



مؤسسه عالی آموزش و پژوهش
مدیریت و برنامه ریزی

اقتصاد رفاه کودکان و توسعه

Economics of Child Well-being and Development

محمد علی مختاری

۴ اردیبهشت ۱۳۹۸

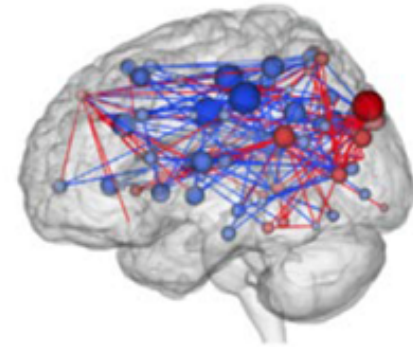
موسسه نیاوران

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Schweiz Suisse Svizzera

- 🌍 In the 1st year of life, the brain grows at the pace of 700-1,000 new neural connections per second, a pace that is *never* achieved again.
- 🌍 By age 3 years, a child's brain is *twice as active* as an adult brain.
- 🌍 It is *early life experiences* that determine the capacity of the brain – its structure and function.





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توسعه سیناپس های عصبی در کودکی

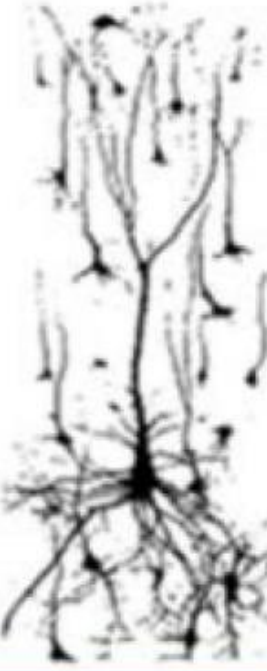
36 weeks gestation



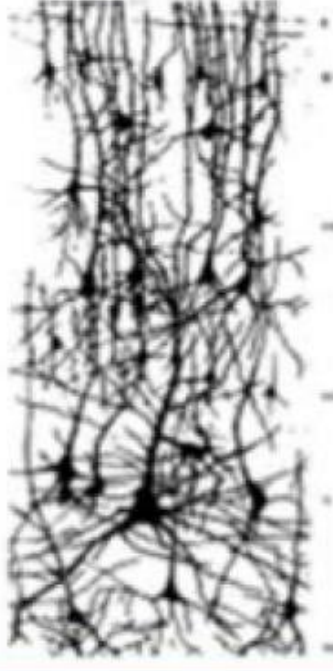
Newborn



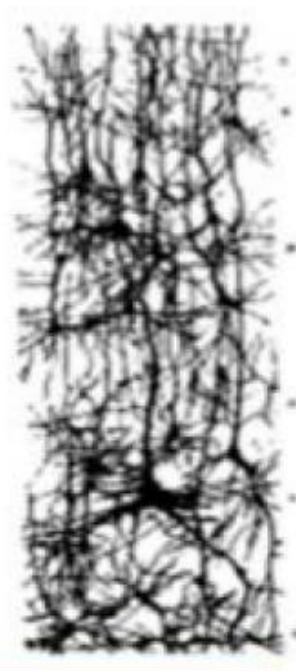
3 months



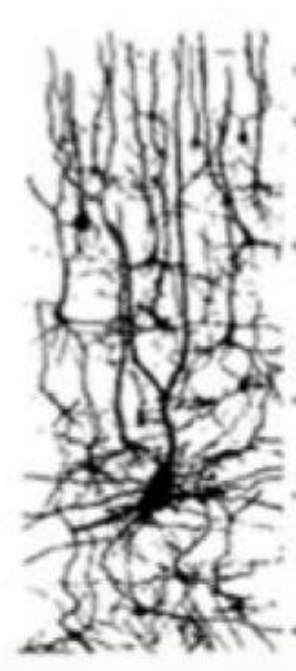
6 months



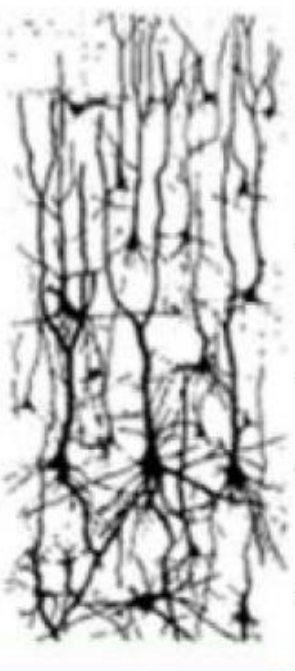
2 years



4 years



6 years



Synapse formation

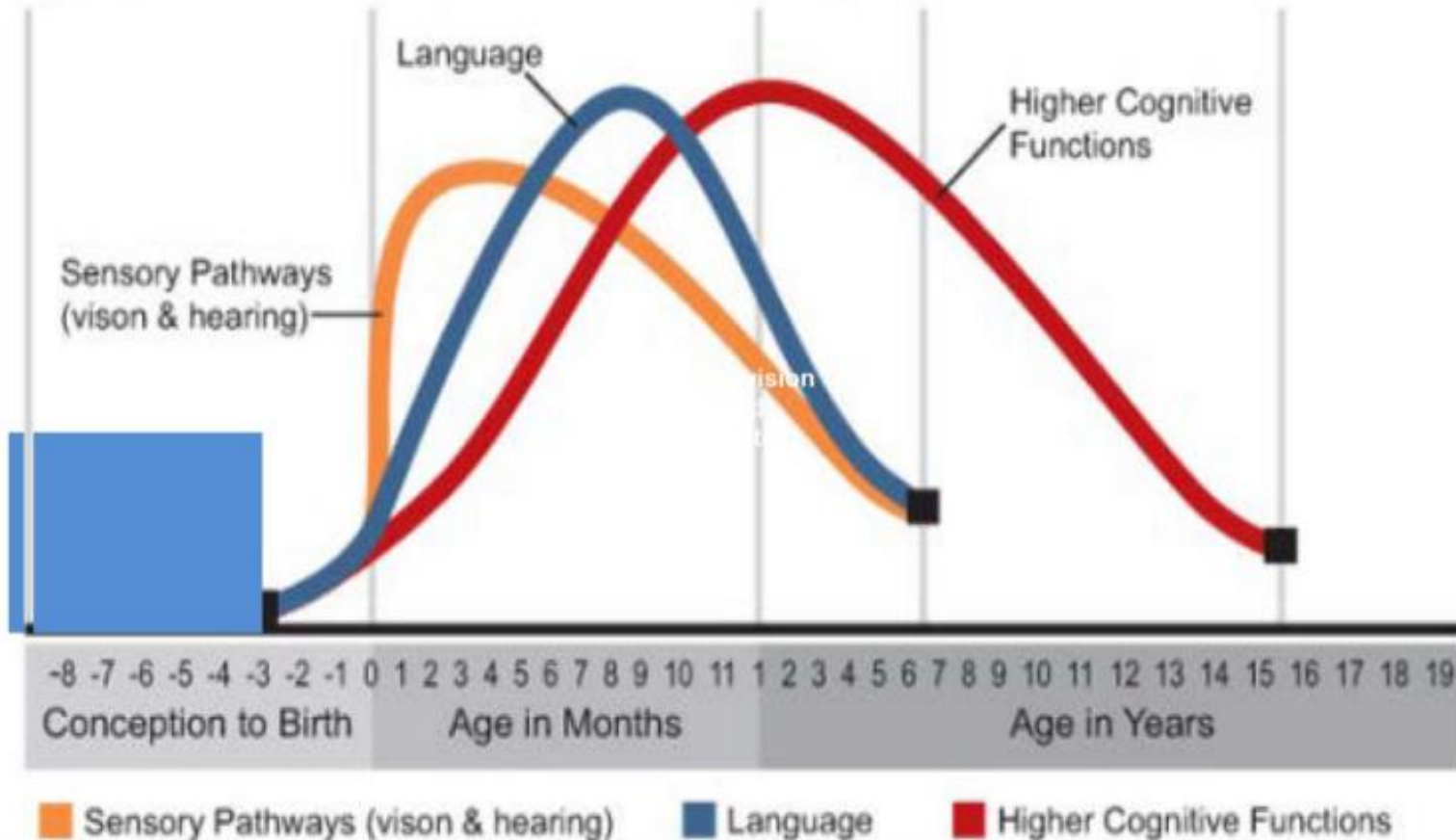
Synapse pruning

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توسعه سیناپس های مرتبط با مهارت ها در کودکی

Human Brain Development

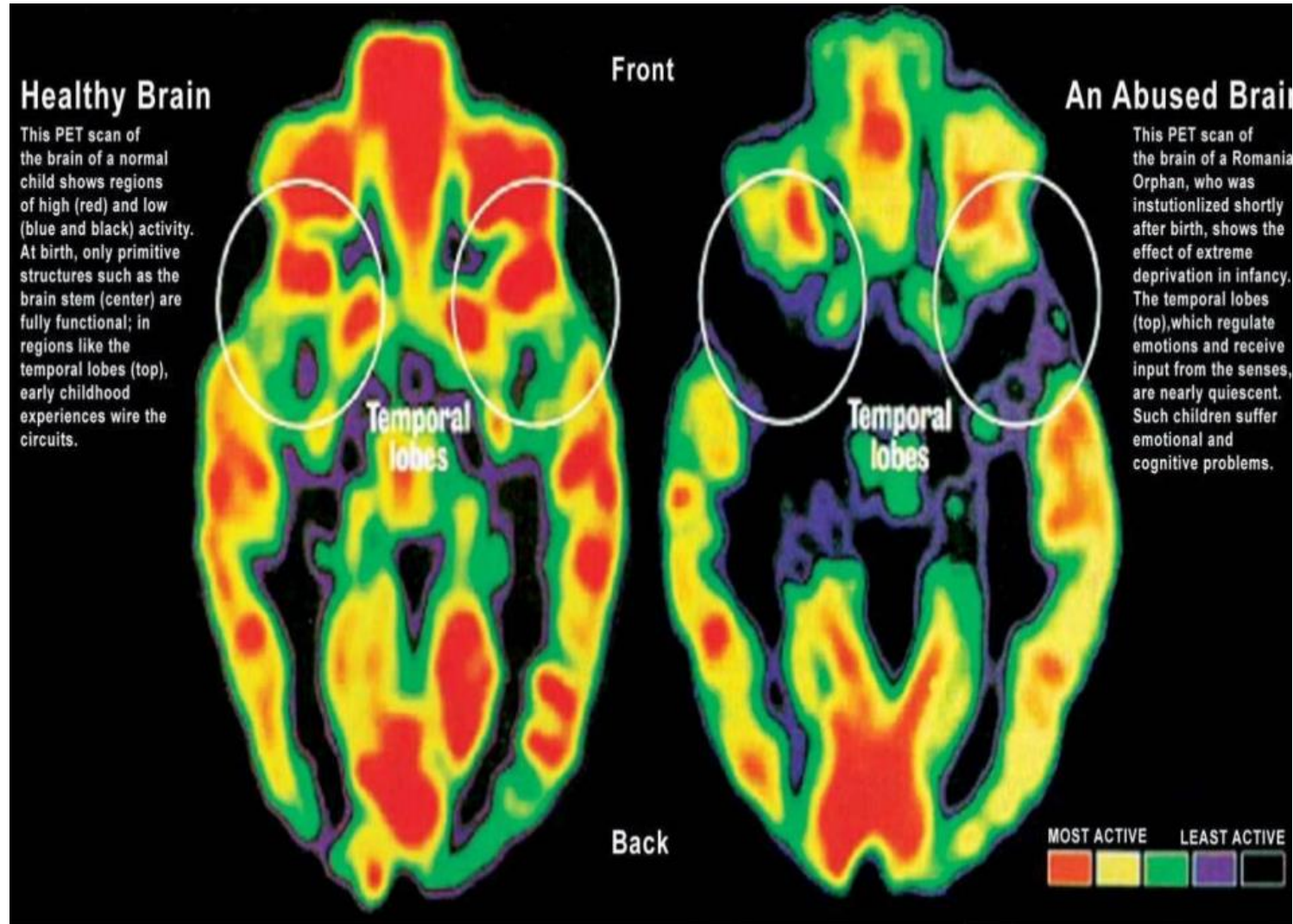
Synapse formation dependent on early experiences



