The impact of divorce laws on family formation and post- marital human capital investment

Theory, empirical investigation, and policy implications

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1 Introduction

Since the second half of the 20th century we have observed dramatic changes in the types of families that form. In traditional marriages, the spouse with higher earning capacity would be more educated and more likely to work in the labor market than the spouse with lower earning capacity. In sharp contrast, in modern marriages spouses have similar education levels and are equally likely to participate in the labor market.

Accompanying these changes in the marriage market, we observe radical changes in the laws regulating family dissolution. For example, in the United States, before the late 1960's divorce in most states required the consent of both spouses. Since then, all states introduce the Unilateral divorce regime that allows any partner to file for divorce without the agreement of the other.

Are these two facts related? Does making divorce easier cause increments in spousal homogamy in education and a decrease in household specialization? How does making divorce easier impact the gains from marriage for different education groups?

In this project I, first, develop a theory of marriage, marital investments, and divorce to study how divorce policy affects the equilibrium in the marriage market. Then, I develop an empirical approach that I apply to study the equilibrium welfare effects of the introduction of Unilateral divorce in the US.

2 Contribution

To the best of my knowledge, no paper in the related literature has considered the impact of making divorce easier on the equilibrium in the marriage market.

The vast literature that studies how divorce and other family laws impact on household organization focuses on already formed couples (Voena (2015), Bayot & Voena (2015), Fernández & Wong (2011), Stevenson (2007), Oreffice (2007), Chiappori *et al.* (2002)). Policy welfare analyses in this literature, hence, do not account for the additional effects generated by changes in marriage patterns.

Moreover, the literature that does consider marriage and divorce in an equilibrium framework is embedded in the so called Becker-Coase environment, in which policy changes have no impact on matching patterns (Chiappori *et al.* (2016), Chiappori *et al.* (2009a), Chiappori *et al.* (2009b), Fernández & Wong (2014)).

Unlike these papers, I develop a framework to study when different policy environments give rise to different marriage market equilibria and to characterize the different equilibria. This is an important research agenda in the light of the long lasting effects of family formation. First, families have heterogeneous access to early childhood investment opportunities. Hence, different equilibrium types of households may be associated to very diverse average quality of the children that will grow up to become the future generations. Second, different marriage market equilibria may differ significantly in the marital gains from pre-marital human capital investments, implying very different aggregate levels of human capital. Third, different degrees of assortativeness in the marriage market are associated with varying levels of across household inequality, with clear policy implications. All in all, a comprehensive understanding of the impact of policies regulating the family cannot ignore the feedback in the types of households that form.

3 Evidence

Contrary to the policy neutrality assumed in previous models of marriage and divorce, preliminary evidence suggests that changes in divorce laws affect matching patterns. To assess this effect, I use data from Current Population Survey (years 1965 to 1992) and the Panel Study of Income Dynamics (years 1968 to 1992) and exploit state and time variation in the introduction of Unilateral divorce in the US. I isolate the effect of divorce laws on *matching* patterns by selecting newlyweds (couples formed within two years of the survey year) to estimate the following regression at the marriage m, time t, and state s level:

$$\begin{aligned} HK^{wife}_{mts} &= \alpha + \gamma HK^{hus}_{mts} + \beta HK^{hus}_{mts} \times Unilateral_{ts} + \theta Unilateral_{ts} + \\ &+ \sum_t \delta_t \times HK^{hus}_{mts} + \sum_s \delta_s \times HK^{hus}_{mts} + \sum_t \delta_t + \sum_s \delta_s + \epsilon_{mts} \end{aligned} \tag{1}$$

HK is human capital at the time of marriage; $Unilateral_{ts}$ is an indicator taking value one if state s has Unilateral divorce in year t and zero if it has Mutual Consent divorce in year t; and δ_t and δ_s are time and state fixed effects, respectively. The coefficient of interest is β, which captures the increment in the correlation between wife's and husband's human capital at the time of marriage associated to the introduction of the Unilateral divorce law.

