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## Venture Capital and the Transformation of Private R&D for Agriculture

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# Venture Capital and the Transformation of Private R&D for Agriculture

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## Introduction

- Innovation in the agricultural and food system has been fundamental for enabling global agriculture to feed the world's growing population.
- Venture capital (VC) investments in privately held startup companies that are intensively engaged in agricultural (R&D) has increased substantially in recent years.
  - There has been a notable emergence of startup seeking to develop new technologies in agriculture.
  - Investments increased from just tens of millions annually in the early 2000s to reportedly more than \$3 billion in 2017.
  - Most recently, VC investments may be as much as 20% of private R&D in the industry.

**This paper addresses the question of what has characterized the increase in the number of new agricultural technology startups and of VC investments in them.**

- We investigate whether recent changes in agricultural commodity prices and large exit events have shift venture capital investments toward startups in agriculture.

## Method

- First, we provide a through descriptive analysis of venture capital backed startups in agriculture using this unique dataset.
- Second, we estimate several fixed-effect investment equations seeking to **identify the effect of exit events ( $ee_t$ ) and agricultural prices ( $P_{gt}$ ) on venture capital investments in startups** following a simple model:

$$y_{jit} = \alpha + \beta_1 P_{gt-k} + \delta_1 ee_{t-k}^{m\&a} + \delta_2 ee_{t-k}^{ipo} + X_i \theta + X_j \mu + u_{jit}$$

where  $X_i$  and  $X_j$  are startups and investment control variables,  $u_{jit}$  is the random error term clustered at the startup level. We control for startups' location, age, and size, and for type of investment.

- This equation is also estimated for 11 industry categories from 1981 to 2018.

## Data

- Our dataset was built using information from three different sources: Crunchbase, PitchBook, and VentureSource (Fig. 1).
- The initial sample contains 13,910 observations of financial deals **and firm level data on 4,552 companies in more than 100 countries.**

