, defined as personal taxable personal income measured in 2006. Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level.

wealth, which includes bank savings, listed stocks, bonds, and mutual fund holdings. We measure liquid financial wealth two years prior to the creation year. We find no indication that post-reform entrants have lower average personal liquidity. Appendix Figure OA.15 further shows that post-reform entrants are not more likely to have particularly low levels of ex-ante liquidity. In addition, Appendix Figure OA.16 (Panel A) considers the *distribution* of ex-ante liquidity. There appears to be some reduction in the 90th percentile, but the 10th through 75th percentile is left unchanged. Overall, these results indicate that the marginal entrepreneur was not liquidity constrained. To rationalize the large increase in firm entry, the capital requirement must therefore have been working through a different constraint – we formalize this intuition in the theoretical framework in Section 5.

Panel B of Figure 5 investigates age at the time of incorporation. A decrease in average age could indicate that entry into entrepreneurship was accelerated rather than increased in response to the reform. Furthermore, age may proxy for entrepreneur ability.[12] However, we find no discrete

[12]Using U.S. data, Azoulay, Jones, Kim, and Miranda (2020) show that the subsequently most successful startups were created by older individuals. In contrast, findings from Ouimet and Zarutskie (2014) suggest the opposite relationship.

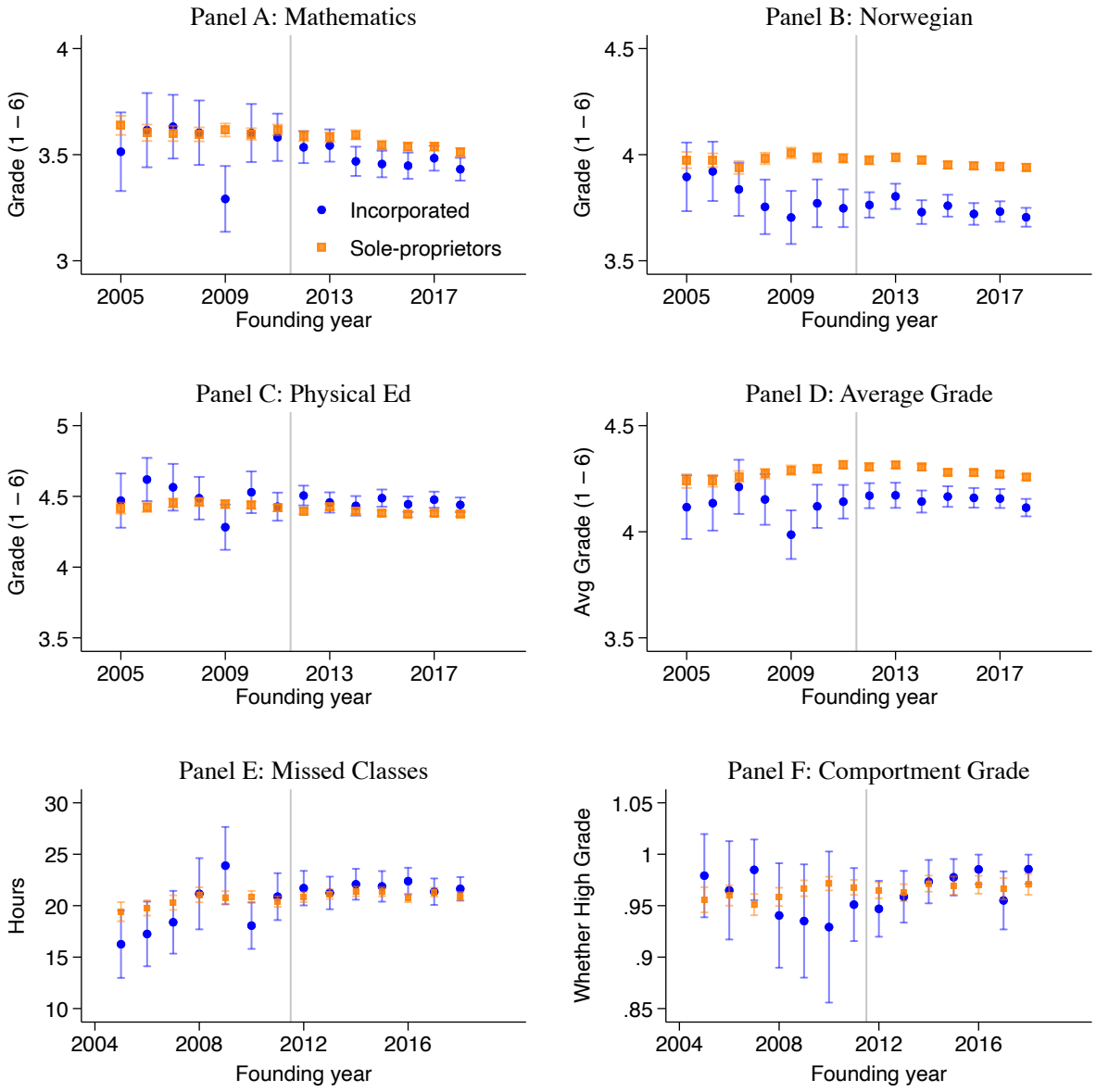
jump in average entrepreneur age around 2012. When considering how the age distribution at incorporation changes over time (Appendix Figure OA.16, Panel D), we see that the age distribution modestly *widens*. Both the 90th and 10th percentiles change by 1–2 years.

Panel C of Figure 5 considers educational attainment which has been found to be an important predictor of entrepreneurial success (Bates 1990, Queiró 2022). We define educational attainment as whether the individual has obtained at least a college degree by 2010. There does not appear to be any change in the share of college educated entrepreneurs entering after the reform. Panel D of Figure 5 considers personal income measured in 2006. Personal income may also proxy for ability (as in, e.g., Hacamo and Kleiner 2022, Evans and Jovanovic 1989), or it can be viewed as a measure of outside options. While there does appear to be some reduction in prior income for incorporations founded in 2012, we observe the same pattern for sole proprietorships. We therefore conclude that the reform did not causally affect the composition of entrepreneurs in terms of prior income.

We also consider educational *performance* in Figure 6, by comparing high school grades between pre and post-reform entrants. High school grades across different subjects may capture different ability dimensions. We do not see any change in average mathematics grades (Panel A), Norwegian grades (Panel B), or physical education grades (Panel C). Panel D considers the average overall GPA. We account for the fact that different students may take classes with varying difficulty by removing any variation explained by school-type-subject fixed effects. Thereby, we address the concern that, e.g., students on a vocational high school track tend to take math courses of a more applied nature than those intending to go to college (Andresen and Løkken 2023). As before, we do not find any difference in average grades.

Panel E and F of Figure 6 consider missed classes and comportment grades respectively. Levine and Rubinstein (2017) show that, relative to sole proprietors, incorporated entrepreneurs are more likely to have engaged in illicit behaviors when young. Even though higher conduct grades and less absenteeism are strongly correlated with higher profitability (see Appendix Table OA.1), we find no evidence that post-reform entrepreneurs have lower comportment grades, miss more classes, or more days of school.

Figure 6: Educational Achievement: High School Grades



Notes: This figure considers high school grades, absences, and comportment scores. Panels A through C consider mathematics, physical education, and Norwegian. When multiple courses for one of these subjects appear, we take the average for each person. Panel D considers the average class grade. All grades are residualized with respect to the subject code ("fagkode") prior to averaging. Panel E considers hours of missed classes. Panel F considers whether the student received a top comportment score ("Good behavior") as opposed to a lower score. Grade data cover high-school subjects taken during 2002 and later.

Robustness. The results reported above are subject to selection effects, as we condition on individuals not being entrepreneurs in year $t-1$. For instance, in 2013, new entrants are selected from those who did not respond to the reform already in 2012. To evaluate whether this selection is affecting our findings, we perform a robustness exercise in which we instead condition on individuals not being entrepreneurs in 2006. Appendix Figure OA.17 confirms that our results

remain qualitatively similar.

Moreover, Figure 1 shows that the increase in firm entry can be partly explained by individuals transitioning from sole proprietors to incorporated entrepreneurs. Appendix Figure OA.18 repeats the analysis from Figure 5 on individuals who make this transition. Overall, the results again appear relatively comparable.

To summarize, our ex-ante entrepreneur characteristics confirm the conclusion from the ex-post firm outcomes – post-reform entrants are not of lower quality than pre-reform entrants. In addition, the lack of a clear change in ex-ante liquidity suggests that the large increase in firm entry after the reform cannot be explained by a binding liquidity constraint. We return to discussing another, more promising, mechanism in Section 5.

3.4 Further unintended consequences of the reform

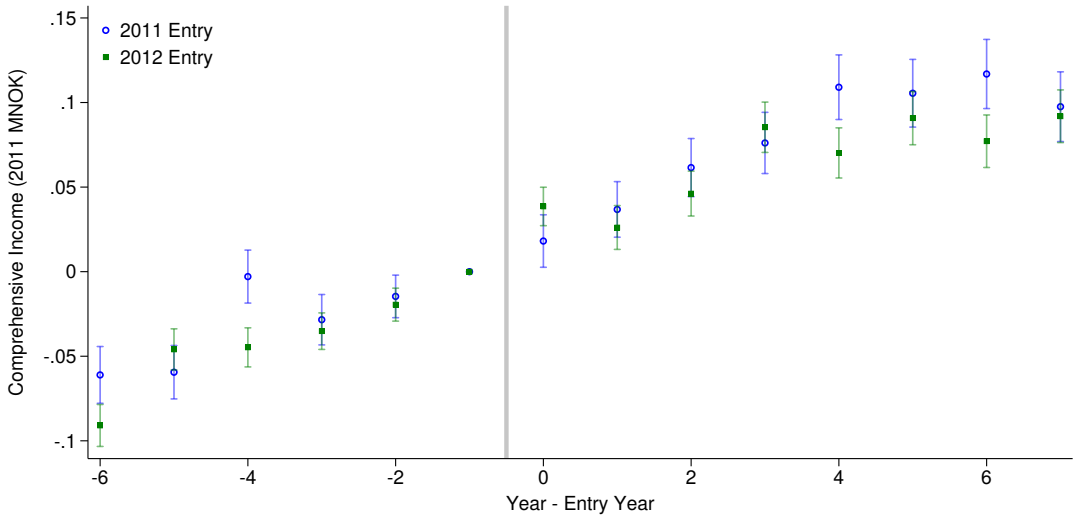
The main argument in favor of capital requirements is to screen out low-quality firms. While we find no support for this argument, there might be other unintended consequences of lowering the capital requirement. For instance, post-reform entrants might engage in less financially rewarding activities, pay less taxes, or be sourced from more productive employers than pre-entrants.

To analyze the entrepreneur income premium, i.e., the financial benefit of entrepreneurship from the individual's viewpoint, we perform an event study around incorporation, comparing individuals who incorporated right before and right after the reform. Our entrepreneurial income measure consists of *comprehensive* personal taxable income, that is, salary and wage earnings and dividends, as well as sole-proprietor income. Importantly, we also include unrealized gains by allocating retained earnings according to ownership shares.[13] This income measure accounts for the fact that some incorporated entrepreneurs become serial entrepreneurs.

We report our findings in Figure 7. Both pre-reform and post-reform entrants are initially on positive income trajectories, that continue following incorporation. There is no evidence that post-reform entrants engage in less rewarding entrepreneurship. Seven years following entry (the last year we observe in our data for the 2012 entrants), the two cohorts have experienced virtually identical cumulative income changes.

[13] We allocate retained earnings from all firms in which the entrepreneur or her spouse has an ownership share. Firm-level retained earnings are proportioned according to the household's ownership share and then allocated to the entrepreneur. We allow for indirect ownership through other LLCs.

Figure 7: Event Study of Entrepreneur's Income Around Entry
Contrasting Pre and Post-reform Entrants



Notes: This figure provides comprehensive income dynamics around the time of entry into incorporated entrepreneurship. The blue circles consider pre-reform (2011) entrants and the green squares consider post-reform (2012) entrants. Point estimates stem from regressing comprehensive income on event-time (years since entry) fixed effects interacted with entry-year fixed effects. We then provide the estimated event-time fixed effects for the two different entry years (2011, 2011).

