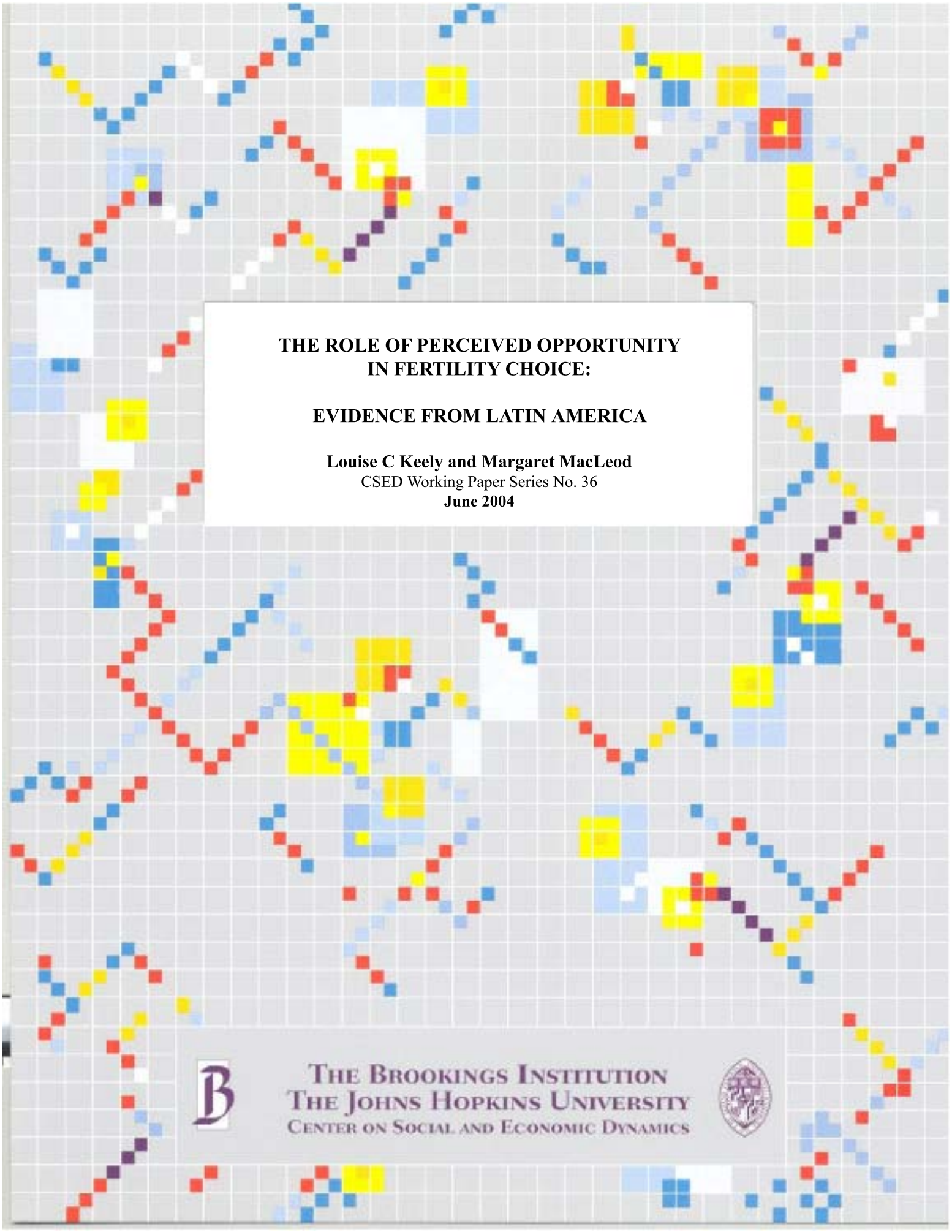

THE ROLE OF PERCEIVED OPPORTUNITY IN FERTILITY CHOICE:

EVIDENCE FROM LATIN AMERICA

Louise C Keely and Margaret MacLeod

CSED Working Paper Series No. 36
June 2004

THE BROOKINGS INSTITUTION
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Abstract

We hypothesize that the perceived returns to human capital and to income uncertainty are important determinants of recent cross-sectional variation in Latin American fertility. An empirical study of cross-country individual level data supports the hypothesis. In particular, we find that a higher perceived return to human capital and higher income uncertainty both lead to higher fertility, all else equal. We interpret the evidence to suggest that increasing economic opportunity in Latin America should be accompanied by institutions that provide social protection in order to promote further decreases in fertility toward the replacement rate.

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1 Introduction

The fertility decline in Latin America, as part of a more general demographic transition, dates from around 1960. Though fertility levels currently remain above replacement levels, and are higher than in Western Europe (see Table 1), the fertility decline in Latin America is expected to continue.[1]

Many studies aim to explain the downward trend in Latin American fertility rates. These studies of population dynamics often focus on the relationship between fertility and income or education. Generally, the empirical correlations found are negative.

Given the decrease in fertility, theories that are used to understand fertility choice in developed countries may also be useful in understanding current cross-sectional fertility variation in Latin America. For instance, Lam and Duryea [17] present evidence of a negative cross-sectional relationship between fertility and maternal education. They argue that their results are better understood by a quality-quantity quality-quantity trade-off in children, as in the model of Becker and Tomes [4], than by variation in the opportunity cost of raising children for mothers who choose how much to participate in the labor market.

Keely [16] extends a model with a standard trade-off between the number of children and their future income (or quality) to allow for a previously unexamined effect on fertility: the perceived return to human capital. The main result is that, controlling for parental income and education, as the perceived return to human capital increases, so does the number of children chosen.

Why might the perceived return to human capital be empirically important? Human capital investment is a potential determinant of children's future income. The choices of whether and how much to invest in one's children's human capital and how many children to have necessarily affect each other. Therefore, individuals require a view on the level of returns to this investment when choosing the number of children. Examination of Western industrialized countries empirically supports this proposed relationship in Keely [16].

A related hypothesis regarding fertility choice, particularly relevant to developing countries, is that the number of children one has can be increasing in one's (perceived) exposure to stochastic effects on income, sometimes termed risk or luck. This relationship has been discussed and empirically assessed by several authors, most notably Mead Cain in a series of articles including

[1] For related reading, see Bongaarts [5], [6] and Guzman et. al. [12].

Cain [7]. The basic hypothesis is that each child provides an expected net transfer to the parent. These intertemporal net transfers incorporate both the parent's expenditure on a child and expected future transfers from that child when he becomes a wage-earner. Risk-averse parents treat the transfer as insurance under risk to parental income. If the risk increases then the number of children chosen will increase.

The perception of risk or luck and its effect on fertility had not, however, been formally modeled until recently by Portner [19]. Portner models children as an asset who provide insurance and a means of savings. He shows, among other things, that the probability of each child's survival affects the number of children via the survival rate's effect on expected future transfers from each child to parents. As survival rates increase, the expected cost of raising children net of transfers from each child decreases. These transfers are important as a form of insurance in that model, as parental income is uncertain. Portner's model does not include a quality-quantity trade-off.

In Section 2 we present a theoretical model that features a quality-quantity trade-off in children, incorporating the insights of Keely [16] and Cain [7]. We develop the model to motivate the empirical study that follows.

In the model, parents derive utility from the quantity of children, but also from their quality. The preference for quality is due to altruism. Crucially, increases in the number of children raise the cost, or shadow price, of the quality of children, and vice versa. This trade-off represented in the shadow prices can, under reasonable conditions, dominate the equilibration of marginal utility and marginal cost relationships as parameters vary exogenously. The interdependence of shadow prices can lead to: a negative relationship between parental education and the number of children, a positive relationship between parental perceived returns to human capital and the number of children, and a negative relationship between expected income transfers from each child and the number of children. The quality-quantity trade-off can also lead to a negative relationship between income and the number of children, and is the result upon which Becker and Tomes [4] focus.

Our main contribution is the empirical study of the relationships that are formally articulated by the model. Ultimately, whether these mechanisms are relevant for Latin American fertility is an empirical question.

In Section 3 we describe the empirical strategy. The determinants of cross-sectional variation in fertility are examined with data from the late 1990s in six Latin American countries. In Section 4, we report the empirical findings. The main conclusion is that beliefs about the importance of hard work and luck, proxies for perceived return to human capital and expected transfers from each child respectively, have statistically and economically significant effects on fertility choice in Latin American countries.

In Section 5 we offer a discussion of the main conclusion. We compare the results with those of Keely [16] and interpret them in that light.

2 Theoretical framework

This framework is based on the canonical model in the economics of fertility choice developed by Becker and Lewis [3] and Becker and Tomes [4]. We use the model to demonstrate a mechanism by which the views on the return to human capital and expected transfers from each child can affect fertility choice at a point in time.

Assume each household has a utility function of the form:

$$u = u(n, w, y) = \epsilon \ln y + \beta \ln w + \gamma \ln n$$

where $\epsilon + \beta + \gamma = 1$, n is the number of children the household raises, w is the future income of each child and y is the consumption of a composite good. Children within a household are assumed to be homogenous. This utility function includes the quantity and quality of a household's children, as understood by Becker and Tomes and Becker [2]. Here, a child's quality is quantified as his future income.

