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Original Article

Delving into the Secular Stagnation Hypothesis: A Firm-Level Analysis of the Private Sector's Excess Savings in Advanced Economies

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We document a persistent increase in excess savings (defined as the difference between gross savings and capital formation) and a steady decline of gross capital formation in a sample of non-financial firms from developed countries. These patterns developed even before the financial breakdown of 2007 reinforcing the case for a secular stagnation hypothesis. They go along with a deleveraging process and a decrease in the share of operating assets in total assets. We discuss three possible explanations for this long-term behavior: financial constraints, operative volatility, and the weakening of business dynamism itself.
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INTRODUCTION

The pace of the global economic recovery in the aftermath of the financial crisis of 2007–2008 triggered debate over the current stage the role macroeconomic policy should play in order to ignite economic growth. One of the most conspicuous hypotheses in that discussion claims that the

developed economies have entered an era of "secular stagnation," a central feature of this being a persistent excess of aggregate savings over investment.

According to Summers (2014), advanced economies experienced various structural changes over the last decades which led to both a substantial increase in the tendency to save and a reduction in the tendency to invest. The equilibrium real interest rate has fallen consistently even into negative levels, preventing the effective real interest rate from reaching its equilibrium level. Given this impossibility to equate savings and investment by using the price channel, the savings–investment equilibrium tends to be the consequence of reducing the output level.

As a matter of fact, national accounts statistics reveal that an excess of gross savings over capital formation has shown up over the last decades in many developed economies, not only at the aggregate level, but within the non-financial corporate sector as well. As a number of recent studies claim (IMF, 2006, 2015; OECD, 2007, 2015), this spurt of corporate excess savings may result from several factors having a positive impact on earnings and a negative effect over investment. Besides, the lower propensity to pay dividends (Fama and French, 2001) also pushes in the same direction. This research also suggests that non-financial corporations used the excess savings (ES) mainly in three ways: financial deleveraging, cash accumulation, and mergers and acquisitions.

Adding to the significance of this ES, the increase in corporate liquidity stemming from it played a key role in the buildup of the financial instability which led to the banking disruption in 2007. Pozsar (2011) claims that such liquidity held by non-financial firms, and managed ultimately by institutional cash pools, provided a substantial source of demand for the assets created by the deregulated financial system. This demand was driven by two factors: on the one hand, the priority given by investment mandates for safety and liquidity of capital; on the other, the relative shortage of safe assets meeting such mandates, namely guaranteed bank deposits and US Treasuries (Krishnamurthy and Vissing-Jorgensen, 2010).

The need for a better understanding of corporate ES is all the more relevant given its tight connection to the sluggish economic growth in the advanced economies. On the one hand, the growing trend of corporate ES seems to have accelerated since 2008. Although housing investment fell particularly abruptly, business capital formation accounted for most of the decline immediately after 2008, having recovered only mildly ever since. The fragile corporate investment resumption after the crisis contrasts with increasing profits in most advanced economies, and buoyant equity markets in some of them. This apparent paradox is referred to as an "investment puzzle" by some observers (Furman, 2015), and it is often mentioned as the

main cause of the slow recovery in economic activity, employment, and even productivity.[1]

In spite of its growing relevance, there is no research directly exploring the longer-term pattern of corporate capital formation and excess savings at the firm level over the last few decades. This paper aims to fill that gap and contribute to the literature by analyzing the corporate ES using firm-level financial data for a sample of non-financial firms from 20 advanced economies over the period 1990–2014. We consider its long-term trajectory over the last decades to determine whether an upward trend can be found before and after the Great Recession and discuss what firm characteristics explain the ES observed in aggregate-level studies.

Using firm-level data becomes a valuable approach in order to determine whether this savings and investment pattern is widespread enough, or whether it is driven by a rather small number of large firms. It also helps identifying different patterns of savings and investment for firms in diverse industries, segments of size, profitability, etc. And finally, it allows investigating which firm-level factors (varying across firms) correlate with and thus help explain the increase in the ES.

We provide evidence for a broad-based, long-term trend of corporate ES growth, which lays the underpinnings for a further development of the secular stagnation hypothesis. Moreover, we show that this trend goes along with a protracted decline of capital expenditures and that both trends were present even before the Great Recession.

First, we show and formally test for the existence of a trend in the ES and its components (gross savings and capital formation), and consider how three applications of the ES (debt reduction, acquisitions, and liquidity accumulation) evolved over time. Second, we propose an explanation based on three factors. In particular, we seek to examine the role played by credit constraints, volatility in the business environment, and firm growth prospects in shaping the observed aggregate trend.

The analysis of firm-level data confirms the existence of an increasing trend of the ES for the total sample and for 9 of the 10 size deciles. This trend was accompanied by a decline in capital formation, a decrease in debt, and increases in both the share of non-operating and liquid assets.

The econometric results show that: (i) the ES is connected to financial constraints since financially constrained firms showed significantly higher ES

[1] Wall Street Journal, "What will it take for companies to unlock their cash hoards?" May 28, 2011, Financial Times, "Corporate Finance: Rivers of Riches," May 22, 2011. See also CNBC "Cash-Hoarding Companies Put Economy, Stock Rally at Risk," April 28, 2011, the New York Times, "Companies Still Hoarding Tons of Cash," September 17, 2010, the Economist, "Show us the money," July 1, 2010, Wall Street Journal, "Jittery Companies Stash Cash," November 3, 2009.

than other firms; (ii) the ES was significantly higher for companies operating in a more volatile environment; (iii) the ES was higher for firms with the weakest growth prospects; and (iv) the increase in ES and the fall of gross capital formation is robust to alternative specifications.

Notwithstanding the lack of specific research dealing with the corporate ES, it is worth acknowledging a number of studies which aim to explain the investment slump immediately after the financial breakdown of 2007/2008, and the capital formation drought since the end of the financial crisis in 2009.

As we discuss more extensively in our theoretical section, the impact of the credit collapse over firm investment has been addressed in several studies in the years following the banking crisis of 2007–2008. For instance, Campello *et al.* (2011b) survey over 1000 chief financial officers in order to assess the impact of the crisis for financially constrained firms on their corporate spending plans. They find that constrained firms planned sharper reductions in tech and capital expenditures, and employment. Moreover, Campello *et al.* (2011a) consider the influence of drawing on credit lines over firm investment during the financial crisis. They do not find a significant relation on average but a positive impact of credit lines surfaces for firms with high internal funding. On the other hand, some authors claim that the economic significance of this causal link between impaired access to financing and corporate investment remains negligible, while other channels drove most of the investment plunge during the year immediately following the crisis. Kahle and Stulz (2013), in effect, reveal how the demand and uncertainty shocks, which led to a contraction of credit demand during 2009, turned out to be more important sources of the investment shrinkage.

Regarding the factors that hold back capital expenditures since 2009, the IMF (2015) and OECD (2015) agree that capital formation deviated only slightly from what could be expected given the observed weakness of overall economic activity. As a consequence, the primary cause of the investment underperformance since 2009 boils down to demand shortage. In addition, evidence shows that financial constraints and policy uncertainty played a relevant role in hindering investment in some countries. Sectors relying more on external funding and those whose equity prices respond more to aggregate uncertainty have cut back further on investment. Similar conclusions are drawn in studies addressing the investment drought in specific European countries (IMF, 2014a, b, c).