Incorporated entrepreneurship has certain tax benefits, for instance by allowing for delayed income taxation. Hence, it is possible that post-reform entrants engage more in tax avoidance behavior than pre-entrants. To test for this channel, Appendix Figure OA.19 repeats the same event study as in Figure 7, but considers the average tax rate (ATR) as the outcome variable. While there seems to be some reduction in tax rates in the year of incorporation, the magnitude is small, and not bigger than the year-to-year variation observed in other years. Importantly, the reduction is identical for pre and post reform entrants, indicating that post-reform incorporations are not stronger motivated by tax avoidance behavior.

Finally, we consider potential welfare costs that may arise if post-reform entrants come from more productive firms. In this case, reducing the capital requirement could lead to some form of labor misallocation. Appendix Figure OA.20 compares the characteristics of pre-entry employers for both groups. We find no discernible differences in terms of profitability, value-added margins, proxies for total factor productivity, or revenue growth rates.

All in all, the large increase in firm entry documented in Section 3.1 appears to have come about without any reduction in firm quality, nor other adverse side effects such as smaller entrepreneur income premiums, lower tax payments, or a reallocation of labor from especially productive firms.

4 Comparing marginal to always-entrepreneurs

Section 3 provides evidence on how post-reform entrants differ from pre-reform entrants. However, the sample of post-reform entrants contains both *always*-entrepreneurs (who would have entered regardless of the reform) and *marginal* entrepreneurs (who only enter due to the reform). Hence, comparing characteristics before and after 2012 understates the actual gap between marginal entrepreneurs and always-entrepreneurs. In this section, we impose more structure to our econometric framework, to identify the magnitudes of this gap. Importantly, for our approach to yield unbiased estimates, we need to assume that (i) the post-reform increase in entrepreneurship rates is entirely caused by the entry of marginal entrepreneurs and (ii) any change in the average characteristic of entrants from before to after the reform is fully attributable to the entry of marginal entrepreneurs. We discuss how these assumptions may not hold when considering ex-post firm outcomes.

4.1 Empirical framework

Differences between pre and post-reform entrants. We assume that there are two types of entrepreneurs: always entrepreneurs, A, who enter regardless of the capital requirement, and marginal entrepreneurs, B, who only enter after the reform. Post-reform there are $N_{post} = N_A + N_B$ entrepreneurs and pre-reform there are $N_{pre} = N_A$ entrepreneurs. We only consider *entrants*, not existing entrepreneurs. Pre-reform, the average entrepreneur characteristic is given by

$$\overline{Y}^{pre} = \frac{1}{N_A} \sum_{i \in A} Y_i. \tag{3}$$

Post-reform, the average characteristic is given by

$$\overline{Y}^{post} = \frac{1}{N_A + N_B} \left(\sum_{i \in A} Y_i + \sum_{i \in B} Y_i \right). \tag{4}$$

This relation implies (see Online Appendix C for a derivation) that the difference in average characteristics is given by

$$\frac{1}{N_B} \sum_{i \in B} Y_i - \frac{1}{N_A} \sum_{i \in A} Y_i = \frac{\overline{Y}^{post} - \overline{Y}^{pre}}{\frac{N_{post} - N_{pre}}{N_{post}}}. \tag{5}$$

Equation (5) says that the difference in means between marginal entrepreneurs and always-entrepreneurs is given by the post-reform average less the pre-reform average, divided by the firm growth rate (relative to the new total – not the existing one). Both terms on the right hand side can be measured directly in the data.

We estimate the difference in means pre and post-reform, i.e. the numerator on the right

hand side in Equation (5), using a regression discontinuity design (RDD). The RDD approach essentially formalizes and quantifies the graphical evidence from Section 3. Because we only want to assign causality in the case of sharp differences not driven by general time trends, we take out linear time trends pre-reform and post-reform. Specifically, our estimate of $\overline{Y}^{post} - \overline{Y}^{pre}$ is captured by the $\hat{\beta}^Y$ from estimating the regression equation

$$Y_{i,h} = \alpha + \beta^Y \mathbb{1}[s \geq 2012] + \gamma^- \times s \times \mathbb{1}[s < 0] + \gamma^+ \times s \times \mathbb{1}[s \geq 0] + \varepsilon_i, \tag{6}$$

where Y_i is a characteristic measured in year h, and s is the founding year, normalized to be zero in 2012. The term $\gamma^- \times s \times \mathbb{1}[\cdot]$ captures a linear time-trend in the pre-reform period, while the term $\gamma^+ \times s \times \mathbb{1}[\cdot]$ captures a linear time-trend in the post-reform period. Consequently, the coefficient β identifies the discrete change in Y that occurs in 2012. To limit the influence of non-linear long-run time trends, we restrict the sample to incorporations that occur within 3 years of the reform, that is, during 2009–2014.

The firm growth rate, i.e. the denominator on the right hand side of Equation (5) is simply $\frac{N^Y_{2012} - N^Y_{2011}}{N^Y_{2012}}$, where Y denotes the given characteristic and reflects that growth rates are based only on incorporation events for which Y is observable. For instance, if Y is firm profits in 2018, firms which exit before 2018 are not included. The choice of a simple estimator for the increase in entry is due to the graphical evidence in Figure 1, which shows no indication of the 2011–2012 jump being related to general time trends. Our estimator of how marginal entrepreneurs differ from always entrepreneurs is thus

$$\widehat{\Delta Y_h} = \frac{\hat{\beta}^Y}{\frac{N^Y_{2012} - N^Y_{2011}}{N^Y_{2012}}}, \tag{7}$$

where we obtain standard errors from a 200-repetition bootstrap procedure.

4.2 Estimated differences

Table 1 provides our formal estimates based on the expression in Equation (7). Panel A considers ex-post firm outcomes in 2018. Consider first the upper row, which reports the coefficient estimates for β^Y from Equation (6). As seen from the first two columns, there is no significant difference in profitability or survival rates. The firm size measures in Columns 3-5 are however significant, consistent with the graphical evidence from Section 3. The growth rate in the number of firms relative to the post-period is reported in the second column.

The third column captures our estimated difference between always-entrepreneurs and marginal entrepreneurs. We find that marginal firms have NOK 2,900,000 ($493,200) less in assets, NOK 2,230,000 ($379,300) less in revenues and NOK 600,000 ($102,000) less in wage bills. These magnitudes imply large reductions in average firm size after the reform. However, the underlying assumption that always-entrepreneurs are unaffected by the reform, might not hold when considering

Table 1: How the Marginal and Always Entrepreneurs Differ

Notes: This table provides estimates of how marginal entrepreneurs differ from always entrepreneurs: The first row contains the estimated coefficients β^Y from Equation (6), the second row is the growth rate in incorporations in the sample where the outcome variable is observed, the third row provides the estimated ΔY_h, which is our main estimate. Panel A considers ex-post outcomes measured in 2018. Wages are the total wage bill (labor costs) for the firm. Entrepreneurial income is the sum of personal taxable income (e.g., salaries, capital income, sole-proprietor income) and allocated retained earnings. $\overline{Y}_{2011}$ is the outcome-variable sample mean for 2011. Panel B considers ex-ante traits of entrepreneurs: total personal income in 2006, liquid financial wealth prior to incorporation, whether they have a college degree in 2010, and age. Standard errors are obtained from a 200-repetition bootstrap procedure.

Panel A: Ex-post firm outcomes, 2018

	(1) Profitability	(2) 1[Nonmissing Accounting]	(3) Assets (MNOK)	(4) Revenues (MNOK)	(5) Wage bill (MNOK)
$\mathbb{1}[s \geq 2012]$	0.00	-0.02	-1.25***	-0.96***	-0.26***
	(0.01)	(0.01)	(0.19)	(0.28)	(0.07)
$\frac{N_{2012}-N_{2011}}{N_{2012}}$	0.43***	0.42***	0.43***	0.43***	0.43***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
$\widehat{\Delta Y}$	0.00	-0.04	-2.90***	-2.23***	-0.60***
	(0.03)	(0.04)	(0.46)	(0.66)	(0.17)
N	13739	23798	13877	13877	13877
$\overline{Y}_{2011}$	0.03	0.56	3.86	4.53	1.17

Panel B: Ex-ante entrepreneur characteristics

	(1) log(Personal Income)	(2) LFW (NOK)	(3) College	(4) Age
$\overline{Y}^{post} - \overline{Y}^{pre}$	-0.037	-15197	-0.020	0.218
	(0.034)	(11528)	(0.015)	(0.309)
$\frac{N_{2012}-N_{2011}}{N_{2012}}$	0.383***	0.408***	0.392***	0.412***
	(0.014)	(0.015)	(0.015)	(0.014)
$\widehat{\Delta Y}$	-0.096	-37252	-0.052	0.528
	(0.090)	(28449)	(0.038)	(0.751)
N	20567	22784	21239	23414

ex-post firm outcomes. Specifically, Figure 2 suggests that (some) always-entrepreneurs respond to the reform by reducing firm size at incorporation, which would lead our estimates of $\widehat{\Delta Y}$ to overstate the difference in firm size between marginal entrepreneurs and always-entrepreneurs.

Panel B considers ex-ante entrepreneur characteristics. These characteristics are determined prior to the reform, and cannot be impacted by the reform itself. As a result, the $\Delta\hat{Y}$ estimates will be unbiased. As reported in the third row, we find no significant difference in prior personal income, liquidity, educational attainment or age, consistent with the graphical evidence in Figure 5. Hence, our findings suggest that – a long the margins considered here – marginal entrepreneurs

are not different to always-entrepreneurs.

5 Conceptual framework

Our empirical analysis reveals that post-reform entrants do not start lower quality or more risky firms that pre-reform entrants. They simply start smaller firms. In addition, pre and post-refrom entrants do not differ along a rich set of observable characteristics, among others pre-entry liquidity, suggesting that liquidity constraints do not dominate in our setting. To interpret these findings, we set up a simple model of entry into entrepreneurship.

The model is based on Evans and Jovanovic (1989), but extended to allow for heterogeneity in returns to scale in production across entrepreneurs. As a result, the capital constraint creates two separate groups of marginal entrepreneurs. First, low-liquidity individuals do not become entrepreneurs because they have insufficient liquidity to satisfy the minimum capital requirement. Second, individuals with very decreasing returns to scale production technologies want to start optimally small firms and do not become entrepreneurs if the capital requirement forces them to operate at a scale too large for profitability. The model thus explains how capital requirements can have large impacts on firm entry, also in a setting where the liquidity constraint does not bind. We conclude by providing empirical evidence in support of the size constraint mechanism.

5.1 General setup

Individuals are endowed with some liquidity ℓ_i. To become an entrepreneur, the individual chooses a capital level $k_i \leq \ell_i$. We assume for simplicity that the invested capital can only be equity. The entrepreneurial profit function is given by

$$f_i(k_i) = \theta_i k_i^{\alpha_i} - r k_i. \tag{8}$$

Individuals vary in terms of their ability $\theta_i > 0$, as well as their returns to scale parameter $\alpha_i \in (0, 1)$, which governs the concavity of the profit function. r is the (opportunity) cost of capital. We abstract from risk or heterogeneity in risk-aversion across entrepreneurs. Our empirical findings do not pick up any change in the risky asset share (see Appendix Figure OA.21), an often-used proxy for risk aversion. We therefore focus on heterogeneity in returns to scale, for which we provide empirical support in Section 5.3.

Individuals become entrepreneurs if two conditions are satisfied. First, they have to satisfy a minimum capital requirement $\underline{k}$. Second, they have to produce an entrepreneurial profit which exceeds their outside option. We now discuss these two conditions in turn.

Liquidity constraint. The capital constraint creates a lower bound on entrepreneurial capital. Specifically, invested capital has to be greater than or equal to the minimum level $\underline{k}$:

$$\underline{k} \quad \leq \quad k_i \quad \leq \quad \ell_i \tag{9}$$

Hence, if individual liquidity does not exceed the capital requirement, the individual *cannot* become an entrepreneur.

