Examining the Impact of Early Childbearing on Labor Market Outcomes

RESEARCH PROPOSAL

Presented to

Partnership for Economic Policy (PEP)

January/23/2018

Abstract

We examine the labor market participation, employment and earnings of women who have had a child during their adolescent years. The literature shows that adolescent mothers experience high secondary school dropout rates and are less likely to obtain a college degree, which will then affect their labor market participation and earnings later in their lives. We also examine other pathways relating to childrearing responsibilities and delayed labor market entry. Cognizant of the endogeneity in this relationship, we explore a number of instruments including age of menarche, miscarriage/abortion, using the Demographic Health Surveys as well as household surveys from countries in Africa, Asia and Latin America. If necessary, we also intend to use recursive structural models and Lewbel approach as ways to deal with the endogeneity problem and lack of outside adequate instrumental variables.

1. Introduction

One of the biggest challenges faced by many low and middle-income countries is the issue of adolescent pregnancy and motherhood. According to the World Health Organization near 21 million girls aged 15 to 19 and about 2 million girls under 15 become pregnant every year - most in low and middle-income countries. The average global birth rate among the age of 15-19 is 49 per 1000 girls, while country rates range from 1 to 299 births per 1000 girls, with the highest rates in sub-Saharan Africa [World Health Statistics (2014)].

The Global Strategy for Women's and Children's health, launched by the United Nations Secretary-General in 2010, stresses the importance of addressing the health and welfare of adolescent girls in order to achieve the fifth Millennium Development

Goal on maternal mortality reduction, knowing that pregnancy and childbirth complications are the leading cause of death among girls from 15 to 19 years in many low and middle-income countries.

According to the United Nations Population Fund (2013), "there are 40 countries where 20 per cent or more of women aged 20 to 24 gave birth before age 18. Of the 15 countries where the figure is over 30 per cent, 14 are in sub-Saharan Africa, with the highest rates observed in Niger (51 per cent), Chad (48 per cent), Mali (46 per cent), Guinea (44 per cent), Mozambique (42 per cent), Sierra Leone (38 per cent), Liberia (38 per cent), Central African Republic (38 per cent), Madagascar (36 per cent), Gabon (35 per cent), Malawi (35 per cent), Zambia (34 per cent), Uganda (33 per cent) and Cameroon (30 per cent). The only country that has a rate above 30 per cent outside sub-Saharan Africa is Bangladesh at 40 per cent."

Becker's human capital theory (1993) points out that early childbearing decreases or prevents educational attainment and consequently affects female labor market participation and earnings. Many girls who become pregnant have to drop out of school, decreasing their skills and opportunities to find a job and earn income. Moreover, it is harder to take the right economic, social and psychological responsibilities when a mother is a teenager, decreasing her quality of life and leaving the mother and her family welfare-dependent.

This literature also relates to the work on fertility and labor market participation. Although there is a vast literature showing a negative correlation between the presence of children and female labor force participation [Bloom et al. (2009); Schultz (2008)], it is well established that there are difficulties involved in the interpretation of the impact of childbearing on mother´s work due to the endogeneity of this decision. A woman´s decision on the number of children she has is a choice variable which is influenced by factors such as her motivation and her own assessment of her productivity and labor market returns – factors that will also affect her labor force participation.

However, with teenage pregnancies there will be additional factors to consider. The question of adolescent motherhood's impact on labor market outcomes is relevant partly due to its intersectionality: combining gender discrimination, vulnerability and many of the challenges of youth unemployment. Estimation of this effect is complicated by the high prevalence of teenage mothers amongst the lower end of the socioeconomic distribution where different social and gender norms (e.g. acceptability of contraception) may prevail and where human capital investment and aspirations often also may be low due to the many constraints that lower income households face.

To solve this endogeneity problem, the ideal counterfactual would be to observe what has happened to the teenager had she not given birth as a teen. However, we cannot observe that as we see young woman with children or without children, but not both at the same time. Lee (2007) used propensity score matching to create a comparison group, but unobserved factors cannot be controlled using this methodology and as noted above unobserved factors such as social and gender norms are important influences for this question.

