From Polygyny to Serial Monogamy: a Unified Theory of Marriage Institutions

David de la Croix and Fabio Mariani

IRES, Université catholique de Louvain

June 2012
Marriage over time

From King Solomon to President Sarkozy
(through King Stephen I of Hungary and Queen Giselle)
Marriage over time

1. Early times: few men had large reproductive success (genetics): polygyny $P$.
2. Middle-Ages in Europe: low illegitimacy rate, illegitimate children lose all their rights: monogamy $M$.
3. Last two centuries: rise of divorce, re-marriage, children of second marriage: serial monogamy $S$.

So far, separate explanation for the transition from $P$ to $M$, and for the emergence of $S$.

We impose a new discipline: explain both regime changes endogenously within the same framework.

→ A unified theory of marriage institutions.
The decline of polygyny

Alternative theories:

- male compromise (Alexander, 1979; Betzig, 1986; Lagerlöf, 2010) [social order, necessity of eliciting cooperation, etc.];
- female choice (Becker et al., 1977; Kanazawa and Still, 1999; Lageröf, 2005) [decreasing male inequality];
- male choice (Gould et al., 2008) [increasing value of child quality].

The emergence of serial monogamy (divorce)

Theories of rational divorce and remarriage do exist (Chiappori and Weiss, 2006; Barham et al., 2009; etc.). However: a theory on the endogenous emergence of divorce laws is still missing.
Questions we address in the paper

*Inequality* is central to some theories of polygyny: can it also be the driving force of other shifts in marriage institutions?

How to compute the *equilibrium* of a polygynous marriage market, where both males and females are heterogeneous by income?

Can marriage institutions emerge as political (*voting*) equilibria? (↩ So far, no political economy model of divorce has been proposed) Do we need to assume unequal distribution of political power? Is polygyny compatible with democracy?

*Dynamics (1)*: is serial monogamy a stable steady state?

*Dynamics (2)*: why don’t we observe a direct transition from polygyny to serial monogamy?
Methodology

An economy with four types of people: rich/poor, male/female

Possible interpretation:
Poor have physical assets (strength, practical skills);
Rich have material assets (land, livestock, physical capital) and human assets (social ties in networks, ritual knowledge, education)

At time $t$,

- the menu is: Polygyny $P$, Monogamy $M$, Serial Monogamy $S$
- Compute the expected utility of each type in the three cases
  $\rightarrow$ define political preferences
- Political economy equilibrium - Majority voting (Condorcet)

Dynamics: given initial conditions, the income distribution changes over time and transition between marriage regimes
Main features (1)

Discrete time. One period = one generation.

Two subperiods of adult life (to deal with divorce).

Two genders

Income: rich male & female = 1. Poor male = \( \omega \).
Poor female = \( \rho < \omega \).

Children: no cost. One per subperiod and per female if married.

Utility = utility from consumption + utility from relationship
Utility from a relationship

Definition (Marriage)

A marriage is a relationship between persons where:
- one and only one male is involved;
- different partners freely choose to enter into;
- resources are pooled and shared equally;
- each female has one child per subperiod.

Relationships:
- Per subperiod: 1 or 2 relationships (polygyny) - concavity
- Length: 2 or 1 (if divorce allowed)
- Quality: good $g$, then bad $b$ with prob $p$.
- Exclusiveness: jealousy cost $m$. 
Main features (2)

Utility from a monogamous relationship:

\[ v(c) + g + (1 - p)g + pb. \]

Utility from a bigamous relationship:

\[ v(c) + (1 + z)u_p. \]

Divorce: monetary cost borne by divorcees: \( d \).

cost for the society: \( s \).

State: \( \mu_t, \phi_t \) (% rich males, females)
At time $t$

**Assumption**

At time $t$, the proportion of rich males is larger than the proportion of rich females, i.e. $\mu_t > \phi_t$.

**Definition (Temporary equilibrium (Gale-Shapley stability))**

A temporary equilibrium in the marriage market is such that no individual prefers to be single and no pair of individuals of opposite sexes prefers to marry each other than to keep their current assignment.