Table 1 shows specifications where HK is measured as education. The row labeled *"Husband educ (avg. main eff.)"* shows the average correlation (across states and years) between husband's and wife's education. The row labeled *"Husband's educ x UD"* reports the additional increment in the spousal correlation in education due to the introduction of Unilateral divorce. The results from the CPS data displayed in columns (1) to (4) indicate that an additional year of husband's education is associated with an increment of between 0.4 and 0.7 years in wife's education[1]. This evidences that the marriage market in the US exhibits positive assortative matching. On top of this, for newlyweds in Unilateral divorce states, there is an additional increment in wife's education that ranges between 10% and 23% of the main husband's education effect, relative to newlyweds in Mutual Consent states. The results using level of education with PSID data shown in columns (5) to (8) evidence similar conclusions. Table 2 reveals that

[1]The effect is also highly significant (test not reported).

these conclusions also hold when *HK* is measured as parental education (columns (1) and (2)) and pre-marital labor income (columns (3) and (4)). Hence, the evidence suggests that divorce laws have a positive effect on assortativeness in the marriage market.

4 Marriage, marital investments, and divorce: theory

In a first paper I build a theory of marriage, household life, and divorce to study how divorce regulations affect the types of families that form. I depart from the Becker-Coase tradition by incorporating spouses' decisions to specialize in household or market labor, one of the most recognized reasons for marriage. By marrying partners that fully take care of household chores, working spouses can increase their opportunities to accumulate human capital. I consider a change in divorce laws that decreases the commitment of ex-spouses to share the returns to the human capital accumulated during the marriage. I show that such a policy reduces the willingness of lower earning spouses to specialize in household labor, hence reducing the value of marriage for some potential couples. As a result, the policy change affects the marriage market equilibrium. In the new divorce regime, spouses match more assortatively in human capital and fewer households specialize.

In the model, individuals match on their discrete level of initial human capital (low or high), live together for one period, and continue together or divorce during the second period. The lifetime value of a marriage is the sum of welfare generated while married and while divorced. The marriage market is competitive: potential partners observe the expected lifetime value of their marriage and take each one's share of that value as a given price. In period one, couples decide if the spouse with the lower earning capacity will specialize in market or household labor. Housework is a marital investment that increases the working partner's earnings in period two. If the couple divorces, ex-spouses pool and share their second period earnings only if divorce requires a mutually agreed settlement. Otherwise, they live off their individual earnings.

I first show that when divorce requires the Mutual Consent of spouses, couples make efficient marital investments. Intuitively, when deciding on their occupation, spouses with comparative advantage in home production can expect to receive a share of their working partner's second period increased earnings in the event of a divorce. I next show that the marriage market equilibrium under mutual consent divorce is optimal and characterize it. When the gains from specialization are sufficiently low, the optimal matching is positive assortative and in all types of couples both spouses work in the labor market. When the gains from specialization are sufficiently high, the optimal matching is also positive assortative but only couples of high skilled females and high skilled males specialize. For intermediate levels of the gains from specialization, matching is negative assortative and only couples with high skilled males and low skilled females specialize.

I then solve the model when divorce is Unilateral and divorce settlements are not enforced. In the model, this means that working spouses are not enforced to share the returns to household specialization with their investing ex-partners after divorce. I, first, show that some given sharing rules in the marriage market induce lower earning spouses to inefficiently work in the labor market as they may secure a higher share (even if) of a lower marital output. Hence, the value of marriages under Unilateral divorce depends on how this value is split. I, then, show that for some values of the gain from specialization and the sex ratio, equilibria under Unilateral divorce is more assortative than equilibria under Mutual Consent divorce.

