

# From Perry Preschool to RIECE Thailand: A Research-based Large-scale Implementation

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# What is RIECE Thailand?

- RIECE Thailand: Reducing Inequality through Early Childhood Education.
- RIECE Thailand promotes high-quality early childhood education based on [HighScope](#) curriculum from the [Perry Preschool research](#) project in rural Thailand.
- RIECE Thailand believes that high-quality early childhood education can enhance [human capital formation](#) efficiently.
- RIECE Thailand collects comprehensive household, children and school data, through which we hope to understand [human capital production process](#) better.

# Early Childhood Interventions are More Effective than Later Interventions

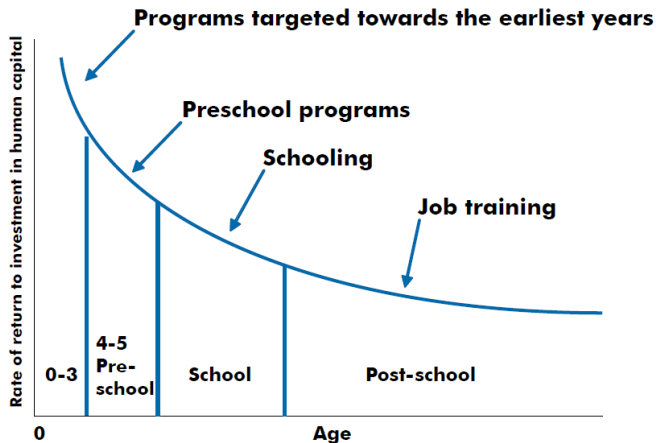


Figure 1: Rate of returns varied by age of receivers. From Heckman (2008).

# RIECE is Motivated by Research Findings from Perry Preschool Project

- The Perry Preschool project started in 1962-1967 in Ypsilanti, Michigan USA.
- It taught HighScope to 3-4 years old children after school for 2.5 hours a day and a 1.5 hours weekly home visit.
- The project randomly selected 123 children (from 5 generations) into
  - ▶ Control: 65 children
  - ▶ Treatment: 58 children
- The project then collected relevant information from these children regularly until now:
  - ▶ Annual data collection: for 3-15 years old, and
  - ▶ Once in several years: for 19, 27, and 40 years old

# Perry Preschool Project has High Benefit to Cost Ratio

- Heckman et.al. (2010) find that the benefit to cost ratio of the Perry Preschool Project is at least 7:1.
- Most of the benefit comes from **higher income** and **lower crime/drug uses** for treatment group.
- Heckman et.al. (2013) also find that this long-term large benefit results mostly from an increase in **non-cognitive skills** not the cognitive one.

# Mechanisms Driving Benefits of Perry Preschool: Not through IQ

Panel B. Stanford-Binet, females

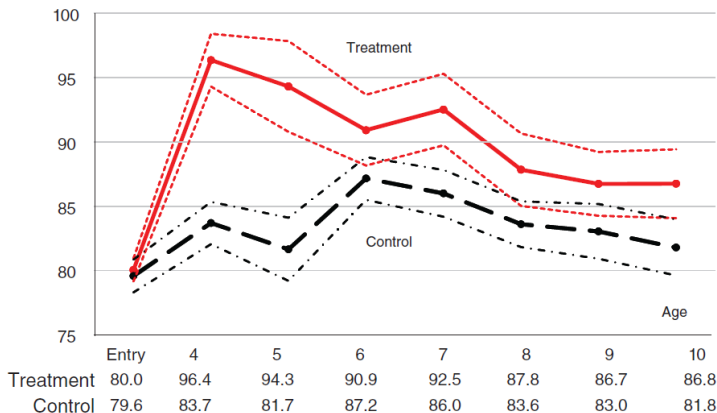


Figure 2: Not the IQ. From Heckman et.al. (2013).