Thus far, the literature has focused on the investment decline during and after the crisis, and turned to financial constraints, and demand and policy uncertainty shocks looking for the causes of this decline. In this paper, we aim to shed light on the longer-term, firm-level trajectory of the investment decline counterpart: the excess of corporate savings over capital formation.

Additionally, we intend to investigate which factors have contributed to its growing trend. While doing this, we concentrate on the causal effect of other long-standing and broadly extended changes in the economic performance of mature economies over the last decades: the rise of firm-level volatility and the weakening of business growth prospects.

The structure of the paper is as follows. "Data and Construction of Variables" section describes the database, defines the main variables of interest, and shows some basic descriptive statistics. In "Excess Savings and Its Applications Over the Last Two Decades" section, we statistically test for the existence of a trend in the ES and describe the time evolution of the ES, its components (gross savings and capital formation), and its main applications. "Existing Literature and Hypotheses Building" section provides a brief literature review that allows framing the analysis and identifying three main testable hypotheses regarding the factors which drive the growth of the ES. "Methodology" section gives a detailed description of the methodology by which these hypotheses are tested. The results are presented in "Results" section, and its implications are discussed in "Conclusions" section.

DATA AND CONSTRUCTION OF VARIABLES

We build a dataset on the basis of quarterly accounting data for a sample of publicly traded firms from 21 advanced economies from the OECD over the period 1990–2014. The countries covered in the database are: Australia, Austria, Belgium, Canada, Denmark, Spain, Estonia, Finland, France, Germany, Ireland, Italy, Japan, the Netherland, Norway, Poland, Portugal, Sweden, Switzerland, UK, and the USA We use the Compustat North America and Compustat Global databases.

Following a common approach in the financial literature, (Bates *et al.*, 2009; Custodio *et al.*, 2013), our database excludes banks, as well as financial and insurance firms. The selection of non-financial firms was based on the SIC codes, excluding SIC codes 6000 to 6999. Although common, using a sample of only publicly traded and comparatively large firms precludes our results from being extrapolated to the whole universe of firms operating in the corporate sector, since we cannot capture the behavior of small and medium enterprises, or private capital firms.

Countries that belong to the group of seven most advanced economies, commonly labeled G-7, prevail in the sample holding 83% of the observations. These countries are: Canada, France, Germany, Italy, Japan, UK, and USA. The US firms by themselves represent a 53% of the observations of the whole sample. This sample concentration in a few countries entails the risk of

selection bias. As we discuss more abundantly in what follows, robustness checks are performed in order to address this potential source of sample bias.

A discussion of the sample composition in terms of survival of the firms is needed in order to address concerns of possible survivorship bias. Our sample contains active as well as inactive firms; for instance, 30% of the firms considered became inactive before 2004, but observations corresponding to their active period remain in the database. Similarly, 40% of the firms became inactive before 2007. Therefore, our results are not driven by firms surviving at the end of the sample period only. Nonetheless, so as to control for possible survivorship bias in our results, we replicate all the empirical exercises in subsamples of firms defined according to their last appearance in the sample: those becoming inactive before 2004, those which became inactive before 2007, and those which became inactive after 2007 or continued in activity until the end of the sample period. The main results of the article hold true in every subsample.

Table 1 shows the definition of each variable of interest, on the basis of the accounting data available in the database. First, we compute the gross savings and gross capital formation separately. We then estimate the ES variable by subtracting the gross capital formation from the gross savings for a given firm in a period t. We complete this first approach to the ES trajectory in the sample by examining the balance sheet structure in order to keep track of the evolution of three of the ES' uses: the demand for liquid assets, the deleveraging process, and the accumulation of assets not directly involved in the firm operating activities, which we denominate non-operating assets and define as those non-current assets other than fixed assets.

We compute gross savings as net income plus depreciation and minus the cash dividends paid. The accounting literature identifies sources of accruals which explain the difference between reported net income and effective cash flows. However, even when we intend to depart from the reported net income, we aim to obtain a firm-level equivalent of the gross savings definition in national accounts for the aggregate, national level. In fact, OECD defines gross savings as undistributed profits plus fixed capital consumption

Table 1: Definition of variables

Variable	Definition
Gross savings	(Net income + depreciation − cash dividends)/total assets
Gross capital formation	(Fixed capital expenditures + Δcurrent assets net of cash)/total assets
Excess savings	Gross savings – gross capital formation
Leverage	Total liabilities/total assets
Liquidity holdings	Cash and short-term investments/total assets
Acquisitions	Non-current assets – property, plant, and equipment/total assets

Table 2: Descriptive statistics

	Mean	SD	p25	p50	p75	Observations
Total sample						
Gross savings	0.063	0.697	0.024	0.046	0.081	565,843
Excess savings	0.024	0.343	−0.010	0.017	0.051	484,396
Gross capital formation	0.037	0.063	0.007	0.029	0.065	591,741
Leverage	0.512	0.247	0.332	0.519	0.674	716,626
Liquidity holding	0.146	0.184	0.022	0.075	0.195	708,483
Acquisitions	0.209	0.197	0.057	0.148	0.305	695,086

Number of observations are firm-year observations. p25, p50, and p75 represent the 25, 50 (median), and 75 percentiles of the distribution. Variable definitions are provided in Table 1.

Table 3: Number of firms by country

Year	Firms	Perc. of total
Australia	1316	5.52
Austria	69	0.29
Belgium	104	0.44
Canada	2181	9.14
Czech Republic	208	0.87
Denmark	122	0.51
Finland	131	0.55
France	632	2.65
Germany	653	2.74
Greece	227	0.95
Ireland	64	0.27
Italy	264	1.11
Japan	3798	15.92
Netherland	155	0.65
Norway	214	0.90
Poland	426	1.79
Portugal	51	0.21
Spain	110	0.46
Sweden	402	1.68
United Kingdom	1537	6.44
USA	11,196	46.92
Total	23,860	100

The number of firms reporting non-missing excess savings by country.

(OECD, 2007, p. 13). When relevant, in what follows we discuss the implications of such a methodological choice.

Table 2 provides descriptive statistics of the main variables, for the whole sample, for each of the G-7 countries, and for the rest of the countries as a whole, presenting the mean, median, 25th and 75th percentiles, standard deviation, and number of observations (firm years) of each of the six variables listed above. Table 3, meanwhile, shows the number of firms reporting ES by country.