5 The impact of divorce policies in the US marriage market equilibrium: a structural approach

The theory reveals that whether changes in divorce laws affect post-marital human capital investments and matching patterns critically depends on the structure of the marriage and labor markets. In a second paper, I develop an empirical structural model to study how divorce policies affect spousal homogamy, household organization, and the gains from marriage. I apply the empirical framework to study the welfare effects of the introduction of Unilateral divorce in the US marriage market.

To answer the research question I build a life cycle model of matching, family life, and divorce. In period zero, people match on a discrete value of their initial human capital. Couples that arrive married at period one live together for a "honeymoon" period. In periods after the honeymoon period, a match quality realizes and couples with low draws may divorce. Each period the couple jointly decides on consumption of private and public goods, savings, and spousal labor supply. When the household organizes such that one spouse works in the labor market and the other in the household, the future earnings of the working spouse increase.

I solve the model under a divorce regime that enforces mutually agreed divorce settlement (i.e., Mutual Consent regime). Importantly, I show that under this divorce regime the model exhibits a transferable utility structure: the life cycle decisions of married couples do not depend on the division of marital lifetime value determined in the matching period. This result allows me to develop a tractable empirical strategy that closely resembles Chiappori *et al.* (2015) (henceforth CDM). In a first step the parameters of the life cycle martial output are estimated by the method of moments. This allows the estimation of the economic value of all potential marriages. In a second step, matching patterns are identified and the gains from marriage are quantified for each human capital type of males and females.

I make two innovations with respect CDM: I consider marital investments and divorce. In ongoing work, I use PSID data from couples, singles, and divorcees in Mutual Consent divorce states. Given the transferable utility structure of the model under this divorce regime, I estimate the parameters of the life cycle model and the gains from marriage. In future work, I plan to use these estimates, to simulate a policy change that reduces the enforcement of divorce settlements. Using data generated by couples, singles, and divorcees in Unilateral divorce states I intend to test the performance of the model in predicting changes in assortativeness and household organization patterns. Finally, I intend to quantify the gains from marriage under the new policy regime and evaluate the full equilibrium welfare effects of the policy change.

Table 1: Unilateral divorce and assortativeness in education for newlyweds

	Dependent variable: wife's education							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CPS data				PSID data			
	Age ≤ 25		All		Age ≤ 25		All	
Husband's educ. x UD	0.0886**	0.1050**	0.0731*	0.0293	0.1113**	0.2767**	0.0857**	0.2476**
	(0.0397)	(0.0520)	(0.0379)	(0.0562)	(0.0495)	(0.1113)	(0.0381)	(0.1024)
Year and State dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Husband Educ. x Year	No	Yes	No	Yes	No	Yes	No	Yes
Husband Educ. x State	No	Yes	No	Yes	No	Yes	No	Yes
Husband Educ (avg. main eff.)	0.4109	0.4810	0.5360	0.7173	0.4686	0.2042	0.4560	0.4376
Observations	12379	12379	24353	24353	2930	2930	5281	5281

Notes: CPS data is from the Annual Social and Economic Supplement and June Supplement of the Current Population Survey for the years $t = \{1965, 1967, 1977, ..., 1992\}$. PSID data is from the Panel Study of Income Dynamics for the years $t = \{1968, ..., 1992\}$. The sample consists of all newlyweds in their first marriage. Newlyweds are defined as couples married within two years of the survey year. The model estimated is $Educ^{wife}_{mts} = \alpha + \gamma Educ^{hus}_{mts} + \beta Educ^{hus}_{mts} \times Unilateral_{ts} + \theta Unilateral_{ts} + \sum_t \delta_t \times Educ^{hus}_{mts} + \sum_s \delta_s \times Educ^{hus}_{mts} + \sum_t \delta_t + \sum_s \delta_s + \epsilon_{mts}$. Wife's and husband's education is measured as years of completed education in the CPS data and as level of education (less than high school, high school, some college or more) in the PSID data. UD is an indicator variable that takes value one if the newlywed couple lives in a Unilateral divorce state and zero if the couple lives in a Mutual Consent divorce state. All specifications include year and state dummies. Standard errors clustered at the state level are in parentheses. **Significant at the 0.05 level. *Significant at the 0.10 level.

