Participation Constraints in the Stock Market: Evidence from Unexpected Inheritance due to Sudden Death

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Joint with
Steffen Andersen, CBS

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Motivation

Standard financial models tell us
- All Households should hold stocks
  - Optimal fraction depends on risk aversion

Empirically it has long been observed that most households choose not to invest in stocks

Today, a majority of households still do not participate
- Italy: 8.2%
- France: 26.2%
- U.K.: 31.5%
- U.S.: 48.9%
- Guiso, Sapenza & Zingales [2008]
Motivation

Why so few invest in stocks?

» Entry and participation costs
  » Discourage participation whenever wealth is insufficient to cover the fixed cost
  » Haliassos and Bertaut [1995], Vissing-Jørgensen [2003]

» Behavioral and psychological barriers
  » Stock ownership is uncomfortable for some individuals
    » Ambiguity, gambling & loss aversion
    » Trust [Guiso, Sapienza, and Zingales, 2008]

» Limited knowledge about investment opportunities (social barriers)
  » Guiso and Jappelli [2005]
Motivation

The usual story
» Cross-sectional tests of participation
  » Wealth correlates with participation
    » Interpret as evidence of fixed objective costs
  » Education (length & type) correlates with participation
    » Interpret by some as evidence of fixed costs
    » Interpret by others as evidence of psychological barriers as education reduces the likelihood of making investment mistakes
  » Age correlates (negatively) with participation
    » Interpret as evidence of fixed costs

Our paper
» Examines the *casual effect* of entry and participation costs using a randomized experiment
Identification Strategy

Natures own Natural Experiment

» *Unexpected inheritance due to sudden deaths*
  » Gets at the *causality* from wealth to participation
    » Inherited wealth is unrelated to current economic and stock market conditions

» *Difference in differences* approach using a matched sample
  » The “Experimental” counterfactual
  » Matched on gender, age, education, income group and wealth group (some 200,000 combinations)
  » Takes care of
    » Individual heterogeneity such as ability
    » Expected changes over time

» “Shock” has to be *exogenous* (random) for this identification strategy to work: Sudden deaths are random!
Research Questions

» This paper is a first step towards separating the relative importance of fixed objective costs and psychological barriers

1. Evidence of fixed objective costs?
   – Can inherited wealth predict stock market entry and exit?
   – Characterization of fixed objective costs
     – One-time entry or ongoing participation costs?

2. How much can fixed objective costs explain?
   – How many individuals respond to windfall wealth?
     – Important for policy reasons …
   – How important is investment inertia and procrastination in explaining non-participation?
Data

- Death Certificates (WHO)
- Tax Authorities’ (Unfortunately knows everything)
- Health Records
- CPR (social security number)
- Educational variables
- Banks Stock Exchange
- CPR Register: Family Relations, Households, Legal Parents
Sample Selection

We have 402,000 deaths over 7 years

» Some 12,000 sudden household terminations
  » Using WHO’s ICD10 Classification system
    » Natural deaths
      » Heart attack and stroke
    » Unnatural deaths
      » Traffic accidents
      » Violence

» 19,127 relevant beneficiaries
  » Inheritance varies in size and composition…
    » We *exploit* that
Table I. Causes of household terminations, 1998-2004

<table>
<thead>
<tr>
<th>IDC10</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A00-Z98</td>
<td>10,104</td>
</tr>
</tbody>
</table>

B. Decedent’s cause of death

<table>
<thead>
<tr>
<th>Natural</th>
<th>A00-R99</th>
<th>9,525</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute myocardial infraction (a)</td>
<td>I22-I23</td>
<td>82</td>
</tr>
<tr>
<td>Cardiac arrest (b)</td>
<td>I46</td>
<td>54</td>
</tr>
<tr>
<td>Congestive heart failure (c)</td>
<td>I50</td>
<td>682</td>
</tr>
<tr>
<td>Stroke (d)</td>
<td>I60-I69</td>
<td>201</td>
</tr>
<tr>
<td>Sudden death by unknown cause (e)</td>
<td>R95-R97</td>
<td>76</td>
</tr>
<tr>
<td>Unnatural deaths</td>
<td>V00-Z98</td>
<td>579</td>
</tr>
<tr>
<td>Traffic accidents (f)</td>
<td>V00-V89</td>
<td>40</td>
</tr>
<tr>
<td>Other accidents and violence (g)</td>
<td>V90-V99</td>
<td>X00-X59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X86-X90</td>
</tr>
</tbody>
</table>