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مغز سه ساله در شرایط چر از استرس مادر

National Scientific Council on the Developing Child (2014):
“Excessive Stress Disrupts the Architecture of the Developing Brain”





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چیست و به چه سوالاتی پاسخ می دهد؟

- The foundations for adult success and failure are laid down early in life. Capabilities interact synergistically to create who we are and what we become. (Heckman 2014)
- Importance of the early years in shaping the capabilities that promote well-being across the life course (Knudsen 2006).

- It is now recognized that human development is a dynamic process that starts in the womb.(Amond 2011)
- How human capital accumulation responds to the early childhood environment?

Prenatal care

Great expectations

What happens in the womb matters even more than was thought



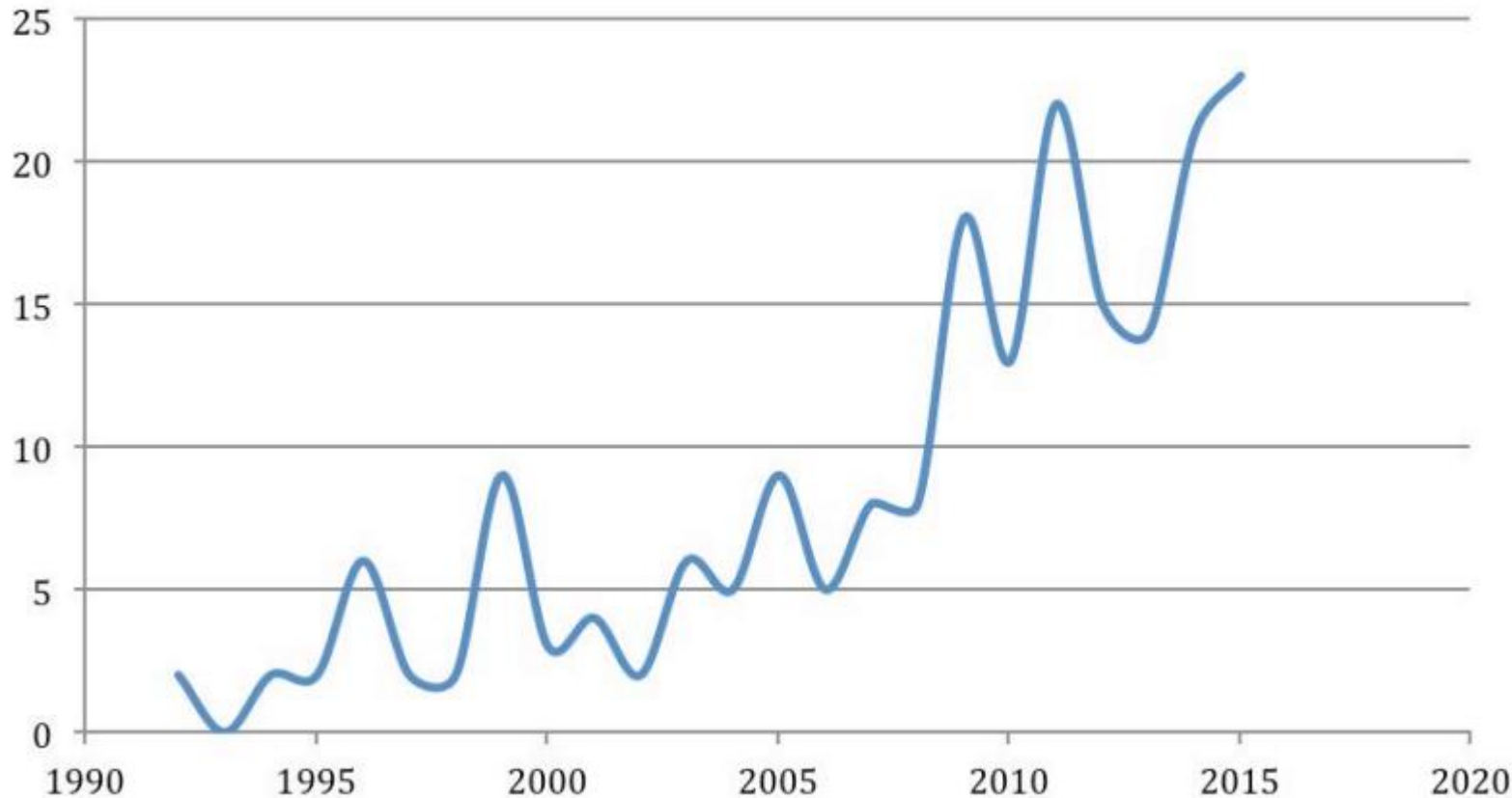


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اهمیت موضوع فرضیه ریشه جنینی Fetal Origin Hypothesis

"Fetal (origins, health)" in Top-Five and Top Field Economic Journals by year



In 2000 there were no articles on this topic in the Journal of Political Economy , Quarterly Journal of Economics, or the American Economic Review but there have been five or six per year in these journals since 2005.