The inclusion of the child's quality is typically interpreted as a modified altruism. Strictly speaking, altruism is present if the children's utility is an argument in the parent's utility function. Including the children's future income is a short cut. This altruism is widely used in models of developed country fertility choice, and it is intuitively reasonable. The future income term is not to be interpreted as expected transfer from children to parents, since that would be correctly captured in the budget constraint rather than the utility function.

The model considers the decision of one household at a time, taking as given the distribution of all other households, because individual households are assumed to consider themselves small relative to the population of households.

The future income of each child is expressed as $w = (q + e)^{\kappa}$, where $(q + e)$ is the child's human capital. The variable q *is* household's input into the human capital of each child, including educational expenditure.

The parameter e is composed of three elements affecting a child's human capital outside of household input: $e = \bar{e} + f + v$. The three elements are assumed independent of each other. The first element e represents a family's endowment or background. The family background can include a combination of innate ability and environmental factors. Variables that capture variation in e

include the parent's education level. The second element *is f,* the (part of a) child's choices that are independent of parental choice of *q* and family background. This variable is assumed stochastic from the parent's point of view. The third element, v, is interpreted as luck and as such is stochastic for both the parent and child.

At the time that fertility choices are made, parents have no information on the realized *f* and v except the distributions from which they are drawn. These elements do not play a significant role in the theoretical analysis, but will serve to clarify the empirical strategy pursued below. In the empirical study, parental education is taken to correspond to $\bar{e}$. The other two elements are assumed stochastic from the parent's point of view when she makes her fertility choice. The assumption implicit in the estimation is that the parent uses expected values of *f* and *v* as she chooses fertility, since their actual values are unknown to her at that point. Therefore, variation in these variables is assumed not to affect fertility.

The parameter $\kappa \in (0, \bar{\kappa}]$ represents the degree to which parents perceive that a child's future income is responsive to his human capital. It is the parent's belief that matters here, because she will make choices regarding human capital investment and number of children based on this belief. The return to human capital, κ, is the important additional variable to the original Becker and Tomes framework.

The household's budget constraint is

$$p_y y + pqn + p_q q + p_n n = I \qquad (1)$$

where *I* is the household's expected full income, p_y is the price of *y* and *p* is the unit price of human capital accumulated to provide a future income for each child that varies with the number of children. Because the model is static, the expected income I and other variables are intended to represent lifetime quantities. The price p_n *is* that of raising a child net of transfers from a child to the parent when the child is grown and P_q allows for a fixed cost part of human capital accumulation[2]. Given that the household considers itself small relative to the population, it will take all prices and full income as given.

Readers familiar with the Becker and Tomes framework will recall that the term *pqn* in the budget constraint will imply that the shadow price of *n* will depend on *q* and vice versa. It is that

[2] There are more general budget constraints that could be pursued, as Becker and Tomes point out. For instance, one might explicitly treat the opportunity cost of lost income as part of the constrain. A full treatment of women's labor force participation choice is beyond the scope of this paper, but a trade-off between children and household income could be represented as part of $p_q q$. See Pampel [18] for a cross-country investigation of the interaction between female labor market participation and fertility.

dependence which can lead to a negative effect of an increase in *I* on *n;* more is said on this below.

Maximizing utility subject to the budget constraint, via choice of *n, q* and *y* yields the following first order conditions:

$$\frac{\gamma}{n} = \lambda [pq + p_n] \qquad \text{(FOC 1)}$$

$$\frac{\beta\kappa}{q+e} = \lambda [pn + p_q] \qquad \text{(FOC 2)}$$

$$\frac{\epsilon}{y} = \lambda p_y \qquad \text{(FOC 3)}$$

where λ *is* the marginal utility of full income.[3]

The theoretical focus here is on the equilibrium effect of a change in κ or p_n on the choice of *n.* The equilibrium effects of increases in *I* or *e* are of interest; these have been considered elsewhere both theoretically, as in Becker and Tomes, and empirically.

Note first that by *(FOC3)* and the assumption that p_y is taken as given, that *y* is constant unless there is a change in *I* (that in turn affects λ *).* Thus, a change in κ or p_n has no effect on *y* and only alters the allocation of household resources between *n* and *q.* There is a unique *(n, q)* equilibrium pair for any given κ. The allocation, and any change to it, can be determined by depicting *(FOCI)* and *(FOC2)* in *(n, q)* space. To do so, note that from *(FOCI)* and *(FOC2),*

$$\frac{\partial q}{\partial n}\,|_{FOC1} = -\frac{\gamma}{\lambda p n^2} < 0$$

$$\frac{\partial q}{\partial n}\,|_{FOC2} = -\lambda p \frac{(q+e)^2}{\beta\kappa} < 0$$

so that $\frac{\partial q}{\partial n}\,|_{FOC2} < \frac{\partial q}{\partial n}\,|_{FOC1}$ if and only if

$$[\lambda p n\,(q+e)]^2 > \gamma\beta\kappa. \qquad (2)$$

This condition will hold for most reasonable combinations of parameter values. As will be explained, this condition is necessary for an increase in e to have a negative impact on n. It is also necessary for κ and p_n to each have a positive effect on *n*.

The relationship between *q* and *n* given the two first order conditions and *(2)* is depicted in

[3] The log-linear utility function rules out zero-valued solutions for *y, c2* and *q,* though they may he observed in data. This particular utility function is used for analytical convenience. The key results of the model do not depend on the particular utility function or the restriction of choices to he strictly positive. Indeed. Becker and Tomes work with a general concave utility function.

Figure 1. The empirical study's motivation is suggested by the predicted equilibrium change in *n* with a change in κ or $p_{n.}$. These changes are described next.

If κ increases then the curve representing *(FOC2)* shifts outward and the position of the curve representing *(FOC 1) is* unchanged. It is immediately clear from Figure *2* that n will increase and *q* decrease as an equilibrium response.

The interdependence of the shadow prices of *q* and *n,* apparent in *(FOCI)* and *(FOC2),* drives this result. This interdependence is also the focus of Becker and Tomes' analysis.

As κ increases the marginal utility of *q* increases and so by *(FOC2)* the shadow price of *q, [pn* $+ p_q]$, can increase in response via an increase in *n.* As *n* increases, the marginal utility of *n* falls, so by *(FOCI)* the shadow price of *n,* $[p_n + pq]$, can decrease in response via a fall in *q*. But the decrease in *q* causes a further increase in the marginal utility of *q* and so on. This cycle continues until equilibrium is re-established at a higher level of *n* and lower *q*.

This prediction is derived holding *I* and *e* fixed, and its relevance relies on the assumption that κ is not perfectly correlated with *e* or *I.* Thus, the model predicts that if the perceived return to human capital κ exogenously increases for a household, the equilibrium number of children chosen by the household rises.

Determination of the effect on *n* if there is an exogenous change in *e is* similar to that for κ. [4] Under (2), if *e* increases, equilibrium *n* will fall and *q* will increase[5]. Thus, an increase in, say, the educational level of a parent, holding fixed the household's full income, will lead to a decrease in the number of children chosen by that household.

The direct cost of a child net of expected transfers, $p_{n,}$ increases as expected transfers from each child decrease. A decrease of expected transfers is, in the spirit of Cain's [7] argument, interpreted as an increased exposure of a parent to the forces of risk and luck. As p_n increases, *(FOCI)* shifts inward in Figure 3. The equilibrium level of *n* increases and *q* decreases. This result is counterintuitive, but is easily understood: the effect of the shadow price of *n* is dominated by the effect of a fall of *q* rather than the initial increase in p_n. Note that this result occurs under the same circumstances that lead to a negative equilibrium correlation between e and *n.*

These key results are all driven by the fact that the shadow price effects dominate marginal utility effects as the equilibrium is re-established. This domination occurs if and only if *(2)* holds.

It remains to examine the effect on *n* of exogenous changes in *I* in this framework. This

[4] As with the result concerning κ, this result is derived holding *I* fixed, and so its relevance relies on the assumption that *e* and *I* are not perfectly correlated.

[5] As with the result concerning κ, this result is derived holding *I* fixed, and so its relevance relies on the assumption that *e* and *I* are not perfectly correlated.

examination is the focus of Becker and Tomes' analysis. Nothing novel is added here. Becker and Tomes demonstrate that, for an increase in *I* to result in a decrease in *n,* the elasticity of *q* with respect to income must be sufficiently large relative to the elasticity of *n* with respect to income. Put in terms of the first order conditions above, if a household's income *I* increases, then λ decreases. By *(FOC3), y* increases. Again, *(FOCI)* and *(FOC2)* must be examined jointly to determine the equilibrium effects of a decrease in λ on *q* and *n.* The rise in *q* induced by the fall in λ given by *(FOC2)* must be large enough so that the increasing shadow price of *n* outweighs the decrease in λ in *(FOCI)* and *n* decreases. The fall in *n* decreases the shadow price of *q,* leading to a further rise in *q,* and so on. This cycle continues until equilibrium is re-established at a lower level of *n* and higher *q* than before the change in *I.*

The null hypotheses that economists and other social scientists typically carry to empirical studies are that the income and education of a household are correlated negatively with the household's number of children. Examination of those hypotheses is part of the empirical inquiry below. As is described by Becker and Tomes [4] and Becker [2], empirical findings on the correlation between income and the number of children do not provide a consistent picture. There is some evidence of a negative link between education and the number of children. As in Becker and Tomes, income and the number of children are predicted to exhibit a negative correlation across a range of incomes and income elasticities but not across all. However, the Becker and Tomes model provides insight into the nature of the ambiguity found in empirical work.