# Mechanisms Driving Benefits of Perry Preschool: Non-Cognitive Matters

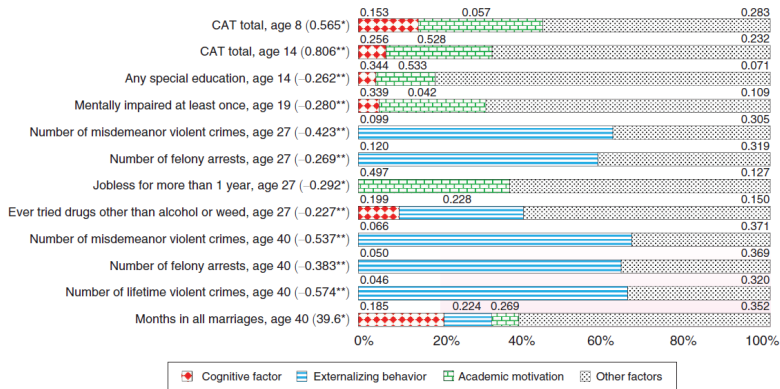


Figure 3: Most of the benefit comes from non-cognitive skills. From Heckman et.al. (2013).

# HighScope Method

- It focuses on child-adult interaction, child initiatives.
- Core teaching process of High/Scope: Plan-Do-Review



**PLAN**

(a) Plan.



**DO**

(b) Do.

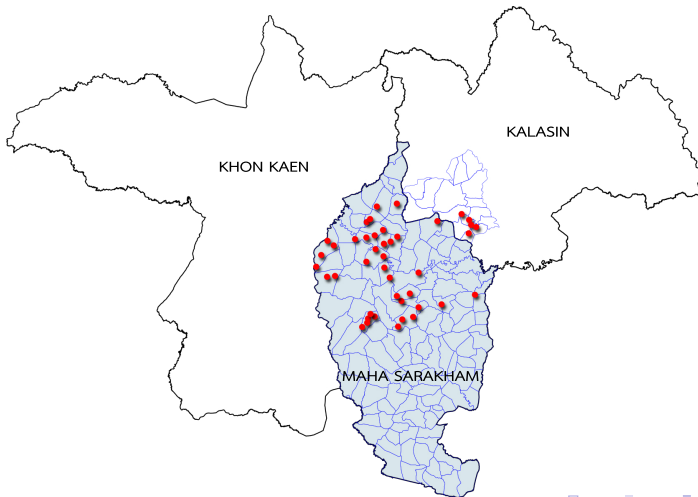


**REVIEW**

(c) Review.

# RIECE Thailand as A Large Scale Implementation

The project covers 50 childcare centers in 2015 and 43 centers in 2016. There are about 2,000 children from 2-4 years old each year. It is still running!



# Main Activities of RIECE Thailand: RIECE Curriculum

- RIECE Thailand created a Thai version of HighScope curriculum with collaboration with Mahasarakham University and Muang Roi-Et school.
  - Detailed teaching plans for each day:

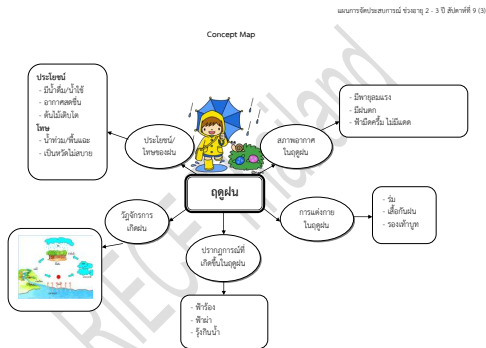


Figure 6: Mind map for a teaching plan regarding rainy season.

# Main Activities of RIECE Thailand: RIECE Teachers

- Randomly added an early childhood teacher to co-teach in 20 childcare centers for a year:
  - ▶ These RIECE teachers are formally trained as early childhood teachers,
  - ▶ This part serves at least two purposes:
    - ① To show local teachers how to use the HighScope curriculum and how effective the HighScope can be.
    - ② To use this randomization as an exogenous variation for research purposes.



Figure 7: RIECE teachers in action.

# Main Activities of RIECE Thailand: Regular Center Visits

- Early childhood education experts regularly (roughly once a month) visited each childcare center with random date. This part serves at least three purposes:
  - ① To give advice on how to implement the HighScope curriculum.
  - ② To monitor each childcare center.
  - ③ To collect data on the quality of instruction.