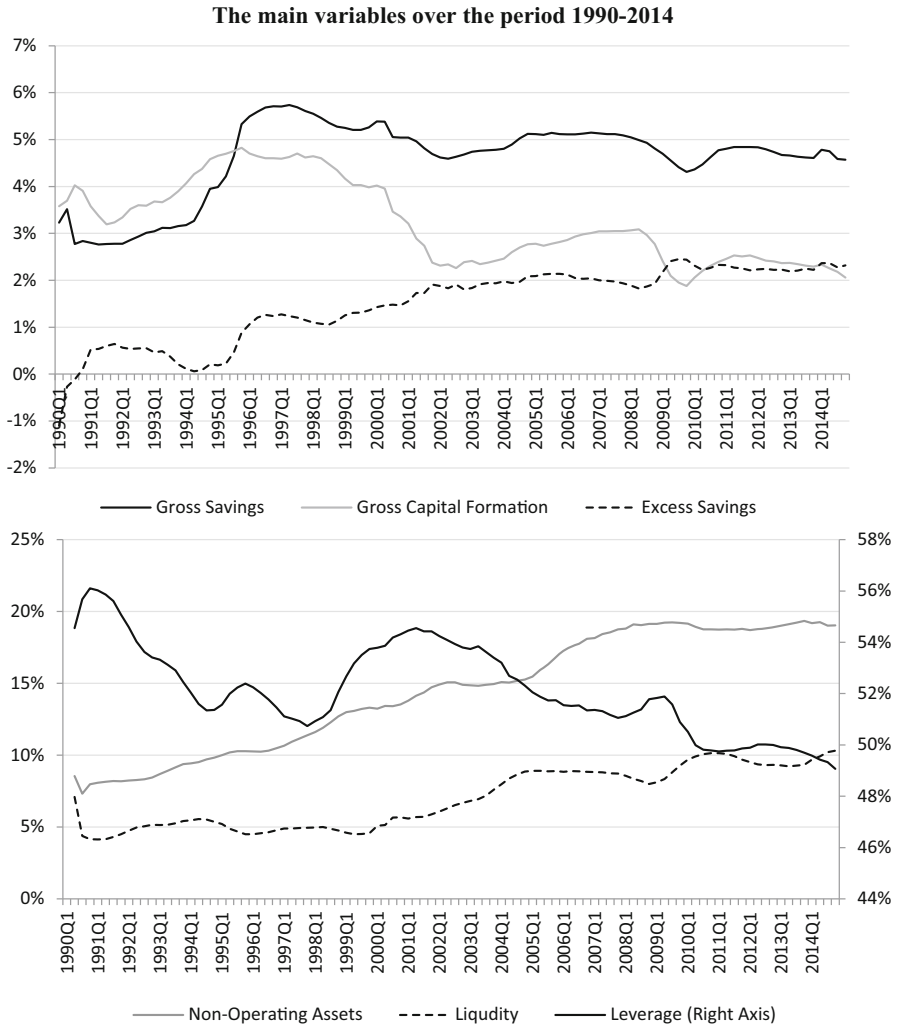

Figure 1: The 4-quarter moving average sample median of excess savings, gross savings, gross capital formation, non-operating assets, leverage, and liquidity holdings, over the period 1990–2014, for the whole sample of non-financial firms

EXCESS SAVINGS AND ITS APPLICATIONS OVER THE LAST TWO DECADES

Figure 1 illustrates the evolution of the variables of interest in our sample over the period going from 1990 to 2014. The time series of these variables are shown in two different panels. Panel A displays the 4 quarters moving average

for the median of ES, GS, and GCF. Panel B, on the other hand, presents the 4 quarters moving average for the median value of the leverage, liquidity demand and share of non-operating long-term assets.

Panel A portrays the growing trend in ES for the full sample. ES increased steadily from almost trivial positive values at the beginning of the 1990s decade, up to a 2% of total assets during the last five years comprised in the sample period. Interestingly, for the whole sample, the median ES did not increased in the aftermath of the financial crisis, but its previous expansion ceased instead. The persistent increase in ES seems to arise from the upsurge of the gross savings, which concentrated in the middle years of the 1990s, and the investment gradual weakening which occurred predominantly in the last half of that decade. Overall, our sample exhibits the very same trends as those found in national accounts data (IMF, 2006; OECD, 2007), suggesting that our sample is representative of the aggregate behavior.

Meanwhile, Panel B illustrates the changes in the balance sheet (stock variables) which occurred, while the ES (flow variable) increased. First, the companies in the sample experienced a steady fall in their indebtedness, which declined almost 7 percentage points of total assets over the period. This can be explained by the higher availability of internal funds from the ES. In addition, the recurrence of financial crises during the sample period might have shifted the corporate sector preferences toward internal funds and away from external sources of financing. Our firm-level data thereby confirm the findings of previous studies based on national accounting data that identify the reduction in firms' indebtedness as one of the main uses of the ES (IMF, 2006).

Firms also dramatically changed the composition of their assets held. From Figure 1, it can be observed that the proportion of long-term non-operating assets, which includes holdings in affiliated companies and other similar investments, increased consistently from 8 to 18%. Liquidity holdings, as a profuse literature has documented, also doubled in the last fifteen years, going from less than 5–10%.

In order to confirm the existence of the time trend of ES illustrated in Figure 1, we present an econometric exercise. We regress the ES on time in a panel model with firm fixed effects, for the entire sample, and for each size decile, based on total assets. We control for the effects that business cycle and long-term economic growth may have on these trends, by including as exogenous variable the percentage change of gross value added at the country level. Size deciles are built on the basis of the each firm's size of total assets, averaged over the whole period over which it appears in the sample. Thereby, firms with the lowest (highest) average total assets size over the whole period will belong to the first (last) size decile.

Table 4 (Panel A) shows the results and confirms that there is a positive trend in the ES for the whole sample and for 9 out of the 10 size deciles. The time coefficient implies that the ES grew 0.028 percentage points (PP) every quarter, mounting to a 2.68 PP increase all through the sample time interval. Panels B and C show the same model as in Panel A, using capital formation and gross saving as dependent variables instead. Panels B and C provide a first hint as to the primary causes of the positive trend in ES. Whereas there is no homogeneous trend in gross saving across size deciles (the trend coefficient is negative and significant for six size deciles and positive only for the bigger firms)[2], there is a significant negative trend in capital formation for the entire sample and for every size decile. Indeed, the typical firm virtually halved its capital expenditures, through a reduction of 2.70 PP all along the sample period. Therefore, from the results in Table 4 we can conclude that there is a positive trend in the ES, largely driven by a negative trend in gross capital formation.

In what follows we discuss a number of robustness checks for the results just described. Although these results are not included in the article, they can be requested to the authors. Thus far we have confirmed the existence of a positive trend of ES, and a persistent decline of GCF for a period which contains the six years following the financial crisis of 2007–8. These results may be biased by the well-known decrease of private investment in advanced economies over the last years. As a consequence, in order to consider the robustness of these trends in the period preceding the financial turmoil of 2007/8, we perform the same regressions but for the shorter period ending in 2006. Over this period, the statistical significance and widespread scope of the ES and GCF trends remain. In addition, a significant positive trend shows up for the GS.

We further investigate whether the ES rise holds if we split the sample in two groups of countries. The first group consists of firms from the G-7 economies, while the second consists of non-G7 developed economies included in the sample. The results shown in Table 4 hold true for both groups of countries, although we find that the rising ES seems to be a more evident and pervasive phenomenon for the most developed economies in the sample.

[2] Of all three components of gross savings, two of them (net income and dividends paid) performed similarly, describing neither a positive nor a negative statistically significant trend. Depreciation and amortizations, on the other hand, described a negative and statistically significant trend, although of a negligible economic significance (less than 0.002 percentage points quarterly). Thus, would we exclude the impact of the depreciations and dividends in the gross savings, we should find no considerable variation in the observed trends of excess savings.