The same theoretical analysis that leads to these null hypotheses regarding the effects of income and education also leads one to the prediction that an increase in a household's perceived return to human capital or a decrease in expected transfers from each child should lead to an increase in the number of children chosen by that household. We examine these hypotheses in the following section.

3 Empirical study

3.1 Data

We employ individual level survey data from six Latin American countries to determine whether there is a link between an individual's perceived return to human capital or expected transfers from each child and her fertility choice. Data are used from the 1995 wave of the World Values Survey (WVS). The variety of topics covered include political activism, child-rearing,

religious beliefs and women's rights. Demographic variables such as the respondent's age, sex, income bracket, socioeconomic status and education level are also collected. Though surveyors intend to draw samples nationally representative of adults over 18 with weighting of certain groups, they probably undersample low income and rural populations.

The dependent variable in the study is the number of children of the respondent. Among the explanatory variables, this study focuses on two which measure the respondent's perceived return to human capital and expected transfer from each child. The other explanatory variables include the respondent's household income category, her highest educational degree, and a measure of her religious upbringing. Finally, country dummies capture variation across borders.

We restrict the sample to married women between 35 and 44 years. The Data Appendix explains the justification of this restriction and other details of the sample and variables. Tables 2-8 summarize each of the regression variables. This section describes the variables of interest, perceived return and expected transfers.

While WVS does not ask directly about the expected return to human capital or expected transfers from children, this analysis uses a survey question used in this analysis which serves as an imperfect proxy. In the theoretical analysis, the perceived return to human capital and expected transfers from each child are independent of household income and family background. Because the analysis considers changes in perceived return and expected transfers holding fixed income and background, we chose a question as unrelated to those variables as possible.

The question used asks about belief in the importance of hard work or luck for socioeconomic success. Belief in the importance of hard work proxies for the perceived return to human capital. Belief in the importance of luck proxies for the inverse of the expected transfers from each child.

The question from the WVS asks respondents to give their view on the following statement:

In the long run, hard work usually brings a better life; or, hard work doesn't generally bring success - it's more a matter of luck and connections. (10=Agree completely with first statement; 1= Agree completely with second statement, 1-10 scale.)

Table 3 contains a summary of responses to this question by country for the sample studied. Overall, the Latin American responses have a u-shaped structure: responses cluster at 1 and 10. However, there is also significant variation across countries[6,7] . The Mexico and Peru samples do

[6] There is also a significant grouping in the middle responses, so that the estimation results are not driven by an absence of responses in the middle range.

[7] The belief question's empirical correlations with a range of questions about the respondent's religious belief

not exhibit this u-shaped structure, and have responses clustered at the hard work end of the scale. Brazil's responses are skewed much more toward the luck and connections end of the scale than are those of the other countries.[8]

The question, then, is whether and how these views actually impact observed behavior, such as the number of children one has.

3.2 Interpretation and use of the hard work/luck survey question

3.2.1 Views on the importance of hard work and luck

The question from the World Values Survey described above provides a spectrum of responses, with a belief in luck's importance at one end and belief in hard work's importance at the other. Views on the importance of hard work and luck are posed as opposing in the construction of the survey question. In fact, a tendency toward the view that luck is important may imply a tendency toward the view that hard work is not important, and vice versa.

Such a tendency does not imply that the responses to the survey question have a monotonic relationship with fertility, as one might reasonably assume if the question only asked about the importance of luck or hard work. While the survey frames the two views as opposite, respondents do not necessarily form and use those views that way.

In fact, views on the importance of luck and hard work might have entirely orthogonal relationships with fertility choice, as in the model of Section 2. In this empirical study, we allow for the presence of a non-monotonic relationship between responses to the survey question and fertility choice.

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and practice were calculated using Spearman's rho. Tests of the null hypothesis that the belief variable responses are independent of the religion questions' responses were conducted. In the majority of cases the Spearman correlation was less than 0.10 and the tests could not reject the null. However, the Spearman's rho was about 0.11 for the belief question and a question that asked about religious background, as well as a question that asked about frequency of church attendance.

Therefore, the question on religious background is included in the regressions reported below. The question on church attendance is not used due to endogeneity concerns. It is found that the coefficients on religious background are not significant, and the inclusion of the variable does not affect the size or sign of the estimated coefficients of the belief variable.

[8] The responses of Western countries considered in Keely [16] are somewhat different. The United States' responses were skewed toward the hard work end of the scale in the sample. Nearly one-fifth of the United States responses were 1, and all but one-fifth were less than 6. By contrast, less than 10% of the European responses were 1, and almost half were greater than 5. The United States' responses were more similar to those of the Latin American countries than were the European responses.

3.2.2 Linking views on hard work and luck to model parameters

We assume that belief in hard work proxies for perceived return to human capital, κ. We assume belief in luck proxies for net expected transfers in p_n.

To see why, recall that in the model human capital is a compendium of elements summarized by $q + e$. All are assumed subject to the same rate of return. We explicitly assume that the element e includes a child's effort f. Asking about the importance of hard work is akin to asking about its perceived return, κ.

We do not use survey questions that ask about the importance of parental input into human capital, such as education expenditures, for interpretive reasons. The goal is to choose a question that is less likely to invoke a response based on the size of q or e, and more likely to invoke a response on the size of κ. Questions on the importance of hard work ask about general views rather than specific personal experience. Therefore, we prefer questions on hard work.

We interpret the importance of luck as corresponding to the parents' expected transfers from children. These transfers lower the net cost of each child, p_n. As expected transfers per child increase, a smaller proportion of the parents' income is subject to uncertainty. Thus, a parent's view of the importance of luck will weaken as expected transfers rise, or as p_n, falls.

An alternative interpretation of luck in the model would be to simply embody luck in v, an element of e. The model's predictions would be unchanged. However, this interpretation would not be the spirit of Cain's explanation of the relationship between risk and fertility.

3.2.3 Specifying the model's predictions in terms of the survey question

For simplicity, assume that there are two types of beliefs in hard work: $\kappa \in [\tilde{\kappa}, \bar{\kappa}]$, $\tilde{\kappa} < \bar{\kappa}$. There are also two levels of expected cost net of transfers: $p_n \in [\tilde{p}_n, \bar{p}_n]$, $\tilde{p}_n < \bar{p}_n$. Assume there are only three types of people. In short, there are people with extremely high beliefs either in luck or in hard work, and there is everyone else. We make this assumption because of the exclusivity of hard work and luck in the survey question's responses, and because of the model's predictions about the effect of κ and p_n, on the number of children chosen. The three types are:

1. Those with low belief in hard work and high belief in luck: $\tilde{\kappa}$ and $\bar{p}_n$
2. Those with low belief in hard work and luck: $\tilde{\kappa}$ and $\tilde{p}_n$
3. Those with a high belief in hard work and low belief in luck: $\bar{\kappa}$ and $\tilde{p}_n$

The model predicts that those in groups 1 and 3 will have more children than those in group 2. The effects of strong belief in hard work and luck may be asymmetric. We consider this prediction in the estimation approach presented next.

3.3 Estimation Approach

A basic regression is

$$children = \alpha_0 + \alpha_1 income + \alpha_2 education + \alpha_3 religion + \alpha_4 belief + \sum_j \alpha_{5+j} country_j + u$$

where *children is* the number of children, *income is* the respondent's household income category, *education is* the respondent's highest educational degree, *religion is* a religious background variable, *belief is* the hard work/luck belief variable, *country is* a dummy variable for country *j* and *u* is the error term.

We use two basic regression formats: linear least squares, and ordered probit. Non-linear relationships between the explanatory variables and the number of children are possible. However, the exact functional form is not known, and using the wrong form can introduce bias into the results, especially when an instrumental variable is used for one or more explanatory variables, as will be the case. On the other hand, a linear regression is a robust format that should correctly capture average effects of the explanatory variables on the number of children. The linear regressions serve as a comparison to the ordered probit regressions. The ordered probit regressions incorporate the fact that the number of children is an ordered categorical variable. The main drawback to the ordered probit regression is the specific distributional assumption on the error terms.

3.4 Estimation Issues

In an ordinary least squares regression, *income* may be correlated with the errors *u*. Omitted variables from the regression that affect *children* may have an independent effect on *income.* Moreover, *children* may itself affect *income.* Therefore, using an instrument for income appears appropriate.

The variable *education,* in contrast to *income, is* predetermined in that almost all adults finish education before they are 35. Nevertheless, it is possible that omitted variables that affect *children* also have an independent effect on *education.* The existence of such omitted variables seems less

likely for *education* than for *income.*[9]

The same consideration for *education* applies to *belief*. However, the sample is restricted to those under 44 so that *belief* can be assumed to not be affected by *children.* The Data appendix describes this choice further.

Because of these concerns, we conduct a Durbin-Hausman-Wu test for endogeneity, but not reported here, for each of the three variables. Endogeneity of *education* and *belief is* strongly rejected. Endogeneity of *income is* rejected more weakly. Because of the strong reasons to suppose endogeneity of income exists, regressions that use an instrumental variable for income are added to the set of linear least squares and ordered probit regressions performed.