Figure 8: Regular center visits.

# Main Activities of RIECE Thailand: Coaching on the Site as our Dynamism

- From the experience, we realize that RIECE teachers can help develop the children in their classrooms very well, but several of them cannot influence other local teachers well enough. Many teachers just leave the classroom to our teachers and did not learn much.
- We are trying a new method this year, called coaching on the cite.
  - ▶ This will be a short term (says a month) co-working and coaching.
  - ▶ The main focus is on how to develop the local teachers directly.
  - ▶ This is similar to business consultant service.
  - ▶ This is likely to be more cost effective than the original RIECE teachers.
  - ▶ A lot to learn, though.

# Main Activities of RIECE Thailand: On-Site Training

- Another finding (not obvious at first) is that
  - ▶ An effective training for early childhood teachers must be an on-site training: where they see a successful case and learn how to apply the concept.

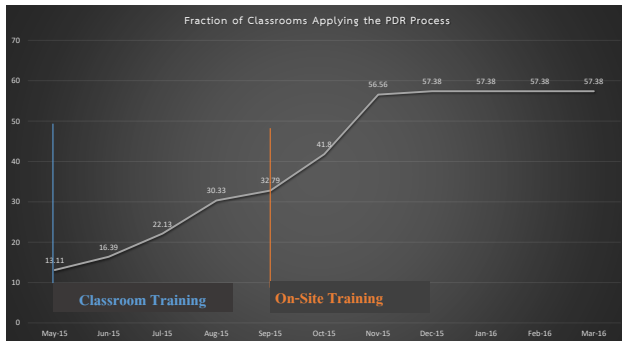


Figure 9: On-site training for early childhood teachers raises more adoption (need to look at quality later).

# Main Activities of RIECE Thailand: Bringing-Books-to-Home Program

- We gave almost 200 children books to each childcare center.
- We encourage them to let kids borrow the books everyday.
- After two years, children have borrowed more than 120,000 times.

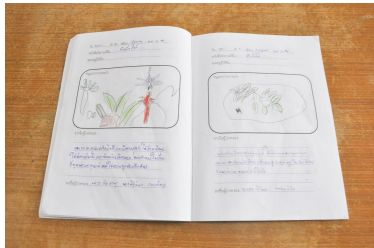


Figure 10: Booklet for brining-books-to-home program.

# HighScope Works Effectively in Rural Thailand but Not Widely Adopted Yet

- To summarize before going into the data and research part, the HighScope curriculum works effectively in rural Thailand.
- The experience from this project leads me to believe that we can improve human capital production process significantly by using an effective (but may not be best) teaching method in a large scale.
- RIECE Thailand has supported the teachers in many ways, but the adoption rate is still not satisfactory.
- The question is how can we get teachers to truly adopt an effective teaching process? Perhaps we need [contract theory](#) here.
- Implementation is very important. Need to understand [process-as-technology adoption](#) better.

# RIECE Thailand Data: The Townsend Spirit in Early Childhood Data

- The data are part of the Reducing Inequality through the Early Childhood Education project (the RIECE Thailand).
- There are two generations of samples: with about 1,400 households and 1,600 targeted children from 23 Tambons/subdistricts in rural areas of Mahasarakham and Kalasin provinces.
- Most of the results presented today come from the first generation of the survey.
- The RIECE data have **both detailed household and school information** in the same data set.

# RIECE Thailand Data: having both household and school information

- There are three main parts of the data:
  - ▶ *Children*: focusing on inputs the child received and child development: information at birth, education, time and material investment, parenting style, child health, chronic disease and disability, child development, biological parents' information etc.
    - ★ Denver Developmental Screening Test, National Educational Panel Study, Early Childhood Longitudinal Program, Time Usage Survey (TUS).
  - ▶ *Households*: standard household survey focusing on demographic information of each member, wage income, agricultural activities, business activities, expenditures, educational expenditure, assets, borrowing and lending, digit memory span, etc.
    - ★ Townsend Thai Data, Socio-Economic Survey Data (SES).
  - ▶ *Schools/Childcare*: focusing on classroom quality, whether the teacher used High/Scope in the classroom, the quality of the instruction (from regular visits by early childhood experts), number of book borrowings, teacher education including grades in college, teacher bonus (if any), teacher's tie to community, etc.

