# Early Life Determinants of Cognitive Ability: A Comparative Study on Madagascar and Senegal

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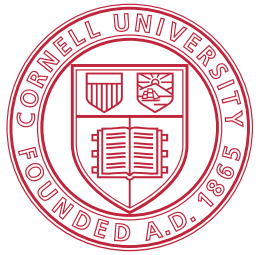


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# Motivation

- Early life human capital (ability) is strongly related to later life success (Cunningham & Stanovich 1997; Feinstein 2003; Bourne et al. 2006; Duncan et al. 2007, Todd & Wolpin 2003, 2007; Heckman 2007; Cunha et al. 2010).
- Evidence mostly comes from developed countries
- In developing country setting long-term data is scarce (Behrman et al. 2008, Young Lives)
- Health in childhood is also an important determinant: can be proxied by adult height (Case & Paxson 2008; Vogl 2014; LaFave & Thomas 2016).

# Research Question

- What are the determinants of cognitive skills and grade attainment in early adulthood ?
- How much does cognitive ability in early life matter?
- Do different types of skills matter differentially?
- How do Senegal and Madagascar compare with each other?
- Are there heterogeneities in different sub-populations?

# Preview of Results

- Early life cognitive ability has a persistent effect on early adulthood cognitive skills and grade attainment.
- This effect is independent of HH wealth and health status.
- Math scores have a strong effect in both SN and MD. French scores have an impact in SN only.
- Girls show higher persistence in outcomes than boys
- Relatively shorter children have a stronger link between second grade and early adulthood outcomes.
- Results suggest heterogeneity based on initial level of HH assets and rank within the school.

# Context

## EDUCATION

- Primary school completion rates increased 1996-2012
  - From 40 to 59 percent in Senegal
  - From 31 to 70 percent in Madagascar
- Repetition and dropout rates high
- French is the first language in school

## ECONOMY

- Madagascar : An island economy with avg. GDP per capita growth close to zero over 1998-2012. Political turmoil.
- Senegal : A dynamic West African economy, GDP per capita growth avg. 1.2 percent between 1995-2012

# Data

## PASEC school based second grade data

- Senegal (1995-96) and Madagascar (1997-98)
- Children in second grade (7-9 years)
- Information on background characteristics
- Test scores
  - Beginning of second grade : not the same test
  - End of second grade (Post) : same test in both countries

## Household Surveys (2012)

- Young adults : Avg. 22 years in Madagascar and 24 years in Senegal
- Test scores on Math and French – some questions are the same (comparable using Itemized Response Theory)
- Household characteristics
- Individual covariates

**Sample Size : Senegal (447 children) , Madagascar (333 children)**

# Itemized Response Theory (IRT)

- The main principle of IRT is to differentiate between the latent ability of any given student to answer a question correctly and the actual response given.

- We construct the IRT scores from the joint distribution of the scores of the two countries.

- The advantage of doing this is that the parameters of IRT are estimated jointly for the common items, which renders the scores comparable.

- For all the regression analysis , we employ IRT scores that were estimated separately for each country, as we estimate country - specific regression models.

# Theoretical framework

Cognitive ability production function (Todd and Wolpin 2003, 2007). Ability at the start of the second grade

$$A_2 = f(\gamma_1 A_1 + \gamma_3 P_1 + \gamma_3 H_1 + \gamma_4 S_1) \quad (1)$$

$P_1$ denotes parental inputs, $H_1$ health endowment and $S_1$ school inputs.

Cognitive ability at the start of the first grade

$$A_1 = h(\beta_1 A_0(\mu) + \beta_2 P_0 + \beta_3 H_0) \quad (2)$$

where $\mu$ is genetic endowment

# Empirical Strategy

We estimate an OLS model of the form:

$$Y_{i,t+1} = \beta_0 + \beta_1 A_{i,t} + \beta_2 Height_{i,t+1} + \beta_3 HH_i + \beta_4 X_i + \gamma_j + \varepsilon_i \quad (3)$$

$HH_i$ is parental inputs, $X_i$ controls, $\gamma_j$ is school FE. $Y_{i,t+1}$ is either grade attainment or cognitive skills $A_i$ in period $t+1$

## Measurement Error

A variety of factors might affect performance on a given day. Therefore, we use second grade pretest score as an instrument for the second grade posttest score (Andrabi et al. 2011, Ladd & Walsh 2002). This corrects for measurement error and satisfies the exclusion restriction.