The next step is to identify an appropriate instrument for *income.*[10]

Background variables may be appropriate instruments, in that they should be correlated with household income, but there is no strong theoretical mechanism by which the background variable independently affects how many children one has. Correlation of a background variable with *income is* established using a regression of *income* on the instrument and other exogenous explanatory variables. The overall strength of the instruments is also noted. The F-test from a first-stage regression should be greater than 10 for the instruments to be considered strong (see Staiger and Stock [22]).

The absence of an independent effect on *children is* established with three tests. First, the appropriate instrument must have a significant estimated coefficient in the regression of *children* on explanatory variables only if *income is* not included as an explanatory variable. In addition, the instrument should not be significantly correlated to regression residuals from a regression of *children* on the set of explanatory variables including *income* (but obviously excluding the instrument). Third, the estimated coefficients, other than that of *income,* should be almost exactly the same whether the instrument is included in the regression or not.

For the WVS 1995 data there are no appropriate background variables available. Thus, we found a constructed background variable based on the experience of older women in one's income group to be a good instrument according to the criteria above. See the Data Appendix for further description of this instrument. We used only one instrument, so that the regression of the number of children is exactly identified. Any bias from using instrumental variables increases with the number of instruments and is approximately zero when only one instrument is used per endogenous variable.

The use of this constructed background variable as an instrument for income highlights the

[9] Indeed, Lam and Duryea [17] treat education as exogenous in their study of schooling and fertility in Brazil.

potential difficulty of empirically distinguishing the effect of income from family background on fertility choice, though they are distinct in the theoretical model. Not only is the respondent's household income correlated with parental education and occupation, it is also highly correlated with the respondent's education level. However, distinguishing the details of these effects is not the focus of this analysis; the relationship between income, education and fertility has been the subject of numerous other studies. Rather, our goal is to control appropriately for income and background, in order to study how beliefs about the importance of hard work and luck affects fertility.

4 Empirical findings

4.1 Basic results

We first establish some basic unconditional effects on *children* of each of the main variables, *income, education,* and *belief.* We report linear ordinary least squares regressions of the number of children on each variable one at a time, plus country dummies, in Table 9. The estimated coefficients for income and education are significant and negative.

The estimated coefficient for *belief* using the question described above is insignificantly different from zero. This question has 10 possible responses. As noted above, it is possible that there is a significant non-linear - even non-monotonic - relationship between *belief* and the number of children that is washed out with the 10 responses in the linear framework. To explore this possibility, we construct binary variables that were equal to 1 if *belief* > *x, x = 2,3,...,* 10 and zero otherwise. Many other possibilities could be tried, but the purpose here is to find a simple way to uncover a non-linear effect of views on the importance of hard work on fertility.

First, we tried each of these binary variables as the *belief* variable with the country dummies in a least squares regression. We report these regressions in Table 10. Those regressions illustrate a clear break such that respondents with responses *1-2* (strong belief in luck) are estimated to have a statistically significantly larger number of children than those with responses *3* to 10. Also, respondents with responses 9-10 (strong belief in hard work) are estimated to have a statistically significantly larger number of children than those with responses 1-8. This dual break is consistent with the theoretical framework described above. We base the choice of this break also on searching for the highest reported regression F statistics, which is a non-nested model selection tool for count data described by Cameron and Trivedi [8].

[10] See Angrist and Krueger [1] for advice that is followed for this paper's analysis.

Second, we include the two binary variables in the same regression. While the estimated coefficients are similar to those of the individual regressions, the F statistic is higher.

Therefore, we report two sets of regression results for the WVS 1995 data using two return variables: one set using the original hard work question with the 10 responses, and one set using the two binary variables. One binary variable equals 1 if the respondent gives responses *3-10* and 0 otherwise. The other binary variable equals 1 if the respondent gives responses 9-10 and 0 otherwise.)[11]

When using the binary variables, there are statistically significant estimated coefficients of these hard work and luck *belief* variables that are consistent with the predictions of the theoretical model.

In Tables *11-12* we report ordinary least squares regression results for regressions that include *income, education,* and the *belief* and country dummies. We present analogous ordered probit regressions in Table *13.* These regressions exhibit features consistent with the regressions including one explanatory variable at a time, except that the coefficient for *income* becomes insignificant. This insignificance occurs with the inclusion of education, and is robust to other versions of the estimation reported below. One explanation for this finding is simply that income and education are highly correlated, and it is difficult to distinguish empirically between their independent effects. However, the goal is simply to isolate the effect of perceived return to human capital on fertility, and this difficulty does not prevent its attainment, as long as both income and background effects are controlled for.

Tables 12-13 contain the following sets of regression results. First, we expand the OLS regressions to include a religious upbringing variable, and the constructed background variable that is used as an instrument for income. We include the constructed background variable in those regressions in part to examine its appropriateness as an instrument for income, as described above. We also report a two stage least squares regression using that instrument. Second, we present the same set of variable combinations in ordered probit regressions. We report an ordered probit regression in which income is instrumented, along with the first stage regression that generates the instrument. The reported standard errors on the second stage regression are bootstrapped because the standard errors reported in the ordered probit regression are not correct.[12]

[11] A single three-outcome variable is not, used. Such an independent variable is appropriate only if the true coefficient on one binary variable is equal in absolute value to the other binary variable's true coefficient *and* if the variable's effect on the dependent variable is monotonic.

[12] The difference between the reported standard errors and bootstrapped standard errors was never large

4.2 Summary of robust findings

The robust findings are as follows. Education is negatively and statistically significantly correlated with the number of children. The size of the coefficient is remarkably consistent across the regressions. The estimated coefficient on income is generally insignificantly different from zero, as described above. This insignificance may be attributed to the empirical difficulty in disentangling the effects of income and education, which are correlated across individuals. Overall, these results are consistent with the model and with received wisdom that higher socioeconomic status is associated with lower fertility.

We find statistically significant effects of beliefs regarding the importance of hard work and luck on fertility. The directions of the estimated effects for the respondents are consistent with that predicted by the theoretical model. An increase above a threshold in a household's belief in the importance of hard work leads to an increase in the household's number of children. An increase above a threshold in a household's belief in the importance of luck leads to an increase in the household's number of children.

We are also interested in the empirical significance of the results. Turning to the two stage least squares regression, this regression predicts that if a given respondent's belief in hard work or luck is very strong, holding all else equal, the average increase in the number of children is over 0.4.
In the ordered probit regression in which income is instrumented, the estimated coefficients are not marginal effects. They must be calculated separately. Estimated marginal effects are reported in Table 14. They indicate that the magnitude of the effect on the distribution of fertility of a change in the belief variables in the sample's Latin American countries is non-negligible. For instance, the estimates predict that if a given respondent's belief in hard work increases (to a response greater than 8), holding all else equal, the probability that she has only one child decreases by 6% percent. If the respondent's belief in luck diminishes (to a response greater than 3), the probability that she has only one child decreases by 7%. Moreover, the marginal effects suggest the largest impact on fertility is in the range of 1-4 children that is relevant for most households.

To make concrete the empirical significance of the results, we use the regression estimates to ask: what is the predicted decrease in fertility in each Latin American country in the sample were to have no extreme responses in the 1-3 or 9-10 range of the *belief* question and holding all else, including the Latin American institutional setting, fixed?

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enough to reverse a significance result.

Coefficient estimates from the two stage least squares (TSLS) and the ordered probit regressions in which income is instrumented are used to construct the predictions. Using the TSLS estimates, the estimated effects on each country's fertility if the responses to *belief* all lie between 4-8 are summarized in Table 15. Fertility is estimated to decrease between 9-12%, or an average of 0.27 children per woman.

Also using the ordered probit regressions, the fertility gap is predicted to decrease with a shift in the distribution *belief* to be entirely within 4-8. These predicted decreases in fertility are reported in Table 15 and are similar to those of the TSLS regressions. Fertility is estimated to decrease between 9-13%, or an average of 0.28 children per woman.

5 Interpretation of results

We now restate the main results of interest. Beliefs about the importance of hard work and luck for socioeconomic success have an estimated statistically and economically significant effect on fertility for Latin American respondents. The effects are consistent with the prediction of the theoretical model that motivates the empirical study: an increase in a household's perceived return to human capital or a decrease expected transfers, which the two beliefs questions are argued to proxy, increases the number of children chosen by the household.

This finding is consistent with that reported for the United States in Keely [16]. However, the support for Western industrial countries more generally is tempered in the following way. Keely finds that in the United States, there is on average a greater belief in the importance of hard work for determining socioeconomic success. Beliefs about hard work's importance also have an empirically stronger effect on fertility choice in the United States than in Western Europe. A non-monotonic relationship between hard work or luck and the number of children was not detected.

The distinction between the two regions is attributed to well-known institutional differences. These differences are, in short, that there is less social protection in the United States, and a greater provision of public assistance in Europe. In Western Europe, parents may therefore care less about the future income of their children, both because some minimum level of their children's income is guaranteed by the state, and because taxation to fund social protection diminishes the return to one's ability to earn market wages. Thus, Keely argues that the social protection in Western Europe may lead to a smaller effect of the perceived return to human capital on fertility relative to that in the United States.

