Intrafamily Resource Allocations:
A Dynamic Model of Birth Weight

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- Estimate a **production function** where :
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  - **maternal smoking and labour supply** are (some of the) inputs
- Account for **between** family and **within** family heterogeneity
- Use **3** data sources for **2** countries, **MCS** and **BHPS** (Britain) and **NSFG** (United States)

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- **Socioeconomic gradient** in cognitive/noncognitive skills opens up at a very early age (Feinstein 2003, Illsley 2002)
- Intrafamily allocation decisions **start with the pregnancy** (initial conditions are controlled for)

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  - **Instruments:** prenatal inputs to child i are instruments for the differenced inputs between child i and child $i+1$
  - **Identifying assumption:** prenatal inputs associated with pregnancy i are uncorrelated with the child-specific endowment of that pregnancy

Child health production function

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- Standard formulation of infant production function is to assume that the human capital at birth, h, of child i in family j is given by:

$$h_{ij} = X'_{ij}\gamma + \mu_j + \phi_{ij},$$

  - h_{ij} = birth weight or fetal growth
  - X_{ij} =vector of prenatal inputs (smoking) and other vbs (child sex)
  - μ_j = mother's endowment
  - ϕ_{ij} =idiosyncratic child endowment of health (that is not subject to the control of parents and uncorrelated with μ_j)
  - γ =vector of parameters

Identification and estimation (1)

Consider an economy in which each family has two children (1 and 2) and uses one input during pregnancy, x, to produce h:

$$h_1 = \gamma_x x_1 + \mu + \phi_1,$$

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1. ϕ_1 and ϕ_2 are **not** known prior to birth
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In this framework changes in parental behaviour across children are **endogenous** but x_1 is a **valid instrument** for the difference $x_2 - x_1$

Identification and estimation (2) — FE-IV

The model is estimated using GMM. The moment conditions are:

$$
\begin{aligned}
\sigma^2_{h_1} &= \gamma_x^2\sigma^2_{x_1} + \gamma_x\sigma_{x_1\mu} + \sigma^2_{\mu} + \sigma^2_{\phi_1}, \\
\sigma^2_{h_2} &= \gamma_x^2\sigma^2_{x_2} + \gamma_x\sigma_{x_2\mu} + \sigma^2_{\mu} + \sigma^2_{\phi_2}, \\
\sigma^2_{h_1h_2} &= \gamma_x^2\sigma^2_{x_1x_2} + \gamma_x(\sigma_{x_1\mu} + \sigma_{x_2\mu}) + \gamma_x\sigma_{x_2\phi_1} + \sigma^2_{\mu}, \\
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- The term $\sigma_{x_2\phi_1}$ is the **dynamic** parameter we are interested in
- The sign of this parameter reveals whether **equity** or **efficiency** considerations dominate intrafamily allocation decisions

Data sources

- **British Household Panel Study 1991-2005 (UK)**
  - Longitudinal, and retrospective
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- **National Survey of Family Growth 1995 (USA)**
  - Longitudinal, **but retrospective**
  - Large sample size
  - **No** information on **fathers**

Descriptive statistics

	BHPS	MCS	NSFG
Birth weight (kg, regression adjusted)	0.000	0.000	0.000
	(0.557)	(0.564)	(0.572)
Fetal growth in (g/wks, regression adjusted)	0.000	0.000	0.000
	(12.513)	(12.825)	(13.506)
Mother smoked during pregnancy	0.225	0.259	0.127
Mother stopped working <1 month before birth	0.158	0.302	0.244
Mother stopped working 1-2 months before birth	0.134	0.283	0.078
Mother stopped working 3+ months before birth	0.099	0.086	0.044
Mother did not work during pregnancy	0.397	0.329	0.502
Mother did not report information on labor supply	0.211		0.131
Child sex (male)	0.495	0.514	0.505
First born child	0.681	0.416	0.523
Mother's age at birth of the child (years)	28.013	29.272	24.675
	(5.751)	(5.794)	(5.513)
Number of observations	1,339	17,483	12,166
Number of mothers	912	17,483	6,153
Number of siblings-pairs	327		2,417
Number of siblings-triplets	50		1,798