Profitability constraint. An individual with sufficient liquidity *chooses* to become an entrepreneur only if entrepreneurial profits exceed some opportunity cost, s_i, such as income from salaried employment:

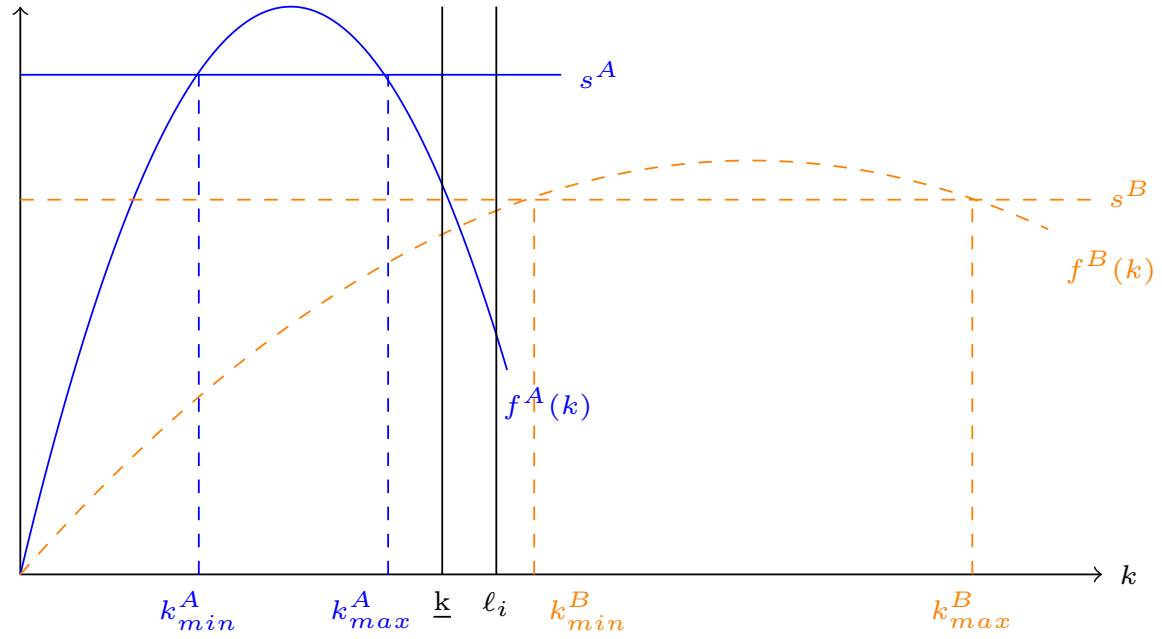
$$\theta_i k_i^{\alpha_i} - r k_i \geq s_i. \tag{10}$$

The profitability constraint can be violated both for small k_i as well as for large k_i. For low levels of capital, entrepreneurial profit is low but increasing – due to a high marginal revenue. As $k_i \to \infty$, marginal revenues approach zero while the marginal cost of capital r_i remains constant, giving rise to a concave profit function, as illustrated in Figure 8. Thus, there exists some minimum capital level k_{min}, which is the lowest amount of capital for which entrepreneurial profits exceed the outside option s_i. Likewise, there exists some maximum amount of capital, k_{max}, which is the highest amount of capital for which entrepreneurial profits exceed the outside option. We can thus re-write the profitability constraint as

$$\underbrace{k_{min}(\theta_i, \alpha_i, s_i)}_{\substack{\text{Minimum capital that} \\ \text{satisfies profitability constraint}}} \leq k_i \leq \underbrace{k_{max}(\theta_i, \alpha_i, s_i).}_{\substack{\text{Maximum capital that} \\ \text{satisfies profitability constraint}}} \tag{11}$$

The thresholds k_{min} and k_{max} depend on ability θ_i, returns to scale α_i, and outside options s_i. Both thresholds are characterized by an indifference condition $\theta_i k_{max}(\theta_i, \alpha_i, s_i)^{\alpha_i} - r k_i = s_i$. In addition, k_{min} is characterized by a positive marginal return condition $f_i'(k_{max}(\theta_i, \alpha_i, s_i)) > 0$, while k_{max} is characterized by a negative marginal return condition $f_i'(k_{max}(\theta_i, \alpha_i, s_i)) < 0$.

Figure 8: Selection into entrepreneurship



Notes: This figure illustrates two entrepreneur profit functions and their corresponding profitability constraint from Equation (10). Individual A satisfies the liquidity constraint, as $l > \underline{k}$, but does not satisfy the profitability constraint, as $k^A_{max} < \underline{k}$. Individual B again satisfies the liquidity constraint, as $l > \underline{k}$, but does not satisfy the profitability constraint, as $k^B_{min} > l$.

Constrained entrepreneurs. The model produces three distinct sets of constrained entrepreneurs:

1. Liquidity constrained individuals, for which $\ell_i < \underline{k}$.
2. Non-regulatory liquidity constrained individuals, for which $\ell_i \geq \underline{k}$, but $\ell_i < k_{min}$.
3. Size-constrained individuals, for which $l_i \geq \underline{k}$, but $\underline{k} > k_{max}$.

Liquidity constrained individuals (1.) do not have sufficient liquidity to meet the capital requirement. Reducing the capital requirement will allow (some) agents from this group to enter.

The second group of constrained individuals have sufficient liquidity to meet the requirement, as $\ell_i \geq \underline{k}$. However, they do not have sufficient liquidity to produce at a surplus, i.e. $\ell_i < k_{min}$, due to for example a high outside option. We call these individuals non-regulatory liquidity constrained individuals (2.), as they too face a liquidity constraint, but this constraint does not arise due to regulation. In fact, lowering the capital requirement will not affect the entry decision of this group.

The size-constrained individuals (3.) again have sufficient liquidity to meet the regulatory requirement, i.e. $\ell_i \geq \underline{k}$. However, the capital requirement forces them to produce at a scale too large for profitability. That is, $\underline{k} > k_{max}$. The capital requirement prevents them from starting an *optimally small* firm that produces at a surplus. Consequently, lowering the capital requirement

would allow (some) agents from this group to become entrepreneurs.

Figure 8 illustrates the difference between non-regulatory liquidity constrained (2.) and size constrained (3.) individuals. In the figure, liquidity ℓ exceeds the capital requirement $\underline{k}$, meaning that neither individual is liquidity constrained. For individual A (solid, blue lines), $k^A_{max} < \underline{k}$, meaning that producing at the minimum regulatory size would result in a negative surplus. Individual A is therefore *size-constrained*, and does not become an entrepreneur. For individual B (dashed, orange lines), $\ell < k^B_{min}$, meaning that her liquidity is not sufficient to allow her to produce at scale sufficiently large for profitability. Individual B is therefore *non-regulatory liquidity constrained*, and does not become an entrepreneur. That is, neither individual A nor B enter, albeit for different reasons.

5.2 Lowering the capital requirement: model and data

Lowering the capital requirement allows for entry of two sets of constrained entrepreneurs: the liquidity constrained (1.) and the size constrained (3.). We now discuss these two channels in turn, evaluating how their model predictions line up with our empirical results.

First, a lower capital requirement loosens the liquidity constraint, and allows more low-liquidity individuals to enter. The marginal entrant in this case will thus have lower liquidity than the extant pool of entrepreneurs. Our empirical results did not indicate any reduction in average liquidity, see Figure 5, nor any change in the probability of having especially low liquidity, see Figure OA.15. We thus conclude that the liquidity constraint does not bind in our setting.

Second, a lower capital requirement loosens the size-constraint, and allows more low-k_{max} individuals to become entrepreneurs. For instance, individual A in Figure 8 will enter through this group, if $\underline{k}$ is lowered sufficiently such that $\underline{k} \leq k^A_{max}$. Unfortunately, we do not have empirical proxies for k_{max}, implying that we cannot directly test for this channel in the data. However, individuals with low k_{max} differ in terms of underlying characteristics. Specifically, k_{max} increases in ability θ_i and returns to scale α_i, and decreases in the outside option s_i, see Proofs B.1-B.3 in the Appendix. Hence, if the size-constraint is important, we should see either a reduction in ability, an increase in outside options, and/or a reduction in returns to scale post-reform.

Our empirical results do not indicate any reduction in proxies for ability or outside options, such as prior income or college degrees, see Figure 5, or high school grades, see Figure 6. We also do not find any difference in the type of previous employers, see Appendix Figure OA.20. For the size constraint to be relevant, we should therefore see a reduction in the returns to scale parameter α_i. Although not directly observable, we attempt to estimate α_i in the upcoming subsection. In line with the model prediction, we indeed find a reduction in estimated α_i for post-reform entrants. As such, we conclude that the size-constraint is important in our setting, and that lowering the capital requirement led to an influx of optimally small firms.

Finally, we note that the model also illustrates the difference between lowering the capital

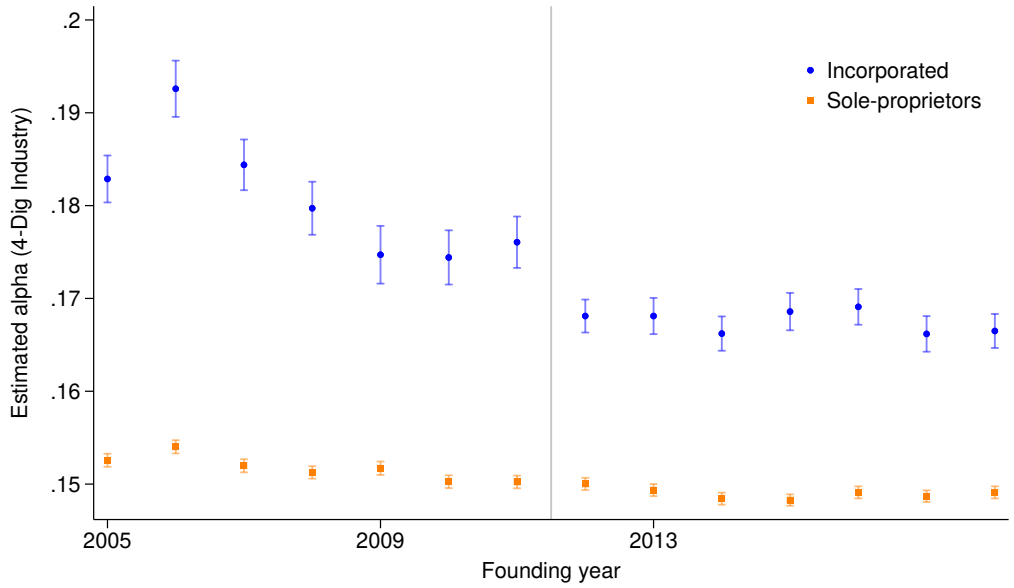
requirement $\underline{k}$ and increasing individual liquidity ℓ_i. Increasing individual liquidity allows some individuals from the liquidity constrained (1.) and the non-regulatory constrained (2.) group to enter. As an example of the latter, consider individual B in Figure 8, who will enter if her liquidity is increased sufficiently so that $\ell_i > k^B_{min}$. In a setting such as the one studied here, in which the liquidity constrained does not bind, the marginal entrepreneur from lowering the capital requirement (the size-constrained) is thus entirely different than the marginal entrepreneur that arises from increasing individual liquidity (the non-regulatory liquidity constrained).

5.3 Estimated returns to scale

To obtain an estimate of the returns to scale parameter α_i, we need a measure of how entrepreneur revenue varies with capital. We adopt a methodology often used to estimate productivity, in which log revenues is regressed on log inputs (see, e.g., Lichtenberg and Siegel 1990, Bertrand and Mullainathan 2003, and Giroud and Mueller 2015). Specifically, we assume $Revenues_{i,t} = \theta K^{\alpha}_{i,t} L^{\rho}_{i,t} M^{\zeta}_{i,t}$, in which K is capital, L is labor, and M is intermediaries. We estimate this equation in log form. The estimation is done on pre-reform data, at the 4-digit industry code level, and gives us an *industry* level proxy for α. See Appendix D.1 for details.

Once we have the industry proxies for α, we assign each entrepreneur the $\hat{\alpha}$ corresponding to their 4-digit industry, regardless of their year of entry. The resulting variation is then limited to changes in the industry composition of new entrepreneurs. Hence, a caveat to our approach is that it does not capture the full variation in capital sensitivities across entrepreneur cohorts, as there is likely important within-industry-code variation as well. The results are illustrated in Figure 9 and show a significant decline in average $\hat{\alpha}$ at the time of the reform. Importantly, the decline is present only for incorporated firms, and not for sole proprietors. We thus conclude that the data is consistent with the model predictions, and that lowering the capital requirement led to increased entry of optimally small firms.

Figure 9: Contrasting the Industry-level Capital Sensitivity of Pre and Post-reform Entrants



Notes: This figure provides proxies for returns to scale (α). We estimate the regression equation $\log(Rev_{i,t}) = \gamma_{n,t} + \alpha_n \log K_{i,t} + \rho_{n,t} M_{i,t} + \zeta_{n,t} L_{i,t}$ on firm-year (i,t) observations for which i was founded weakly before 2010 and strictly before t. n corresponds to 4-digit NACE industry codes. See Appendix D.1 for a discussion of this methodology. We then assign $\hat{\alpha}_n$ to all entrants (sole-proprietors or incorporated) depending on their industry code, n, regardless of when they enter. We only use pre-*2010* entrants in the estimation, to ensure that the estimation-sample cut-off date is not driving the discontinuity (if so, the drop would occur between 2010 and 2011).