# IV Strategy

Our 2SLS model, therefore, takes the following form:

$$TS_i^{post} = \alpha_o + \alpha_1 TS_i^{pre} + \alpha_2 Height_i + \alpha_3 HH_i + \alpha_4 X_i + \gamma_j + \tau_i \quad (2b)$$

$$Y_i = \delta_o + \delta_1 TS_i^{post} + \delta_2 Height_i + \delta_3 HH_i + \delta_4 X_i + \gamma_j + \theta_i \quad (2c)$$

where posttest and pretest scores are denoted by $TS_i^{p\ ost}$ and $TS_i^{pre}$, respectively; $\gamma_j$ denotes school fixed effects; $HH_i$ refers to household level inputs (parents' education and assets); and $X_i$ denotes individual-specific controls.

# Highest Grade Attained - Senegal

| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) OLS | (6) OLS | (7) OLS | (8) OLS | (9) IV |
|---|---|---|---|---|---|---|---|---|---|
| **Composite Post Score** | | **1.645*** ** | | **1.783*** ** | | **1.728*** ** | | **1.695*** ** | **1.380*** ** |
| | | **(0.185)** | | **(0.207)** | | **(0.194)** | | **(0.195)** | **(0.310)** |
| **Assets in second grade** | | | | | **0.659*** ** | **0.495*** | **0.641** ** | **0.487*** | **0.549** ** |
| | | | | | **(0.301)** | **(0.285)** | **(0.300)** | **(0.285)** | **(0.271)** |
| **Height** | | | | | | | **0.055** ** | **0.042*** | **0.045** ** |
| | | | | | | | **(0.024)** | **(0.023)** | **(0.021)** |
| Observations | 447 | 447 | 447 | 447 | 447 | 447 | 447 | 447 | 447 |
| Controls | No | No | No | No | All* | All* | All | All | All |
| School Fixed Effects | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.028 | 0.143 | 0.263 | 0.349 | 0.339 | 0.413 | 0.349 | 0.419 | 0.235 |
| F-stat (excluded instrument) | | | | | | | | | 254.8 |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. ALL* implies all controls except proxy for childhood stature are used. Standard errors are in brackets.

# Highest Grade Attained - Madagascar

| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) OLS | (6) OLS | (7) OLS | (8) OLS | (9) IV |
|---|---|---|---|---|---|---|---|---|---|
| **Composite Post Score** | | **0.993*** ** | | **0.716*** ** | | **0.666*** ** | | **0.665*** ** | **1.285*** ** |
| | | **(0.185)** | | **(0.207)** | | **(0.194)** | | **(0.195)** | **(0.310)** |
| **Assets in second grade** | | | | | **-0.037** | **-0.063** | **-0.033** | **-0.059** | **-0.119** |
| | | | | | **(0.238)** | **(0.246)** | **(0.239)** | **(0.248)** | **(0.242)** |
| **Height** | | | | | | | **0.017** | **0.019** | **0.019** |
| | | | | | | | **(0.021)** | **(0.02)** | **(0.018)** |
| Observations | 333 | 333 | 333 | 333 | 333 | 333 | 333 | 333 | 333 |
| Controls | No | No | No | No | All* | All* | All | All | All |
| School Fixed Effects | No | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.053 | 0.085 | 0.366 | 0.366 | 0.496 | 0.496 | 0.497 | 0.498 | 0.209 |
| F-stat (excluded instrument) | | | | | | | | | 82.71 |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. ALL* implies all controls except proxy for childhood stature are used. Standard errors are in brackets.