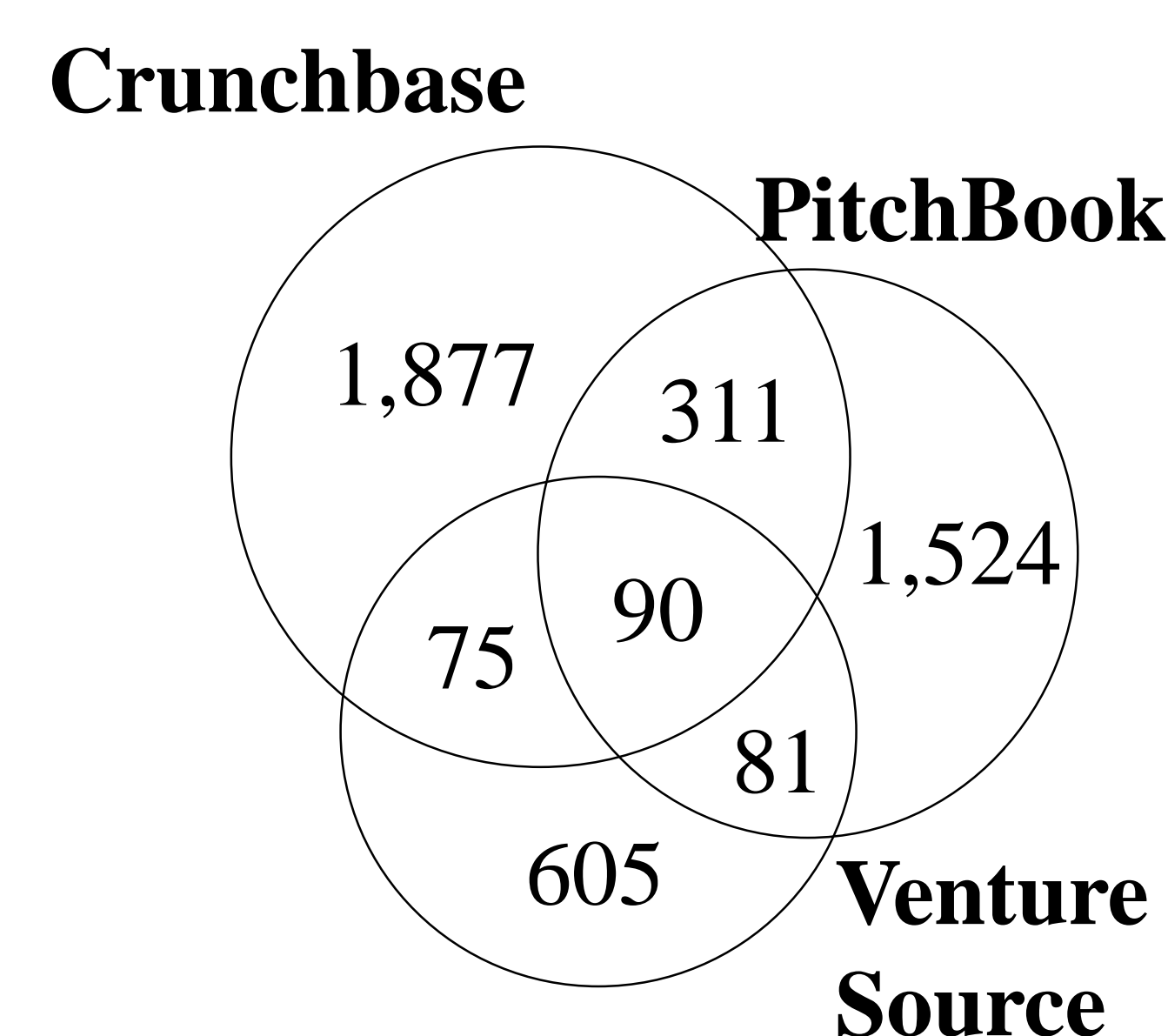


Figure 1. Startup data source

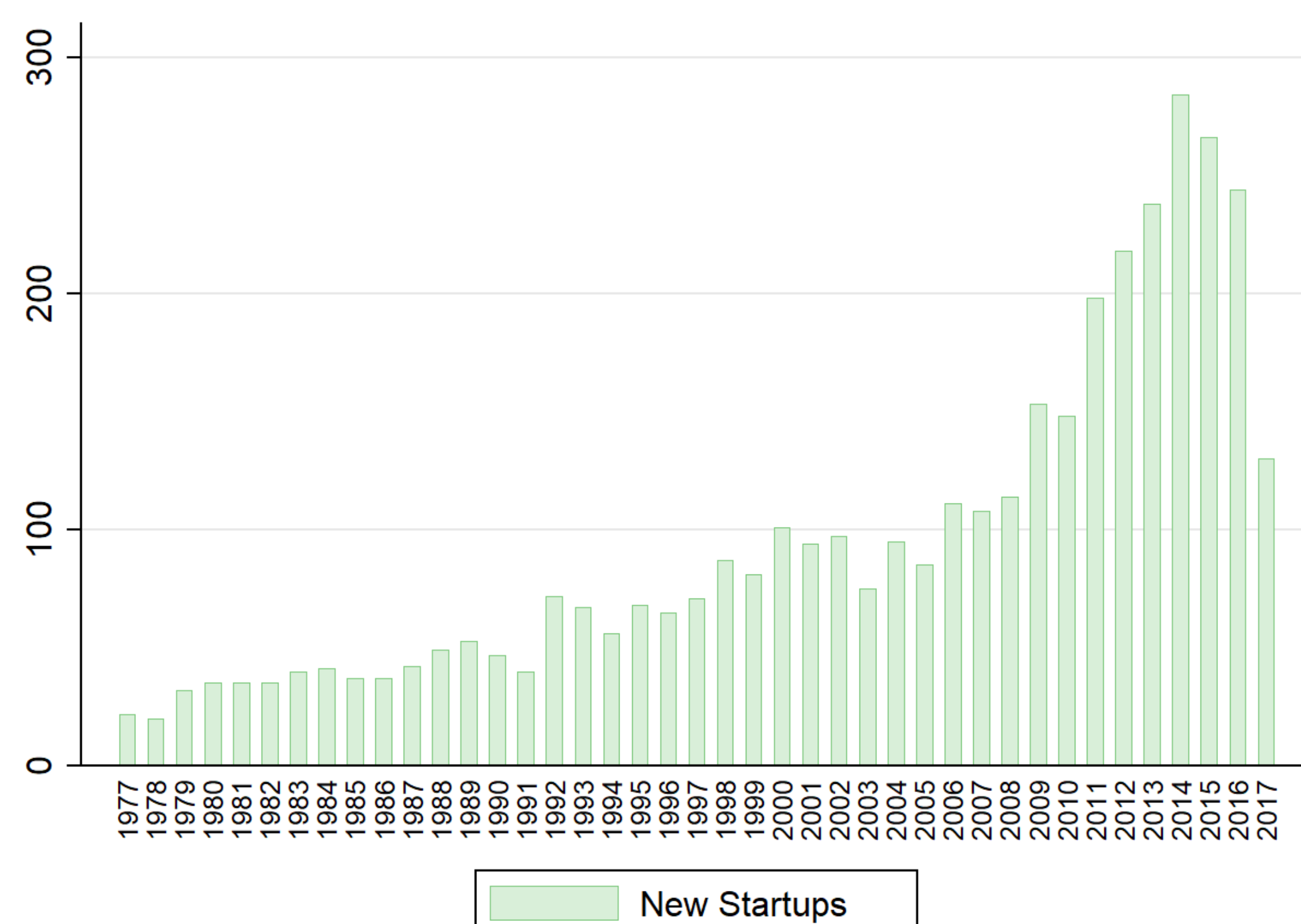


Figure 2. New Startups in the Agricultural industry

- Since 2008, the number of startups increased drastically (Figure 2).
- It raises the question *Why such a sharp increase on new startups and increase on demand for venture capital investments in the late 2000s?*
- In this paper we test whether changes in agricultural prices and large exit events by venture funded companies in this industry played a role.

## Results & Discussion

- Both investments (Figure 3) and exit events (Figure 4) increased in the late 2000s.
  - The number of exits increased a few years prior to the jump in investments.
- Our results suggest that agricultural prices affected investment amounts, both contemporaneously and lagged.
  - Large positive commodity price changes, such as those in 2010, increased investment in startups.
- We find that IPOs and M&As have had a positive effect on new investments.
  - IPOs have had a much stronger effect on investments (at both firm and industry level).

**Venture capital will likely continue to invest in startups, increasing the scope of technologies being pursued by private ag R&D.**