Natural experiments rarely provide a way forward – especially not if the interest is in studying this research question across several countries. The literature on fertility decisions and labor market outcomes have proposed a number of exogenous sources of variation in family size. For example, Rosenzweig & Wolpin (1980) used the occurrence of twins in the first pregnancy and Angrist & Evans (1998) used gender composition of the first two children as instrument to family size. However, these instruments may be less relevant for instrumentation of becoming a teen mother. More relevant for this research may be instrumentation via infertility, miscarriage and age of menarche [Hotz, Sanders & McElroy (2005); Fletcher & Wolfe (2008); Aguero & Marks (2011)].

2. Bibliography Review

We intend to conduct a comprehensive overview of the state of the literature on the Impact of Early Childbearing on Labor Market Outcomes, including but going far beyond past PEP (notably PAGE-I) research on this theme.

3. Research Questions and Approach

The main objective of this proposal is to use cross-country surveys from different low and middle-income countries to **measure the impact of early childbearing on education and labor market outcomes**, such as participation in the labor market, participation in the formal labor market and earnings. Few studies have investigated differences across countries and this provides an opportunity to examine how social and gender norms and child care support may influence the long-term impact of early childbearing. The pooled cross-country work will be complemented by country case studies for Philippines, Brazil, Burkina Faso and Pakistan.

To enable the research to provide useful social policy recommendations, we will consider **factors that are protective of labor market performance for adolescent mothers** or that appear to worsen and deepen labor market scarring. We are also interested in understanding the role of educational attainment as an important transmission mechanism and how social and cultural norms re children as well as norms and social support for child care may affect how teenage pregnancy affect educational attainment, and ultimately, via this route, also labor market outcomes.

We will also examine the **relationship between vulnerability dimensions and adolescent pregnancy**. We will study access to and utilization of contraceptive methods for adolescents. It is common to observe discontinuities in the use of contraceptive methods due to the absence of appropriate sexual education in families and school environments and the strong gender hierarchy. Moreover, cultural barriers make it difficult for the society to approach the topic in a less harmful way, thus turning sexual initiation into a prohibit process with moral disapproval.

Our analysis will address how vulnerability dimensions intersect with the likelihood of adolescent pregnancy and also the impact of early childbearing on labor market outcomes. It has been shown that when vulnerability dimensions overlap they can produce “isolated minorities” and more extreme marginalization. We will therefore consider an intersectional approach to study the prevalence and impact of adolescent pregnancy in vulnerable groups, such as poor black females, recognizing that groups often experience distinctive forms of stereotyping or barriers based on a combination of race and gender. In cases where there are strong prohibitive norms about adolescent pregnancy, such events may introduce additional layers of social marginalization and discrimination.

4. Policy Relevance.

Policy-interventions for supporting childrearing responsibilities: The team believes that there are several pathways to childrearing responsibilities and labor market entry. The literature recognizes that we do not fully know about these pathways and the understanding at the policy making level is even scarce. This knowledge deficit at policy-making tier is reflected in less than optimal legislative interventions (with weak outcomes), and public administration – where key performance indicators usually ignore interventions that can ease the education access and labor market mobility for adolescent mothers.

Better informed legislation at grass roots level: A major segment of the literature recognizes that support to adolescent mothers as envisaged in national-level legislation is inadequate. While over the past two decades several developing countries have administratively devolved social sectors, however sub-national and local-level legislation is still missing. Customized interventions at a micro-level would require legislation – which is locally owned and informed through evidence and learning.

Improving design of social safety nets: Given the heterogeneity in our sample, there could be learning across countries on the best way to improve social safety nets for adolescent mothers. The conditional or non-conditional support to these mothers is a weakly understood area in several of the countries under consideration. The linkages of a well-designed social safety nets scheme with an inclusive labor market could ensure important government considerations such as 'exit from social programs and sustainability. Ultimately once such social safety nets are in place, these can address the vulnerability dimensions seen by adolescent mothers in education and labor market spaces.

Policies that help outreach and overcome cultural barriers: A key expected outcome of this proposed project is to offer the results in a non-technical language, which if smartly designed for an outreach campaign by the government, has potential to overcome several forms of cultural barriers around this subject. Such barriers include, but are not limited to: access to and utilization of contraceptive methods for adolescents, absence of appropriate formal or informal sexual education in families and school environments, strong gender hierarchy, and social disapproval of adolescent mothers on several accounts.