# Summary Statistics (Con't)

|                            | Both parents    | One parent      | No parents      | Total           | N    |
|----------------------------|-----------------|-----------------|-----------------|-----------------|------|
| Child female dummy         | 0.48<br>(.5)    | 0.47<br>(.5)    | 0.49<br>(.5)    | 0.49<br>(.5)    | 1101 |
| Birth weight<br>(kilogram) | 3.06<br>(.48)   | 3.03<br>(.44)   | 3.05<br>(.47)   | 3.05<br>(.47)   | 1064 |
| Child age                  | 39.19<br>(7.71) | 39.10<br>(7.47) | 39.72<br>(8.)   | 39.40<br>(7.8)  | 1055 |
| Attending CC               | 0.97<br>(.16)   | 0.99<br>(.11)   | 0.98<br>(.13)   | 0.98<br>(.14)   | 1102 |
| Using paid CC              | 0.007<br>(.082) | 0.017<br>(.13)  | 0.002<br>(.046) | 0.006<br>(.079) | 1103 |
| Fraction of sample         | 40.34 %         | 15.87 %         | 43.79 %         | 100 %           |      |

† Standard deviations in parentheses. N is number of observations

**Table 1:** Statistics on children's characteristics by family structures

## Summary Statistics (Con't)

|                    | Both parents | One parent | No parents | Total   | N    |
|--------------------|--------------|------------|------------|---------|------|
| Material Expense   | 684          | 526        | 299        | 490     | 1102 |
| (Baht per month)   | (1313)       | (688)      | (577)      | (973)   |      |
| Activity time      | 46.63        | 45.41      | 37.23      | 42.32   | 1102 |
| (Hours per month)  | (45.09)      | (44.27)    | (41.1)     | (43.45) |      |
| Caring time        | 481          | 340        | 279        | 370     | 1098 |
| (Hours per month)  | (141)        | (113)      | (46)       | (140)   |      |
| Total rearing time | 527          | 386        | 317        | 412     | 1097 |
| (Hours per month)  | (147)        | (119)      | (60)       | (148)   |      |
| Fraction of sample | 40.34 %      | 15.87 %    | 43.79 %    | 100 %   |      |

† Standard deviations in parentheses. N is number of observations

Table 2: Statistics on time and material investments by family structures

# Summary Statistics (Con't)

|                              | Both parents     | One parent      | No parents      | Total            | N    |
|------------------------------|------------------|-----------------|-----------------|------------------|------|
| Father's age at child birth  | 30.67<br>(7.41)  | 29.84<br>(7.25) | 27.67<br>(5.77) | 29.48<br>(6.98)  | 772  |
| Mother's age at child birth  | 26.95<br>(6.41)  | 26.65<br>(7.25) | 24.92<br>(5.26) | 26.08<br>(6.19)  | 891  |
| Caregiver's age              | 37.18<br>(12.17) | 39.46<br>(12.7) | 52.95<br>(8.83) | 44.51<br>(13.27) | 1004 |
| Caregiver female dummy       | 0.92<br>(.27)    | 0.95<br>(.22)   | 0.89<br>(.31)   | 0.91<br>(.28)    | 1045 |
| Father's yrs of schooling    | 10.35<br>(3.04)  | 10.58<br>(3.44) | 10.64<br>(3.09) | 10.50<br>(3.13)  | 927  |
| Mother's yrs of schooling    | 10.86<br>(3.16)  | 10.86<br>(3.24) | 10.97<br>(2.88) | 10.91<br>(3.05)  | 1021 |
| Caregiver's yrs of schooling | 9.31<br>(3.75)   | 8.68<br>(3.75)  | 5.36<br>(2.54)  | 7.46<br>(3.77)   | 1044 |
| Fraction of sample           | 39.66 %          | 16.01 %         | 44.32 %         | 100 %            |      |