# Test Scores - Senegal

| | Composite Score (2012) | | Math Score (2012) | | French Score (2012) | |
|---|---|---|---|---|---|---|
| | **OLS** | **IV** | **OLS** | **IV** | **OLS** | **IV** |
| **Composite Post Score** | **0.362*** ** | **0.269*** ** | **0.625*** ** | **0.556*** ** | **0.307*** ** | **0.210*** ** |
| | **(0.051)** | **(0.07)** | **(0.08)** | **(0.117)** | **(0.048)** | **(0.068)** |
| **Assets (Second Grade)** | **0.123*** | **0.141** ** | **0.200*** | **0.213** ** | **0.134** ** | **0.152** ** |
| | **(0.067)** | **(0.063)** | **(0.105)** | **(0.101)** | **(0.065)** | **(0.061)** |
| **Height** | **0.007** | **0.008** | **0.012** | **0.012** | **0.006** | **0.007** |
| | **(0.006)** | **(0.005)** | **(0.008)** | **(0.008)** | **(0.006)** | **(0.005)** |
| Observations | 381 | 381 | 447 | 447 | 381 | 381 |
| Controls | All | All | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.351 | 0.166 | 0.327 | 0.193 | 0.342 | 0.140 |
| F-stat (excluded instrument) | | 232.9 | | 254.8 | | 232.9 |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Test Scores - Madagascar

| | Composite Score (2012) | | Math Score (2012) | | French Score (2012) | |
|---|---|---|---|---|---|---|
| | **OLS** | **IV** | **OLS** | **IV** | **OLS** | **IV** |
| **Composite Post Score** | **0.146**** | **0.316**** | **0.154**** | **0.349**** | **0.127*** | **0.26*** |
| | **(0.064)** | **(0.134)** | **(0.07)** | **(0.139)** | **(0.068)** | **(0.142)** |
| **Assets (Second Grade)** | **0.064** | **0.052** | **0.088** | **0.074** | **0.019** | **0.009** |
| | **(0.07)** | **(0.065)** | **(0.067)** | **(0.0630** | **(0.082)** | **(0.077)** |
| **Height** | **0.005** | **0.005** | **-0.001** | **-0.001** | **0.005** | **0.005** |
| | (0.006) | (0.005) | (0.006) | (0.006) | (0.006) | (0.006) |
| Observations | 310 | 310 | 318 | 318 | 312 | 312 |
| Controls | All | All | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.49 | 0.118 | 0.377 | 0.071 | 0.529 | 0.133 |
| F-stat (excluded instrument) | | 57.8 | | 60.01 | | 57.39 |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Heterogeneity Results

- Math Vs. French Scores
- Gender differences
- Stature (Height) based heterogeneity
- Household Assets

# Difference b/w Math & French

- Literature has shown that skills measured by math and French tests are different. (Duncan et al 2007 ; Duncan & Magnusson 2011)

- To test this, we use the math and French scores as the main independent variable of interest (instead of composite score)

- In Senegal, math and French scores are both equally good predictors of later life outcomes. In Madagascar, math scores seem to have a larger impact on later life outcomes.

# Math Score Vs. French Score- Senegal

| | (1) OLS | (2) IV | (3) OLS | (4) IV |
|---|---|---|---|---|
| | Grade | Grade | Composite | Composite |
| **Math Post Score** | **1.383*** ** | **1.406*** ** | **0.284*** ** | **0.267*** ** |
| | (0.202) | (0.330) | (0.052) | (0.077) |
| R-Squared | 0.396 | 0.210 | 0.323 | 0.138 |
| F-stat (excluded instrument) | | 191.9 | | 169.3 |
| **French Post Score** | **1.652*** ** | **1.592*** ** | **0.363*** ** | **0.333*** ** |
| | (0.203) | (0.409) | (0.052) | (0.099) |
| R-Squared | 0.405 | 0.221 | 0.343 | 0.163 |
| F-stat (excluded instrument) | | 121.4 | | 101.3 |
| Observations | 447 | 447 | 381 | 381 |
| Controls | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Math Score Vs. French Score- Madagascar

| | (1) OLS | (2) IV | (3) OLS | (4) IV |
|---|---|---|---|---|
| | Grade | Grade | Composite | Composite |
| **Math Post Score** | **0.617*** ** | **1.179** ** | **0.161*** ** | **0.356** ** |
| | (0.194) | (0.471) | (0.055) | (0.173) |
| R-Squared | 0.5 | 0.21 | 0.496 | 0.112 |
| F-stat (excluded instrument) | | 51.28 | | 45.16 |
| **French Post Score** | **0.424** | **1.696*** | **0.047** | **0.303** |
| | (0.265) | (0.876) | (0.075) | (0.215) |
| R-Squared | 0.488 | 0.156 | 0.481 | 0.088 |
| F-stat (excluded instrument) | | 31.73 | | 25.56 |
| Observations | 333 | 333 | 310 | 310 |
| Controls | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes |

Note: Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Gender Heterogeneity

We explore whether the persistence of early life test scores into later life outcomes is uniform across both genders.