We intend to consider and discuss the following policy recommendations: (i) reducing marriage before the age of 18; (ii) creating understanding and support to reduce pregnancy before the age of 18; (iii) increasing the use of contraception by adolescents at risk of unintended pregnancy; (iv) reducing coerced sex among adolescents; (v) reducing unsafe abortion among adolescents; (vi) increasing use of skilled antenatal, childbirth and postnatal care among adolescents; (vii) protect and safeguard school completion and labor force participation.

In cases where the teenagers have already a new baby born, it is important to push mothers back to school or to work, offering daycares or nurseries to young children.

Highlighting the need for improved data availability: One of the key constraints to expanding the number of countries in this research is the lack of data on age of menarche. We believe that an important policy-relevant output of this proposed project can be highlighting these data gaps and how availability of data around some other variables could have allowed us to go deeper into varied streams of research which would now be regarded as limitations of our work. In several examples from least developed countries it is usual to find information on adolescent mothers in labor market missing from national-level datasets.

5. Methodology

5.1 Model

To achieve the objectives, we will use cross-sectional data across selected countries to determine the causal relationship between teenage pregnancy and labor market participation and its impact on labor market outcomes such as employment and income. In order to address the endogeneity concerns described earlier, we will use infertility, miscarriage and the age of first menstruation or menarche of adolescent mothers[1] as an instrumental variable.

[1] Karapanou and Papadimitriou (2010) point out that while there are many factors that influence menarche, most of them are random such as season and month at birth, and position at the sibship.

We will implement the instrumental variable approach following Aguero and Marks (2011). Consider regressing the following equations:

$$Y_i = c_1 + \alpha T_i + \gamma x_i + u_i \qquad (1)$$

$$T_i = c_2 + \beta \, instrument + \delta x_i + v_i \qquad (2)$$

where Y_i represents individual i labor market outcomes. The parameter α represents the effect of teenage motherhood on labor market outcomes. The endogenous variable T_i refers to whether the individual had a child below the age of 18. x_i is a vector of exogenous variables such as marital status, age, race, educational attainment, parental status, location (rural or urban), and husbands´ occupation. Moreover, c_1, c_2 and u_i, v_i denote the constant terms and the unobserved error terms.

The instrumental variable for teenage pregnancy in equation 2, $instrument$, refers to the three instruments (may vary according to data set).

5.2 The Lewbel´s Approach

Estimating the relationship between teenage pregnancy and labor outcomes is complicated because a woman´s decision on being pregnant is many times influenced by her motivation, productivity and labor market returns, which also affect her labor force participation. To correct for the endogeneity of teenage pregnancy in case we do not have a good outside instrument, is to use the Lewbel (2012) approach. This method consists of creating instrumental variables from the model, by exploiting the heteroscedasticity of the error terms of the endogenous variables. Kelly and Markowitz (2009), Le Moglie et al. (2015), Millimet & Roy (2016), Fortin and Ragued (2017) and Kassouf, Tiberti & Garcias (2017) found that the generated instruments satisfy the overidentification test and yield to strong first stage F-statistics when using Lewbel's method.

Following Lewbel (2012), consider the structural equation (1) and (2). Sometimes, variables affecting Y also affect T, leading to lack of exclusion restrictions and therefore instruments to identify the model.

From Kassouf, Tiberti & Garcias (2017), the Lewbel's identification technique relies on covariates which are correlated with the conditional variance of v_i but uncorrelated with the conditional covariance between u_i and v_i. Formally, let *z* be a vector of observed exogenous variables, possibly being a subvector of x or even equal to x. In this case, Lewbel (2012) shows that under the assumptions

$$\operatorname{cov}(z, u_i v_i) = 0 \text{ and } \operatorname{cov}(z, {v_i}^2) \neq 0 \tag{3}$$

along with heteroskedasticity of v_i, the structural equation can be identified. In particular, $\operatorname{cov}(z, u_i v_i) = 0$ assures that the error terms are uncorrelated conditional on z, and $\operatorname{cov}(z, {v_i}^2) \neq 0$ means that z and the variance of the first stage error must be correlated and affects the extent of heteroscedasticity of v_i.