Table 4: Trends of the excess savings, gross savings, and gross capital formation, by decile of size

Dependent variable	Whole sample	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5
Panel A: Excess savings						
Trend	0.000280***	0.000273	0.000239***	0.000351***	0.000369***	0.000287***
	(3.17e−05)	(0.000806)	(3.58e−05)	(3.34e−05)	(2.65e−05)	(2.88e−05)
Country GDP growth rate	−0.000125	−0.00189	−0.000669***	−0.000344***	−0.000735***	−0.000523***
	(8.95e−05)	(0.00314)	(0.000127)	(0.000109)	(8.98e−05)	(9.51e−05)
Constant	0.00607***	0.0426	0.0185***	0.00552**	0.00263	0.00577***
	(0.00224)	(0.0487)	(0.00234)	(0.00221)	(0.00180)	(0.00199)
Number of observations	438,248	20,805	35,665	38,329	40,526	42,318
R-squared	0.000	0.000	0.003	0.004	0.008	0.004
Number of firms	21,253	2,232	2,406	2,308	2,122	1,981
Panel B:Gross capital formation						
Trend	−0.000282***	−0.000115***	−0.000233***	−0.000271***	−0.000342***	−0.000323***
	(4.56e−06)	(2.92e−05)	(2.08e−05)	(1.94e−05)	(1.73e−05)	(1.56e−05)
Country GDP growth rate	0.000517***	0.000921***	0.00116***	0.000935***	0.00122***	0.00116***
	(1.53e−05)	(0.000135)	(8.99e−05)	(7.66e−05)	(6.97e−05)	(6.18e−05)
Constant	0.0521***	0.0296***	0.0430***	0.0486***	0.0558***	0.0564***
	(0.000295)	(0.00148)	(0.00121)	(0.00115)	(0.00106)	(0.000984)
Number of observations	540,756	39,976	51,228	51,781	51,659	52,783
R-squared	0.010	0.002	0.007	0.008	0.016	0.017
Number of firms	23,179	3,320	2,761	2,505	2,237	2,045
Panel C: Gross savings						
Trend	−5.18e−05*	−1.38e−05	−0.000278**	−3.57e−05	−7.53e−05***	−0.000121***
	(2.72e−05)	(0.000668)	(0.000137)	(2.49e−05)	(1.72e−05)	(2.10e−05)
Country GDP growth rate	0.000371***	−0.000754	0.000520	0.000579***	0.000408***	0.000562***
	(8.37e−05)	(0.00260)	(0.000491)	(8.43e−05)	(6.01e−05)	(7.25e−05)
Constant	0.0651***	0.107***	0.0857***	0.0659***	0.0682***	0.0712***
	(0.00189)	(0.0403)	(0.00895)	(0.00164)	(0.00115)	(0.00144)
Number of observations	511,423	24,397	41,207	44,635	47,603	49,249
R-squared	0.000	0.000	0.000	0.001	0.002	0.002
Number of firms	23,582	2,558	2,679	2,569	2,402	2,237

Table 4: (*Continued*)

Dependent variable	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
Panel A: Excess savings					
Trend	0.000401***	0.000260***	0.000255***	0.000230***	0.000165***
	(2.21e−05)	(2.03e−05)	(1.70e−05)	(1.26e−05)	(7.91e−06)
Country GDP growth rate	−0.000468***	−0.000594***	−0.000285***	7.34e−05**	0.000306***
	(7.79e−05)	(7.50e−05)	(5.92e−05)	(3.17e−05)	(1.53e−05)
Constant	−0.00450***	0.00516***	0.00537***	0.00483***	0.00718***
	(0.00154)	(0.00145)	(0.00125)	(0.000958)	(0.000617)
Number of observations	43,756	46,958	47,581	54,973	67,337
R-squared	0.010	0.006	0.006	0.006	0.012
Number of firms	1,802	1,653	1,640	2,262	2,847
Panel B:Gross capital formation					
Trend	−0.000382***	−0.000306***	−0.000321***	−0.000240***	−0.000152***
	(1.39e−05)	(1.18e−05)	(1.05e−05)	(8.83e−06)	(6.04e−06)
Country GDP growth rate	0.00103***	0.00111***	0.000770***	0.000194***	−5.31e−05***
	(5.76e−05)	(5.18e−05)	(4.32e−05)	(2.58e−05)	(1.22e−05)
Constant	0.0620***	0.0568***	0.0581***	0.0506***	0.0418***
	(0.000888)	(0.000785)	(0.000717)	(0.000641)	(0.000465)
Number of observations	53,134	55,377	55,036	60,695	69,087
R-squared	0.024	0.024	0.026	0.014	0.010
Number of firms	1,850	1,674	1,660	2,278	2,849
Panel C: Gross savings					
Trend	−4.49e−05***	−4.35e−05***	−4.96e−05***	4.24e−06	1.29e−05*
	(1.50e−05)	(1.66e−05)	(1.15e−05)	(8.60e−06)	(6.69e−06)
Country GDP growth rate	0.000504***	0.000578***	0.000479***	0.000314***	0.000267***
	(5.50e−05)	(6.51e−05)	(4.41e−05)	(2.50e−05)	(1.42e−05)
Constant	0.0640***	0.0630***	0.0628***	0.0538***	0.0486***
	(0.00103)	(0.00117)	(0.000822)	(0.000634)	(0.000511)
Number of observations	51,216	55,643	57,940	65,142	74,391

Table 4: (*Continued*)

Dependent variable	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
R-squared	0.002	0.002	0.003	0.003	0.005
Number of firms	2,034	1,883	1,858	2,413	2,949

Full sample period and before 2007. Firm fixed effects with a linear trend.

The linear trend of the main variables of interest (excess savings, gross capital formation, and gross savings) in a firm fixed effect model including a constant and the country GDP aimed at controlling for the macroeconomic growth. The results are presented for the whole sample and for every decile of size in each panel. Panels A, B, and C show the results of regressions for the whole sample period, 1990–2014. Standard deviations are reported between brackets.

*, **, *** Significance at the 10, 5, and 1%, respectively.

Finally, the sample bias is further explored by sequentially excluding from the sample firms from each of the G-7 countries. By doing this, we evaluate whether the results shown in Table 4 reflect events taking place predominantly in one of the countries with higher representation in our sample. The time coefficients remain positive and significant for the seven subsamples, suggesting that the ES increase observed in Table 4 is a widespread phenomenon affecting all advanced countries in the sample.

Summing up, in this section we provide evidence for the existence of a widespread positive trend of ES in the advanced economies' corporate sector over the last decades, which partly resulted from a consistent GCF decline. This long-term trend is also perceived for the period preceding the financial crisis of 2007–2008. The economic significance of this trend is evident too, with a typical firm reducing capital formation by 2.7 PP and increasing ES by 2.7 PP over the whole sample period.

EXISTING LITERATURE AND HYPOTHESES BUILDING

Why does a firm tend to generate ES? To the best of our knowledge, there is no theoretical model that specifically addresses the phenomenon of the ES in the corporate sector. However, there is a well-established finance literature related to corporate investment, free cash flow, and cash holdings that provides some insights as to the causes of the ES increase. Besides, a number of recent studies aimed at explaining the investment slump after the financial collapse of 2007/2008 offer a helpful perspective too. Following this literature, we identify three factors potentially pushing firms toward the generation of ES: (i) financial constraints, (ii) volatility of the operating environment, and (iii) worsening firm growth prospects.

The financial constraints effect

A vast literature in finance explores into the effects of impaired access to capital over firm financing decisions and capital expenditures. Since the seminal studies discussing the existence of financial constraints (Akerlof, 1970; Stiglitz and Weiss, 1981), the investment impact of these constraints was abundantly addressed at both the theoretical and the empirical level.