CONCEPTUAL FRAMEWORK

- Grossman (1972) models health as a stock variable that varies over time in response to investments and depreciation.
- In contrast, the “early influences” literature asks whether health and investments in early childhood have sustained effects on adult outcomes.
- The magnitude of these effects may persist or even increase as individuals age because childhood development occurs in distinct stages that are more or less influential of adult outcomes.



- Theory of capacity formation

Heckman (2007) highlights two features of “capacity formation” beyond the previous Modeling

1. Dynamic complementarities
2. Self-productivity



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نظریه شکل‌گیری استعداد هگمن: پویایی مکملی

Dynamic complementarities:

Investments in t are more productive when there is a high level of capability in period $t - 1$

مثال: دانش‌آموزی که در دوره راهنمایی مدرسه بهتری بوده بازدهی بالاتری برای سرمایه‌گذاری در دبیرستان برتر دارد.



Self-productivity:

Implies that higher levels of capacity in one period create higher levels of capacity in future periods

کودک چاق تحرک کمتری دارد و در نتیجه در دوره بعد نیز چاق‌تر می‌شود.



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Heckman (2007):

$$h = A[\gamma I_1^\phi + (1 - \gamma)I_2^\phi]^{1/\phi}$$

The production technology with Constant Elasticity of Substitution (CES)

h : health or human capital at the completion of childhood.

I_1 : Investment in the first childhood period (e.g., in utero)

I_2 : Investment during second period of childhood



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γ : represents the weight each childhood period receives in the production of adult health or more generally, adult human capital. “capacity multiplier” in Heckman (2007)

\emptyset : denotes the extent to which investments in different periods are substitutes or complements.

For a given total investment level $I_1 + I_2$, how the allocation between period 1 and 2 will also affect h depends on the elasticity of substitution, $1/(1 - \emptyset)$ and the share parameter γ
 $\emptyset = 1$ (perfect substitutability of investments)



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نتایج مدل پایه ای برای سرمایه انسانی کودک

What Happen if Impose an Exogenous shock to group of people In period 1?

Exogenous shocks α_g to investments occur for group during the prenatal period

Net investments in the first period will change to: $I_1 - \alpha_g$.

we can trace out the effect of α_g while holding other inputs fixed.



Impact of an early-life shock on adult outcomes is:

$$\frac{\partial h}{\partial \alpha_g} = -\gamma A [\gamma (\bar{I}_1 - \alpha_g)^\phi + (1 - \gamma) \bar{I}_2^\phi]^{1-\phi} / \phi (\bar{I}_1 - \alpha_g)^{\phi-1}$$

In Case of perfect substitutability: $\frac{\partial h}{\partial \alpha_g} = -\gamma A$. Damage to adult human capital is proportional to the share parameter on prenatal investments, and is unrelated to the investment level : I_1



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For less than perfect substitutability between periods?

Shocks experienced at different baseline investment levels have heterogeneous effects on h .

Expected Result: children in poorer families are subject to more or larger early-life shocks.



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یک مدل پایه ای برای سرمایه انسانی کودک: پارامترهای مختلف و سیاستگذاری

We might think that in addition to low income, y , poor families face restricted access to production technologies.

Given a productivity factor $A < A$ for disadvantaged families, we would see worse child outcomes for equivalent income and investments.

It is also possible that poor families have different values of γ and \emptyset , which would generate more nuanced predictions for investments and child outcomes.



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مدل پایه : حالت جانشینی کامل

- Defining h as health or human capital at the completion of childhood:

$$h = A[\gamma(\bar{I}_1 + \mu_{1g}) + (1 - \gamma)(I_2 + \mu_{2g})]$$

γ : represents the weight each childhood period receives in the production of adult health or more generally, adult human capital. “capacity multiplier”

I_1 : investments during childhood through age 5

I_2 : investments during childhood after age 5.



- h are traded off against parental consumption, i.e., parents maximize their utility, $U = U(C, h)$ which is increasing in both arguments
- Parents have a budget constraint (expressed in monetary units) of: $Y = P_c C + P_I I_1 + P_I I_2 / 1 + r$
- where Y denotes family income, p_c and p_I are the market prices of consumption and investment, and r is the interest rate. We assume a Cobb-Douglas utility function of the form:

$$U = (1 - \alpha)\log(C) + \alpha\log(h)$$



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مدل پایه سرمایه انسانی و کودکی

$$\delta U / \delta C^* = \delta U / \delta h \cdot \delta h / \delta I_2^* (1 + r) / p_I.$$

So under this scenario:

$$\frac{1 - \alpha}{C^*} = \frac{\alpha}{h} A(1 - \gamma)(1 + r) / p_I$$

$$\frac{1 - \alpha}{y - p_I \bar{I}_1 - p_I I_2^* / (1 + r)} = \frac{\alpha(1 - \gamma)(1 + r) / p_I}{\gamma(\bar{I}_1 + \mu_{1g}) + (1 - \gamma)(I_2^* + \mu_{2g})}$$

$$I_2^* = \alpha(y - p_I \bar{I}_1)(1 + r) / p_I - (1 - \alpha)(\gamma / (1 - \gamma))(\bar{I}_1 + \mu_{1g}) - (1 - \alpha)\mu_{2g}$$



$$\frac{\delta I_2^*}{\delta \mu_{1g}} = -\frac{(1-\alpha)\gamma}{(1-\gamma)} < 0.$$

If the μ_{1g} shock is positive (e.g., prenatal Food Stamps), then optimized postnatal investments fall in response.