Defining matrices Ψ_{zx} and Ψ_{zz} by

$$\Psi_{zx} = E\left[\begin{pmatrix} x \\ [z - E(z)]v_i \end{pmatrix}\begin{pmatrix} x \\ T \end{pmatrix}'\right], \Psi_{zz} = E\left[\begin{pmatrix} x \\ [z - E(z)]v_i \end{pmatrix}\begin{pmatrix} x \\ [z - E(z)]v_i \end{pmatrix}'\right]$$

and let Ψ be any positive definite matrix that has the same dimension as Ψ_{zz}, Lewbel shows that,

$$\delta = E(xx')^{-1}E(xT)$$

$$\begin{pmatrix} \gamma \\ \alpha \end{pmatrix} = (\Psi'_{zx}\Psi\Psi_{zx})^{-1}\Psi'_{zx}\Psi\left[E\begin{pmatrix} x \\ [z - E(z)]v_i \end{pmatrix}Y\right]$$

This result means that δ and α can be obtained by two stage least squares regression of *Y* on *x* and *T* using *x* and [*z* - E(*z*)] v_i as instruments. Importantly, the assumption that z is uncorrelated with $u_i v_i$ means that the generated instrument $[z - E(z)]v_i$ is exogenous (since uncorrelated with u_i) and, so, a valid instrument for *T*. Also, the larger the degree of heteroskedasticity of v_i with respect to z the stronger the instrument, since its correlation with T is proportional to the covariance of z and v_i. The extent of the heteroscedasticity depends on z. According to Lewbel (2017), such a technique is valid also when binary endogenous regressors are used.

The estimation procedure is as follows. The coefficient δ is estimated by linearly regressing *T* on *x* to obtain the residuals $\hat{v}_i$. Then *γ* and *α* can be estimated by regressing *Y* on *x* and *T* using *x* and $(z - \bar{z})\hat{v}_i$ as instruments, where $\bar{z}$ is the sample mean of *z*. Let over bars denote sample averages, the resulting estimators are

$$\hat{\delta} \quad = (\overline{xx'})^{-1}\overline{xT}, \quad \hat{v}_i = T - x'\hat{\delta}$$

and

$$\begin{pmatrix} \hat{\gamma} \\ \hat{\alpha} \end{pmatrix} = (\hat{\Psi}'_{zx}\hat{\Psi}_{zz}^{-1}\hat{\Psi}_{zx})^{-1}\hat{\Psi}'_{zx}\hat{\Psi}_{zz}^{-1}\begin{pmatrix} \overline{xY} \\ \overline{(z - \bar{z})\hat{v}_i Y} \end{pmatrix}$$

As reviewed and discussed in Fortin and Ragued (2017), in various contexts the results based on the Lewbel's approach are found to be more plausible than IV results estimated with external instruments of dubious validity.

5.3 Recursive Structural Models

We intend to consider recursive structural models as suggested by the referee and estimate the age at first birth and labor market equations. Parental education, family income and characteristics of the household are some of the common observable factors that influence these choices. However, there are also unobserved factors influencing the choices, such as women´s preferences. Following Marchetta & Sahn (2016), in the lack of repeated outcomes for the same individual, we may assume that all the sisters living in the same household share identical heterogeneity components for each equation.

6. Data

This study will use Demographic and Health Survey and other data sets from countries in Africa, Asia and Latin America. We described below a summary of the DHS datasets and the Health survey for Brazil and Pakistan.

6.1 Demographic and Health Surveys (DHS)

The basic approach of the Demographic and Health Surveys (DHS) Program is to collect data that are comparable across countries. To achieve this, standard model questionnaires have been developed, along with a written description of why certain questions or sections have been included. These model questionnaires—which have been reviewed and modified in each of the six phases of The DHS Program—form the basis for the questionnaires that are applied in each country. Typically, a country is asked to adopt the model questionnaire in its entirety, but can add questions of particular interest. However, questions in the model can be deleted if they are irrelevant in a particular country.

DHS are nationally representative population-based surveys with large sample sizes (usually between 5,000 and 30,000 households). In all households, women age 15-49 are eligible to participate; in many surveys men age 15-54(59) from a sub-sample are also eligible to participate. There are three core questionnaires in DHS surveys: A Household Questionnaire, a Women’s Questionnaire, and a Men's questionnaire. There are also several standardized modules for countries with interest in those topics. This data source is useful because the women questionnaire contains questions on employment status, birth history, current and future contraceptive use, fertility preferences and socio-economic and marital status. Anthropometric measures such as weight and height were also collected in most of the countries in phases 4 and 5.