First, a number of studies claim that, as a result of financial constraints, a positive relation comes out between the internal flow of funds or other sources of internal liquidity, on the one hand, and capital expenditures, on the other (see Fazzari *et al.*, 1988; Kaplan and Zingales, 1997; Stein, 2003). However, it is also suggested that financially constrained firms should

systematically save a fraction of its cash flow to safeguard against future investment unable to be funded by external financing (Almeida *et al.*, 2004).

Likewise, following Myers and Majluf (1984) pecking-order theory, information asymmetries between managers and investors will encourage firms to stockpile a liquidity buffer whenever the flow of funds exceeds the cash requirements of investment opportunities arising in the same period. A firm may also find optimal to use the flow of funds to pay down debt in order to improve its balance sheets in case an investment opportunity arises that can be met by its debt capacity (Acharya *et al.*, 2007). This literature points to a positive effect of financial constraints over non-investment applications of corporate internal savings: liquidity holdings and financial deleveraging.

Consequently, a testable hypothesis stems from this literature regarding the causes of corporate ES: financial constraints generate ES. Thus, we should find that the ES is larger among financially constrained firms.

A strand of the finance literature has recently evaluated the effect of financial constraints over investment by considering the impact of the credit collapse in the years immediately following the banking crisis of 2007–2008. Consistent with a causal effect of a supply shock, Duchin *et al.* (2010) show that the decline in capital expenditures provoked by the subprime financial crisis is greatest for firms that have low cash reserves or high net short-term debt, are financially constrained, or operate in industries that depend on external finance. Similarly, Campello *et al.* (2011b) survey over 1000 chief financial officers in order to assess the impact of the crisis for financially constrained firms on their corporate spending plans. They find that constrained firms planned sharper reductions in tech and capital expenditures, and employment. Moreover, Campello *et al.* (2011a) consider the influence of drawing on credit lines over firm investment during the financial crisis. They do not find a significant relation on average but a positive impact of credit lines surfaces for firms with high internal funding.

On the other hand, some authors claim that the economic significance of this causal link between impaired access to financing and corporate investment remains negligible, while other channels drove most of the investment plunge during the year following the crisis. Kahle and Stulz (2013), in effect, reveal how the demand and uncertainty shocks, which led to a contraction of credit demand during 2009, turned out to be more important sources of the investment shrinkage.

The effects of volatility of the operating environment

Some finance literature has found a long-lasting increase in idiosyncratic return and firm fundamentals volatility, which substantially outpaces overall market volatility. Irvine and Pontiff (2008) show that the idiosyncratic return

volatility and volatility of fundamentals, like earnings, sales growth and cash flows, have increased at a high rate since the 1960s. Moreover, while the idiosyncratic return volatility has risen at a 6% per year, the earnings per share or flow of funds volatility increased at a much higher rate of 15/16% per year. According to these and other authors (Comin and Philippon, 2006), this firm-level volatility increase obeys mostly to more intense product market competition. Baker *et al.* (2015), on the other hand, document an increase in economic policy uncertainty beginning in the 1960s which may also be another source of firm-level performance volatility.

Leahy and Whited (1996) claim that most investment models do not provide an unambiguous prediction regarding the sign of the uncertainty's effect over investment. Nonetheless, a significant number of empirical studies find a negative correlation between firm-level volatility and investment. Leahy and Whited document a negative relation between idiosyncratic return volatility and firm investment. A negative effect of the subjective probability distribution of the future demand for products over firm investment is found in a sample of Italian manufacturing firms in Guiso and Parigi (1999). Finally, Ghosal and Loungani (2000) identify a deterring effect of price volatility over firm investment in markets with relatively low seller concentration.

Moreover, there are specific reasons to postulate that firm-level volatility increases ES. Bates *et al.* (2009) find that the increase in cash demand is significantly stronger in firms experiencing the greatest increase in idiosyncratic volatility (Bates *et al.*, 2009). According to Froot *et al.* (1993), firms' optimal risk management strategy in a context of financial frictions leads them to increase their hedging in the face of growing volatility, by using a series of forward contracts or other hedging instrument. In addition, firms' liquidity demand is also stimulated by the increase in macroeconomic uncertainty (Baum *et al.*, 2008). Summing up, we should find an increasing trend in the ES in firms facing a more volatile operating environment.

The effects of worsening firm growth prospects

A recent but rapidly growing literature documents a 30-year decline in a number of measures of business dynamism in the USA. On the basis of evidence from several datasets and methodologies, Decker *et al.* (2014) and Davis *et al.* (2007) argue that the rate of business startups, the role of dynamic young businesses, and the pace of employment dynamism in the US economy has fallen over recent decades, with this downward trend accelerating after 2000. Moreover, unlike the previous years, the post-2000 period shows a contraction of business dynamism for high-growth young firms (Decker *et al.*, 2016).

There are a number of reasons why this long-term pattern may be producing the observed ES growing trend. To begin with, theoretical

accelerator models imply that firms reduce investment in the face of vanishing sale opportunities, as formalized, for instance, by Jorgenson and Siebert (1968) and Chirinko (1993).The worsening business prospects generate low expected sales growth for existing firms, thus deterring firm capital formation. In effect, the recent empirical evidence confirms this by showing that the contraction of economic activity accounts for the bulk of the business investment contraction in the years following the financial crisis of 2007–2008 (IMF, 2015; OECD, 2015).

In addition, a causal link between poor growth prospects and the ES may be determined on a theoretical basis. As described by Jensen (1986, 1989), companies in mature and declining industries tend to have positive and large cash flow, but low growth and profitable investment opportunities. Unless management is wasting cash flow through unsound investment projects or paying out dividends, we should find that the ES is larger among low-growth firms.

This hypothesis is indirectly tested in the literature on corporate diversification. For instance, while looking for the determinants of leveraged buyouts Opler and Titman (1991) find that firms that initiate these deals combine low growth or investment opportunities in their original businesses and high cash flows. Meanwhile, Arikan and Stulz (2011) find evidence consistent with the idea that acquisitions by mature firms are induced by the depletion of internal growth opportunities.

Summing up, we have three not mutually exclusive hypotheses concerning the factors that drive the rise of the ES:

(i) Excess savings are generated by those firms facing financial constraints;
(ii) Excess savings are generated by firms going through a volatile operating environment;
(iii) Excess savings are caused by firms facing worsening growth prospects.

METHODOLOGY

The rest of the article is intended to test the extent to which these hypotheses explain the evolution of the ES from 1990 to 2014. In order to accomplish this, we estimate a fixed effects model, using alternatively ES and GCF as dependent variables and reverting them on a trend variable and indicators of financial constraints, volatility of the business environment, and growth prospects. This will allow us to determine whether the positive trend in the ES

remains positive and significant after controlling for firm characteristics, and whether these firm characteristics significantly explain the ES. By repeating the same set of regressions using GCF as a dependent variable, we intend to consider whether these factors affect companies' investment behavior, thus driving the ES. We therefore make an additional effort to link the empirical evidence coming from the investment literature to our main topic in this paper, the ES.

In order to deal with robustness concerns, we use several measures of financial constraints, growth prospects, and volatility of operating environment. Consequently, in a first step, we conduct separate tests of each of the three hypotheses by using a set of alternative measures of each of the potential causes. Secondly, we evaluate the joint impact of all three causes through the inclusion as exogenous variables in a regression of one measure of each of them.