We find that girls show a stronger relationship between second grade test scores and later life outcomes.

# Gender Heterogeneity

| SENEGAL | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys |
| **Composite Post Score** | **2.264*** ** | **1.231** ** | **0.507*** ** | **0.259** ** | **0.47*** ** | **0.201** ** | **0.866*** ** | **0.578*** ** |
| | (0.538) | (0.401) | (0.121) | (0.088) | (0.106) | (0.09) | (0.196) | (0.14) |
| Observations | 188 | 259 | 161 | 220 | 161 | 220 | 188 | 259 |
| F-stat (excluded instrument) | 67.03 | 180.8 | 66.58 | 149.3 | 66.58 | 149.3 | 67.03 | 180.8 |
| P-value Difference | | 0.123 | | 0.097 | | 0.054 | | 0.232 |

| MADAGASCAR | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys |
| **Composite Post Score** | **2.448*** ** | **0.586** | **0.62** ** | **0.221** | **0.559** * | **0.161** | **0.685** ** | **0.282** |
| | (0.66) | (0.591) | (0.283) | (0.178) | (0.300) | (0.172) | (0.271) | (0.200) |
| Observations | 179 | 154 | 164 | 146 | 165 | 147 | 170 | 148 |
| F-stat (excluded instrument) | 41.94 | 30.97 | 20.45 | 25.94 | 20.58 | 25.17 | 24 | 25.27 |
| P-value Difference | | 0.036 | | 0.233 | | 0.251 | | 0.232 |

Note: Each specification uses the pre test composite score in second grade as an instrument for the post test composite score. All specifications contain school FE and full set of controls. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Height Heterogeneity

We investigate if health endowment, as measured by a proxy of childhood stature has some effect on this relationship.

To do this, we calculate gender specific medians. We then classify each individual as being above or below the median based on their gender specific median value

We find suggestive evidence that individuals with relatively shorter stature have a stronger relationship between early life cognition and later life cognition across both countries.

# Height Heterogeneity

| SENEGAL | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 |
| **Composite Post Score** | **1.495*** ** | **1.638*** ** | **0.304*** ** | **0.319*** ** | **0.210*** | **0.259*** ** | **0.545*** ** | **0.648*** ** |
| | (0.437) | (0.385) | (0.116) | (0.105) | (0.118) | (0.098) | (0.186) | (0.149) |
| Observations | 234 | 213 | 198 | 183 | 198 | 183 | 234 | 213 |
| F-stat (excluded instrument) | 100.3 | 156.1 | 84.57 | 156.3 | 84.57 | 156.3 | 100.3 | 156.1 |
| P-value Difference | | 0.807 | | 0.924 | | 0.751 | | 0.667 |

| MADAGASCAR | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 |
| **Composite Post Score** | **0.983** ** | **1.105** | **0.220** | **0.443** | **0.125** | **0.452*** | **0.312** | **0.476*** ** |
| | (0.471) | (0.829) | (0.283) | (0.178) | (0.300) | (0.172) | (0.271) | (0.200) |
| Observations | 172 | 161 | 160 | 150 | 161 | 151 | 164 | 154 |
| F-stat (excluded instrument) | 55.84 | 25.34 | 30.63 | 23.05 | 30.68 | 22.93 | 33.28 | 23.15 |
| P-value Difference | | 0.898 | | 0.393 | | 0.268 | | 0.554 |

Note: Each specification uses the pre test composite score in second grade as an instrument for the post test composite score. All specifications contain school FE and full set of controls. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# HH Asset Heterogeneity

There could be differential effects based on the amount of assets in the household in second grade.

To check for this, we calculate median value of assets and divide the sample into two parts (for each country separately).