Infertility, which is sometimes referred to as subfecundity, is defined in the medical literature as the inability to conceive following a year of regular intercourse without contraception. Women who have never been able to conceive under these conditions are categorized under primary infertility, while those who have had at least one successful pregnancy fall under the secondary infertility category. The DHS allows one to identify infertility through two questions. The first question captures the reason which a woman chooses for why she is currently not using contraception, to which she may respond that she is sub-fertile or infertile. A second question, which is asked to non-sterilized women, measures desire for future children and includes a category for unable to have more children. The main indicator of fertility is the union of these two measures of infertility. The data will also allow us to use twinning and sibling composition as alternative instruments.

Aguero and Marks (2011) list a number of requirements for the inclusion of a country in their analysis. Four criteria need to be fulfilled before a country may be included: (1) both of the infertility questions which constitute the main fertility indicator need to be included in the country's survey, (2) these questions should have been asked to the entire sample and they need to include either infertile, subfertile, subfecund or infecund as an independent response, (3) the survey has to capture information about the different labor force participation variables consistently, and (4) the data needs to be publicly available. In order to test the external validity of their results in a consistent manner, this paper imposed their restrictions on the main pooled dataset which was used for analysis.

Unfortunately, not many low-income countries have data on menarche. Sommers (2013) discusses the importance of having menarche information and at the same time the fact that datasets available have generally not included this important measure. According to the author, "across low-income regions of the world, there is almost no systematic effort to monitor the socio-epidemiology of menarche. This lack of monitoring represents a missed opportunity for shaping public health interventions targeting girls transitioning into young womanhood, and for deepening the understanding of the relationship between socioeconomic inequalities and adolescent girls' nutritional status, risk of unintended pregnancy, and risk of sexually transmitted infections."

Table 6.1 contains information on DHS countries where the menarche question is available. If we use information from the year 2000 on, only Gabon, Indonesia, Morocco, Philippines and Uganda have data on menarche. However, all countries have information on abortion/miscarriage.

Table 6.1 – Countries with menarche information in the DHS dataset.

Countries	Menarche
Botswana 1988 DHS	1
Cameroon 1991 DHS	1
Egypt 1988 1992 1995 DHS	1
Gabon 2000 DHS	1
Ghana 1998-99 DHS	1
India 1992-93	1
Indonesia 2002-03, 2007 2012 (Special)	1
Kyrgyz Republic 1997 DHS	1
Morocco 2003-04 DHS	1
Philippines 1993, 2003, 2008, 2013 DHS	1
Senegal 1986 DHS	1
Uganda 2000-01 DHS	1
Uzbekistan 1996 DHS	1
Yemen 1997, 1991-92 DHS	1
Zambia 1998	

6.2 Brazilian National Health Survey (PNS) 2013

The National Health Survey is a household-based nationwide survey carried out by the Ministry of Health in partnership with the Brazilian Institute of Geography and Statistics in 2013. The scope of the survey is to establish the health status and lifestyles of the population - as well as how they look after their health - with regard to access and use of services, preventive actions, continuity of care, and health care financing. The sample size is 80,000 households and enables the calculation of some indicators at different geographic levels, namely states, capitals, metropolitan and rural areas. The questionnaire is divided into three parts. The first two are answered by one resident and include questions on the household characteristics and on the social and economic level and health status of all inhabitants. The individual questionnaire is answered by an adult (aged 18 years or more), selected with equal probability among the adult residents, and focuses on morbidity and lifestyle.

Information on the age of menarche is available in the Brazilian National Health Survey.

6.3 Pakistan Demographic and Health Survey (PDHS) 2013

This survey employs a sampling frame from 2003 Economic Census for urban areas and 1998 Population Census for rural areas. This covers 140,000 households from 248 urban and 252 rural clusters of Pakistan. In each household the respondents include all ever-married women 15-49 years of age. The women's questionnaire includes information on: basic characteristics (age, education, literacy, employment, etc.); reproductive history; knowledge and use of family planning; fertility preferences; antenatal, delivery; and postnatal care; breastfeeding and infant feeding practices; vaccinations and childhood illnesses; woman's work and husband's background characteristics; infant and childhood mortality; women's decision making; knowledge of HIV/AIDS; other health issues; and domestic violence. Besides this the community-level questions include information related to health facilities and services, transportation, education, and related facilities.