C. Sudden terminations (a+b+c+d+e+f+g) 1,347

| Average number of beneficiaries | 1.59 |
| Number of beneficiaries         | 2,136 |
| Terminations with single beneficiaries | 839 |

D. Both parent dies within the year 94

| Average number of beneficiaries | 1.72 |
| Number of beneficiaries         | 160  |
Empirical Results: Entry Decision

Table III, Difference-in-Difference Estimation

<table>
<thead>
<tr>
<th>Sample</th>
<th>Unexpected inheritance (1)</th>
<th>Matched (2)</th>
<th>Difference (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>After</td>
<td>0.101**</td>
<td>0.045***</td>
<td>0.056***</td>
</tr>
<tr>
<td>Difference</td>
<td>0.101**</td>
<td>0.045***</td>
<td>0.056***</td>
</tr>
</tbody>
</table>

N [15,064]
Empirical Results: Ongoing Participation Decision

Table III, Difference-in-Difference Estimation

<table>
<thead>
<tr>
<th>Sample</th>
<th>Unexpected inheritance</th>
<th>Matched</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Before</td>
<td>1.000</td>
<td>1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>After</td>
<td>0.915</td>
<td>0.911</td>
<td>0.005</td>
</tr>
<tr>
<td>Difference</td>
<td>-0.085 ***</td>
<td>-0.089 ***</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>N</td>
<td>[4,063]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Empirical Results: Principal finding #1

» Entry does increase
  » But only by 5.6%
  » Consistent with the existence of fixed costs

» Exit does not fall
  » Consistent with no ongoing participation cost

» **Disclaimer**
  » *Estimates are really confounded by individuals who inherit close to nothing!*
Empirical Results: 
Effect of Inherited Wealth

Table IV. Difference-in-differences estimation

<table>
<thead>
<tr>
<th>Inherited wealth decile</th>
<th>Mean inherited wealth (1000s)</th>
<th>Before (1)</th>
<th>After (2)</th>
<th>Difference (3)</th>
<th>Difference in Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Entry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>0</td>
<td>0.000</td>
<td>0.045</td>
<td>0.045***</td>
<td>0.013***</td>
</tr>
<tr>
<td>3</td>
<td>1.5</td>
<td>0.000</td>
<td>0.028</td>
<td>0.028***</td>
<td>-0.006</td>
</tr>
<tr>
<td>4</td>
<td>6.1</td>
<td>0.000</td>
<td>0.046</td>
<td>0.046***</td>
<td>0.010**</td>
</tr>
<tr>
<td>5</td>
<td>16.3</td>
<td>0.000</td>
<td>0.049</td>
<td>0.049***</td>
<td>0.005</td>
</tr>
<tr>
<td>6</td>
<td>43.3</td>
<td>0.000</td>
<td>0.084</td>
<td>0.084***</td>
<td>0.037***</td>
</tr>
<tr>
<td>7</td>
<td>104.7</td>
<td>0.000</td>
<td>0.099</td>
<td>0.099***</td>
<td>0.051***</td>
</tr>
<tr>
<td>8</td>
<td>205.4</td>
<td>0.000</td>
<td>0.144</td>
<td>0.144***</td>
<td>0.091***</td>
</tr>
<tr>
<td>9</td>
<td>384.5</td>
<td>0.000</td>
<td>0.198</td>
<td>0.198***</td>
<td>0.138***</td>
</tr>
<tr>
<td>10</td>
<td>1,221.5</td>
<td>0.000</td>
<td>0.272</td>
<td>0.272***</td>
<td>0.201***</td>
</tr>
<tr>
<td><strong>B. Continued participation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>2.4</td>
<td>1.000</td>
<td>0.877</td>
<td>-0.123***</td>
<td>-0.016</td>
</tr>
<tr>
<td>3</td>
<td>18.4</td>
<td>1.000</td>
<td>0.899</td>
<td>-0.101***</td>
<td>-0.006</td>
</tr>
<tr>
<td>4</td>
<td>52.1</td>
<td>1.000</td>
<td>0.921</td>
<td>-0.079***</td>
<td>0.018</td>
</tr>
<tr>
<td>5</td>
<td>110.5</td>
<td>1.000</td>
<td>0.894</td>
<td>-0.106***</td>
<td>-0.006</td>
</tr>
<tr>
<td>6</td>
<td>193.8</td>
<td>1.000</td>
<td>0.921</td>
<td>-0.079***</td>
<td>0.003</td>
</tr>
<tr>
<td>7</td>
<td>306.1</td>
<td>1.000</td>
<td>0.922</td>
<td>-0.078***</td>
<td>0.007</td>
</tr>
<tr>
<td>8</td>
<td>467.6</td>
<td>1.000</td>
<td>0.938</td>
<td>-0.062***</td>
<td>0.011</td>
</tr>
<tr>
<td>9</td>
<td>771.8</td>
<td>1.000</td>
<td>0.943</td>
<td>-0.057***</td>
<td>0.017**</td>
</tr>
<tr>
<td>10</td>
<td>2,630.8</td>
<td>1.000</td>
<td>0.961</td>
<td>-0.039***</td>
<td>0.033***</td>
</tr>
</tbody>
</table>
## Empirical Results: Effect of Inheritance Wealth