6 Discussion

Capital requirements are a common tool used to regulate entrepreneurship. While they could potentially protect stakeholders and creditors by screening out 'unserious' businesses, they also impose a barrier to firm entry. We study a Norwegian reform in which the capital requirement was reduced from \$17,000 to \$5,000. We find a large and sustained increase in firm entry following the reform. While the post-reform entrants are considerably smaller in terms of assets and revenues, we find no indication of a reduction in quality. Ex-post firm outcomes such as survival rates and profitability remain unchanged, as do ex-ante entrepreneur characteristics such as prior income, educational attainment, and educational performance.

In terms of mechanisms, we find that post-reform entrants do not have lower liquidity, suggesting that the liquidity constraint does not bind. To rationalize our findings, we set up a theoretical framework in which the capital constraint keeps optimally small firms form entering. Relaxing the capital constraint relaxes the size constraint, and allows the optimally small firms to produce at a scale compatible with a positive entrepreneur surplus. In line with the model prediction, we find that post-reform firms on average have lower estimated returns to scale in their production.

Our study offers the first evidence on reduced capital requirements in an emerged economy

setting, in which the liquidity constraint does not bind. The results documented here should therefore be of special interest to other emerged economies – many of which still have sizable capital requirements in place.

Overall, our findings imply limited support for minimum capital requirements. The main argument in favor of these requirements is to protect creditors and customers. However, we do not see any indication that the firms entering due to a lower requirement are excessively risky, less serious, or of lower quality. Nor do we find any indication that individuals starting firms during the post-reform period have less to gain from entrepreneurship in terms of total income. What we do see however, is that the capital requirement hinders the establishment of small firms. Intuitively, not all firms require large amounts of capital to start their business. For instance, service-based businesses or online consultancy firms might not need much more than a home office, a laptop, and some office tools. Imposing a minimum capital requirement means that these individuals must either operate their firm at a non-optimally large scale, or choose not to enter in the first place.

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Online Appendix

A Data Appendix

A.1 Accounting for indirect ownership

To link individuals with firms through indirect ownership, we take the following approach.[14] We first limit our data to ownership links of at least 1% of total shares. For shares owned by a second firm, we rank the owners in that second firm, keep the top 10 owners, remove ownership links $< 10\%$, and assign iterated ownership shares to the individuals who own shares in the second firm. That is, if a person owns 10% of firm A which owns 10% of firm B, then that person owns 1% of firm B. We then aggregate ownership shares at the firm-person-year level, allowing for both direct and indirect ownership. We further aggregate ownership shares at the household (spouses) level.

A.2 Unincorporated entrepreneurs

In some of our analyses, we also consider sole-proprietorships ("enkeltmannsforetak"), partnerships ("DA" and "ANS"), and foreign-incorporated firms to compare to limited liability companies.

For these organizational forms, we define the entrepreneur either as the proprietor ("innehaver") or we select the partner that is also the CEO. If there is no partner-CEO, we select the chair of the board or, alternatively, the vice chair. For foreign-incorporated firms, we do not observe ownership, but assign the registered CEO as the entrepreneur.

B Derivations for conceptual framework

B.1 k_{max} that satisfies profitability constraint increases in θ

$k_{max}(\theta_i, \alpha_i, s_i)$ is increasing in θ_i. k_{max} is defined by $\theta_i k_{max}^{\alpha_i} - r k_{max} - s = 0$. If we differentiate this with respect to θ_i, we obtain

$$\frac{dk_{max}}{d\theta_i} = \frac{-k_{max}^{\alpha_i}}{\theta_i \alpha_i k^{max,\alpha_i - 1} - r} = \frac{-k_{max}^{\alpha_i}}{f'(k_{max}^{\alpha_i})}, \tag{12}$$

which is positive since $f'(k_{max}^{\alpha_i})$ must be negative. Otherwise, we would want to increase capital above $k_{max}^{\alpha_i}$.

[14] In 2006, Norway introduced a dividend tax for dividends paid from corporations to private shareholders. This reform created an incentive to own economically active firms through another LLC in order to postpone realizing dividends.

B.2 k_{max} that satisfies profitability constraint increases in α

$k_{max}(\theta_i, \alpha_i, s_i)$ is increasing in α_i: k_{max} is defined by $\theta_i k_{max}^{\alpha_i} - r k_{max} - s_i = 0$. If we differentiate this with respect to α_i, we obtain

$$\theta_i k_{max}^{\alpha_i} \left[\frac{\alpha_i}{k_{max}} \frac{dk_{max}}{d\alpha_i} + \log(k_{max}) \right] - r \frac{dk_{max}}{d\alpha_i} = 0. \tag{13}$$

We reorganize and get

$$\frac{dk_{max}}{d\alpha_i} = \frac{\theta_i k_{max}^{\alpha_i} \log(k_{max})}{r - \theta_i k_{max}^{\alpha_i - 1} \alpha_i} \tag{14}$$

$$= \frac{\theta_i k_{max}^{\alpha_i} \log(k_{max})}{-f'(k_{max})}, \tag{15}$$

which is strictly positive as long as $k_{max} > 1$ due to the fact that $f'(k_{max})$ must be negative (otherwise, k_{max} does not exist).

B.3 k_{max} that satisfies profitability constraint decreases in s

$k_{max}(\theta_i, \alpha_i, s_i)$ is decreasing in s_i: k_{max} is defined by $\theta_i k_{max}^{\alpha_i} - r k_{max} - s_i = 0$. If we differentiate this with respect to s_i, we obtain

$$\alpha_i \theta_i k_{max}^{\alpha_i - 1} \frac{dk_{max}}{ds_i} - r \frac{dk_{max}}{ds_i} - 1 = 0 \tag{16}$$

We reorganize and get

$$\frac{dk_{max}}{ds_i} = \frac{1}{\alpha_i \theta_i k_{max}^{\alpha_i - 1} - r} \tag{17}$$

$$= \frac{1}{f'(k_{max})}, \tag{18}$$

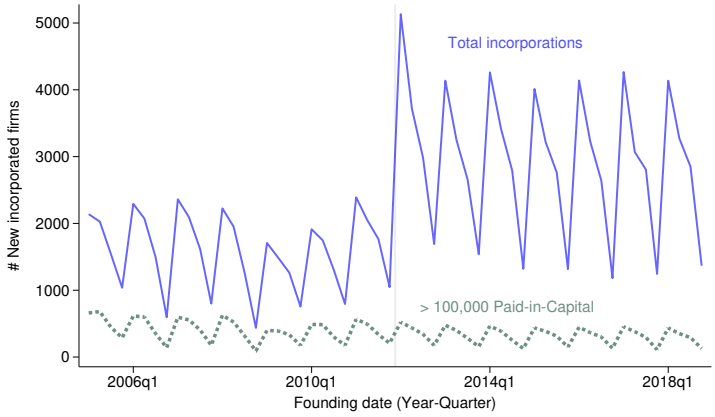
which is negative due to the fact that $f'(k_{max})$ must be negative (otherwise, k_{max} does not exist).

C Derivations for empirical specification

$$
\begin{aligned}
\frac{1}{N_B}\sum_{i\in B} Y_i - \frac{1}{N_A}\sum_{i\in A} Y_i &= \frac{1}{N_B}\left(\overline{Y}^{post}(N_A+N_B) - N_A\overline{Y}^{pre}\right) - \frac{1}{N_A}\sum_{i\in A} Y_i \\
&= \frac{N_A}{N_B}\left(\overline{Y}^{post}\frac{N_A+N_B}{N_A} - \overline{Y}^{pre}\right) - \overline{Y}^{pre} \\
&= \frac{N_A}{N_B}\left(\overline{Y}^{post}\frac{N_A+N_B}{N_A} - \overline{Y}^{pre}\left[1+\frac{N_B}{N_A}\right]\right) \\
&= \frac{N_A}{N_B}\left(\overline{Y}^{post}\frac{N_A+N_B}{N_A} - \overline{Y}^{pre}\left[\frac{N_A+N_B}{N_A}\right]\right) \\
&= \frac{N_A}{N_B}\left(\overline{Y}^{post} - \overline{Y}^{pre}\right)\frac{N_A+N_B}{N_A} \\
&= \frac{\overline{Y}^{post} - \overline{Y}^{pre}}{\frac{N_B}{N_A+N_B}} \\
&= \frac{\overline{Y}^{post} - \overline{Y}^{pre}}{\frac{N_{post}-N_{pre}}{N_{post}}}.
\end{aligned} \tag{19}
$$

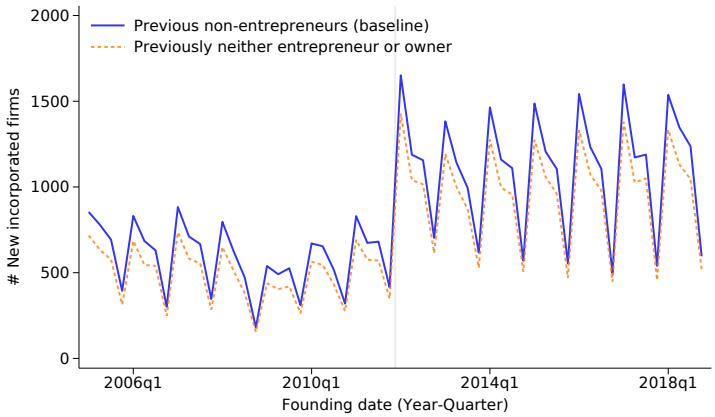
D Supplementary figures

Figure OA.1: Firm Creation Before and After the Reform: No Effect on High-Capital Firm Creations



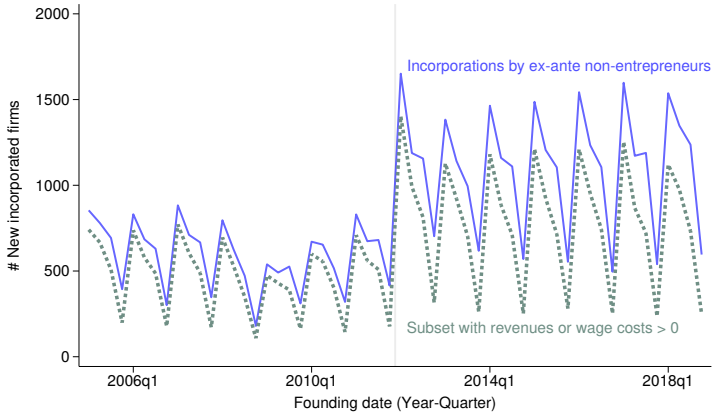
Notes: The solid blue line shows the total number of incorporations (as in Panel B of main-text Figure 1). The dashed teal line shows the total number of incorporations of firms with strictly more than NOK 100,000 in paid-in-capital (measured at the end of the incorporation year).

Figure OA.2: Firm Creation Before and After the Reform: Excluding Entrepreneurs Who Owned Any Private Equity



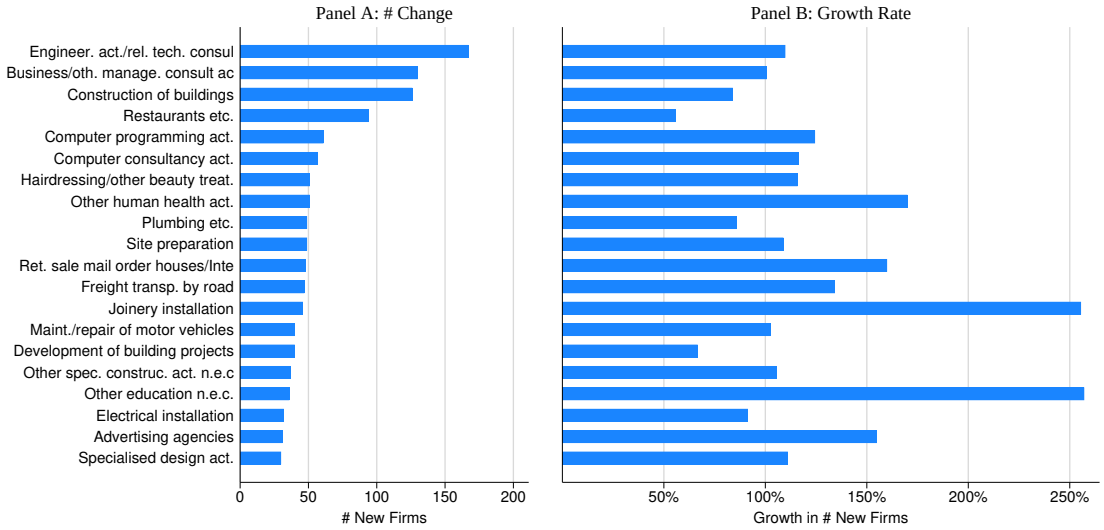
Notes: The solid blue line considers only incorporations done by individuals who were not previously entrepreneurs: neither incorporated (AS), sole-proprietor (ENK), CEO-partner of a partnership (ANS, DA), or CEO of a foreign-incorporated firm (NUF). The dashed orange line restricts the sample to incorporations done by individuals who were not entrepreneurs *nor did they own* $\geq 1\%$ of the shares in any limited liability firm (AS).