The basic background results of this survey are in line with Pakistan Living Standards Measurement Survey. For example, the PDHS dataset informs that 11% of the households were headed by female members; average household size was 6.8 members; and almost 39% of the population is under the age of 15 years.

Information on the age of menarche is available in the PDHS.

7. Preliminary Results for the Brazilian Case

Based on the suggestion from item 6 of the comments, we estimated simple OLS first stage regressions using menarche, abortion/miscarriage and month of birth as instrumental variables, when available. The results are presented below.

Table 7.1 presents the analyses for Brazil first-stage regression using the National Health Survey (PNS) from 2013. The dependent variable is equal one if a woman had a child before the age of 18 and 0 otherwise. The right hand side variables are the **birth months indicators** (January is base – so expect all other birth months to be negative by comparison because this would be youngest age cohort and thus have shortest fertility exposure if all other things are presumed equal), **age of menarche** or the age girls got their first period and **abortion/miscarriage**.

The coefficients for **menarche** and **abortion/miscarriage** IV variables are highly significant and negative as expected, as well as birth months.

Table 7.1 - Brazil: The weighted OLS **first stage regression** on the relationship between early childbearing and some instrumental variables using a National Health Survey - PNS survey from 2013.

Y= early childbearing	(1)	(2)	(3)	(4)
Miscarriage=1	-0.014	-	-0.015	-
	(0.011)	-	(0.011)	-
Birth month=1	-0.043*	-0.035	-0.042	-0.042*
	(0.025)	(0.024)	(0.026)	(0.025)
Birth month=2	-0.054**	-0.051**	-0.056**	-0.053**
	(0.025)	(0.024)	(0.025)	(0.025)
Birth month=3	-0.067***	-0.062***	-0.065***	-0.067***
	(0.023)	(0.021)	(0.023)	(0.023)
Birth month=4	-0.063***	-0.057**	-0.060**	-0.063***
	(0.024)	(0.022)	(0.024)	(0.024)
Birth month=5	-0.046*	-0.034	-0.046*	-0.045*
	(0.026)	(0.024)	(0.026)	(0.026)
Birth month=6	-0.070***	-0.061***	-0.070***	-0.070***
	(0.024)	(0.023)	(0.024)	(0.024)
Birth month=7	-0.062**	-0.057**	-0.062**	-0.062**
	(0.025)	(0.024)	(0.025)	(0.025)
Birth month=8	-0.032	-0.018	-0.027	-0.032
	(0.025)	(0.024)	(0.025)	(0.025)
Birth month=9	-0.024	-0.018	-0.022	-0.023
	(0.025)	(0.023)	(0.025)	(0.025)
Birth month=10	-0.017	-0.010	-0.013	-0.016
	(0.028)	(0.026)	(0.028)	(0.028)
Birth month=11	-0.041*	-0.035	-0.040	-0.041*
	(0.025)	(0.023)	(0.025)	(0.025)
Age of menarche	-	-0.020***	-0.020***	-
	-	(0.002)	(0.002)	-
Abortion=1	-	-	-	-0.040***
	-	-	-	(0.015)
Constant	0.151***	0.389***	0.411***	0.149***
	(0.020)	(0.037)	(0.039)	(0.020)
N. obs.	12,923	13,839	12,834	12,923
F-stat	2.024	8.137	7.288	2.451

Note: Standard errors in parentheses;
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 7.2 shows the results of regressing work participation on age of menarche, miscarriage and abortion, using the Brazilian National Household Survey.

The coefficients for **menarche** and **abortion/miscarriage** IV variables are not statistically significant at 10% level or less.

Table 7.2 - Brazil: The weighted OLS regression on the relationship between work participation and some instrumental variables using a National Health Survey - PNS survey from 2013.