### Table V. Inherited wealth and stock market entry and continued participation

<table>
<thead>
<tr>
<th>Decision</th>
<th>Entry</th>
<th>Continued participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Inherited wealth</td>
<td>0.0998***</td>
<td>0.1839***</td>
</tr>
<tr>
<td></td>
<td>(0.0041)</td>
<td>(0.0066)</td>
</tr>
<tr>
<td>Inherited wealth squared</td>
<td>-0.0118***</td>
<td>-0.0004*</td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td>(0.0002)</td>
</tr>
<tr>
<td>Preference shifters</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>15,046</td>
<td>15,046</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.040</td>
<td>0.056</td>
</tr>
</tbody>
</table>
Empirical Results:
Principal finding #3

» The effect on entry and exit comes from receiving inherence
  » Marginal effect suggests that fixed objective costs is a second order effect

» Changes in demographics explains very little variation
  » Getting married, unemployed, retire & having children

» What characterizes the fixed entry costs?
  » One-time entry costs predict a stronger effect for younger individuals
  » Education should lower entry costs, but weaken the effect of inherited wealth on participation
  » Economists should have even lower entry costs
Empirical Results: Principal finding #5

» Education increases participation
  » Effect is decreasing in inherited wealth
  » A high school drop out with 10 years of education is likely to participate in
    » 7.3% of the cases if he inherits 100,000 DKR
    » 24.5% of the cases if he inherits 1 million DKR
  » An individual with a university degree and 17 years of schooling is likely to participate in
    » 10.5% of the cases if he inherits 100,000 DKR
    » 23.3% of the cases if he inherits 1 million DKR

» Financial education increases participation
  » Financial education has a higher impact than education in general
### Alternative Explanation: Investment Inertia

Table VII. The effect of investment inertia: Alternative event windows

<table>
<thead>
<tr>
<th>Decision</th>
<th>Entry</th>
<th>Continued participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Event window</td>
<td>(-1;+1)</td>
<td>(+1;+3)</td>
</tr>
<tr>
<td>Inherited wealth</td>
<td>0.1839*** (0.0066)</td>
<td>0.1053*** (0.0080)</td>
</tr>
<tr>
<td>Inherited wealth squared</td>
<td>-0.0118*** (0.0007)</td>
<td>-0.0059*** (0.0008)</td>
</tr>
<tr>
<td>Preference shifters</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>15,046</td>
<td>9,244</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.040</td>
<td>0.020</td>
</tr>
</tbody>
</table>
### Alternative Explanation: Procrastination

Table VIII. The effect of procrastination: Windfall cash versus windfall stocks

<table>
<thead>
<tr>
<th>Decision</th>
<th>Entry 1</th>
<th>Entry 2</th>
<th>Entry 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inherited wealth</td>
<td>0.1269***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0069)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inherited wealth squared</td>
<td>-0.0073***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inherited estate holds stocks (0/1)</td>
<td>0.1267***</td>
<td>0.1232***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0056)</td>
<td>(0.0056)</td>
<td></td>
</tr>
<tr>
<td>Inherited wealth excluding stocks</td>
<td>0.1588***</td>
<td>0.1153***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0073)</td>
<td>(0.0074)</td>
<td></td>
</tr>
<tr>
<td>Inherited wealth excluding stocks squared</td>
<td>-0.0100***</td>
<td>-0.0066***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td>(0.0078)</td>
<td></td>
</tr>
<tr>
<td>Value of inherited stocks</td>
<td>0.4026***</td>
<td>0.2366***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0302)</td>
<td>(0.0307)</td>
<td></td>
</tr>
<tr>
<td>Value of inherited stocks squared</td>
<td>-0.0267***</td>
<td>-0.0161***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0023)</td>
<td>(0.0023)</td>
<td></td>
</tr>
<tr>
<td>Preference shifters</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>15,064</td>
<td>15,064</td>
<td>15,064</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.088</td>
<td>0.061</td>
<td>0.089</td>
</tr>
</tbody>
</table>
**Interpretation:**
Stock are just uncomfortable for many household.