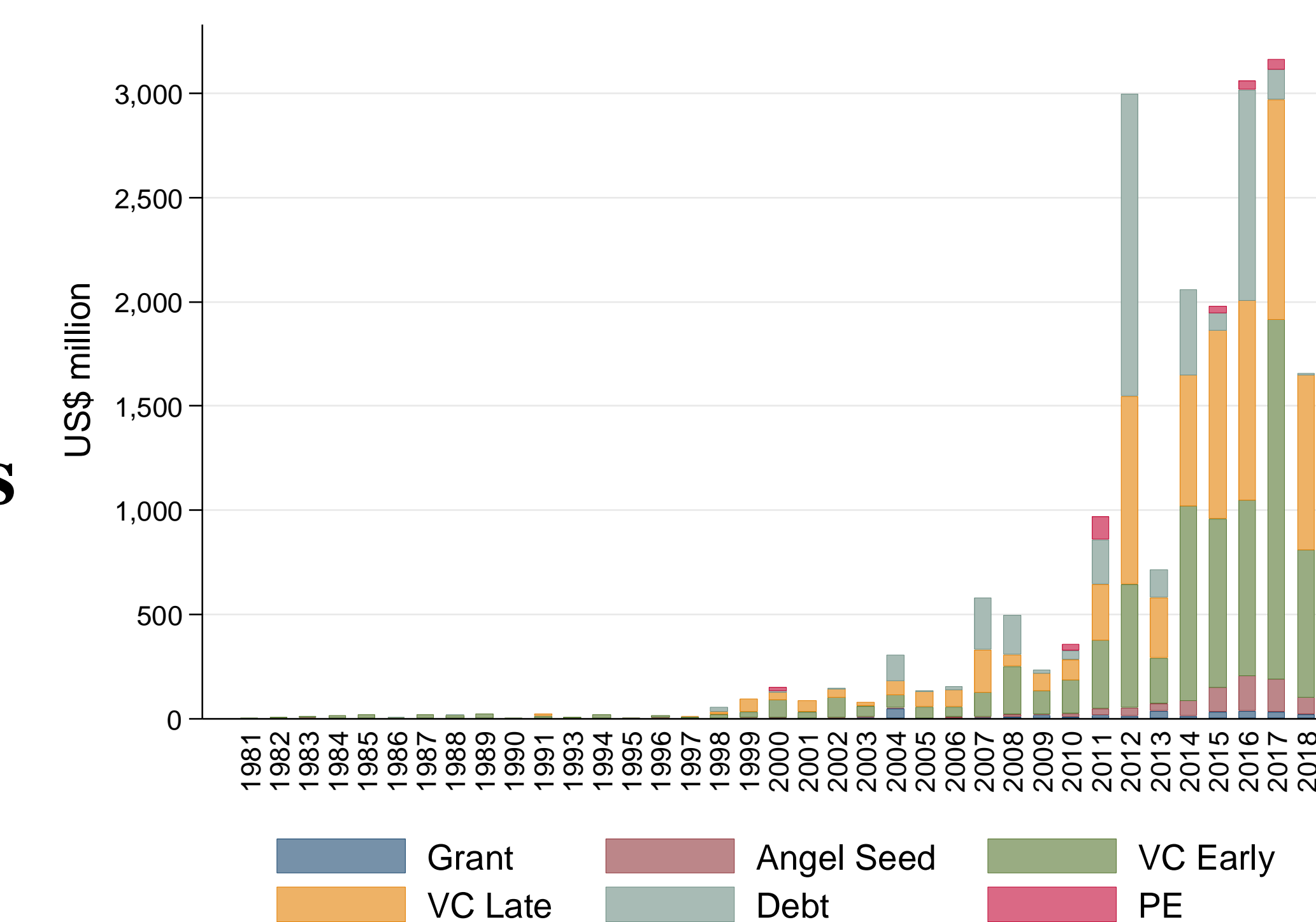


Figure 3. Investments In Agricultural Startups

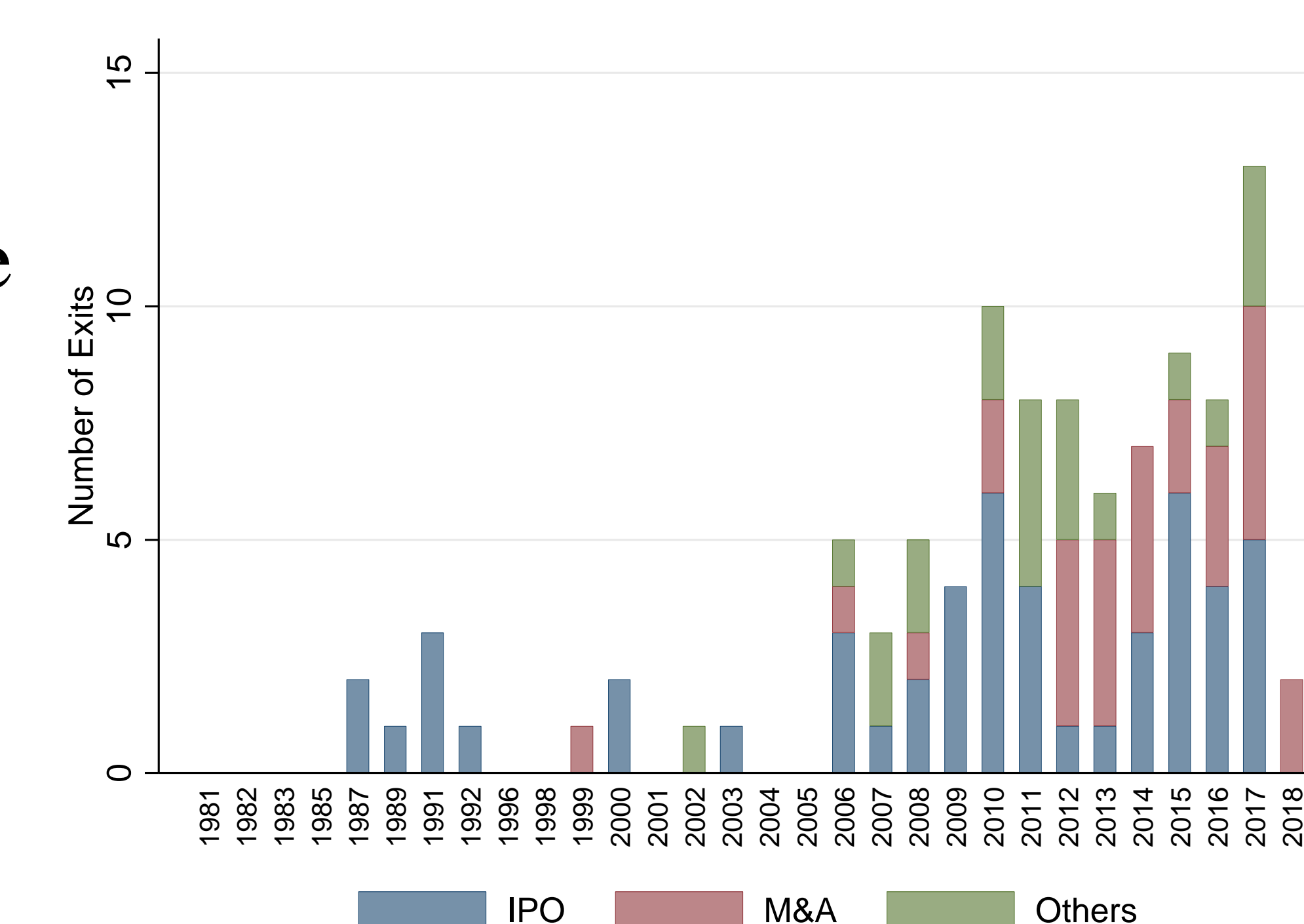


Figure 4. Exit events in Agricultural Startups