Figure OA.3: Incorporations of firms with strictly positive revenues or labor costs



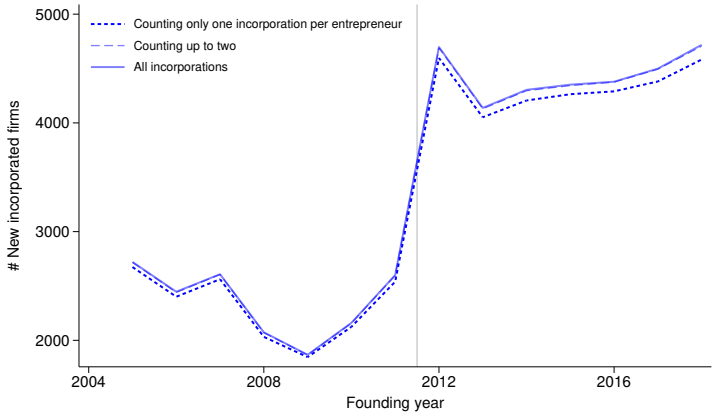
Notes: The solid blue line shows the total number of incorporations by ex-ante non-entrepreneurs (as in Panel B of Figure 1). The dashed teal line shows the subset of these incorporations where the firms had strictly positive revenues or wage bills in the year of incorporation as an indication of (immediate) economic activity.

Figure OA.4: Industry Decomposition of the Increase in Incorporations From 2011 to 2012



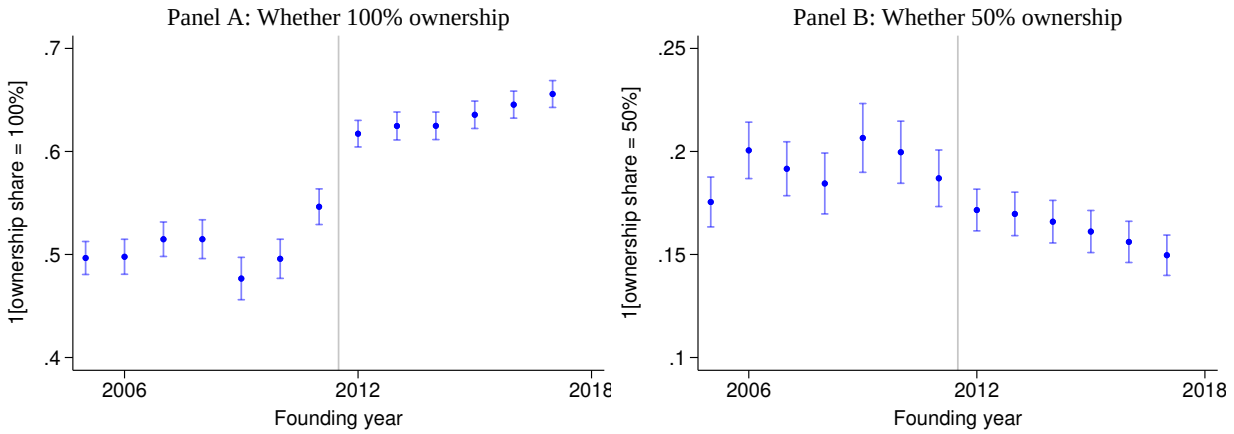
Notes: This figure considers the change (Panel A) and relative change (Panel B) in incorporations from 2011 to 2012. This is done separately for different four-digit NACE-code industries. The figure only includes data for four-digit NACE codes for which there were at least 30 more incorporations in 2012 than in 2011. "Education n.e.c" only consists of five-digit NACE code 85.599, which is titled "Other education." "Construction of buildings" only consists of NACE code 41.200, also titled "Construction of buildings."

Figure OA.5: How the change in incorporation rates (does not) depend on multiple incorporations by individual entrepreneurs



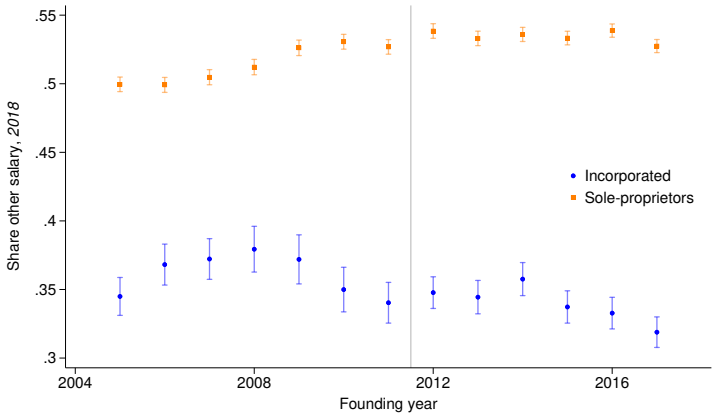
Notes: The solid blue line shows the total number of incorporations by ex-ante non-entrepreneurs (as in Panel B of Figure 1) aggregated to a yearly frequency. The long-dashed blue line shows the number of new incorporations when we count at most two incorporations per entrepreneur (per year). The short-dashed blue line shows the number of incorporations when we only count one incorporation per entrepreneur.

Figure OA.6: Ownership shares at incorporation



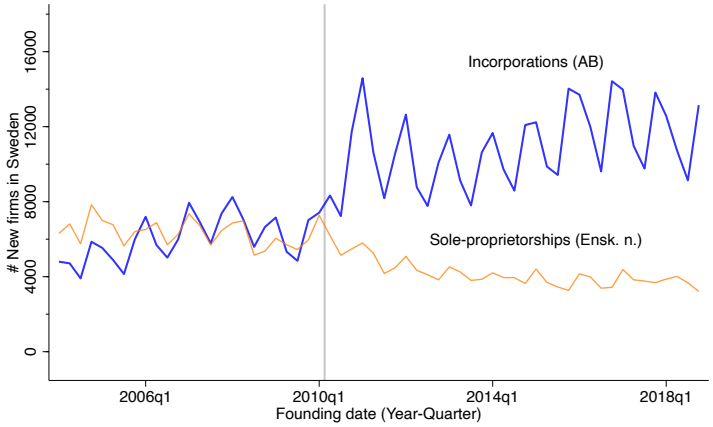
Notes: All panels condition on firms created by individuals who were not entrepreneurs in the prior year. This figure considers whether the entrepreneur either (A) fully owned or (B) owned exactly one half of the firm at the end of the incorporation year.

Figure OA.7: The importance of labor earnings from other (nonentrepreneurial) sources



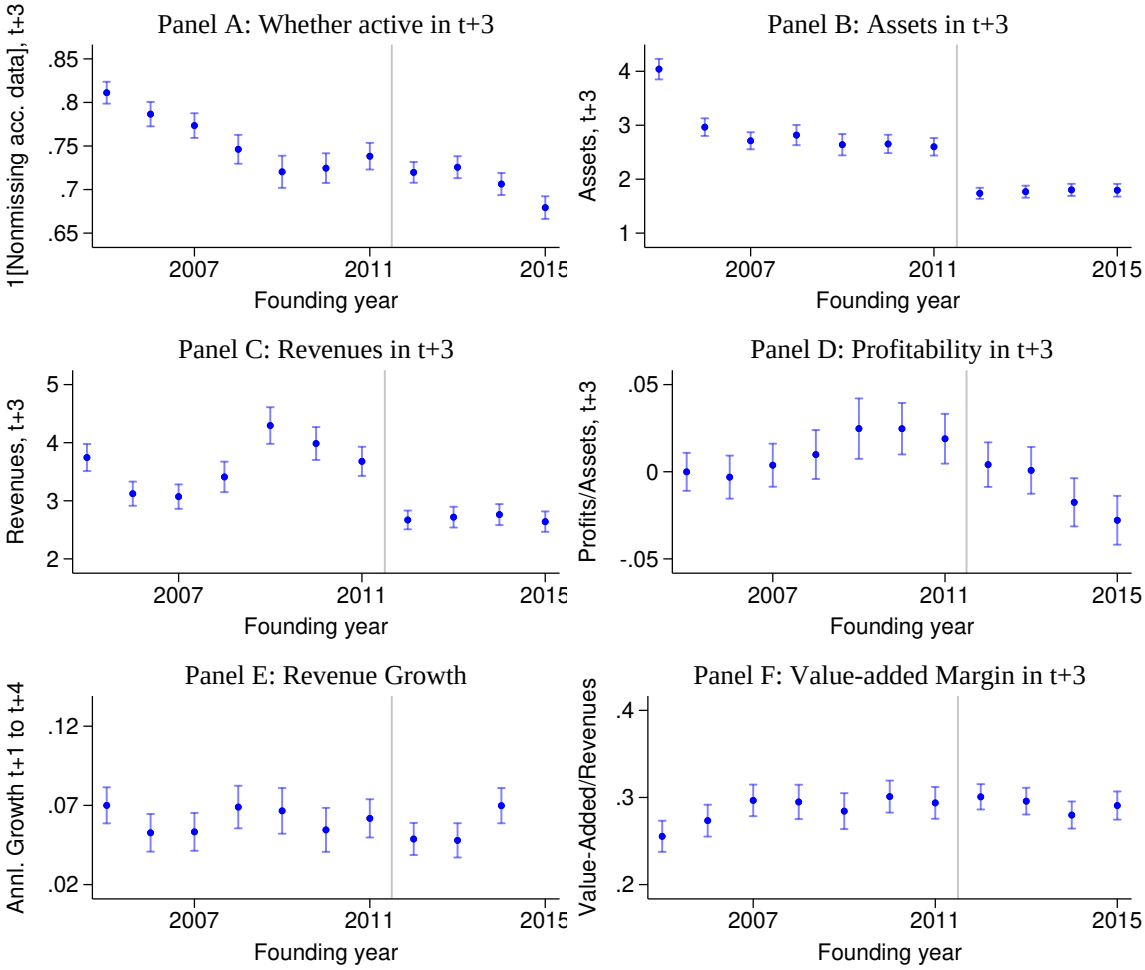
Notes: This figure considers the importance of nonentrepreneurial income, i.e., labor earnings from firms in which the entrepreneur has no significant ownership stake ($< 1\%$). The dependent variable is the ratio of such labor earnings to total personal income plus max(allocated retained earnings,0) measured in 2018. The max operator ensures that negative retained earnings do not increase this ratio.

Figure OA.8: Firm Creation Around the 2010 Swedish Reform



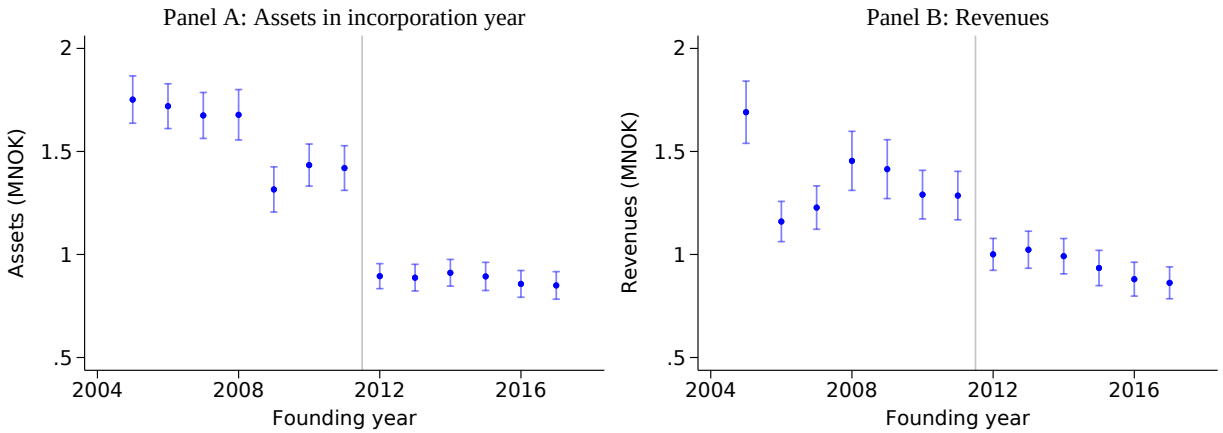
Notes: This figure plots firm creations by type and quarter using data from the Swedish business register (bolagsverket.se). The raw data is at the municipality-month-corporate form level, which we aggregate to the quarterly level for aktiebolag ("AB", which are private LLCs) and enskilda näringsidkare ("E", which are sole-proprietors).