Results suggest that children from relatively better off households are better able to sustain their performance from second grade into later life. Potential mechanism : higher investment in the children.

# HH Asset Heterogeneity

| SENEGAL | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 |
| **Composite Post Score** | **1.820*** ** | **0.893*** | **0.300** ** | **0.180** | **0.221*** | **0.143** | **0.707*** ** | **0.476*** ** |
| | (0.513) | (0.467) | (0.125) | (0.113) | (0.121) | (0.112) | (0.202) | (0.168) |
| Observations | 224 | 223 | 190 | 191 | 190 | 191 | 224 | 223 |
| F-stat (excluded instrument) | 81.96 | 128.4 | 74.9 | 117.7 | 74.9 | 117.7 | 81.96 | 128.4 |
| P-value Difference | | 0.181 | | 0.477 | | 0.636 | | 0.379 |

| MADAGASCAR | Highest Grade | | Composite Score | | French Score | | Math Score | |
|---|---|---|---|---|---|---|---|---|
| | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 | Above P50 | Below P50 |
| **Composite Post Score** | **1.296*** | **0.964*** | **0.583*** ** | **-0.041** | **0.496*** ** | **-0.01** | **0.052** ** | **0.043** |
| | (0.757) | (0.579) | (0.211) | (0.168) | (0.188) | (0.194) | (0.221) | (0.185) |
| Observations | 167 | 166 | 156 | 154 | 156 | 156 | 157 | 161 |
| F-stat (excluded instrument) | 27.06 | 43.63 | 23.31 | 22.23 | 23.31 | 21.58 | 23.84 | 24.59 |
| P-value Difference | | 0.727 | | 0.0210 | | 0.062 | | 0.0971 |

Note: Each specification uses the pre test composite score in second grade as an instrument for the post test composite score. All specifications contain school FE and full set of controls. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# ROBUSTNESS CHECKS

- Lewbel (2012) Method
- Inverse Probability Weighted regressions

# Lewbel (2012) Method

- Helps identify parameters in models where there are endogenous or mismeasured regressors, in the absence of external instruments.

- Identification is achieved by imposing conditions on the covariates and the product of the heteroskedastic errors – different from OLS assumptions. Internal instruments are generated. Method is similar to Arellano-Bond in panel data

- We supplement our analysis with the instrument (pre test) in our data to conduct Sargan-Hansen test. We cannot do this test originally as our model is just identified. With the generated instruments with this method, we can test the over identification restrictions.

- Results are mostly stable to the inclusion of generated instruments. Null hypothesis (Sargan-Hansen) of over-identification cannot be rejected.

# Lewbel 2012 Results- Senegal

| | (1) Highest Grade | (2) Composite Score | (3) French Score | (4) Math Score |
|---|---|---|---|---|
| **Composite Post Score** | **1.338*** ** | **0.265*** ** | **0.570*** ** | **0.203*** ** |
| | **(0.327)** | **(0.076)** | **(0.127)** | **(0.074)** |
| Observations | 447 | 381 | 447 | 381 |
| Controls | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes |
| R-Squared | 0.234 | 0.165 | 0.196 | 0.139 |
| F-stat (excluded instruments) | 41.75 | 38.07 | 42.32 | 38.07 |
| P-value (Sargan overidentification Test) | 0.172 | 0.716 | 0.928 | 0.525 |

Note: The results are based on IV specifications where set of instruments include the second grade pre test composite score and the generated instrument using the Lewbel (2012) method. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Lewbel 2012 Results- Madagascar

| | (1) Highest Grade | (2) Composite Score | (3) French Score | (4) Math Score |
|---|---|---|---|---|
| **Composite Post Score** | **1.023**** | **0.240*** | **0.239*** | **0.196** |
| | **(0.478)** | **(0.128)** | **(0.133)** | **(0.137)** |
| Observations | 333 | 310 | 318 | 312 |
| Controls | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes |
| R-Squared | 0.221 | 0.133 | 0.086 | 0.142 |
| F-stat (excluded instruments) | 13.71 | 10.48 | 10.75 | 10.49 |
| P-value (Sargan overidentification Test) | 0.395 | 0.699 | 0.631 | 0.663 |