If μ_{1g} is negative (e.g., prenatal stress), then postnatal investments increase in response.

That is, period 2 investments are compensatory

When investment responses are compensatory, reduced form analyses of the impact of will tend to understate biological effects (Royer, 2009).

Following Heckman (2007), we now consider the opposite extreme of perfectly complementary investments:

$$h = \text{Amin}[\gamma(\bar{I}_1 + \mu_{1g}), (1 - \gamma)(I_1 + \mu_{2g})]$$

Now optimizing parents set:

$$\gamma(\bar{I}_1 + \mu_{1g}) = (1 - \gamma)(I_2^* + \mu_{2g})$$

$$\frac{\partial I_2^*}{\partial \mu_{1g}} = \frac{\gamma}{1 - \gamma} > 0$$



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سوال اصلی و یک مدل پایه

The period 2 investment response is now reinforcing. Attempting to ameliorate a negative prenatal shock is completely ineffective, so it is optimal to match period 1 investments (subject to weighting by β) but consume the rest.



reinforce/compensate?

- Some empirical studies from developing countries find evidence of reinforcing behavior (see Rosenzweig and Paul Schultz (1982), Rosenzweig and Wolpin (1988) and Pitt et al. (1990)).
- As discussed in Almond and Currie, 2011b, to the extent that period 1 and period 2 are complements, there are stronger tendencies for parents to reinforce endowment shocks.



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تخصیص درون خانوار: چند کار تجربی

For example, Datar et al. (2010) use data from the National Longitudinal Survey of Youth-Child and show that:

low birth weight children are:

- less likely to be breastfed
- have fewer well-baby visits,
- are less likely to be immunized,
- and are less likely to attend preschool than normal birth weight siblings.



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Hsin (2009)

looks at the relationship between children's endowments, measured using birth weight, and maternal time.

- There is little relationship between low birth weight and maternal time investments.*
- she argues that this masks important differences by maternal socioeconomic status.*
- In particular, she finds that in models with maternal fixed effects, less educated women spend less time with their low birth weight children, while more educated women spend more time*



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تخصیص درون خانوار: تشدید یا جبران شوک؟

- Birth weight and future educational attainment: Black et al. (2007). Their key result was that a 1% increase in birth weight increased high school completion by 0.09 percentage points
- low-income parents to be more likely to reinforce a negative shock than high-income parents



Methodological issues:

sibling fixed effects (or maternal fixed effects)

The issue of how parents allocate resources between siblings has received a good deal of attention in economics.

For example, Currie and Thomas (1995) find that in the cross-section, children who were in Head Start do worse than children who were not. However, compared to their own siblings, Head Start children do better.

Other casual Econometrics: Control, DID, IV, RD



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شواہد تجربی

EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

In this section, we summarize recent empirical research findings that experiences before five have persistent effects, shaping human capital in particular.



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

An intriguing sub-current is the possibility that some of these effects may remain latent during childhood (at least from the researcher's perspective) until manifested in either adolescence or adulthood.

The weather fluctuates and this provides an opportunity to assess vulnerability to weather shocks:

- Maccini and Yang (2009): Under the weather
- Burgess, et al (2014): Unequal effects of weather



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Maccini and Yang (2009): Under the weather

Long run impact of weather shocks around the time of birth

- rainfall
- Indonesian women/men born between 1953 and 1974
- Indonesian Family Life Surveys (IFLS): location and year of birth
- Outcomes in 2000

Impact of rainfall on outcomes:

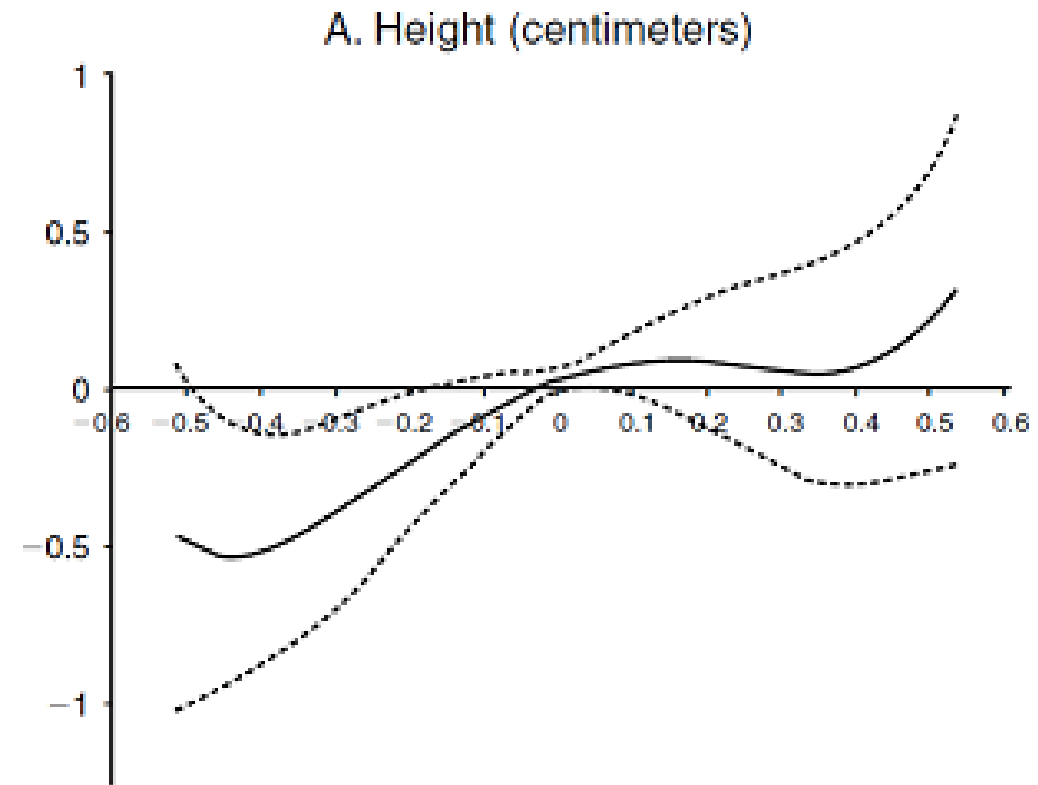
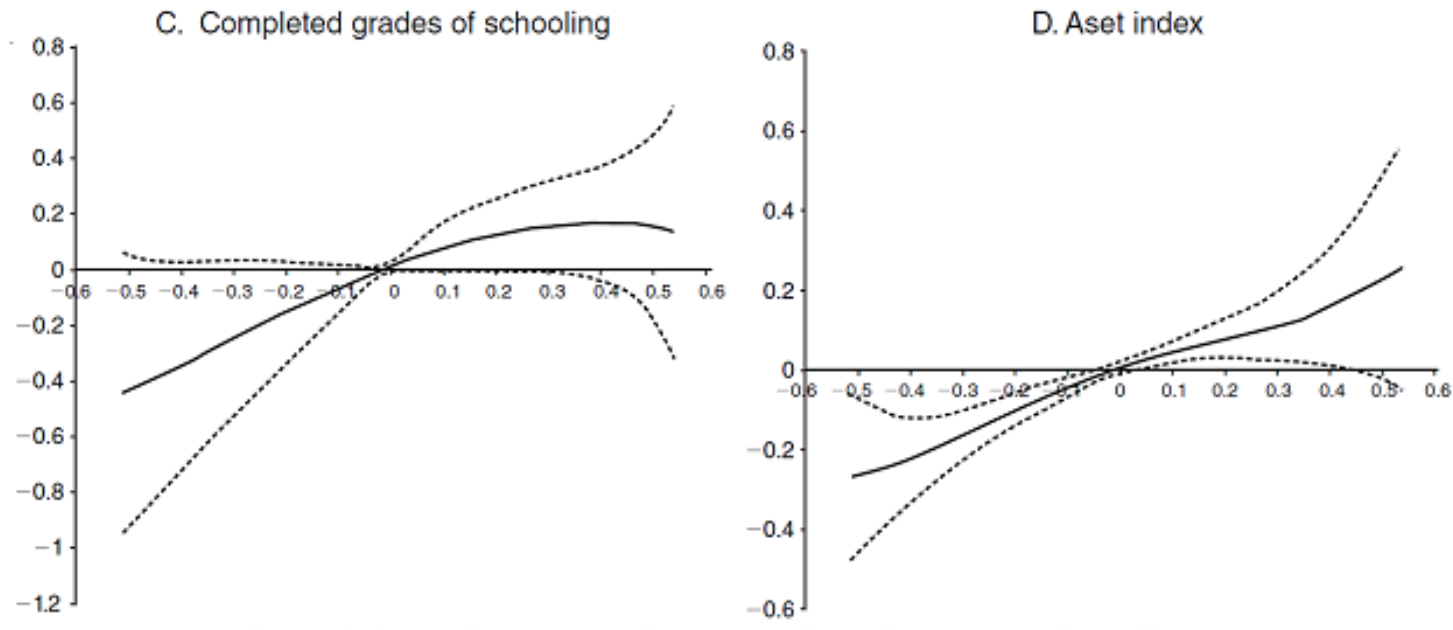


FIGURE 1. ADULT OUTCOMES ON RAINFALL IN BIRTH DISTRICT AND BIRTH YEAR

Impact of rainfall on outcomes:

FIGURE 1. ADULT OUTCOMES ON RAINFALL IN BIRTH DISTRICT AND BIRTH YEAR





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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Nutritional Shocks

متغیر ابزاری: مواجهہ جنین بہ ماہ رمضان

Fasting is of broad interest as roughly three-quarters of the world's 1.6 billion Muslims spent some portion of the in utero period during Ramadan.

Almond and Mazumder (2011), Almond, Mazumder, and Van Ewijk (2015), Hoffman (2014), and Greve, Schultz-Nielsen, and Tekin (2015) all study the effects of Ramadan fasting during pregnancy. Ramadan cycles through the calendar, enabling the effects of Ramadan fasting to be separated from seasonal variation in nutrition