† Standard deviations in parentheses. N is number of observations

**Table 3:** Statistics on parents' characteristics by family structures

# Summary Statistics (Con't)

|                   | Both<br>parents | One<br>parent | No<br>parents | Total   | N   | Whole<br>sample | N    |
|-------------------|-----------------|---------------|---------------|---------|-----|-----------------|------|
|                   | (1)             | (2)           | (3)           | (4)     | (5) | (6)             | (7)  |
| Income            | 23542           | 13996         | 8354          | 14744   | 729 | 15434           | 893  |
| (Baht per month)  | (24929)         | (19043)       | (11894)       | (19919) |     | (20817)         |      |
| Household size    | 5.13            | 4.49          | 3.83          | 4.44    | 853 | 4.71            | 1053 |
|                   | (1.34)          | (1.35)        | (1.14)        | (1.39)  |     | (1.53)          |      |
| Wealth index      | 0.17            | 0.06          | -0.28         | -0.05   | 852 | 0.00            | 1052 |
|                   | (1.24)          | (1.12)        | (.91)         | (1.1)   |     | (1.12)          |      |
| Total leisure     | 1016            | 858           | 670           | 835     | 853 | 859             | 1053 |
| (Hours per month) | (436)           | (480)         | (312)         | (424)   |     | (437)           |      |
| consumption       | 19254           | 16346         | 13760         | 16295   | 827 | 16621           | 1022 |
| (Baht per month)  | (17592)         | (11363)       | (9787)        | (13771) |     | (13318)         |      |
| Remittance        | 487             | 9128          | 9765          | 5987    | 842 | 6227            | 1035 |
| (Baht per month)  | (3916)          | (19714)       | (12378)       | (12411) |     | (12207)         |      |

† Standard deviations in parentheses. N is number of observations

Table 4: Statistics on household's characteristics by family structures

# An Economic Model of Parental Investment

- Consider a household with two agents, called an adult and a child.
- The household's decision problem is to choose consumption  $c$ , leisure  $\ell$ , time investment  $I_t$ , and material investment  $I_m$  to maximize household utility:

$$\max_{c, \ell, I_t, I_m} U(c, \ell + \alpha_u I_t, \theta)$$

subject to the full-income budget constraint, and the skill formation technology, respectively,

$$\begin{aligned} c + I_m + w(\ell + I_t) &\leq wT + b, \\ Af(I_t, I_m) &= \theta, \end{aligned}$$

where  $w$  is the wage rate,  $b$  is a non-labor income (e.g., remittances from relatives and friends),  $A$  is the productivity of skill formation, and  $T$  is the total time endowment.

# Key Implications of the Model

- An optimal condition with respect to time and material investments is

$$\frac{f_t(l_t, l_m)}{f_m(l_t, l_m)} = (1 - \alpha_u) w,$$

- The first key implication of the model is that the preference (except  $\alpha_u$ ) and productivity parameters do not enter this optimal condition.
- With the CES production function  $f(l_t, l_m) = [\mu_t l_t^\rho + \mu_m l_m^\rho]^{\frac{1}{\rho}}$ , we have

$$\ln \left( \frac{l_t}{l_m} \right) = -\frac{1}{1-\rho} \ln w - \frac{1}{1-\rho} \ln \left( \frac{\mu_m}{\mu_t} \right) - \frac{1}{1-\rho} \ln (1 - \alpha_u).$$

- This leads to the following regression:

$$\ln \left( \frac{l_t}{l_m} \right) = -\frac{1}{1-\rho} \ln w + \beta_0 \mathbf{X}_i + \epsilon_i, \quad (1)$$

- We can estimate the elasticity of substitution  $\frac{1}{1-\rho}$  from this specification.