<table>
<thead>
<tr>
<th>Characteristics of beneficiaries</th>
<th>Horizon</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year</td>
<td>3 year</td>
<td>5 year</td>
</tr>
<tr>
<td><strong>A. All individuals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>0.101</td>
<td>0.131</td>
<td>0.155</td>
</tr>
<tr>
<td></td>
<td>[15,064]</td>
<td>[10,358]</td>
<td>[5,806]</td>
</tr>
<tr>
<td>Young (aged 18-40)</td>
<td>0.090</td>
<td>0.117</td>
<td>0.138</td>
</tr>
<tr>
<td></td>
<td>[6,996]</td>
<td>[5,197]</td>
<td>[3,161]</td>
</tr>
<tr>
<td>University degree</td>
<td>0.147</td>
<td>0.202</td>
<td>0.224</td>
</tr>
<tr>
<td></td>
<td>[2,629]</td>
<td>[1,757]</td>
<td>[958]</td>
</tr>
<tr>
<td>Financial literate</td>
<td>0.224</td>
<td>0.287</td>
<td>0.410</td>
</tr>
<tr>
<td></td>
<td>[281]</td>
<td>[202]</td>
<td>[117]</td>
</tr>
<tr>
<td><strong>B. Individual with windfall wealth &gt; 745,000 DKR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>0.313</td>
<td>0.406</td>
<td>0.397</td>
</tr>
<tr>
<td></td>
<td>[965]</td>
<td>[530]</td>
<td>[257]</td>
</tr>
<tr>
<td>Young (aged 18-40)</td>
<td>0.391</td>
<td>0.520</td>
<td>0.526</td>
</tr>
<tr>
<td></td>
<td>[225]</td>
<td>[146]</td>
<td>[76]</td>
</tr>
<tr>
<td>University degree</td>
<td>0.326</td>
<td>0.480</td>
<td>0.488</td>
</tr>
<tr>
<td></td>
<td>[350]</td>
<td>[179]</td>
<td>[84]</td>
</tr>
<tr>
<td>Financial literate</td>
<td>0.395</td>
<td>0.522</td>
<td>0.583</td>
</tr>
<tr>
<td></td>
<td>[38]</td>
<td>[23]</td>
<td>[12]</td>
</tr>
</tbody>
</table>
Robustness: Ensuring Exogeneity

- Accidents: Sudden and completely unanticipated
- Both parents within same year: More unanticipated
- No siblings: No sibling infighting over estate
- Household aggregations: Who invest?

<table>
<thead>
<tr>
<th>Decision</th>
<th>Entry</th>
<th>Continued Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Accidents</td>
<td>(2) Both parents</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
<td></td>
</tr>
<tr>
<td>Inherited wealth</td>
<td>0.2256***</td>
<td>0.1416***</td>
</tr>
<tr>
<td></td>
<td>(0.0164)</td>
<td>(0.0203)</td>
</tr>
<tr>
<td>Inherited wealth squared</td>
<td>-0.0153***</td>
<td>-0.0078***</td>
</tr>
<tr>
<td></td>
<td>(0.0016)</td>
<td>(0.0015)</td>
</tr>
<tr>
<td>Preference shifters</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed-effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>2,865</td>
<td>1,116</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.076</td>
<td>0.059</td>
</tr>
</tbody>
</table>
Conclusion

» We have shown the causal impact of fixed and ongoing participation cost on participation.
  » But objective costs do not explain very much

» Modest reaction not explained by
  » Investment inertia and procrastination

» Overall, we provide evidence that objective costs are an second order effect in explaining participation
  » Non-participation for many households is likely to be explained by behavioral and psychological barriers
    » Gambling aversion
    » Lack of trust in financial institutions

» In future research it will be interesting to understand whether one can promote stock ownership through financial education