Graham [11] provides evidence that parental views on their children's opportunities are very

similar across the United States and Latin America. It is expected, given Graham's and this paper's results, that Latin American social protection and income inequality should be closer to United States' levels than European levels. This expectation is correct. Income inequality in Latin American countries is higher than that of the United States, and the United States' income inequality is higher than that of Western Europe.[13] Data available from the OECD on member countries document that Mexican social expenditure as a percentage of GDP is slightly more than half the United States' percentage, and less than a third of the Western European average.[14] We interpret the significance of beliefs about the importance of hard work and luck in determining socioeconomic success are determinants of fertility in Latin America as partly a product of the absence of strong social protection institutions and the level of income inequality. This situation heightens the importance of both the private return to human capital and exposure to forces of risk and luck in Latin America relative to the United States or Western Europe.

What policy prescription might be taken away from this? Suppose that there are two policy objectives: encouraging a continued decrease in fertility toward the replacement rate in Latin America and increasing economic opportunity within Latin America. On the face of it, these objectives seem in conflict with one another given the results presented above. This is particularly the case if one supposes that beliefs about the importance of hard work follow changes in actual economic opportunity. These policy objectives also seem in conflict if one considers the Easterlin hypothesis of Easterlin [9], [10]. We might expect that increasing economic opportunity will lead to a baby boom in Latin America, as Easterlin has proposed was an impetus for the American baby boom.

Consideration of these results alongside those for the United States and Western Europe yields a possible resolution to this conflict. Significant social protection may lead to a weakened link between fertility and individual beliefs regarding the importance of hard work and luck. If social protection institutions are strengthened in Latin America, fertility may not increase even as economic opportunity increases. As publicly-provided economic security increases along with taxation to fund social protection, the return to human capital net of taxes will be diminished and income uncertainty will decrease. One interpretation of these results is that instituting policies to increase economic opportunity alongside policies that strengthen social protection may allow fertility to decrease further over time.

[13] See the 1998-99 Inter-American Development Bank report [14].
[14] See the OECD website for data: http://www.oecd.org/dataoecd/43/14/2087083.xls

6 Data appendix

6.1 Sample summaries

Individual level survey data from Latin American economies are used to determine whether there is a link between an individual's perceived return to human capital and her fertility choice. Data are used from the 1995 wave of the World Values Survey (WVS). A variety of topics are covered in the questions, such as political activism, child-rearing, religious beliefs, and women's rights. Demographic variables such as the respondent's age, sex, income bracket, socioeconomic status, and education level are also collected. The samples are intended to be nationally representative of adults over 18, with weighting of certain groups.

The countries that are included in the analysis are Brazil, Chile, Mexico, Peru, Uruguay and Venezuela. The set of countries is constrained by data availability. These countries are quite heterogeneous and represent a variety of Latin American experiences with regard to economic development and the demographic transition.

6.2 Choice of population studied

The population studied is married women between 35 and 44.

The main reason to study only women is that they are less likely to misreport the number of children they have had than are males. A second reason to study women only is that it provides a greater consistency in interpretation of the number of children reported across respondents; the number is going to be the completed fertility for the vast majority of the sample. Women's reproductive cycles end definitively. The best age range could be debated, but almost all women have all of their children by time they are 40, both in the samples studied here *and* in each country's population.

In addition, only self-reported married women are included in the analysis. The reason is as follows. Interpreting reported household (or family) income across married people is straightforward; it can be taken to include the incomes of both spouses. Comparing that to reported household income of cohabiting adults or single adults with children is more difficult. For instance, a cohabiting woman may report only her income as her household income if she considers herself financially independent of her partner, and thus constituting her own household. Errors in the calculation and interpretation of household income are avoided by including only women with

long-term partners. Because marriage is often interpreted to include common-law partnerships in Latin America, it is expected that the sample includes not only legally married women, but also women in long-term partnerships in a shared household.

The reason not to include older women in the sample is as follows. The variables regarding belief in the importance of hard work and luck are considered to be low frequency variables, though they are not exogenous in any fundamental sense, and they may change over a person's lifetime. However, this study relies on the assertion that it is reasonable to assume that the response will not vary for any given individual over the child-bearing period. This assumption is also implicit in the work of Easterlin [91, [101, who argues that time-series variation of fertility is affected by individual economics aspirations and views about institutional structures influencing the income distribution, such as labor demand. Moreover, he argues that these fundamental views are determined, once and for all, in young adulthood. Unfortunately, time-series evidence does not exist to assess this assumption.

If these views do not change over the first part of adulthood, then fertility would influence these views only later in adulthood, via one's children's economic outcomes. Those outcomes, however, will not be observed until one's children are themselves young adults. The sample is therefore restricted to women at the end of their child bearing period and does not include older women. The women in the sample are making, or have just made, the final choice about how many children to have, but cannot yet observe the potential long-run impact of their fertility choice on economic outcomes of their children. Fertility choice should not, in the sample studied, affect the perceived return to human capital or expected transfers from each child.

6.3 The dependent variable

The dependent variable in the regressions is the reported number of children. The WVS survey question v90 asks "Have you had any children? If yes, how many?". The WVS survey, for reasons which the authors have not been able to uncover, recorded those who said they have no children as missing values. In the context of the model, this is not terribly problematic since the model could apply only to those with a positive number of (optimal) children. Childless families are not treated differently from families with children in terms of the estimation. The cost of the omission is probably an underestimation of the effect of perceived human capital return on the number children.

6.4 The explanatory variables

The variable measuring beliefs about hard work and luck is discussed in the main text. The other explanatory variables used in the analysis are detailed here.

6.4.1 Household income and family background

The WVS 1995 survey includes a categorical variable for household income. The WVS possible responses correspond to percentiles in the respondent's country's income distribution. For instance, a respondent in Mexico who reports an income decile 5 is in the 5th income decile in Mexico.
As a proxy for family background, the respondent's highest educational degree is included as an explanatory variable. The WVS 1995 contains a variable with a consistent set of possible responses across countries. There are 9 categories of responses: no formal, incomplete primary, complete primary, incomplete vocational secondary, complete vocational secondary, incomplete theoretical secondary, complete theoretical secondary, some university, and university degree.

Other background variables were considered. The WVS 1995 contains no questions on the respondent's parents' education or occupation. Because there is no parental background information in the WVS 1995 survey, a variable is constructed to proxy for parental background and to use as an instrument for income. This variable is constructed as the average occupation classification of the chief wage earner (derived from v224) of the household of females 55 and older at the time of the survey, and in the same income decile and country as the respondent. If the chief wage earner is retired, the response gives the previous occupation of the chief wage earner. The occupation classifications are ordered into 13 categories as: employer/manager of establishment with 10 or more employees, employer/manager of establishment with less than 10 employees, professional worker, supervisory non-manual office worker, non-manual non-supervisory office worker, foreman and supervisor, skilled manual worker, semi-skilled manual worker, unskilled manual worker, farmer: has own farm, agricultural worker, member of armed forces or security personnel, and never had a job. (These categories make clear that one disadvantage of using this sort of question is the arbitrariness of the occupational ordering).

This constructed variable is not a choice variable of the respondent and should have no independent effect on the number of children chosen by the respondent. Appropriate checks, described in the main text, confirm that there is no independent effect. However, the constructed variable is correlated with the respondent's reported household income decile. It is therefore an appropriate instrument.

6.4.2 Religious upbringing

Another element of family background that may impact fertility choice is the respondent's religious upbringing. Sociologists have focused on religious beliefs as a determinant of fertility choice, and so religious beliefs are considered in the present context.

A principal question running through the sociology literature is whether, and why, there are important differences in fertility between Catholics, Protestants and others (for instance, see Rosenzweig and Schultz [20]). A related question is whether religious beliefs in themselves can affect fertility.

A problem that plagues the sociology literature is the endogeneity of religious beliefs. It is not only the case that religious beliefs may affect fertility, but also that fertility could affect religious beliefs in the near-term. Fertility can affect whether one associates with a particular religious denomination, it may affect the denomination choice, and it can affect the frequency of religious participation. Religion variables that measure current practice or denomination, as a proxy for beliefs, should not be used without some instrumental variables procedure at the very least. Most studies do not do this (for exceptions, see Sander [21] and Tomes [23]).

In addition, many studies do not control for socioeconomic background of the individuals when considering the effect of religion on fertility. Studies that address the endogeneity problem and control for socioeconomic characteristics find, in contrast to others, that Catholicism does not increase fertility in United States women born after the 1920s (Sander [21]).

Even if an instrumental variables procedure is used, that process is only as good as the instruments. It is well-known that if the instrumental variables are weak, then the coefficient estimates may be biased. Therefore, it is this author's view is that ideally the religious belief variables used should measure religious background, such as one's religious upbringing.

A related issue that requires care is exactly what a survey question that asks about religious association or participation is intended to measure. These variables are of interest to economists because religious institutions can be used to develop and maintain behavioral norms (Keely [15]). Norms can influence individual decisions. Those norms may vary across religions, or be common to a range of religions. Norms should be viewed as deeply embedded; once adopted, they will generally be maintained by an individual over his lifetime. Religious upbringing, to the extent that it determines norms that, in turn, influence fertility choice, is thus a relevant variable for our purposes.

The variables used to control for religious upbringing are dictated by data availability. The WVS asked respondents in 1995 if they were raised religiously, with a yes or no response. This

binary variable provided the religious background variable in the regressions.

(An aside: Another possible background variable tried was one for ethnic background. The WVS contains country-specific questions on ethnic background. Unfortunately, the responses are so different across countries that only a binary variable reporting whether the respondent is white or non-white can be constructed for use across all six countries in the sample.