# Estimation Results with Imputed Wage from LFS

|                             | Whole Sample          |                       | One Child Only        |                       |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                             | InTimeMaterial        | InTimeMaterial        | InTimeMaterial        | InTimeMaterial        |
| No parents at home          | 0.649***<br>(0.189)   | 0.659***<br>(0.238)   | 0.675***<br>(0.217)   | 0.733***<br>(0.280)   |
| One parent at home          | 0.0457<br>(0.174)     | 0.0480<br>(0.176)     | -0.0887<br>(0.204)    | -0.0741<br>(0.207)    |
| Child female dummy          | 0.827***<br>(0.117)   | 0.827***<br>(0.117)   | 0.822***<br>(0.136)   | 0.825***<br>(0.137)   |
| Log imputed wage rate       | -0.439**<br>(0.195)   | -0.438**<br>(0.195)   | -0.343<br>(0.212)     | -0.342<br>(0.212)     |
| Wealth                      | -0.232***<br>(0.0551) | -0.231***<br>(0.0560) | -0.189***<br>(0.0641) | -0.187***<br>(0.0649) |
| Log memory digit span score | 0.237*<br>(0.128)     | 0.236*<br>(0.129)     | 0.207<br>(0.143)      | 0.200<br>(0.145)      |
| Log birth weight            | 0.834**<br>(0.381)    | 0.834**<br>(0.381)    | 0.641<br>(0.451)      | 0.642<br>(0.451)      |
| Is parent main caregiver?   |                       | 0.0120<br>(0.172)     |                       | 0.0710<br>(0.210)     |
| Observations                | 816                   | 816                   | 637                   | 637                   |

† Standard deviations in parentheses.

Table 5: Estimation Results using imputed wage from LFS.

# Results with Wage Rate from Household Income

|                             | Whole Sample          |                       | One Child Only        |                       |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                             | InTimeMaterial        | InTimeMaterial        | InTimeMaterial        | InTimeMaterial        |
| No parents at home          | 0.576***<br>(0.206)   | 0.560**<br>(0.252)    | 0.606**<br>(0.240)    | 0.608**<br>(0.300)    |
| One parent at home          | -0.0495<br>(0.196)    | -0.0542<br>(0.197)    | -0.187<br>(0.229)     | -0.186<br>(0.230)     |
| Child female dummy          | 0.986***<br>(0.130)   | 0.986***<br>(0.130)   | 0.966***<br>(0.151)   | 0.966***<br>(0.151)   |
| Log wage rate               | -0.158***<br>(0.0558) | -0.158***<br>(0.0560) | -0.187***<br>(0.0609) | -0.187***<br>(0.0611) |
| Wealth                      | -0.239***<br>(0.0608) | -0.239***<br>(0.0612) | -0.159**<br>(0.0663)  | -0.159**<br>(0.0667)  |
| Log memory digit span score | 0.384***<br>(0.142)   | 0.387***<br>(0.144)   | 0.352**<br>(0.156)    | 0.352**<br>(0.159)    |
| Log birth weight            | 0.934**<br>(0.425)    | 0.934**<br>(0.426)    | 0.834<br>(0.520)      | 0.834<br>(0.522)      |
| Is parent main caregiver?   |                       | -0.0204<br>(0.188)    |                       | 0.00202<br>(0.230)    |
| Observations                | 655                   | 655                   | 516                   | 516                   |

† Standard deviations in parentheses.

Table 6: Estimation Results using wage from household income.

# Using Parental Expectation to Capture $\frac{\mu_m}{\mu_t}$

- To proxy the relative factor weight of time investment  $\frac{\mu_m}{\mu_t}$ , we adopt an innovative approach from Cunha et al., (2013) to elicit main caregiver's belief in the effects of time and material investments on child development.
- There are four hypothetical scenarios:

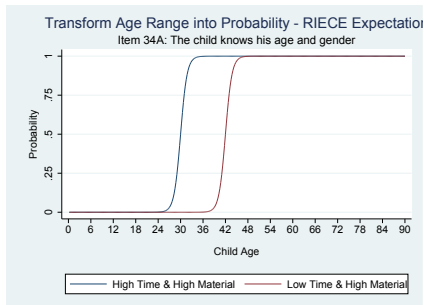
|                                                      |                                                     |
|------------------------------------------------------|-----------------------------------------------------|
| High Time Investment and<br>High Material Investment | Low Time Investment and<br>High Material Investment |
| High Time Investment and<br>Low Material Investment  | Low Time Investment and<br>Low Material Investment  |