Financial constraints are not directly observable, and this leads the empirical literature to rely on different observable firm characteristics in order to measure the magnitude of these constraints. Several studies have addressed these measurement issues leading to the production of a set of indicators, all of which involve specific measurement problems, which in turn pose warnings against drawing strong conclusions out of them. Farre-Mensa and Ljungqvist (2016), for instance, show that popular indices of financial constraints may turn out misleading when it comes to identifying financially constrained firms. In effect, they argue that seemingly constrained firms find no obstacles obtaining credit in the face of an exogenous increase in their demand for debt.

Having said that, in this paper we use three measures of financial constraints: (1) the Whited–Wu index; (2) the logarithm of total assets (with smaller firms facing more financial constraints); and (3) the square of the logarithm of total assets, to address a possible nonlinear relationship between firm size and financial constraints (Hadlock and Pierce, 2010). Nevertheless, the aforementioned caveats related to these measures should be taken into account when interpreting the results.

The Whited–Wu index is defined by the following equation, obtained by Whited and Wu (2006):

$$\begin{aligned} WW\ Index = & -0.091 * \frac{NCF}{TA} + 0.062 * dummy\ dividends \\ & + 0.021 * NonCurrent\ Liabilities \\ & - 0.044 * \log(TA) - 0.035 * Sales\ Growth\ Rate \end{aligned} \tag{1}$$

where *NCF/TA* represents the ratio of net cash flow to assets, *dummy dividends* is an indicator variable equal to one when the firm distributes dividends, and log(*AT*) represents the natural logarithm of total assets.

We expect the ES to relate positively with the Whited–Wu index and negatively with the logarithm of total assets and squared logarithm of total assets.

Volatility of the business environment is measured by the variation coefficient of four different variables: (1) net sales; (2) the ratio of net cash flow to sales; (3) sales growth rate; and (4) the return on assets. In all four cases, we compute the variation coefficient using a 5-year rolling window of the standard deviation and the mean of each variable. We expect these proxies of volatility to have positive signs when ES is the endogenous variable.

Finally, we used three different variables that measure growth opportunities: (1) net sales growth and (2) the ration of R&D expenditures to total assets, following Graham (2000) and Fama and French (2002). The coefficients of these growth indicators should be negative in case the growth opportunities affect ES in line with our hypothesis.

We also include a set of control variables that capture the effects of different firm's financial policies and of the macroeconomic environment. To begin with, following the financial flexibility literature (Denis, 2011) firms' financial management policy may affect the ES in specific periods when corporate cash ratios or capital structure differ from the firm's optimal or desired levels. Optimal levels may be thought of as targeted ratios of cash holdings or debt which in turn secure financial flexibility to the firm. As a result, when deviated from optimal levels (for instance, due to a liquidity shortfall or unpredicted cash needs), a given firm may decide to route internal savings toward the accumulation of liquid assets or the reduction in liabilities, thus affecting ES. In our econometrical model, the effects of these financial policies are captured by the lagged values of corporate leverage, short-term debt-to-assets ratio, and liquidity holdings to assets. We expect firms with relatively higher leverage and short-term debt to show higher ES, reflecting the need to use internal savings in order to reach lower, targeted levels of debt. Similarly, we expect the cash ratio to have a negative coefficient, reflecting the need of ES to accumulate more cash when this falls below optimal levels.

Additionally, macroeconomic conditions may have non-trivial effects over firm savings and investment, which may vary reflecting country specificities and over time. In fact, the IMF (2015) shows that a close connection exists between firm-level and aggregate investment. This and other recent empirical studies address the effects of macroeconomics conditions by controlling for variables such as recession or financial crises' dummies (IMF, 2015), and interest rates which operate as a key price determining both aggregate savings and investment (Chirinko, 1993; OECD, 2007). Consequently, we add two variables in order to control for the effects of macroeconomic conditions. First, in order to capture the effects of each country's level of economic activity, we

use an index of real GDP compiled by the OECD statistics. Second, we use central bank policy interest rates so as to capture the monetary policy stance.

The estimated models can be summarized by the following equation:

$$y = X\beta + \alpha z + \gamma t + u \tag{2}$$

where y is alternatively ES and GCF, X is a vector of control variables, z is a measure of either financial constraints, growth volatility, or growth as described above, and t is a trend variable. Our main focus of attention will be on the coefficients α and γ. γ will determine whether the trends identified in Table 4 are still present after controlling for firm characteristics. α will inform whether the ES and gross capital formation are explained by financial constraints, growth volatility, and growth.

Having discussed the individual relevance of each hypothesis, a second step consists of determining the joint impact of all three causes in the ES. We estimate the following two-way fixed effect model, including one measure of each of the three potential causes.

$$y = X\beta + a \times financial\ constraints + b \times Volatility + c \times Growth + u$$

where y is alternatively ES and GCF, X is a vector of control variables, and *financ.constraints*, *Volatility*, and *Growth* represent one measure of each of the potential causes of ES.

Table 5: Definition of variables included in the econometric models

Variable	Definition
Trend	Quarterly based measure of time
Firm size	Firm' size in period t is computed as the logarithm of total assets in period t
Squared firm size	Squared value of the logarithm of total assets in period t
WW index	Whited–Wu index, computed as shown in the text
Sales growth	Sales growth rate, computed as (net sales_t − net sales_{t-1})/net sales_{t-1}
R&D expenses	Ratio of R&D expenses to total assets
Cash-flow volatility	Five-quarter moving coefficient of variation of the ratio of net cash flow to net sales
Sales volatility	Five-quarter moving coefficient of variation of the ratio of net sales
Net income volatility	Five-quarter moving coefficient of variation of net income to net sales
ROA volatility	Five-quarter moving coefficient of variation of net income to total assets
L.Leverage	Lagged value of leverage
L.CLTA	Lagged value of the ratio of current liabilities to total assets
L.Liquidity demand	Lagged value of the ratio of cash and short-term assets to total assets
Country GDP growth rate	The country-level gross value added growth rate. Real, index. Source: OECD
Interest rate	The country-level central bank policy rate, percent per annum. Source: OECD

Table 5 summarizes and provides a definition of the variables included in the models tested in the next section.

RESULTS

Table 6 shows the effects of financial constraints on ES (Panel A) and on gross capital formation (Panel B). The first finding is that the ES is higher for financially constrained firms and that these results are robust to alternative measures of financial constraints: all three measures considered in Panel A point to this conclusion. This is consistent with our first hypothesis and with the empirical literature (Almeida *et al.*, 2004; and Acharya *et al.*, 2007), showing that constrained firms are more likely to allocate cash flows to uses other than capital formation in order to moderate the impact of financial constraints.

The second finding is that there is still a positive trend in ES, which remains even after controlling for financial constraints. The third finding is that we confirm the existence of a negative trend in the GCF (Panel B). Regarding the effect of financial constraints on GCF, the results in Panel B are mixed. For we find that gross capital formation was smaller among financial constrained firms in one specification (square logarithm of total assets), but the opposite is found in other specifications (Whited–Wu index, logarithm of total assets). That said, an extensive literature on financial constraints provides evidence of this deterring effect of financial constraints over firms' investment.