Figure OA.9: Firm outcomes measured three years later, contrasting pre- and post-reform entrants



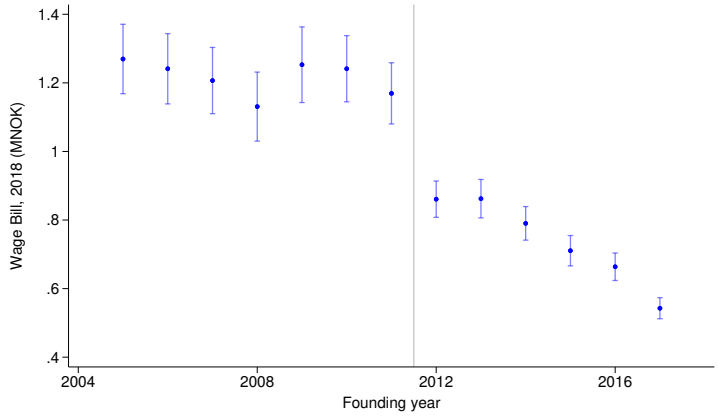
Notes: All panels condition on firms incorporated by individuals who were not entrepreneurs in the prior year. Panel A considers whether the firm has nonmissing accounting data at $t+3$, where t denotes the year of incorporation. Panel B considers the total book assets (winsorized at the 95th percentile) and panel C considers the total revenues (also winsorized at the 95th percentile), and panel D considers profitability. Profitability is measured as the ratio of operating income to assets, censored to be in $[-1, 1]$. Revenue Growth is the growth in revenues between $t+1$ to $t+4$, censored to lie in $[-1, 1]$ and annualized by dividing by 3. Value-added Margin is the ratio of operating income plus wage bill to revenues, censored to lie in $[-1, 1]$. Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level. See main-text Figure OA.9 for results when all panels (except E) use 2018 instead of $t+3$ data.

Figure OA.10: Assets and Revenues Right After Incorporation



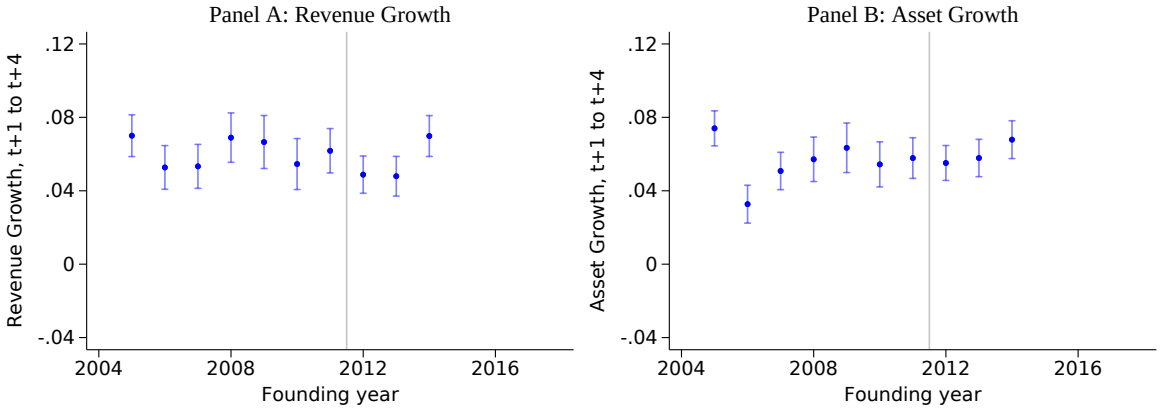
Notes: This figure plots how assets and revenues, measured at the end of the incorporation year, varies with the incorporation year.

Figure OA.11: Total wage bill



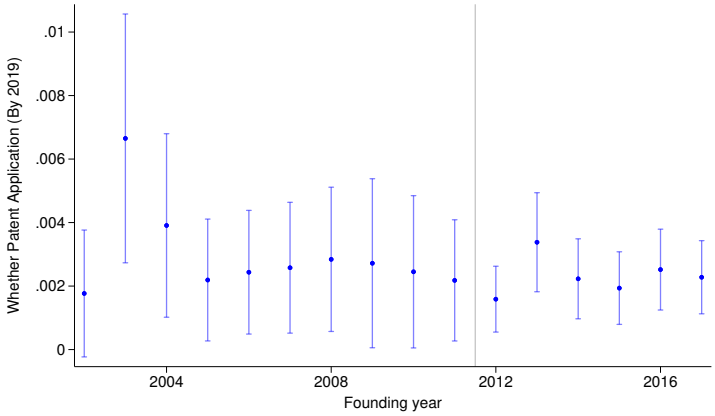
Notes: We supplement Figure 4 by also considering the total labor cost (wage bill, winsorized at 95th percentile) of the firms measured in 2018.

Figure OA.12: Firms' Ex-post Outcomes: Revenue and Asset Growth in the Three Years Following Incorporation



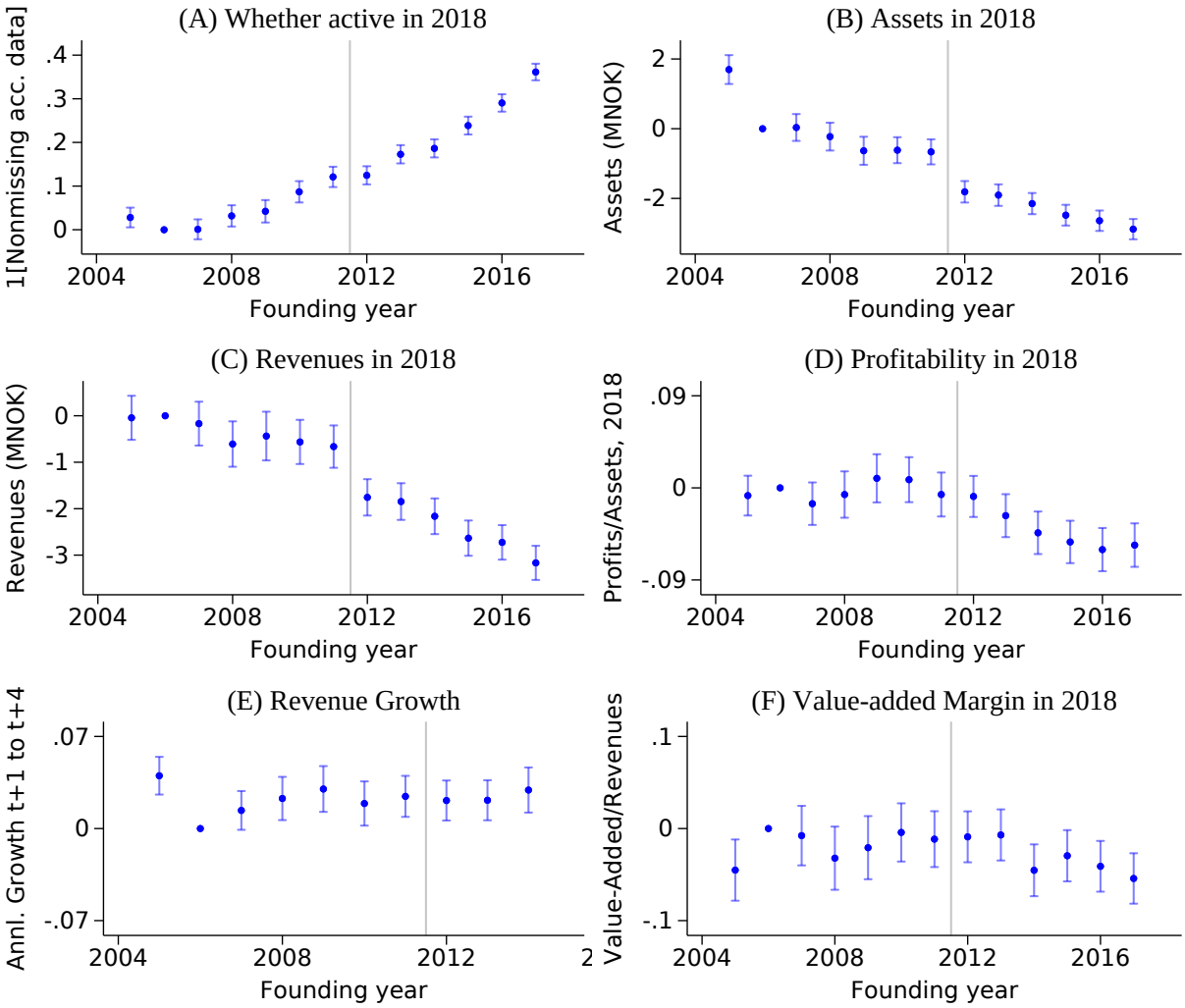
Notes: This figure considers revenue and asset growth in the three-year period after incorporation (from $t+1$ to $t+4$). Revenue growth is measured as the symmetric growth rate and is annualized by dividing the growth rate by 3. We drop observations where the $t+1$ or $t+4$ value is missing or weakly negative. See main text and Figure 4 for further details.

Figure OA.13: Patenting



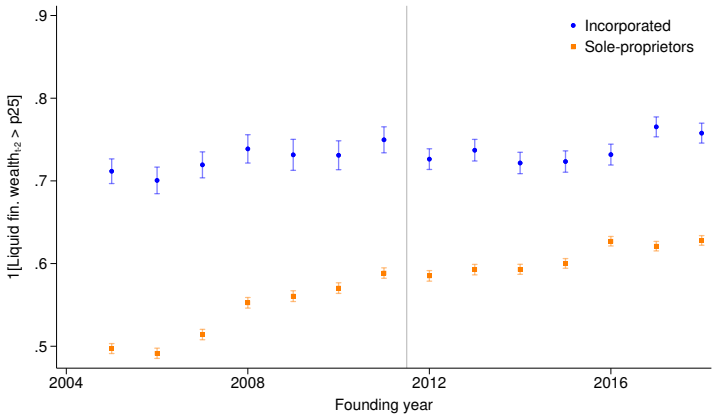
Notes: This figure is plots the propensity to apply for patents during the 2002–2019 period. For these analyses, we use a different dataset that require a (largely coarser) definition of entry. In these analyses, we lack data on who the CEOs are. We thus define strict majority owners as the entrepreneur (dropping firms with no $> 50\%$ owner). We do not exclude firms incorporated ex-ante sole-proprietors, but exclude firms incorporated by entrepreneurs who owned more than 1% of a LLC in the prior year.

Figure OA.14: Firm outcomes, contrasting pre- and post-reform entrants while controlling for industry fixed effects.



Notes: In contrast to Figure 4, the following regression estimates are the result of also controlling for the incorporated firms' 5-digit NACE industry codes. All panels condition on firms incorporated by individuals who were not entrepreneurs in the prior year. All variables are measured, except revenue growth, are measured in 2018. Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level.