## Using Parental Expectation to Capture $\frac{\mu_m}{\mu_t}$ (Con't)

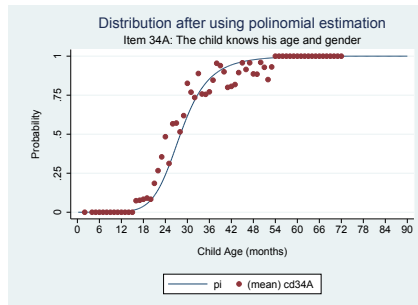
- We ask a main caregiver: what is the soonest and latest months in which a normal child will be able to do a specific task (some standard child development indicator) if the child is in each scenario?
- The two points of the data are used to calibrate two parameters of a logistic distribution as in Cunha et al. (2013).
- We then estimate the “implied skill”  $\theta$  from the belief distribution and the “population” distribution.
- Finally, we recover  $\frac{\mu_m}{\mu_t}$  using the “implied skills” from those scenarios based on the CES production function:

$$Af(I_t, I_m) = A[\mu_t I_t^\rho + \mu_m I_m^\rho]^{\frac{1}{\rho}} = \theta.$$

# Parental Expectation and Actual Distribution



(a) Distribution of parental expectation for a particular item



(b) Distribution of actual child development item

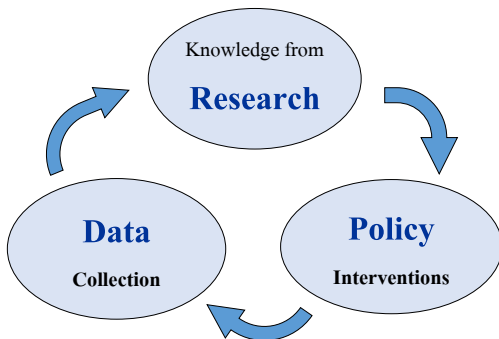
# Results with Expectation and Wage Rate from LFS

|                           | Without $\frac{\mu_m}{\mu_t}$ |                      | With $\frac{\mu_m}{\mu_t}$ |                      |
|---------------------------|-------------------------------|----------------------|----------------------------|----------------------|
|                           | InTimeMaterial                | InTimeMaterial       | InTimeMaterial             | InTimeMaterial       |
| No Parents At Home        | 0.0427<br>(0.399)             | 0.0551<br>(0.502)    | 0.0162<br>(0.393)          | 0.0460<br>(0.490)    |
| Only One Parent at Home   | -0.701**<br>(0.348)           | -0.699**<br>(0.350)  | -0.741**<br>(0.350)        | -0.736**<br>(0.351)  |
| Child female dummy        | 0.737***<br>(0.249)           | 0.739***<br>(0.248)  | 0.682***<br>(0.249)        | 0.686***<br>(0.250)  |
| Log imputed wage          | -0.239<br>(0.401)             | -0.240<br>(0.403)    | -0.238<br>(0.398)          | -0.239<br>(0.400)    |
| Wealth                    | -0.204*<br>(0.120)            | -0.204*<br>(0.120)   | -0.231*<br>(0.125)         | -0.230*<br>(0.125)   |
| Log no. of adults         | -1.177***<br>(0.364)          | -1.173***<br>(0.366) | -1.234***<br>(0.363)       | -1.225***<br>(0.367) |
| Is parent main caregiver? |                               | 0.0134<br>(0.360)    |                            | 0.0319<br>(0.349)    |
| $\ln \frac{\mu_m}{\mu_t}$ |                               |                      | -0.0559*<br>(0.0327)       | -0.0560*<br>(0.0328) |
| Adjusted $R^2$            | 0.104                         | 0.099                | 0.114                      | 0.109                |
| Observations              | 183                           | 183                  | 183                        | 183                  |

† Standard deviations in parentheses.

# Conclusion

- Research is beneficial for policy design and implementation.
- Data collection is crucial for policy evaluation.
- Research using new data will lead to a better policy design.



**Figure 12:** From research to policy to data collection and back to research.