This binary variable was found to be consistently insignificant in the estimation. Its inclusion decreases the number of observations by about one-third and does not substantially change any of the other estimated coefficients in the regressions. Therefore, it is not used in the reported results.)

6.4.3 Country dummies

Country dummies are included in each regression. These dummies are intended to control for institutional differences across the countries.

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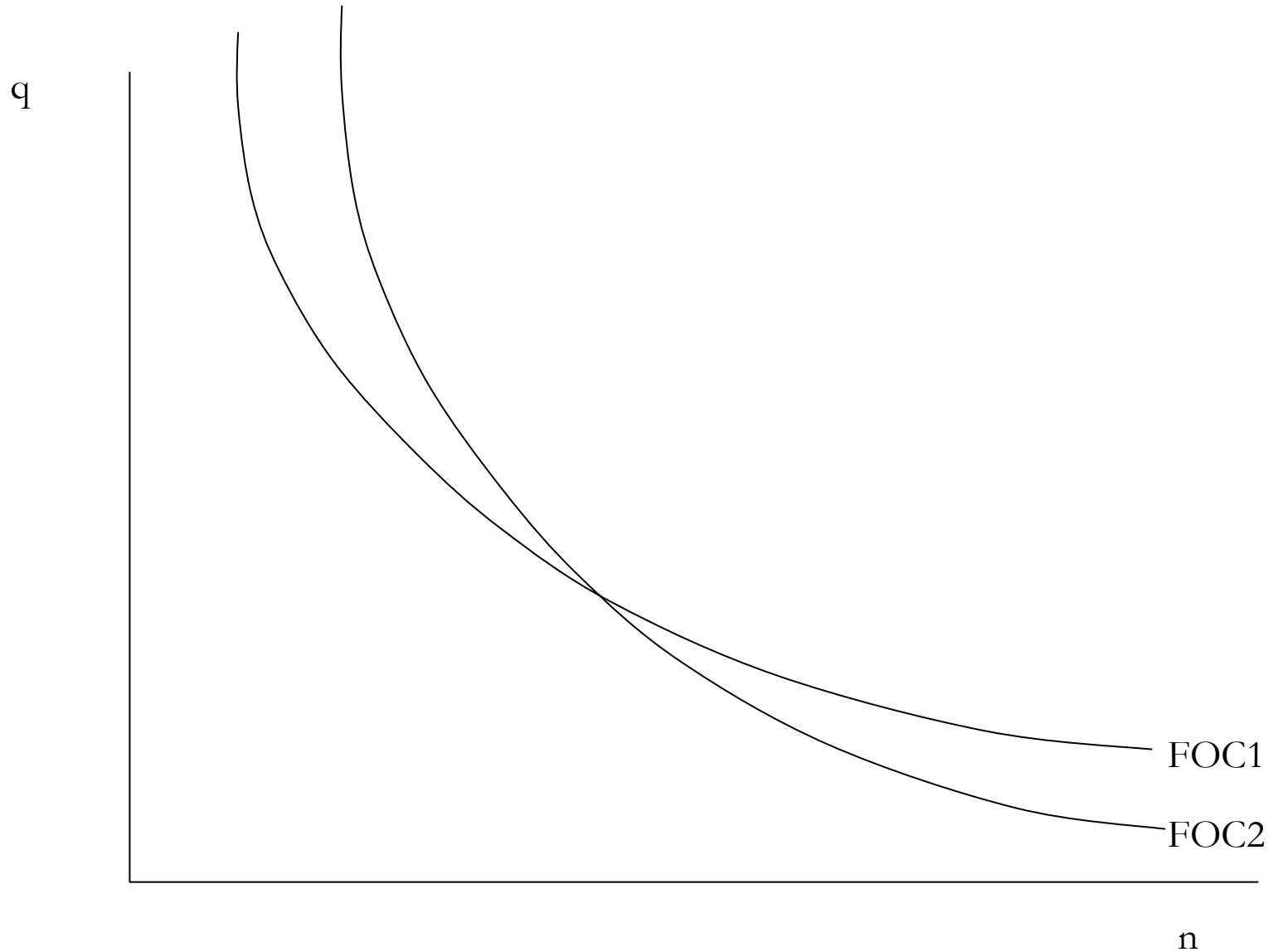