this mild and brief nutritional deprivation

large effects on sex ratios among children of Arabian descent in Michigan



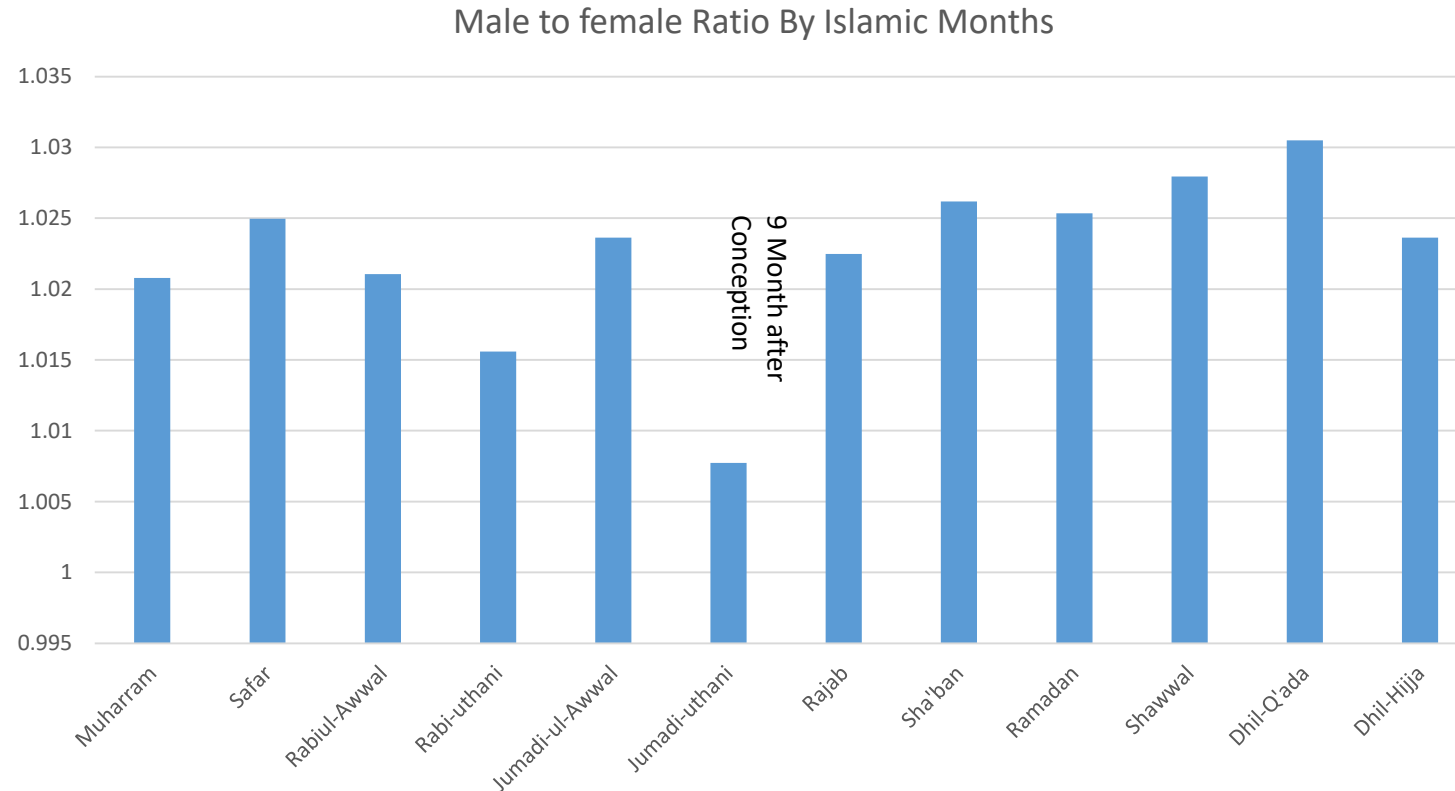
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Nutritional Shocks





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Nutritional Shocks

متغیر ابزاری: مواجهہ جنین بہ ماہ رمضان

prenatal Ramadan exposure is estimated to have pronounced effects on adult outcomes in a

variety of settings :

Uganda, Iraq, Indonesia, England, and Denmark

including to :

educational attainment, test scores, adult anthropometrics, mental disability, and wealth measures.



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Nutritional Shocks

Likewise, positive nutrition-related shocks can also have substantial effects even when relatively mild.

For example, Linnemayr and Alderman (2011) examine nutritional supplementation for pregnant women and 0 to 3 year old children in Senegal and find that supplementation during pregnancy has a significant effect on the weight-for-age of toddlers, but that post-birth supplementation had little impact, suggesting the uniqueness of the in utero period



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Nutritional Shocks

- Ludwig, Rouse, and Currie (2013) show that maternal weight gain during pregnancy predicts childhood obesity in the context of sibling fixed effects models.
- Fitzsimons and Vera-Hernandez (2014) use a novel instrumental variables strategy for postnatal nutrition. They note that mothers of infants born on weekends are less likely to receive breastfeeding instruction, and are correspondingly less likely to go on to breastfeed. Using this variation, they find large effects of breastfeeding on cognitive development.



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Nutritional Shocks

- As a group, these studies support the hypothesis that relatively ordinary variations in nutrition (positive and negative) that are within the experience of many contemporary families even in rich countries like the U.S. and the U.K., have the potential to impact children health both at birth and in the longer term.



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Prenatal Maternal Stress

دشواری عدم وجود کورتیزول به عنوان معیار دقیق

راه حل: متغیر ابزاری کاهش یافته شامل حوادث طبیعی برونزا

reduced form: Evaluating whether an exogenous event that is likely to have caused maternal stress can be shown to have affected children.

Currie and Rossin-Slater (2013) identify women in Texas who lived in the announced potential path of major hurricanes during pregnancy

They conclude that stress increases the probability of an abnormal condition of the newborn, but they found no effects on the incidence of low birth weight or gestation length



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Prenatal Maternal Stress

دشواری عدم وجود کورتیزول به عنوان معیار دقیق

راه حل دوم: متغیر ابزاری فرم کاهش یافته شامل از دست دادن اقوام درجه یک مادر

Persson and Rossin-Slater (2016), study the effect of more severe emotional shocks including, the death of a family member in Sweden, uses Swedish registry data to follow affected children up to age 30.