Note: The results are based on IV specifications where set of instruments include the second grade pre test composite score and the generated instrument using the Lewbel (2012) method. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Attrition

- Attrition is nearly 50 percent in both countries
  - CEBU Philipines (~ 38 percent) – Adair et al 2011
  - Guatemala study (~40 percent) – Hodinott et al 2008
  - Carolina Abecedarian Project (~40 percent) – Campbell et al 2014
  - Young Lives Study (8.1 percent)

- This may be due to many reasons :
  - Long nature of our panel (15-17 years)
  - Migration in young adult life

- This is a concern we address
  - Check for mean differences across the attrited and non-attrited sample
  - Inverse probability weighted regressions

# Difference in Means

## SENEGAL

| | Not in panel | Panel | Difference |
|---|---|---|---|
| French 2nd grade (pre) | -0.10 | -0.09 | -0.01 |
| French 2nd grade (post) | -0.18 | -0.12 | -0.06 |
| Math 2nd grade (pre) | -0.14 | -0.09 | -0.05 |
| Math 2nd grade (post) | -0.17 | -0.08 | -0.09 |
| Math and French 2nd grade (post) | -0.21 | -0.11 | -0.10 |
| Math and French 2nd grade (pre) | -0.19 | -0.07 | -0.12* |
| Assets 2nd grade | -0.05 | 0.02 | -0.07 |
| Female 1995–96 | 0.36 | 0.40 | -0.04 |
| Age 2nd grade | 8.19 | 8.31 | -0.12* |

## MADAGASCAR

| | Not in panel | Panel | Difference |
|---|---|---|---|
| French 2nd grade (pre) | -0.01 | 0.10 | -0.11* |
| French 2nd grade (post) | 0.02 | -0.09 | 0.11* |
| Math 2nd grade (pre) | -0.01 | 0.06 | -0.06 |
| Math 2nd grade (post) | 0.01 | 0.01 | -0.00 |
| Math and French 2nd grade (post) | -0.01 | 0.07 | -0.08 |
| Math and French 2nd grade (pre) | 0.01 | -0.04 | 0.06 |
| Assets 2nd grade | 0.02 | -0.08 | 0.10** |
| Female 1995–96 | 0.51 | 0.53 | -0.03 |
| Age 2nd grade | 8.74 | 8.21 | 0.53*** |

# Inverse Probability Weights - Senegal

| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) IV |
|---|---|---|---|---|---|
| **Composite Pre Score** | **0.909*** ** | | **0.900*** ** | | |
| | **(0.251)** | | **(0.248)** | | |
| **Composite Post Score** | | **1.710*** ** | | **1.675*** ** | **1.357*** ** |
| | | **(0.211)** | | **(0.215)** | **(0.328)** |
| Observations | 447 | 447 | 447 | 447 | 447 |
| Controls | All | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.346 | 0.42 | 0.355 | 0.424 | 0.227 |
| F-stat (excluded instrument) | | | | | 226.9 |

Note: Probability weights calculated based on a logit model. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Inverse Probability Weights - Madagascar

| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) IV |
|---|---|---|---|---|---|
| **Composite Pre Score** | **0.691*** ** | | **0.701*** ** | | |
| | **(0.284)** | | **(0.286)** | | |
| **Composite Post Score** | | **0.419** | | **0.425** | **1.352*** ** |
| | | **(0.279)** | | **(0.279)** | **(0.545)** |
| Observations | 323 | 323 | 323 | 323 | 323 |
| Controls | All | All | All | All | All |
| School Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| R-Squared | 0.523 | 0.515 | 0.525 | 0.517 | 0.139 |
| F-stat (excluded instrument) | | | | | 64.84 |

Note: Probability weights calculated based on a logit model. Controls include asset index (second grade), proxy for childhood stature, mother's education, father's education, age and female dummy. Standard errors are in brackets.

# Conclusion

- Evidence of the strong impact of early life cognitive abilities on later life educational and cognitive outcomes.
- Certain skills (math) might matter more than other skills (French)
- Stronger persistence seen for girls
- Individuals with relatively shorter stature have a stronger link between early life score and later life success
- Having higher assets in second grade leads to larger positive impact on later life outcomes.

# THANK YOU.

Any comments/suggestions/questions are welcome.