Table 2: Unilateral divorce and assortativeness in parental education and pre-marital labor income for newlyweds

	Dependent variable: wife's ability			
	(1)	(2)	(3)	(4)
	Parental Education		Labor income	
	Age ≤ 25	All	Age ≤ 25	All
Husband's ability x UD	0.3443*	0.1842	0.0718	0.1924***
	(0.1970)	(0.2342)	(0.0890)	(0.0474)
Year and State dummies	Yes	Yes	Yes	Yes
Husband's ability x Year	Yes	Yes	Yes	Yes
Husband's ability x State	Yes	Yes	Yes	Yes
Husband's ability (avg. main eff.)	0.0756	0.2527	0.3085	0.5026
Observations	2789	4987	1695	2691

Notes: Data is from the Panel Study of Income Dynamics for the years $t = \{1968, ..., 1992\}$. The sample consists of all newlyweds in their first marriage. Newlyweds are defined as couples married within one or two years of the survey year. The model estimated is $Ability^{wife}_{mts} = \alpha + \gamma Ability^{hus}_{mts} + \beta Ability^{hus}_{mts} \times Unilateral_{ts} + \theta Unilateral_{ts} + \sum_t \delta_t \times Ability^{hus}_{mts} + \sum_s \delta_s \times Ability^{hus}_{mts} + \sum_t \delta_t + \sum_s \delta_s + \epsilon_{mts}$. In specifications (1) to (4) ability is measured as the education level of the individual's father (less than high school, high school, some college or more). In specifications (5) to (8) ability is measured as the individual's labor income the year before marriage, and it is only observed for couples married within one year of the survey year. UD is an indicator variable that takes value one if the newlywed couple lives in a Unilateral divorce state and zero if the couple lives in a Mutual Consent divorce state. All specifications include year and state dummies. Standard errors clustered at the state level are in parentheses. ***Significant at the 0.01 level. *Significant at the 0.10 level.

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2012 (Written): Microeconomics, Macroeconomics

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M.A., Economics, Yale University, 2013
M.A., Economics, Universidad de San Andrés, 2011
B.A., Economics (*magna cum laude*), Universidad de Buenos Aires, 2007

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Fellowships, Honors and Awards:

Ryoichi Sasakawa Young Leaders Fellowship Fund, Yale University, 2013-2014
Yale University Cowles Foundation Fellowship, 2011-2015
Yale University Graduate Fellowship, 2011-2016
Full merit-based tuition award, Universidad de San Andrés, 2008
Universidad de Buenos Aires UBACyT Graduate Fellowship, 2008-2011

Teaching Experience:

Yale University:
Econometrics and Data Analysis II (undergraduate, instructor: Costas Meghir), Spring 2015
General Economic Theory: Microeconomics (graduate, instructor: Truman Bewley), Fall 2014
Econometrics and Data Analysis I, (undergraduate, instructor: Nancy Qian), Spring 2014
Introductory Microeconomics (undergraduate, instructor: Christopher Udry), Fall 2013
Universidad de San Andrés:
Game Theory and Strategic Behavior (undergraduate, instructor: Martín Rossi), 2010-2011
Universidad de Buenos Aires:
Microeconomics I (undergraduate, instructor: Martín Rossi), 2009-2011
Mathematics for Economists (undergraduate, instructor: María Teresa Casparri), 2004-2009

Research and Work Experience:

Research Assistant to Professor Costas Meghir, Yale University, 2013
Research Assistant to Professor Irene Brambilla, Universidad de San Andrés, 2009-2011
Research Assistant to Professor Martín Rossi, Universidad de San Andrés, 2009-2011

Working Papers:

"Marriage, marital investments, and divorce" (October 2016), *Job Market Paper*

"Matching in marriage markets with polygamy" (October 2016)

"Education Quality and Teaching Practices" with Marina Bassi and Costas Meghir (October 2016), *NBER Working Paper #22719*

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Work In Progress:

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19 November 2016

To whom it may concern

RE: Ana Reynoso

I am delighted to recommend Ana for a postdoc position. I have been advising Ana together with Joe Altonji on her thesis and I can say she is an excellent student with a first rate creative mind. She clearly has an instinct for interesting questions and an excellent ability to formulate a model with the key elements that allow her to investigate the question and come up with clear conclusions. Effectively she combines some of the best characteristics of applied theorists and empirical microeconomists.