Figure 1: The first order conditions in (n,q) space

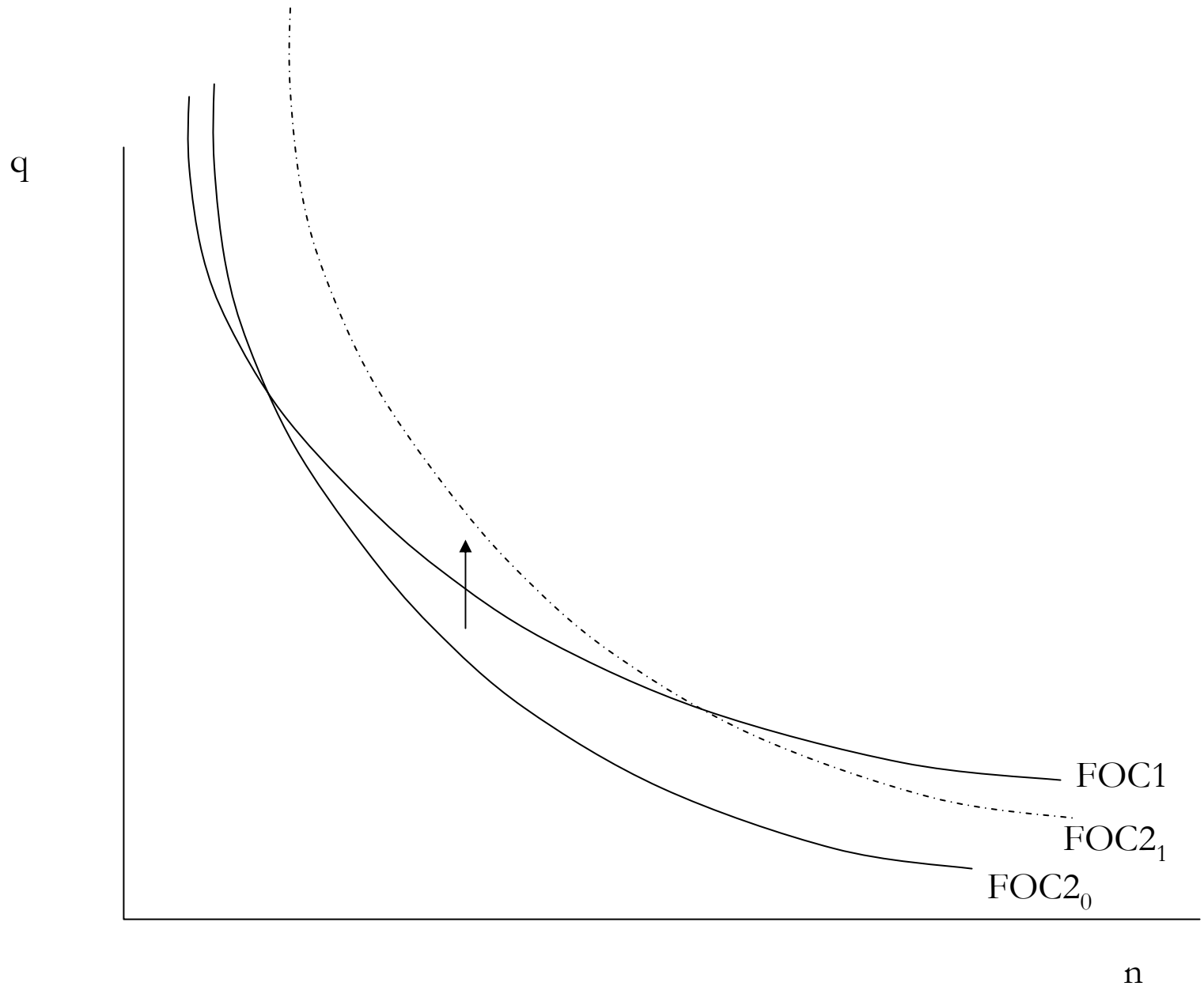

Figure 2: Effect of a change in $\varkappa$

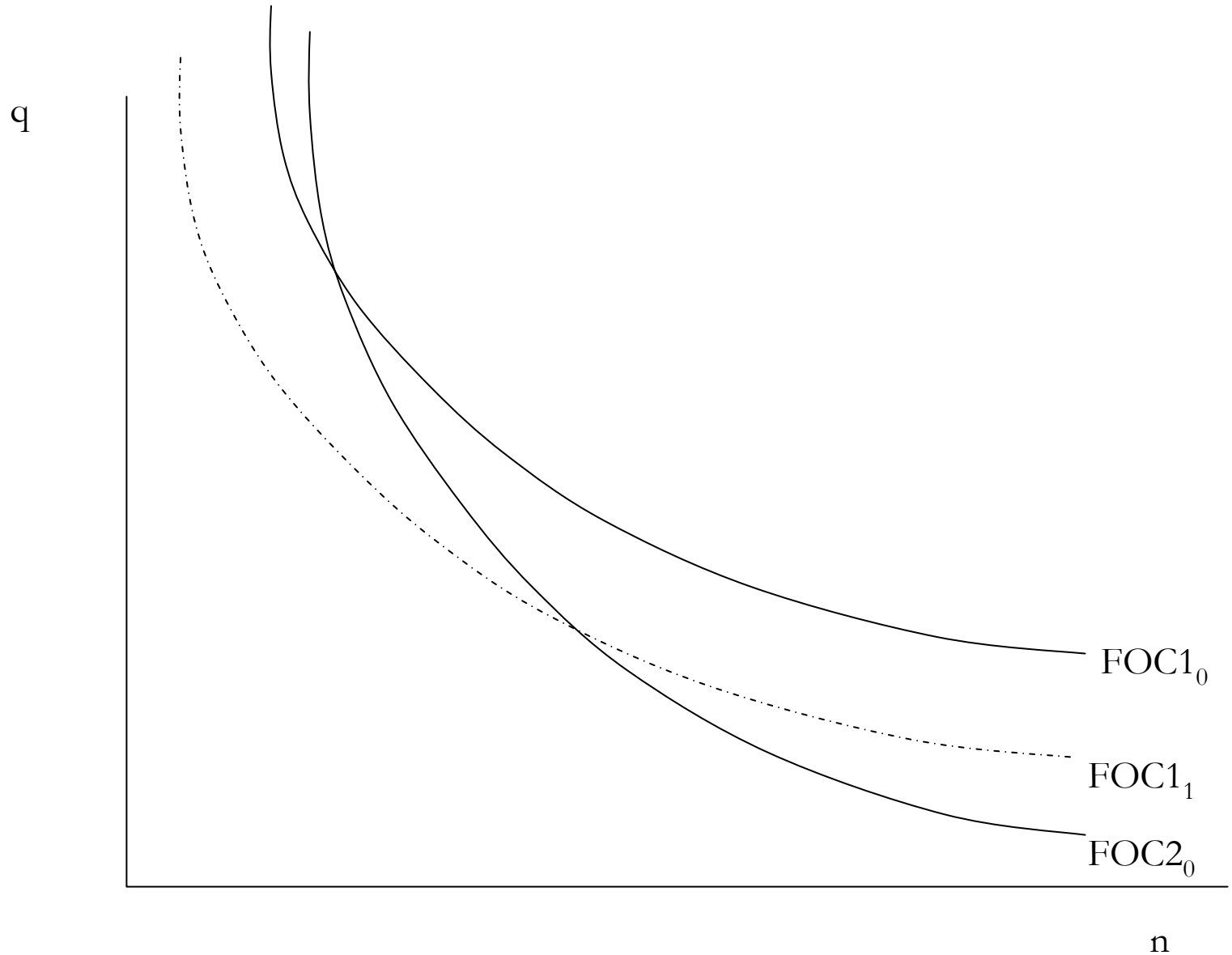

Figure 3: Effect of an increase in p_n

Table 1: Fertility Rates in Latin American Economies

Country	**Total Fertility Rate 1995-2000 (Children per woman)**
Brazil	2.3
Chile	2.4
Mexico	2.8
Peru	3.2
Uruguay	2.4
Venezuela	3.0
All Latin America & Carr	2.7
Source: UN World Population Prospects [Available at: http://esa.un.org/unpp/]	

Table 2: Summary of Variables

WVS 1995 Variables Summary				
Married Women 35-44 (n = 325)				
Var Name	**Variable Description**	**Range of Responses**	**Sample Mean**	**Std Deviation**
Children	Number of children respondent has ever had	1 to 7	2.76	1.25
Income	Respondent's household income category	1 to 10	3.57	2.51
Education	Respondent's highest educational degree	1=no formal - 9=university	4.70	2.28
Country Dummy	Country dummy for all countries (Peru excl)	0=true, and 1=false		
Raised Religiously	Was respondent raised religiously at home?	0=no, and 1=yes	0.83	0.38
Average Chief Job	Average occupation of chief wage earner for women 65+ in the same income category and country as respondent	1 to 10	7.96	2.24
Hardwork	How do you place your views on this scale? 1means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between. Left statement: In the long run, hard work usually brings a better life. Right statement: Hard work doesn't generally bring success-- it's more a matter of luck and connections.	1 to 10	5.49	3.40

Table 3: Hard work Responses by Country

WVS v129 (How would you place your views on the following scale:
1=In the long run, hard work usually brings a better life,
10=Hardwork doesn't generally bring success-- it's more a matter of luck and connections)

Responses:	1 (Hardwork)	2	3	4	5	6	7	8	9	10 (Luck)	Mean	Obs
Brazil	19.5%	4.9%	2.4%	0.0%	7.3%	9.8%	4.9%	9.8%	2.4%	39.0%	6.6	41
Chile	26.8%	4.1%	10.3%	8.3%	15.5%	8.3%	4.1%	9.3%	3.1%	10.3%	4.6	97
Mexico	29.2%	13.9%	10.8%	3.1%	15.4%	4.6%	6.2%	9.2%	3.1%	4.6%	3.9	65
Peru	43.6%	12.8%	15.4%	2.6%	5.1%	7.7%	2.6%	2.6%	0.0%	7.7%	3.1	39
Uruguay	19.4%	3.2%	12.9%	12.9%	12.9%	9.7%	3.2%	3.2%	0.0%	22.6%	5.1	31
Venezuela	29.0%	2.6%	7.9%	7.9%	10.5%	2.6%	13.2%	2.6%	2.6%	21.1%	5.1	38
Total	**28.0%**	**7.1%**	**10.0%**	**5.8%**	**12.2%**	**7.1%**	**5.5%**	**7.1%**	**2.3%**	**15.1%**	**4.6**	**311**

Notes:
Sample includes only married females aged 35-44
These are the question and response options as presented to the respondent. For the regression, an oppositely scaled "Hard work" variable was created for which high values suggest, more intuitively, greater faith in the payoff to hard work.

Table 4: Fertility Rates in Latin American Sample

Country	**Fertility (Children / woman) 1997**		**Observations**
	Mean	Standard Deviation	
Brazil	2.61	1.10	150
Chile	2.39	0.80	41
Mexico	3.06	1.30	35
Peru	3.09	1.44	32
Uruguay	2.69	1.39	29
Venezuela	3.24	1.63	38
Total	2.76	1.25	325
Source: World Values Survey, Married Women 35-45 Note: WVS sample includes responses ≥1 only. No children recorded as missing (see text).			

Table 5: Income Summary by Country

WVS 1995 Income summary by country Married women 35-44			
	Number of observations	**Sample mean**	**Standard deviation**
Brazil	150	2.7	2.2
Chile	41	5.9	2.5
Mexico	35	3.5	2.1
Peru	32	3.3	2.1
Uruguay	29	6.4	2.5
Venezuela	38	2.6	0.9

Table 6: Education Summary by Country

WVS 1995 Education summary by country Married women 35-44			
	Number of observations	**Sample mean**	**Standard deviation**
Brazil	150	3.8	2.1
Chile	41	5.7	1.8
Mexico	35	5.1	2.5
Peru	32	5.9	2.3
Uruguay	29	5.8	2.1
Venezuela	38	5.0	2.0

Table 7: AvgChfJob Summary by Country

WVS 1995 AvgChfJob summary by country Married women 35-44			
	Number of observations	**Sample mean**	**Standard deviation**
Brazil	150	8.9	2.2
Chile	41	6.2	0.8
Mexico	35	6.6	1.6
Peru	32	6.4	1.1
Uruguay	29	6.1	0.7
Venezuela	38	10.1	1.5

Table 8: Raised Religiously by Country

WVS 1995 Raised Religiously summary by country Married women 35-44			
	Number of observations	**Sample mean**	**Standard deviation**
Brazil	150	0.8	0.4
Chile	41	0.7	0.5
Mexico	35	1.0	0.2
Peru	32	1.0	0.2
Uruguay	29	0.8	0.4
Venezuela	38	0.8	0.4

Table 9: Basic OLS Regressions

WVS 1995 hard work basic OLS regressions				
	Dependent variable: number of children ever had			
Explanatory variables	**OLS (1)**	**OLS (2)**	**OLS (3)**	**OLS (4)**
income	**-0.10 (.03)**			-0.03 (0.03)
education		**-0.15 (0.03)**		**-0.12 (0.03)**
hard work			0.01 (0.02)	0.2 (0.02)
Brazil dummy	**0.65 (0.28)**	**-0.85 (0.27)**	**-0.60 (0.28)**	**-0.71 (0.29)**
Chile dummy	-0.32 (0.29)	**-0.80 (0.28)**	**-0.55 (0.29)**	**-0.63 (0.31)**
Mexico dummy	0.06 (0.31)	-0.16 (0.31)	-0.13 (0.30)	-0.14 (0.33)
Peru dummy	-0.19 (0.34)	-0.19 (0.31)	-0.23 (0.33)	-0.14 (0.34)
Uruguay Dummy	0.21 (0.39)	-0.34 (0.38)	-0.40 (0.40)	-0.32 (0.40)
Constant	**3.54 (0.27)**	**4.01 (0.31)**	**3.17 (0.30)**	**3.8 (0.34)**
Number of observations	436	365	455	338
F statistic	6.07	7.47	2.54	4.60

Notes:

Standard errors in parentheses

Standard errors are heteroskedasticity robust

Coefficients significant at the 10% level in bold

Sample is married women 35-44

Table10: Threshold Regression

WVS 1995 hard work threshold regressions									
	Dependent variable: number of children ever had								
Explanatory variables	**OLS (2)**	**OLS (3)**	**OLS (4)**	**OLS (5)**	**OLS (6)**	**OLS (7)**	**OLS (8)**	**OLS (9)**	**OLS (10)**
hard work (x to 10)	**-0.32(0.16)**	**-0.34 (0.14)**	-0.12 (0.14)	0.04(0.13)	0.09 (0.13)	0.17 (0.13)	0.23 (0.13)	**0.34 (0.14)**	**0.32 (0.15)**
F statistic	3.20	3.54	2.51	2.48	2.66	2.90	3.12	3.64	3.25

Notes:

Number of observations in each regression = 455

Regressions all indude country dummies; estimated coefficients not reported

Standard errors in parentheses

Standard errors are heteroskedasticity robust

Coefficients significant at the 10% level in bold

Sample is married women 35-44

Table 11: Basic OLS Regression with Threshold Dummies

WVS 1995 hard work basic OLS regressions				
	Dependent variable: number of children ever had			
Explanatory variables	**OLS (1)**	**OLS (2)**	**OLS (3)**	**OLS (4)**
income	**-0.10 (.03)**			-0.02 (0.03)
education		**-0.15 (0.03)**		**-0.12 (0.03)**
Hardwork (>=3) Dummy			**-0.52 (0.15)**	**-0.38 (0.16)**
Hardwork (>=9) Dummy			**0.49 (0.14)**	**0.47 (0.17)**
Brazil dummy	**0.65 (0.28)**	**-0.85 (0.27)**	**-0.67 (0.28)**	**-0.77 (0.28)**
Chile dummy	-0.32 (0.29)	**-0.80 (0.28)**	**-0.49 (0.28)**	**-0.55 (0.31)**
Mexico dummy	0.06 (0.31)	-0.16 (0.31)	-0.09 (0.30)	-0.13 (0.33)
Peru dummy	-0.19 (0.34)	-0.19 (0.31)	-0.22 (0.33)	-0.11 (0.34)
Uruguay Dummy	0.21 (0.39)	-0.34 (0.38)	-0.35 (0.38)	-0.32 (0.39)
Constant	**3.54 (0.27)**	**4.01 (0.31)**	**3.48 (0.28)**	**4.03 (0.33)**
Number of observations	**436**	**365**	455	338
F statistic	6.07	7.47	5.35	5.53

Notes:

Standard errors in parentheses

Standard errors are heteroskedasticity robust

Coefficients significant at the 10% level in bold

Sample is married women 35-44

Table 12: Other OLS & TSLS

WVS 1995 hard work basic OLS regressions					
	Dependent variable: number of children ever had				
Explanatory variables	**OLS (5)**	**OLS (6)**	**OLS (7)**	**2nd SLS**	**1st SLS**
income	-0.03 (0.03)	-0.02 (0.03)		-0.06 (0.08)	
education	**-0.12 (0.03)**	**-0.12 (0.03)**	**-0.14 (0.28)**	**-0.14 (0.03)**	
Hardwork (>=3) Dummy	**-0.37 (0.15)**	**-0.36 (0.16)**	**-0.43 (0.16)**	**-0.43 (0.16)**	
Hardwork (>=9) Dummy	**0.45 (0.17)**	**0.45 (0.17)**	**0.41 (0.17)**	**0.41 (0.17)**	
AvgChfJob		0.02 (0.04)	0.03 (0.04)		**-0.47 (0.06)**
Raised Religiously	-0.06 (0.17)	-0.06 (0.18)	-0.04 (0.18)	-0.04 (0.18)	**-0.08 (0.27)**
Brazil dummy	**-0.77 (0.28)**	**-0.75 (0.28)**	**-0.79 (0.28)**	**-0.82 (0.28)**	**-0.39 (0.38)**
Chile dummy	**-0.55 (0.31)**	**-0.48 (0.33)**	**-0.52 (0.32)**	**-0.47 (0.35)**	**0.79 (0.45)**
Mexico dummy	-0.12 (0.32)	-0.04 (0.35)	-0.05 (0.34)	-0.09 (0.33)	-0.58 (0.46)
Peru dummy	-0.05 (0.35)	0.04 (0.37)	0.01 (0.35)	-0.07 (0.33)	**-1.11 (0.55)**
Uruguay Dummy	-0.30 (0.39)	-0.22 (0.40)	-0.13 (0.40)	-0.02 (0.48)	**1.79 (0.56)**
Constant	**4.09 (0.36)**	**3.86 (0.57)**	**3.86 (0.54)**	**4.32 (0.41)**	**7.28 (0.76)**
Number of observations	333	325	345	345	437
F statistic	5.06	4.61	5.29	5.29	26.91

Notes:

Standard errors (shown in parentheses) are heteroskedasticity robust.

Income in the 2nd stage least squares regression is the predicted income from the 1st Stage OLS regression

Coefficients significant at the 10% level in bold

Sample is married women 35-44

Table 13: Ordered Probit Regression

WVS 1995 Hardwork threshold Ordered Probit Regressions

Dependent variable: number of children ever had

Explanatory variables	**Oprobit (1)**	**Oprobit (2)**	**Oprobit (3)**	**Oprobit 2S (4)**
income	-0.02 (0.03)	-0.01 (0.03)	-0.01 (0.03)	-0.04 (0.08)
education	**-0.11 (0.03)**	**-0.11 (0.03)**	**-0.11 (0.03)**	**-0.12 (0.03)**
Hardwork (>=3) Dummy	**-0.38 (0.14)**	**-0.36 (0.14)**	**-0.39 (0.14)**	**-0.41 (0.14)**
Hardwork (>=9) Dummy	**0.41 (0.15)**	**0.41 (0.15)**	**0.42 (0.15)**	**0.35 (0.15)**
AvgChfJob		0.01 (0.04)		
Raised Religiously	-0.01 (0.16)	-0.02 (0.16)		0.00 (0.16)
Brazil dummy	**-0.61 (0.23)**	**-0.60 (0.24)**	**-0.60 (0.23)**	**-0.63 (0.23)**
Chile dummy	-0.39 (0.27)	**-0.34 (0.29)**	**-0.40 (0.26)**	-0.35 (0.32)
Mexico dummy	-0.02 (0.28)	-0.03 (0.30)	-0.03 (0.28)	0.00 (0.29)
Peru dummy	-0.01 (0.28)	0.04 (0.31)	0.06 (0.28)	0.01 (0.27)
Uruguay Dummy	-0.28 (0.33)	-0.22 (0.34)	-0.29 (0.33)	-0.08 (0.43)
Number of observations	333	325	345	345
Wald Statistic	47.22	47.35	45.79	49.62

Notes:

Standard errors (shown in parentheses) are heteroskedasticity robust.

Income in the 2nd stage least squares regression is the predicted income from the 1st Stage OLS regression

Standard Errors for the second stage ordered probit are bootstrapped.

Coefficients significant at the 10% level in bold

Sample is married women 35-44

Table 14: Marginal Effects of Changing Beliefs
(Ordered Probit with Instrumental Variable)

Dependent variable	**Independent variables**
V90 (number of children)	Income hat (extrapolated v227 household income of reference group) Edu (v217) Hrdwrk_thrs3 (hardwork ≥ 3) Hrdwrk_thrs9 (hardwork ≥ 9) Raised Religiously (v180) Brazil, Chile, Mexico, Peru, Uruguay dummies

Marginal effects				
dPr(n=1)/ d hrdwrk_3-10	0.067		dPr(n=1)/ d hrdwrk_9-10	-0.059
dPr(n=2)/ d hrdwrk_3-10	0.093		dPr(n=2)/ d hrdwrk_9-10	-0.079
dPr(n=3)/ d hrdwrk_3-10	-0.037		dPr(n=3)/ d hrdwrk_9-10	0.034
dPr(n=4)/ d hrdwrk_3-10	-0.059		dPr(n=4)/ d hrdwrk_9-10	0.051
dPr(n=5)/ d hrdwrk_3-10	-0.024		dPr(n=5)/ d hrdwrk_9-10	0.021
dPr(n=6)/ d hrdwrk_3-10	-0.032		dPr(n=6)/ d hrdwrk_9-10	0.027
dPr(n=7)/ d hrdwrk_3-10	-0.005		dPr(n=7)/ d hrdwrk_9-10	0.004
dPr(n=8)/ d hrdwrk_3-10	-0.003		dPr(n=8)/ d hrdwrk_9-10	0.002

Note: independent variables evaluated at their mean for marginal effect calculations.

Table 15: Estimated Effects on Fertility

If each country's responses to the hard work/luck question were entirely within the non-extreme range of 4-8, what is the predicted effect on fertility?

TSLS regression predictions

Country	Actual sample fertility	Predicted sample fertility	Percent change
Brazil	2.61	2.33	-12.3%
Chile	2.39	2.16	-10.8%
Mexico	3.06	2.80	-9.4%
Peru	3.09	2.75	-12.4%
Uruguay	2.69	2.44	-10.0%
Venezuela	3.24	2.97	-9.0%

Ordered probit (two stage) predictions

Country	Actual sample fertility	Predicted sample fertility	Percent change
Brazil	2.61	2.32	-12.4%
Chile	2.39	2.15	-11.3%
Mexico	3.06	2.78	-10.0%
Peru	3.09	2.73	-13.3%
Uruguay	2.69	2.44	-10.4%
Venezuela	3.24	2.96	-9.3%