Birth weight — OLS and FE

Birth weight

	BHPS		MCS	NSFG	
	OLS	FE	OLS	OLS	FE
Mother smoked during pg.	-0.187**	-0.189*	-0.203**	-0.139**	-0.140**
	(0.043)	(0.095)	(0.013)	(0.017)	(0.044)
Mother stopped working, 1-2 months before birth	0.168**	0.187*	0.161**	0.067**	0.063*
	(0.060)	(0.075)	(0.012)	(0.021)	(0.027)
Mother stopped working, 3+ months before birth	0.169**	0.241**	0.086**	0.023	0.061
	(0.064)	(0.079)	(0.021)	(0.026)	(0.034)
Mother did not work	0.110*	0.143*	0.069**	0.021	0.043*
	(0.047)	(0.062)	(0.016)	(0.015)	(0.020)

Fetal growth — OLS and FE

Fetal growth	**BHPS**		**MCS**	**NSFG**	
	OLS	FE	OLS	OLS	FE
Mother smoked during pg.	-4.143**	-4.687*	-4.787**	-3.588**	-3.523**
	(0.954)	(2.059)	(0.293)	(0.390)	(1.032)
Mother stopped working, 1-2 months before birth	2.948*	3.730*	2.661**	1.084*	0.701
	(1.355)	(1.632)	(0.297)	(0.506)	(0.635)
Mother stopped working, 3+ months before birth	3.238*	4.257*	1.565**	0.238	0.678
	(1.431)	(1.710)	(0.461)	(0.611)	(0.799)
Mother did not work	1.995	2.645	1.078**	0.222	0.670
	(1.046)	(1.354)	(0.352)	(0.345)	(0.480)

Birth outcomes — FE-IV on NSFG sample

	Birth weight		Fetal growth	
	FE-IV	FE-IV	FE-IV	FE-IV
Mother smoked during pg.	-0.151**	-0.164**	-3.557*	-3.618*
	(0.036)	(0.042)	(1.421)	(1.279)
Mother stopped working	0.092**	0.096**	0.894*	0.883*
1-2 months before birth	(0.034)	(0.029)	(0.388)	(0.356)
Mother stopped working	0.071	0.070	0.514	0.525
3+ months before birth	(0.064)	(0.056)	(0.821)	(0.826)
Mother did not work	0.046	0.048*	0.547	0.648
	(0.025)	(0.021)	(0.469)	(0.612)
Selected **dynamic responses:**				
Smoking 2nd pregnancy and ϕ_1	-0.043**	-0.045**	-0.061*	-0.073**
	(0.015)	(0.016)	(0.024)	(0.020)
Smoking 3rd pregnancy and ϕ_1	-0.019*	-0.022*	-0.028*	-0.026**
	(0.009)	(0.009)	(0.012)	(0.010)
Stops working 2nd pregnancy and ϕ_1	0.026*	0.029*	0.008	
	(0.012)	(0.012)	(0.062)	
Stops working 3rd pregnancy and ϕ_1	-0.006		-0.011	
	(0.018)		(0.079)	

Main results and theoretical implications

- Maternal smoking during pregnancy: **negative** effect
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- Work interruptions before birth: **positive** effect
  - US: 1/2 to 1/4 of the size of the smoking effect (in abs. value)
  - UK: same abs. size of the smoking effect
- FE-IV is statistically the preferred model specification:
  - **Significant dynamic responses**
  - Parents are guided by **equity rather than efficiency concerns**

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  - Education: Most of the **smoking/labor supply** effects are concentrated among **low education** women
  - Age at birth: Most of the negative effect of **smoking** is concentrated among **young** mothers. Most of the positive effect of **work interruptions** is concentrated among **older** mother

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- We also analyse **postnatal inputs** , i.e. breastfeeding decisions
  - Inference is based on **reduced-form** analyses
  - Responses are in line with a notion of intrafamily allocations driven by **equity considerations**

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Conclusions

- Importance of analyzing **within family heterogeneity** and parental responses to idiosyncratic endowments
- Evidence of intrafamily allocations to children driven by **equity concerns** rather than efficiency arguments in the case of both **prenatal** and **postnatal** investments
- Important **policy implication** : transfer programs directed towards lower income households are likely to be effective at reducing inequality