Y=work or not	(1)	(2)	(3)	(4)
Miscarriage=1	0.002	-	0.003	-
	(0.017)	-	(0.017)	-
Birth month=1	0.011	0.019	0.007	0.011
	(0.039)	(0.038)	(0.039)	(0.038)
Birth month=2	0.036	0.048	0.035	0.036
	(0.037)	(0.036)	(0.037)	(0.037)
Birth month=3	-0.026	-0.027	-0.030	-0.026
	(0.039)	(0.038)	(0.039)	(0.039)
Birth month=4	0.019	0.021	0.021	0.019
	(0.039)	(0.039)	(0.039)	(0.039)
Birth month=5	0.035	0.032	0.032	0.035
	(0.039)	(0.038)	(0.039)	(0.039)
Birth month=6	0.057	0.076*	0.055	0.057
	(0.041)	(0.040)	(0.041)	(0.041)
Birth month=7	0.040	0.040	0.042	0.040
	(0.038)	(0.038)	(0.038)	(0.038)
Birth month=8	0.050	0.063*	0.049	0.050
	(0.038)	(0.037)	(0.038)	(0.038)
Birth month=9	0.025	0.013	0.026	0.026
	(0.038)	(0.037)	(0.038)	(0.038)
Birth month=10	0.042	0.028	0.043	0.042
	(0.039)	(0.038)	(0.039)	(0.039)
Birth month=11	0.085**	0.086**	0.084**	0.085**
	(0.038)	(0.037)	(0.038)	(0.038)
Age of menarche	-	-0.002	-0.004	-
	-	(0.005)	(0.005)	-
Abortion=1	-	-	-	-0.019
	-	-	-	(0.044)
Constant	0.503***	0.522***	0.552***	0.504***
	(0.029)	(0.071)	(0.072)	(0.029)
N. obs.	12923	13839	12834	12923
F-stat	1.272	1.667	1.266	1.284

Note: Standard errors in parentheses;
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Similarly, Table 7.3 shows the results of regressing monthly wages on age of menarche, miscarriage and abortion, using the Brazilian National Household Survey.

The coefficients for **age of menarche** and miscarriage are not significant at 10% level or less in columns (1) and (2). In column (3) the **age of menarche** coefficient is significant only at 10% level and **abortion** in column (4) is highly significant.

Table 7.3 - Brazil: The weighted OLS regression on the relationship between monthly wages and some instrumental variables using a National Health Survey - PNS survey from 2013.

Y= monthly wages	(1)	(2)	(3)	(4)
Miscarriage=1	-94.159	-	-97.749	-
	(99.027)	-	(98.954)	-
Birth month=1	-29.860	-25.596	-14.003	-33.102
	(129.095)	(121.139)	(129.341)	(129.795)
Birth month=2	70.609	82.199	85.032	75.838
	(143.913)	(134.995)	(144.156)	(144.307)
Birth month=3	215.396	195.200	228.865	215.066
	(165.933)	(155.533)	(167.144)	(166.272)
Birth month=4	-61.690	-19.217	-48.507	-61.966
	(126.060)	(119.312)	(126.047)	(126.157)
Birth month=5	-65.389	-48.394	-51.762	-58.253
	(122.194)	(114.105)	(121.933)	(122.108)
Birth month=6	394.185**	384.673**	409.688**	393.199**
	(180.153)	(160.915)	(180.714)	(179.532)
Birth month=7	242.237	323.742*	253.363	246.376
	(164.767)	(176.801)	(165.430)	(165.144)
Birth month=8	223.034	300.397	247.096	220.707
	(211.552)	(206.626)	(212.636)	(210.450)
Birth month=9	111.623	202.895	125.684	109.512
	(151.086)	(147.759)	(151.189)	(151.585)
Birth month=10	100.421	138.951	123.328	103.574
	(178.966)	(171.578)	(180.278)	(179.737)
Birth month=11	578.624*	582.260*	593.183*	577.813*
	(340.461)	(314.860)	(341.110)	(340.008)
Age of menarche	-	-32.524	-37.087*	-
	-	(23.120)	(22.256)	-
Abortion=1	-	-	-	-428.817***
	-	-	-	(82.609)
Constant	1236.278***	1615.936***	1701.157***	1226.402***
	(111.120)	(310.276)	(299.663)	(108.169)
N. obs.	7319	7844	7273	7319
F-stat	1.696	2.573	2.568	3.198

Note: Standard errors in parentheses;
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Similarly, Table 7.4 shows the results of regressing hours per week worked on age of menarche, miscarriage and abortion, using the Brazilian National Household Survey.