While the effects on birth weight are small overall, they appear to be concentrated in the lower tail of the distribution with a 20% increase in the incidence of low birth weight (birth weight less than 2500 grams).



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Quintana-Domeque and Rodenas-Serrano (2016) : uses family death terrorist attacks in Spain:

- follow affected infants into adulthood,
- find negative effects on mental health outcomes measured using prescription drug data.
- For instance, affected individuals are 23% more likely to use ADHD medication, and 9% more likely to use antidepressants as adults.



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Prenatal Maternal Stress

Aizer, Stroud, and Buka (2016):

- made an exceptional contribution to this literature
- measured stress during pregnancy using cortisol.
- infants exposed to higher cortisol levels during pregnancy have up to 1 year less school than their siblings
- Given rich background information on the mothers, this study is also able to ask which infants are most affected by higher maternal stress levels?
- They find that children born to less educated mothers suffer larger impacts of exposure to a given cortisol level



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Economic shocks

considers economic shocks around the time of birth:

Van Den Berget al. (2006)'s basic result is that adult survival in the Netherlands is reduced for those born during economic downturns.

Banerjee et al. (forthcoming) found that shocks to the productive capacity of French vineyards did not have detectable effects on life expectancy or health outcomes, but did reduce height in adulthood.



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Diseases

Almond (2006) showed that the Spanish flu epidemic of 1918 had long lasting effects. The pandemic arrived unexpectedly in the fall of 1918 generating sharp predictions for long-term effects.

Data from the 1960–80 decennial U.S. Census indicate that cohorts in utero during the pandemic:

- displayed reduced educational attainment
- increased rates of physical disability,
- lower income
- lower socioeconomic status
- compared with other birth cohorts.
- These results indicate that investments in fetal health can increase human capital.



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اقتصاد رفاه کودکان و توسعه

شواهد تجربی: بیماری ها – مقاله هانس شواند

EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Diseases

Hannes Schwandt (2018) “The Lasting Legacy of Seasonal Influenza: In-utero Exposure and Human Capital Development”

- Between 1980 and 1993, “essentially no vaccination of pregnant women for influenza in Denmark”
- Can identify women hospitalized for influenza-like diseases during pregnancy
- IV: seasonal pattern of influenza outbreaks
- In-utero exposure to influenza is associated not only with worse health at birth, but with 10% lower earnings, a 7% decrease in labor market participation, and a strong 43% increase in welfare dependence
- Effects are maximal for those exposed between months 4 to 6.



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شواهد تجربی: سایر مقالات اثر مواجهه با شوک های کودکی

EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

- Famines: Banerjee et al. (2007), Chen and Zhou (2007), Almond et al. (2010), Lindeboom et al. (2010)
- Natural disasters: Torche (2011), Simeonova (2011), Currie and Rossin-Slater (2013)
- Nuclear accidents: Almond, Edlund and Palme (2009), Black et al. (2014)
- Terror attacks: Lauderdale (2006), Camacho (2008)



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Effects of Education

Two main questions:

1. Does education increase productivity and income?
2. Are social returns higher than private returns?

$$\ln(W_i) = \beta_0 + \beta_1 S_i + \sum_{k=2}^K \beta_k X_k + \varepsilon_i$$

If we regress log-earnings ($\ln w_i$) on schooling (s_i), what do we estimate? Is it the causal effect of education on earnings? why not?



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Methodology: Instrumental Variables

Ester Duflo (2001) "Schooling and labor market consequences of school construction in indonesia: evidence from an unusual policy experiment"
1973-1978, Indonesia built 61,000+ schools

Goal of the program: to increase enrollment rates among 7-12 year-old children

Enrollment rose from 69% to 85% over the course of the program



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EMPIRICAL LITERATURE: EVIDENCE OF LONG TERM CONSEQUENCES

Methodology: Instrumental Variables

Exposure to new schools varied by:

1. Region: Government focused investments in building schools in regions where baseline enrollment was low
2. Year of birth (cohort): Only individuals who were young enough (less than 12 years old) were exposed to the reform



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		Cohort		Difference
		2-6 yo	12+ yo	Young - Old
Baseline	Low	Young & Low	Old & Low	Diff: YL-OL
	High	Young & High	Old & High	Diff: YH-OH
Difference	Low-High	Diff: YL-YH	Diff: OL-OH	Diff-in-diff

affected by the
intervention

counterfactual

Under what
conditions?



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آموزش: آیا تکنولوژی می تواند موجب بهبود آموزش کودکان شود؟

SUMMARY RECOMMENDATIONS

1. Technologies inside the classroom
 - 1.1 Computers ✗
 - 1.2 Internet ✗
 - 1.3 Tablets ✓
2. Remote learning technologies
 - 2.1 Video lectures ✓
 - 2.2 Cell-phones ✓
 - 2.3 Digital television ✓
3. Technologies to support management
 - 3.1 Communicating with students and parents ✓
 - 3.2 Monitoring teachers ✓
 - 3.3 Generalizing best practices ✓



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موارد مهم مرتبط به ایران

ناکارایی آموزش:

Lant Pritchett (2007) “Where has all the education gone?”

ازدواج کودکان و تاثیر آن بر سرمایه انسانی:

Ambrus and Field (2010) “Early Marriage, Age of Menarche, and Female Schooling Attainment in Bangladesh”

رفتار خانوار و پدیده جهیزیه:

Chowdhury (2015) “Evolution of Mehr and Dowry among Muslims in Bangladesh: evidence from natural experiments”

خدمت سربازی اجباری و تاثیر آن بر سرمایه انسانی

Joshua D. Angrist(1995)” Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants”

سیپاس از حسن توجه شما