Figure OA.15: Whether Entrepreneurs Ex-Ante Liquidity is Above the 25th Percentile



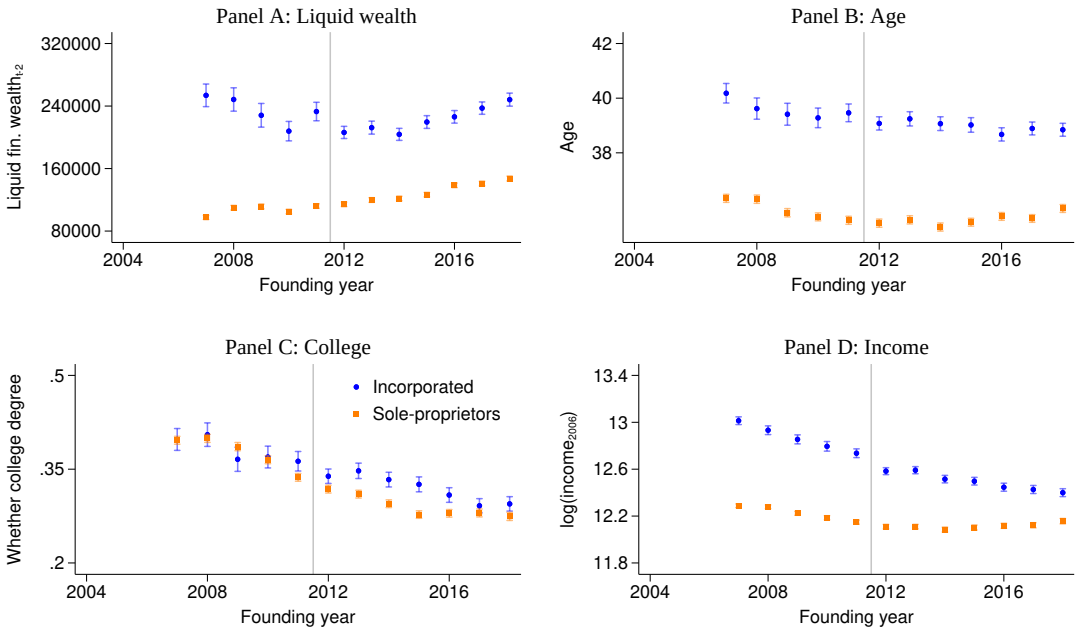
Notes: All panels condition on firms created by individuals who were not entrepreneurs in the prior year. This figure considers whether the entrepreneur's liquid financial wealth is above the 25th percentile (measured in 2011 among incorporating entrepreneurs). Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level.

Figure OA.16: Distribution of ex-ante Characteristics of Entrepreneurs Around the Reform



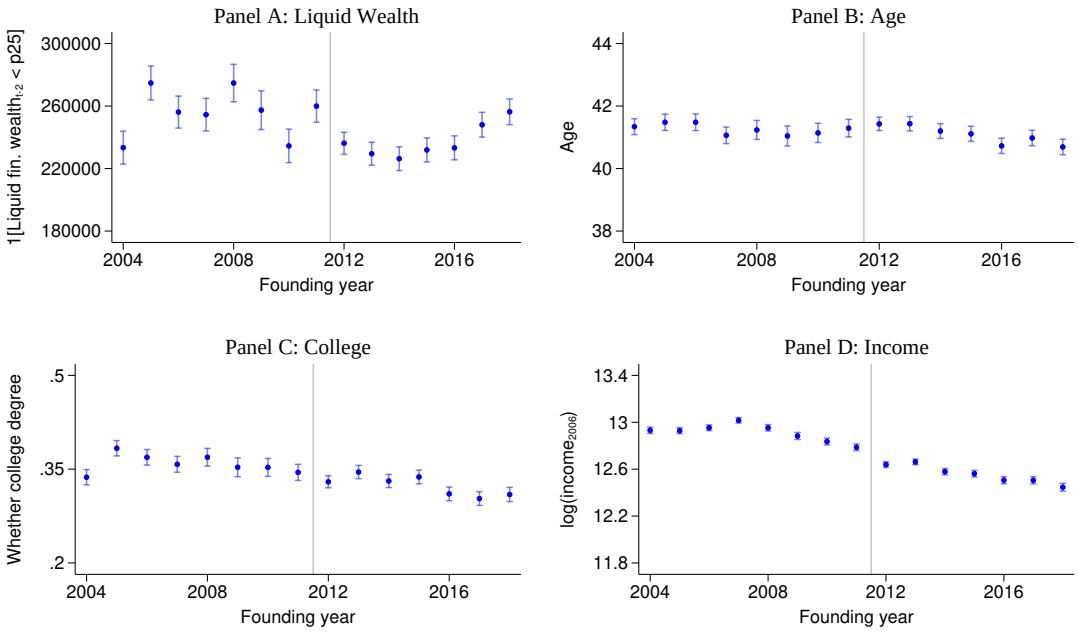
Notes: In contrast to Figure 5 that considers mean characteristics, this figure considers the 10th, 25th, 50th, 75th, and 90th percentiles of the characteristics. We omit the indicator variable for a college education since it is a binary variable. We do not estimate a regression equation but rather provide the relevant summary statistics for each subsample of incorporated entrepreneurs (split by the year of incorporation). The combined sample is the same as the one used to provide the estimates in Figure 5.

Figure OA.17: Characteristics of Entrepreneurs
Conditioning on Not Being an Entrepreneur in 2006



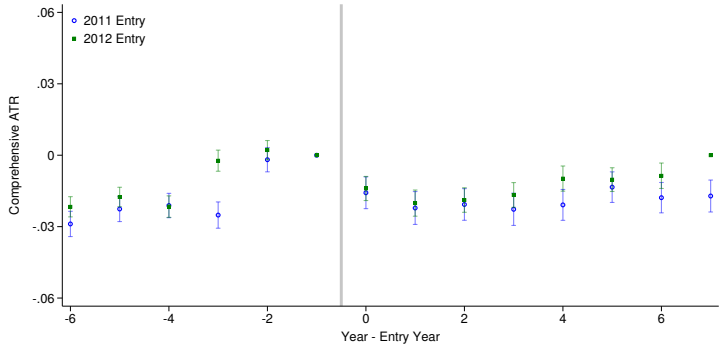
Notes: We modify the definition of new entrants relative to main Figure 5 to be those who create new firms and *were not entrepreneurs as of 2006*. The baseline criteria is that those who start new firms were not already entrepreneurs as of $t-1$.

Figure OA.18: Characteristics of Entrepreneurs Who Transition from Sole-proprietorship to Incorporated Entrepreneurship



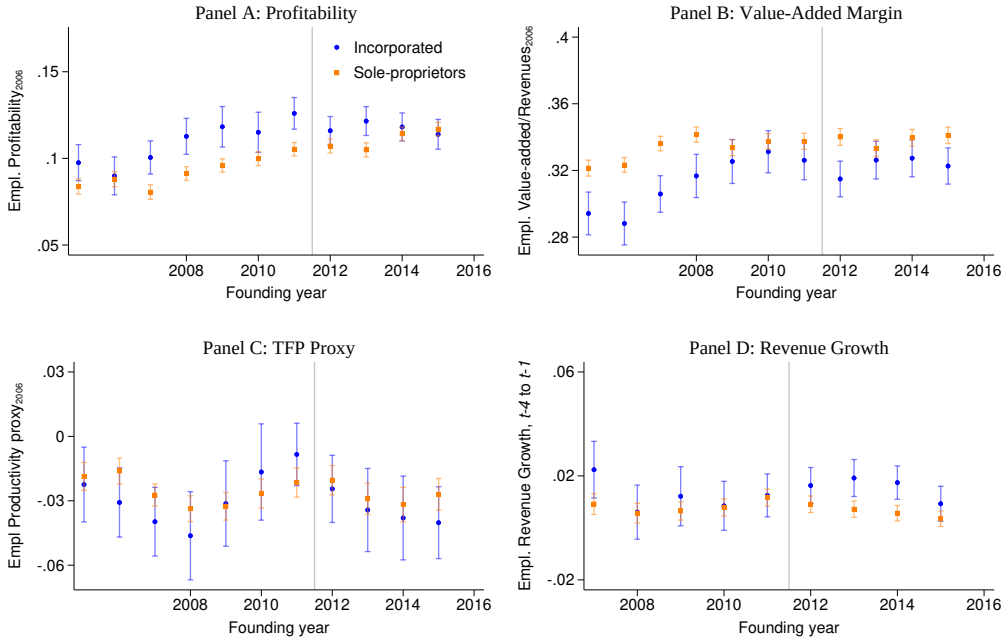
Notes: All panels condition on firms created by individuals who were sole-proprietors but otherwise not entrepreneurs. Standard errors underlying the 95% confidence bands are clustered at the person (entrepreneur) level.

Figure OA.19: Event Study of Entrepreneur's Comprehensive Tax Rates Contrasting Pre and Post-reform Entrants



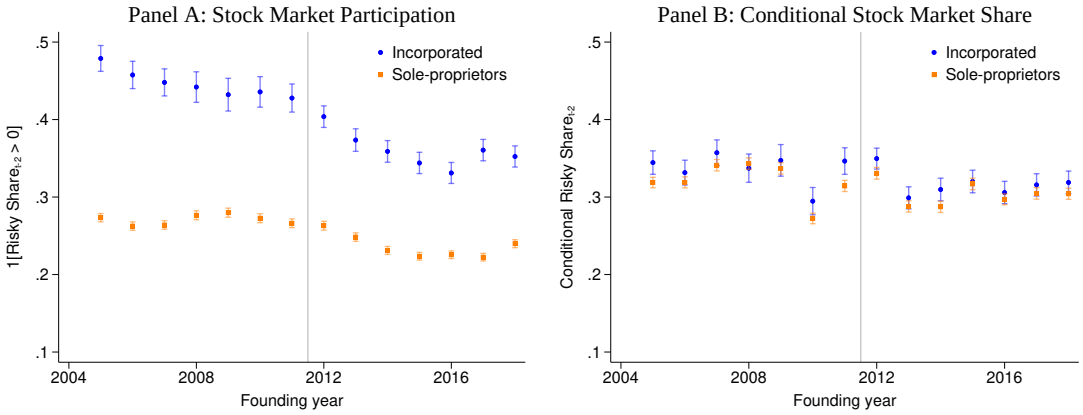
Notes: This figure provides comprehensive average tax rate (ATR) dynamics around the time of entry into incorporated entrepreneurship. The comprehensive ATR is the ratio of personal income and wealth taxes plus corporate taxes allocated via ownership links to comprehensive income. The blue circles consider pre-reform (2011) entrants and the green squares consider post-reform (2012) entrants. Point estimates stem from regressing comprehensive income on event-time (years since entry) fixed effects interacted with entry-year fixed effects. We then provide the estimated event-time fixed effects for the two different entry years (2011, 2011).

Figure OA.20: Characteristics of Entrants' Prior Employers



Notes: This figure plots the characteristics of new entrants' ex-ante employers. Panel A considers Profitability (operating income divided by assets). Panel B considers the value-added margin (operating income plus wage bill divided by revenues. Panel C considers the TFP proxy described in Appendix D.1. Panel D considers revenue growth from $t-4$ to $t-1$. These characteristics are all assigned using the main (highest-paying) employer of the entrepreneur as of the year prior to entry $(t-1)$. Profitability, the value-added margin, and revenue growth rates are all measured (at the firm level) at the start of the sample in 2006.

Figure OA.21: Portfolio Allocation of Pre- and Post-reform Entrepreneurs



Notes: This figure considers the portfolio allocation of entrepreneurs. We use the same approach as in Figure 5 for different left-hand-side variables. Panel A considers stock market participation. That is, whether an individual owns listed stocks or mutual funds. Panel B considers the conditional stock market share: the ratio of listed stocks plus mutual fund holdings divided by listed stocks, mutual fund holdings, deposits, and bond holdings, which is only defined for those who participate in the stock market. For both Panels A and B we measure the outcome variable two years prior to the founding date.

Table OA.1: Predictors of Firm Outcomes

Notes: This table provides the regression coefficients from regressing profitability, value-added margin, and revenues (in MNOK) on different individual characteristics. Sample sizes vary with the coverage of the right-hand-side variables. In columns (3), (6), and (9), where personal income in 2006 is a left-hand-side variable, the sample is restricted to observations after 2006. All regressions include year fixed effects and standard errors are clustered at the person (entrepreneur) level. Stars indicate significance at the 10%, 5%, and 1% levels.