Ana would normally be on the market this year for a position as an assistant professor and she very nearly was. However, given she had a child while studying for her Ph.D. we felt this put undue pressure on her to complete in a time frame, which for all practical purposes was much tighter than that of her peers who have not had children. As a result we recommended she postpone her participation for one year and seek a postdoc position instead. Her plan is to complete the current paper she is working on and to also complete an additional project.

At the moment Ana has four papers, two single authored and two co-authored. Her main paper is truly an excellent piece that I fully expect will be publishable in a top Journal once completed. It deals with the how divorce laws affect sorting in the marriage market – who marries whom. However there is an important twist. In her model if one of the partners stays at home this can enhance the human capital of the working partner. Formally the stay-at-home partner is making an investment in the other that cannot be verified in court. Indeed she shows empirically that such a causal channel exists and is quite strong and hence it is important to consider the implications. She sets up a simple three period model, with matching in the first period, work in the second and possible divorce and a final work period in the third either as a couple or singles. She then solves for equilibrium in the marriage market conditional on two alternative divorce regimes: mutual consent and unilateral. Under mutual consent the partners can be forced into transfers so that both enjoy the fruits of the unverifiable investment. In this case efficient investments take place in marriage and sorting tends to be negative assortative. However, under unilateral divorce the stay-at-home partner may not be able to recover the share of investment. As a result these investments may inefficiently not take place and interestingly marital sorting may end up being negative assortative in equilibrium. This paper is truly innovative and as far as I know it is the first paper to treat divorce in an equilibrium context;

the addition of the holdup problem makes it particularly interesting. Within the paper she shows empirically how changes in divorce laws did indeed change sorting in the labor market.

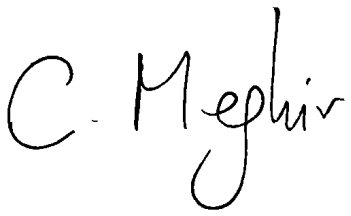
She is now seeking to develop the empirical analysis further by specifying and estimating a structural model of marriage and divorce in a lifecycle context. This will extend existing work by Voena, who considers the impact of divorce on *already married* couples and does not consider implications for marriage and sorting. This promises to be an exciting paper.

Ana has also written a paper on polygamy, which she has estimated based on data from Ghana. Polygamy is very prevalent and understanding equilibria in these marriage markets as well as the implications for individuals in these unions is generally a very important issue. In that model the marriage market consists of men and women with heterogeneous skills. She derives an equilibrium where the men of highest skill form polygamous households where one wife is also of high skill but the second wife is a low skill partner. Middle skill men and middle skill women form monogamous unions. The lowest skill men remain unmarried. The skill thresholds between monogamy and polygamy are endogenous and depend on economic conditions, giving us an insight of how monogamy can become prevalent. The paper is ready and she should soon be submitting it to a journal.

In addition to these papers she also has two co-authored papers, one with me and Marina Bassi of the IADB, which we have submitted to the Journal of Human Resources (NBER WP22719 - Education Quality and Teaching Practices) and one with her undergraduate advisors. In our paper we analyse a randomized experiment where structured teaching methods were tested in schools serving mainly low-income families in Chile. Ana was instrumental in this analysis. She was creative and took many initiatives that improved the paper substantially. Her other paper looks at the effect of sending children to school in the evening rather than during the day. This allocation is random in Argentina. She was particularly concerned about risky behavior of teenagers in the late hours.