The coefficients for **age of menarche** and miscarriage are not significant at 10% level or less in columns (1), (2) and (4). In column (3) the **age of menarche** coefficient is significant only at 10% level.

Table 7.4 - Brazil: The OLS regression on the relationship between hours per week worked and some instrumental variables using a National Health Survey - PNS survey from 2013.

Y= hours per week	(1)	(2)	(3)	(4)
Miscarriage=1	-0.846	-	-0.867	-
	(0.754)	-	(0.757)	-
Birth month=1	0.938	0.879	0.999	0.938
	(1.509)	(1.444)	(1.515)	(1.518)
Birth month=2	0.262	0.063	0.331	0.283
	(1.562)	(1.489)	(1.570)	(1.573)
Birth month=3	0.543	0.585	0.585	0.556
	(1.586)	(1.513)	(1.590)	(1.597)
Birth month=4	-0.091	0.025	-0.107	-0.102
	(1.641)	(1.565)	(1.647)	(1.647)
Birth month=5	0.610	0.597	0.713	0.651
	(1.616)	(1.545)	(1.626)	(1.632)
Birth month=6	3.003*	2.293	3.071*	3.039*
	(1.705)	(1.621)	(1.712)	(1.711)
Birth month=7	1.203	1.018	1.263	1.191
	(1.679)	(1.599)	(1.690)	(1.682)
Birth month=8	0.856	0.843	0.877	0.859
	(1.615)	(1.504)	(1.623)	(1.619)
Birth month=9	0.307	-0.001	0.356	0.291
	(1.659)	(1.574)	(1.660)	(1.666)
Birth month=10	-0.826	-1.024	-0.764	-0.804
	(1.692)	(1.605)	(1.680)	(1.701)
Birth month=11	1.180	1.039	1.225	1.209
	(1.477)	(1.423)	(1.478)	(1.490)
Age of menarche	-	-0.243	-0.341*	-
	-	(0.185)	(0.195)	-
Abortion=1	-	-	-	-0.237
	-	-	-	(2.042)
Constant	35.962***	39.007***	40.320***	35.770***
	(1.243)	(2.596)	(2.684)	(1.276)
N. obs.	7,518	8,050	7,469	7,518
F-stat	0.938	0.674	1.075	0.702

Note: Standard errors in parentheses;
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

8. Conclusions

We concluded from this simple exercise that we have some strong first stage estimations, observed by the significance of the instrumental variables and large *F* statistics in the teenage pregnancy equations (Table 7.1). We also found almost no significance between the IV and the labor outcome variables as shown in tables 7.2 through 7.4.

If necessary, we intend to investigate other methods (Lewbel, recursive structural models) and different instrumental variables to be used in the analyses.
Unfortunately, not many recent DHS datasets have information on age of menarche. From the year 2000 on, only Gabon, Indonesia, Morocco, Philippines and Uganda have this variable. Also, Brazil and Pakistan health survey carry this information.

Although we have a restriction on the number of countries with age of menarche information, we consider that is very important to analyze this datasets not only to understand the relationship between early childbearing and labor market outcomes, but also to show how important is for the researchers and policy makers to have menarche information.

So, the idea is to do a more in-depth analysis of a group of countries, combining with other data sets and involving a more in-depth policy engagement strategy. We intend to analyze Brazil and Pakistan using national health survey and then the DHSes in sub-Saharan African countries or other areas that have age of menarche, such as Gabon, Indonesia, Morocco, Philippines and Uganda.

9. Intended roles of each member of the team.

Ana Lucia Kassouf
Coordinate the project. Work on the bibliography review, methodology and on the analyses of the Brazilian national health dataset and DHS data on Morocco.
Ronelle Burger
Work on the bibliography review, methodology and the available DHS data analyses for African countries (Gabon, Uganda).
Vaqar Ahmed
Work on the Policy Analyses, Implications, Relevance and Dissemination. Work on the analyses of the Pakistan dataset
Mitzie Irene Conchada

Work on the bibliography review and the available DHS data analyses for Asian countries (Indonesia, Philippines).

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