	Profitability			VA Margin			Revenues		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Good Conduct Grade	0.0354**			0.0521*			-0.2373		
	(0.0169)			(0.0281)			(0.5135)		
Missed Classes		-0.0012***			-0.0011***			-0.0073**	
		(0.0002)			(0.0002)			(0.0035)	
Missed Days		-0.0009*			-0.0013**			0.0068	
		(0.0005)			(0.0006)			(0.0091)	
College			0.0040***			0.0409***			-1.4371***
			(0.0010)			(0.0017)			(0.0326)
log(income$_{2006}$)			0.0217***			0.0279***			0.8210***
			(0.0006)			(0.0010)			(0.0181)
Age			0.0002***			-0.0000			-0.0377***
			(0.0000)			(0.0001)			(0.0013)
N	23929	47092	1475386	18829	37288	1194363	24013	47358	1479768

D.1 Alternative productivity measure

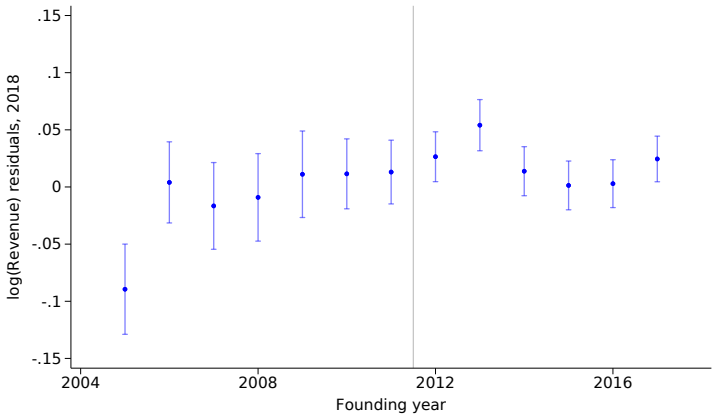
Following Lichtenberg and Siegel (1990), Bertrand and Mullainathan (2003), and Giroud and Mueller (2015), we use the residuals from regressions of log revenues on log inputs as a proxy for productivity. More formally, for each year and 3-digit NACE industry, we estimate

$$\begin{aligned} \log(\text{Revenues}_{f,t}) &= \beta_0 + \beta_1 \log(\text{Assets}_{f,t}) \\ &+ \beta_2 \log(\text{Wage bill}_{f,t}) \\ &+ \beta_3 \log(\text{Operating costs minus payroll tax, depr., and write-downs}_{f,t}) + \varepsilon_{f,t}, \end{aligned} \tag{20}$$

and use the estimated $\hat{\varepsilon}_{f,2018}$ as our productivity measure. To allow for zero-wage-bill firms, we shift the log-argument by an inflation-adjusted NOK 10,000.[15] All operating cost components are truncated below at zero. We residualize the productivity measure at the 1st and 99th percentile of the 2018 distribution. Note that the year fixed effects in the regression above does not produce a bias in favor of finding no differences in productivity because we consider revenue residuals as of 2018 and compare firms based on their incorporation year (not the year in which productivity is measured). Figure OA.22 reports our findings on how this proxy for productivity in 2018 varies with the year of incorporation.

[15] Inflation adjustment assumes a constant rate of inflation of 2%.

Figure OA.22: Firms' Ex-post Outcomes: Productivity Measured as a log(Revenue) Residual



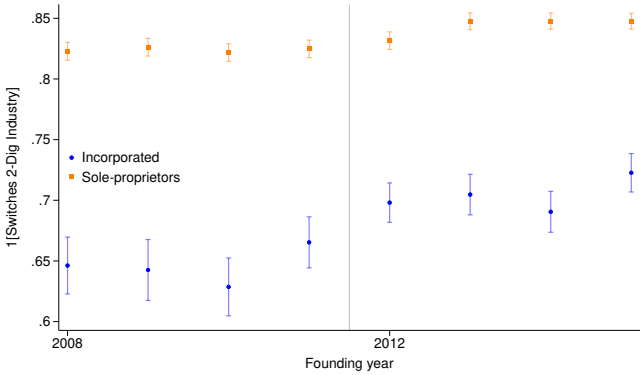
Notes: This figure considers the 2018 residuals from a regression of log revenues on the log of input factors as the dependent variable. See Appendix D.1 for details on constructing the productivity measure and the main- text and Figure 4 for further details on methodology.

E Industry-to-industry flows

We define industry switching to occur when the new business is registered with a different NACE industry code than the entrepreneur's prior $(t-1)$ employer. Figures OA.23 and OA.24 consider the propensity to switch two and three-digit NACE codes, respectively.

These exercises reveal quite high baseline switch rates of 65% to 70%. To validate the data, we therefore tabulate (2-digit NACE) industry-industry flows in Table OA.2. The modal entrant in 2012 enters in the same industry as their employer, and a large share of the switching is to closely related industries. One example is from "Construction of buildings" to "specialized construction activities." Hence, the high baseline switch rates do not imply that most entrepreneurs create businesses unrelated to their prior occupation.

Figure OA.23: Propensity to Switch Industries:
Whether Business is in Same Industry as Prior Employer



Notes: This figure considers the the propensity to switch industries. We consider 2-digit NACE codes, and see if the industry code of the employer at $t-1$ differs from the industry code of the business (either the incorporated firm or the sole-proprietorship). We only consider entry events after 2008 due to the implementation of a new NACE code system in 2008. We only consider entry events prior to 2015 due to the switch to a new employer-employee reporting system in 2014.

Table OA.2: Industry-to-Industry flows

Notes: We look at the number of entrants into given 2-digit NACE industry (rows) based on the 2-digit NACE code of their 2011 employer. We consider entry as of 2012. If there are < 10 entrants in a NACE-NACE cell, we report and count zero entries (only) or the purpose of this tabulation. We only consider source (rows) industries with at least 500 entrants.

	Constr. Bldngs	Spec. Cnstr	Wholes Trade	Retail Trade	Food, Bev	Empl Activ	Tot
Crop and animal production, hunting	58	77	36	35	0	13	219
Forestry and logging	22	26	13	0	0	0	61
Wearing apparel	0	0	0	11	0	0	11
Repair, installation of machinery	0	0	22	13	0	0	35
Construction of buildings	**337**	73	23	18	0	45	496
Specialised construction activities	162	**462**	55	46	0	67	792
Motor vehicles, trade and repair	0	11	21	22	12	0	66
Wholesale trade	0	13	**101**	50	15	0	179
Retail trade	13	35	77	**350**	31	44	550
Land transport, pipeline transport	0	20	19	30	0	31	100
Postal and courier activities	0	0	0	22	10	10	42
Food and beverage service act.	0	0	14	55	**109**	0	178
Motion picture, TV, music prod.	0	0	0	60	11	0	71
Computer programming, consultancy	0	17	46	76	0	44	183
Information service activities	0	0	0	11	0	0	11
Head offices, management consult.	0	0	50	45	0	25	120
Architecture, engineering act.	42	31	27	13	0	29	142
Advertising and market research	0	0	16	41	0	0	57
Other prof., scientific, techn. act.	13	20	58	204	47	54	396
Rental and leasing activities	0	14	12	0	0	0	26
Employment activities	0	0	0	0	0	**19**	19
Travel agency, tour operators	0	0	0	13	0	0	13
Buildings, landscape service act.	13	47	25	40	19	22	166
Business support activities	0	0	0	24	0	10	34
Education	0	16	40	123	28	28	235
Human health activities	0	0	20	60	16	17	113
Social work without accommodation	0	0	0	13	0	0	13
Arts and entertainment activities	12	54	46	252	79	49	492
Repair, personal, household goods	0	11	11	14	0	0	36
Other personal service activities	0	0	26	109	34	39	208
Total	672	927	758	1750	411	546	5064

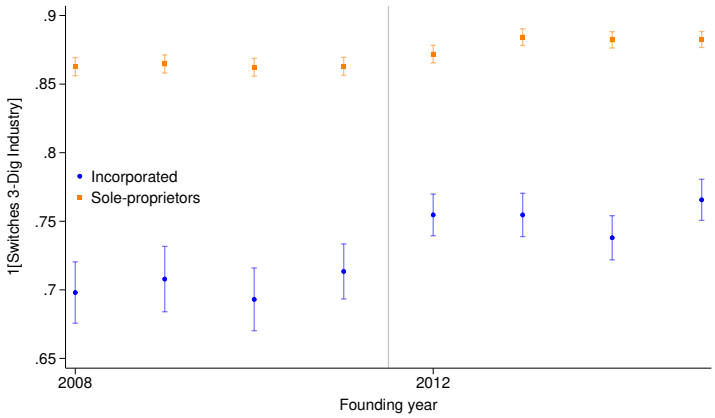
F Balance sheets at incorporation

Our analysis suggestes that the only difference between pre-reform entrants and post-reform entrants is a sizable reduction in firm size. To further investigate this reduction, we consider different types of assets and liabilities at time of incorporation. However, note that the assumption that always-entrepreneurs are unaffected by the reform is likely to fail in this case, especially for the liability side (see Section 4). Because of this caveat, we focus our discussion on the simple pre-post reform difference.

The results are reported in Table OA.3. Panel A considers the asset side of the balance sheet. Post-reform firms are smaller with regard to all types of assets. The largest difference occurs for property, plant, equipment, and vehicles, which explains 20% of the total difference.

Panel B considers the liability side of the balance sheet. Post-reform entrants have $18,000

Figure OA.24: Propensity to Switch 3-Digit NACE Industries: Whether Business is in Same Industry as Prior Employer



Notes: This figure considers the the propensity to switch industries. We consider 3-digit NACE codes, and see if the industry code of the employer at $t-1$ differs from the industry code of the business (either the incorporated firm or the sole-proprietorship). We only consider entry events after 2008 due to the implementation of a new NACE code system in 2008. We only consider entry events prior to 2015 due to the switch to a new employer-employee reporting system in 2014.

(NOK 110,000) less in paid in capital (PIC), with the statutory change of $9,000 being included in the 95% confidence interval. In addition, post-reform entrants have about $30,000 less in financial debt (banks/bonds and other). Dividing the difference in financial debt by the difference in PIC gives a sizable multiplier of 1.7.[16] We also observe a reduction in debt to affiliated parties, such as firms in the same conglomerate or equity holders. All in all, we find no evidence that the reduction in paid-in-capital is being counteracted by an increase in debt financing.

[16]Note that this multiplier is likely downward biased because many "always-entrepreneurs" may have wanted to choose a higher debt to equity ratio before 2012 but were only able to do so after the equity requirement was lowered in 2012.

Table OA.3: The Balance Sheets of Marginal Entrepreneurs at incorporation

Notes: This table provides estimates how the balance sheet of marginal entrepreneurs differs from that of always entrepreneurs: The first row contains the estimated coefficients from equation (6), the second row is the growth rate in incorporations in the sample where the outcome variable is observed, the third row provides the estimated ΔY_h, which is the main estimate. All variables are measured at the end of the year of incorporation. Intangible assets consists of R&D assets, patents, goodwill and similar. PPEV is plant, property, equipment, and vehicles. REI is real-estate investments, Subsid is equity and debt in subsidiaries or affiliated companies. FA Secur is unlisted and listed securities. AR is accounts payable. CA Secur consists of listed securities. Cash is cash and bank deposits. On the liability side, taxes consist of unpaid VAT and income tax liabilities. Bank/bonds consist of bonds, debt to banks and other traded debt securities. Affil consists of debt to affiliated or parent companies. Standard errors are obtained from a 200-repetition bootstrap procedure.

Panel A: Assets in year of incorporation, Million NOK

		Fixed Assets						Current Assets		
	Total	Intang	PPEV	REI	Subsid	Secur	Other	AR	Secur	Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbb{1}[s \geq 2012]$	-0.60***	-0.03***	-0.12***	-0.06***	-0.06**	-0.05***	-0.02	-0.10***	0.00	-0.09***
	(0.08)	(0.01)	(0.04)	(0.02)	(0.03)	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)
$\widehat{\Delta Y}$	-1.41***	-0.08***	-0.28***	-0.14***	-0.13**	-0.13***	-0.04	-0.25***	0.01	-0.20***
	(0.20)	(0.03)	(0.09)	(0.05)	(0.06)	(0.04)	(0.03)	(0.07)	(0.03)	(0.06)
N	20968	20968	20968	20968	20968	20968	20968	20968	20968	20968

Panel B: Liabilities in year of incorporation, Million NOK

		Equity		Debt					
	Total	Paid-in	Retained	Taxes	Banks/Bonds	Suppliers	Wages	Affil	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}[s \geq 2012]$	-0.60***	-0.11***	-0.04	-0.03***	-0.18***	-0.06***	-0.01**	-0.06***	-0.12***
	(0.08)	(0.03)	(0.03)	(0.01)	(0.00)	(0.02)	(0.03)	(0.02)	(0.03)
$\widehat{\Delta Y}$	-1.41***	-0.27***	-0.08	-0.06***	-0.43***	-0.15***	-0.02**	-0.15***	-0.29***
	(0.20)	(0.06)	(0.06)	(0.02)	(0.08)	(0.06)	(0.01)	(0.05)	(0.08)
N	20968	20968	20968	20968	20968	20968	20968	20968	20968