Ana is a first rate student and I have very high hopes on her placement in the job market. She is a creative mind and an independent thinker. It is clear from her papers that she has her own independent style and an extremely effective analytical approach as well as great ideas. I recommend her extremely strongly: she will contribute actively to the department and be a first rate colleague.

Yours Sincerely



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December 28, 2016

Letter of Recommendation for Ana Reynoso

I am delighted to write in support of **Ana** Reynoso's application for a post doc at NBER. I know Ana fairly well. We have been interacting on a regular basis since her second year at Yale, and we have had many conversations about her various projects. I am serving as a member of her dissertation committee.

Ana's broad fields of interest are labor economics and development economics. However, most of her research is on the economics of the family, particularly marriage. Her main paper presents a new model of marriage and divorce in the presence of marital investments. She uses the model to study the effects of mutual consent divorce law versus unilateral divorce law on who marries who and on specialization in marriage.

An extensive literature in economics and sociology has documented an increase in positive assortative matching over the past few decades. The rise in sorting has gone hand in hand with a decline in specialization in the household, where the wife works at home and the husband works in the market. Ana asks whether the move from mutual consent to unilateral divorce contributed to both trends. She motivates her paper by using the PSID and CPS to show that the link between wife's education and husband's education in new marriages is stronger in unilateral divorce states even after accounting for general trends and state differences in the link.

The main models of marriage and matching either do not incorporate divorce in a sophisticated way or focus on existing marriages. They cannot be used to examine the effects of divorce laws on assortative matching or specialization in marriage. And many marriage models satisfy the Becker-Coase theorem. With transferable utility, policies that influence the division of the marriage surplus do not alter who marries who or efficiency in time use within the marriage.

Ana fills the knowledge gap with an impressive piece of applied theory. She crafts an elegant model with precisely the elements needed to provide a more realistic analysis of the effects of divorce policy, to illuminate the key mechanisms, and to achieve interesting analytic results. The key ingredients are heterogeneity in initial human capital, and the assumption that a stay at home wife boosts the career of a high skill husbands, by allowing him to devote more energy to his job.

In the mutual consent world, the wife will share in the husband's advance earning potential, because she will not agree to a divorce unless she is just as well off if the marriage ends as she is if it continues. In the unilateral divorce case with imperfect enforcement of post marriage transfers, the husband can walk off with the gain in future earnings made possible by the wife's choice to work at home.

Ana fully characterizes the relationship between the effect of a stay-at-home spouse on husband's earnings potential on matching patterns, and whether or not the wife works in the market. She shows that the degree of positive assortative matching can only increase following a shift to a unilateral regime, and women are less likely to specialize in home work. Her paper provides the foundation for how other factors that alter transferability of utility between partners affect marriage patterns and efficiency within the marriage.

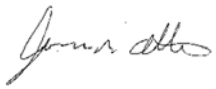
Ana is working on an empirical version of her model of marriage, specialization, and divorce. She has already made a substantial amount of progress in the hard work of coming up with a specification that balance realism with tractability. This project will keep her busy for quite a while, and it will be great companion to her current paper.

Let me also mention that Ana two other interesting papers, including a new equilibrium model of marriage markets with polygamy with supporting empirical analysis using Nigerian data, and a co-authored paper with Marina Bassi and Costas Meghir that uses and RCT to study a teacher intervention. She has been quite productive.

Ana is different from most students I have worked with, who tend to be more heavily empirical. The combination of her commitment to empirical work with her talent and creativity to devise and analyze models that get to the heart of complex phenomena is a potentially powerful combination. I think there is a very good chance that Ana will be competitive at the top level of the job market next year. She is also a wonderful person. You will enjoy having her around. I strongly recommend Ana Reynoso for a postdoctoral fellowship.

Do not hesitate to contact me if you would like further information.

Sincerely,



Joseph G. Altonji