Overall, the empirical results seem to validate the first hypothesis postulated in "Existing Literature and Hypotheses Building" regarding the positive effect of financial constraints on ES. Nevertheless, the impact of financial constraints over firms' investment is not clear cut. As we claim above, problems arising from the measures of financial constraints may act as one of the causes of this ambiguity.[3]

The results display a considerable economic significance of the financial constraints effect over ES. In fact, taking the coefficient of the Whited–Wu index, an interquartile-range increase in the financial constraints index leads to an increase in 1.16 pp in the ES, which represents a 50% of the average ES in the sample. Correspondingly, an interquartile-range decrease in the logarithm of total assets produces an increase in the ES of 2 pp, a 100% of the average ES in the sample.

Table 7 shows the effects of the volatility of the operating environment on ES and on GCF (Panels A and B, respectively). The first result is that ES is

[3] Although the coefficients of our control variables are not reported in Table 6, they exhibit the expected results and may be requested from the authors.

Table 6: The effect of financial constraints on the trend of excess savings fixed effects model by firm

Independent variables	Panel A Dependent variable: excess savings			Panel B Dependent variable: gross capital formation		
Trend	0.000470*** (2.61e−05)	0.000434*** (2.29e−05)	0.000169*** (1.67e−05)	−0.000212*** (1.51e−05)	−0.000197*** (1.50e−05)	−8.19e−05*** (1.32e−05)
Firm size	−0.00930*** (0.000914)			0.00515*** (0.000458)		
Squared firm size		−0.000641*** (6.08e−05)			0.000373*** (3.60e−05)	
WW index			0.0694***			0.0379***
Constant	0.0565*** (0.00356)	0.0298*** (0.00203)	0.0392*** (0.00268)	−0.000617 (0.00289)	0.0139*** (0.00195)	0.0388*** (0.00247)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	277,499	277,499	266,029	249,061	249,061	236,930
R-squared	0.197	0.196	0.201	0.045	0.044	0.054
Number of firms	13,681	13,681	13,271	13,802	13,802	13,069

Each column of Table 6 reports the regression results corresponding to one measure of financial constraints. Our control variables are the country GDP growth rate, the country interest rate, and the variables controlling for firms financial policy: the lagged values of the ratio of total liabilities/total assets, the current liabilities/total assets ratio, and the cash and short-term investment/total assets ratio. Standard deviation robust to clustering by firm is reported between brackets.

*, **, *** Significance at the 10, 5, and 1% level, respectively.

Table 7: The effects of volatility on excess savings fixed effects model by firm

Independent variables	Panel A Dependent variable: excess savings				Panel B Dependent variable: gross capital formation			
Trend	0.000319*** (2.69e−05)	0.000307*** (2.70e−05)	0.000336*** (2.43e−05)	0.000265*** (2.32e−05)	−0.000179*** (1.59e−05)	−0.000173*** (1.56e−05)	−0.000201*** (1.64e−05)	−0.000155*** (1.76e−05)
Cash-flow volatility	1.23e−06*** (1.93e−07)				−1.43e−06*** (1.96e−07)			
Net income volatility		1.66e−07 (1.20e−07)				−2.88e−07*** (6.13e−08)		
Sales volatility			0.0257*** (0.00420)				−0.0223*** (0.00306)	
ROA volatility				4.69e−05** (2.31e−05)				−7.66e−06 (1.42e−05)
Constant	0.0208** (0.00961)	0.0179* (0.00914)	0.0178*** (0.00658)	0.0168*** (0.00425)	0.0146*** (0.00274)	0.0166*** (0.00266)	0.0117** (0.00550)	0.0105*** (0.00310)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	219,164	226,263	226,836	190,813	223,546	230,760	231,348	195,124
R-squared	0.192	0.180	0.177	0.215	0.053	0.052	0.049	0.051
Number of firms	11,756	12,219	12,300	9,671	12,016	12,481	12,564	9,940

Each column of Table 7 reports the regression results corresponding to one measure of volatility. Each column reports the coefficient estimates for the trend, our control variables, and the measure of volatility. Our control variables are the country GDP growth rate, the country interest rate, and the variables controlling for firms financial policy: the lagged values of the ratio of total liabilities/total assets (leverage), the current liabilities/total assets ratio, and the cash and short-term investment/total assets ratio. Standard deviation robust to clustering by firm is reported between brackets.

*, **, *** Significance at the 10, 5 and 1% level, respectively.

higher for more volatile firms, an outcome consistent with the theoretical discussion, and the evidence provided by studies like Leahy and Whited (1996), Ghosal and Loungani (2000), or Baum *et al.* (2008), which show a negative effect of firm-level volatility and uncertainty over investment, and a positive effect over cash demand. The robustness of this result is confirmed by the positive and statistically significant coefficient for three out of four measures of volatility.

The second result is that we find a positive trend in ES for the entire sample of firms even after controlling for operating environment volatility. Third, we confirm a negative trend in the GCF for the entire sample, since the time coefficients are negative and statistically significant in all four regressions in Panel B. Finally, there is evidence suggesting that firms that faced a more volatile environment had less GCF. In fact, two of the measures indicate a negative effect of operating environment volatility over firm GCF.

The economic weight of these effects is non-negligible. If we estimate the impact of an interquartile-range increase in net sales volatility, the ES grows by 0.33 pp, which amounts to 16.5% of the sample ES average. An interdecile range (from the 10th to 90th percentile) increase in net sales volatility produces a 25% increase in the sample ES average. Considering the long-term increase in firm-level volatility documented by Irvine and Pontiff (2008), at an annual rate of over 15%, this effect results in a considerable source of corporate ES rise.

Table 8 shows the effect of the growth opportunities on ES (Panel A) and on GCF (Panel B). First, we find that the ES was higher for low-growth firms and that this result remains either whether we consider the sales growth rate or the R&D expenditures as a measure of growth opportunities. This confirms our second hypothesis and is consistent with other evidence pointing to the accelerator effect over firm investment and the impact of deteriorating growth prospects over free cash flow.

Second, there remains a positive trend in ES after we control for growth prospects. Third, again a negative trend arises in the GCF which looks like those found in the previous GCF models. This hypothesis turns out economically relevant too, since an interquartile increase in the sales growth rate produces an growth of 0.5 pp in the ES, or a 25% of the sample ES average.

Having tested all three hypotheses separately, we go on building a complete model which allows performing a joint evaluation of all of them. Panel A of Table 8 shows the results of several model specifications in which we regress ES on measures of financial constraints, growth prospects, and operative volatility. First, we use the logarithm of total assets as a proxy of financial constraints, the sales growth rate as a measure of growth prospects,

Table 8: The effects of growth on excess savings fixed effects model by firm

Independent variables	Panel A Dependent variable: excess savings		Panel B Dependent variable: gross capital formation	
Trend	0.000325***	0.000489***	−0.000195***	−0.000258***
	(2.57e−05)	(7.18e−05)	(1.57e−05)	(2.78e−05)
Sales growth rate	−0.00279***		0.00466***	
	(0.000357)		(0.000526)	
R&D expenditures		−0.210***		0.130***
		(0.0587)		(0.0386)
Constant	0.0215***	−0.00152	0.0134***	0.0309***
	(0.00733)	(0.0127)	(0.00378)	(0.00507)
Controls	Yes	Yes	Yes	Yes
Number of observations	231,791	78,593	236,994	78,612
R-squared	0.176	0.163	0.054	0.060
Number of firms	12,688	5,170	13,075	5,171

Each column of Table 8 reports the regression results corresponding to one measure of growth. Each column reports the coefficient estimates for the trend and one measure of growth. Our control variables are the country GDP growth rate, the country interest rate, and the variables controlling for firms financial policy: the lagged values of the ratio of total liabilities/total assets (leverage), the current liabilities/total assets ratio (CLTA), and the cash and short-term investment/total assets ratio. Standard deviation robust to clustering by firm is reported between brackets.

*, **, *** Significance at the 10, 5, and 1% level, respectively.

and the moving variation coefficient of net sales as a proxy of operative volatility. Column 1 of Table 9 offers a first look at the joint test of all three effects through a pooled OLS model, columns 2 and 3 show the results of a panel firm fixed effects and random effects in turn, while columns 4 and 5 display the results of two-way fixed effects models using year dummies or quarter dummies, respectively. Although not reported, we performed robustness checks for these results using the squared logarithm of total assets, the ratio of R&D expenditures to total assets, and the moving coefficient of variation of net cash flow, to account for the effects of financial constraints, growth prospects, and operative volatility. The coefficients' signs and the main conclusions hold.

Both panels show results consistent with the joint validity of our hypotheses. First, both the logarithm of total assets and its squared value show a negative and significant coefficient, confirming the expected effect of financial constraints over ES. Second, the sales growth rate and the R&D expenditures show statistically significant negative coefficients, pointing to a substantial effect of weakening growth prospects over the ES growth. Third, the effects of the moving variation coefficients of net sales and net cash flow result in positive and significant, showing the expected effect of firm-level

Table 9: Complete models – the effects of financial constraints, volatility, and growth prospects on excess savings fixed effects model by firm

Dependent variable: excess savings	Pooled OLS	FE	RE	Two-way-Qr
Trend	3.95e−05***	0.000321***	0.000274***	−5.54e−06
	(1.08e−05)	(2.73e−05)	(2.20e−05)	(0.000401)
Firm size	−0.00199***	−0.00880***	−0.00718***	−0.00884***
	(0.000136)	(0.00106)	(0.000769)	(0.00107)
Sales growth	−0.00134***	−0.00199***	−0.00181***	−0.00267***
	(0.000425)	(0.000409)	(0.000402)	(0.000533)
movcv_net_sales	0.0235***	0.0181***	0.0202***	0.0137***
	(0.00713)	(0.00486)	(0.00513)	(0.00499)
L.Leverage	−0.0124***	−0.0132***	−0.0106***	−0.0135***
	(0.00354)	(0.00203)	(0.00265)	(0.00205)
L.CLTA	0.0555***	0.0357**	0.0392***	0.0335**
	(0.00235)	(0.0155)	(0.0130)	(0.0156)
L.Liquidity demand	0.0488***	−0.0145***	−0.00542	−0.0171***
	(0.00272)	(0.00531)	(0.00385)	(0.00538)
Country GDP growth rate	−0.000553***	−0.000678***	−0.000661***	−0.000231**
	(3.57e−05)	(3.81e−05)	(3.66e−05)	(9.20e−05)
Interest rate	−0.00160***	−0.00149***	−0.00154***	−0.00129***
	(0.000107)	(0.000119)	(0.000117)	(0.000326)
Constant	−0.0362***	0.00827	−0.00349	0.0520
	(0.00321)	(0.0111)	(0.00843)	(0.0446)
Number of observations	226,713	226,713	226,713	226,713
R-squared	0.185	0.179		0.183
Number of firms		12,417	12,417	12,417

Each column of Table 9 reports the regression results corresponding to one specification of the model. Column 1 offers the results of a pooled OLS model, columns 2 and 3 show the results of a panel firm fixed effects and random effects models in turn, while column 4 displays the results of two-way fixed effects model using quarter dummies. Standard deviation robust to clustering by firm is reported between brackets.

*, **, *** Significance at the 10, 5, and 1% level, respectively.

volatility. Moreover, Table 9 shows that a growing ES trend still remains even after controlling for our explanatory variables.

A brief discussion of the limits of these results is in order. Specifically, as we discuss above, there are a number of caveats regarding the indicators of financial constraints which prevent us from drawing strong conclusions out of them. Second, the composition of the sample should also be taken into account: given that it comprises only public and comparably large firms, these results are not directly attributable to SMEs or private firms. Nevertheless, taken all the evidence together, these results point to the accuracy of all our three hypotheses concerning the effects of financial constraints, firm-level volatility, and growth prospects over the observed ES rise.

CONCLUSIONS

The fragile and erratic economic growth in developed countries over the last seven years has thrown the spotlight on a phenomenon that had gone overlooked in the prior years: the growing trend of excess savings. A number of contributions coming from the macroeconomics literature, more precisely, those advocating the secular stagnation hypothesis, postulate that the aggregate excess savings play a central part in shaping the current economic conditions. However, less attention has been paid to the accumulation of excess savings specifically within the corporate sector.

This paper contributes to the literature by analyzing the corporate ES in advanced economies, using firm-level financial data for a sample of non-financial firms. We document a broad-based, long-term trend of corporate ES growth, providing new underpinnings for a further development of the secular stagnation hypothesis. We show that this trend goes along with a protracted decline of firm capital expenditures and that both trends were present even before the Great Recession. We offer a first hint as to the economic significance of this trend, showing that a typical firm reduced capital formation by 2.7% points and increased ES by 2.75% points over the full sample period.

We discuss three possible explanations for the ES upsurge. First, financially constrained firms may be compelled to generate ES, in order to hedge against the possibility of facing future investment opportunities that cannot be met by external financing. Second, firms facing worsening growth prospects may produce ES as a result of large cash flow and/or declining investment opportunities. Finally, in an increasingly volatile operating environment, firms may generate ES as volatility deters capital formation and leads to an increase in cash and liquid assets demand.

Our empirical study confirms the validity and economic relevance of all three hypotheses. As a first step, we conduct a test for each hypothesis considered individually. We reveal that: (i) the ES is connected to financial constraint problems, for constrained firms show significantly higher ES than the rest of the firms; (ii) the ES was significantly higher for companies operating in a more volatile environment; and (iii) the ES was higher for those firms whose sales growth rate was lower and showed less business dynamism. We develop a robustness check for each hypothesis, by using a variety of measures for financial constraints, growth prospects, and firm-level operative volatility. Finally, the simultaneous tests conducted in the full models of Table 8 allow us to conclude that these effects remain even when they are examined in one joint regression.

An overall assessment of the evidence presented points to the secular nature of some of the causes of the corporate ES. As other studies have already confirmed, the increasingly weakened firm growth prospects and higher firm-level volatility represent two long-standing, widespread developments unfolding in advanced economies since the 1960s. We show that these changes contribute to increase the private sector ES and, by so doing, exert downward pressures to economic activity in developed countries.

In the aftermath of the financial crisis, thus far we have witnessed a sequence of macroeconomic policies implemented by the economic authorities failing to reinvigorate the private sector dynamism. Specifically, monetary authorities have turn to "unconventional" interventions such as near-zero or negative interest rates, and quantitative easing policy whose results in terms of private investment recovery fell well behind the expectations.

The fact that ES and the weakness of corporate investment result from deep-rooted developments poses a significant challenge to economic policy in the search of a bold economic recovery in those countries. It can be observed that for the private investment to recover and corporate excess savings to give place to a sustained recovery, these long-term issues may have to be specifically addressed.

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