**Assumption**

Parameters are such that voluntary singleness is excluded.
Polygyny

Definition

Marriages satisfy the following additional characteristics:

- each male is allowed to marry up to two females at the same time;
- partners remain together for the two subperiods.
Polygyny - assumptions

Females prefer harem headed by rich to couple with a poor:

**Assumption**

The jealousy cost $m$ satisfies

\[
m < v(2) - v(1 + \omega)
\]

\[
m < v \left( \frac{2 + 4\rho}{3} \right) - v(\omega + \rho)
\]

Men like diversity enough: they prefer two poor wives to one rich

**Assumption**

\[
z^u_p > v(2) - v \left( \frac{2 + 4\rho}{3} \right)
\]
Polygyny - results

Lemma (segregation)

There is no harem including both rich and poor females.

Lemma

Only rich males may have harems.
Proposition

Suppose \( P \) is the constitution and that Assumptions 1 to 4 hold. If \( \mu_t < \frac{1}{2} \), we have in equilibrium:

- \( \frac{\phi_t}{2} \) rich harems, \( \mu_t - \frac{\phi_t}{2} \) poor harems, \( 1 - 2\mu_t \) poor couples, \( \mu_t \) poor single males.

Other cases in the paper.
\[\frac{\phi_t}{2} \text{ rich harems}\]

\[\mu_t - \frac{\phi_t}{2} \text{ poor harems}\]

\[1 - 2\mu_t \text{ poor couples}\]

\[\mu_t \text{ single poor men}\]

**Polygyny equilibrium**

**Case** \( \mu_t < \frac{1}{2} \)
Increase in $\mu$ within $P$ regime

As $\mu_t$ increases, the number of rich harems diminishes and are “transformed” into rich couples.

As $\mu_t$ increases further, the poor harems are progressively muted into rich/poor couples.

Hence, within polygyny regime, the intensity of polygyny is variable.
Monogamy

Definition (Monogamy)

Marriages satisfy the following additional characteristics:

(a) each person is allowed to marry at most one person of the opposite sex;

(b) partners remain together for the two subperiods.
Proposition

Assume that monogamy is the constitution at time $t$, and that Assumptions 1 and 6 hold. Then, we have in equilibrium:

(i) $\phi_t$ marriages between rich persons,

(ii) $1 - \mu_t$ marriages between poor persons,

(iii) $(\mu_t - \phi_t)$ marriages between rich males and poor females.
Monogamy equilibrium - M

\[ \phi_t \text{ marriages between rich persons} \]

\[ (\mu_t - \phi_t) \text{ marriages between rich males and poor females} \]

\[ 1 - \mu_t \text{ marriages between poor persons} \]

\[ v(2) + u_p \]

\[ v(1 + \rho) + u_p \]

\[ v(\omega + \rho) + u_p \]
Serial Monogamy

Definition (Serial Monogamy)

Marriages satisfy the following additional characteristics:

(a) each person is allowed to marry at most one partner of the opposite sex for every subperiod;

(b) a marriage can end in divorce at the end of the first subperiod if one of the spouses is willing so;

(c) it is possible to marry a new partner at the beginning of the second subperiod.
Serial Monogamy - assumptions

Unhappy poor female never divorce but unhappy rich female always divorce.

Key: $d$ is a good cost and utility is concave

Assumption

The divorce cost $d$ satisfies

\[
v(\omega + \rho) + g + b > v \left( \frac{\omega + 1 + 2\rho}{2} - d \right) + 2g, \]

\[
v(2) + g + b < v(2 - d) + 2g. \]
Proposition

Assume that serial monogamy is the constitution at time $t$ and that Assumptions 1, 6 and 5 hold. We take the case $\nu_t < \nu(1 + \rho) < \bar{\nu}_t$. We have in equilibrium:

(i) $(1 - p) \phi_t$ lasting marriages between rich persons,

(ii) $p \phi_t$ marriages between rich persons ending in divorce by mutual consent,

(iii) $p \phi_t$ remarriages between rich persons,

(iv) $1 - \mu_t$ lasting marriages between poor persons.

(v) $p(\mu_t - \phi_t)$ marriages between rich males and poor females ending in divorce,

(vi) $p(\mu_t - \phi_t)$ remarriages between rich males and poor females,

(vii) $(1 - p)(\mu_t - \phi_t)$ lasting marriages between rich males and poor females,
(1 - p)φₜ lasting marriages and 2pφₜ short marriages between skilled persons

(1 - p)(µₜ - φₜ) lasting marriages and 2p(µₜ - φₜ) short marriages between skilled males and unskilled females

1 - µₜ lasting marriages between unskilled persons
Vote

We do *as if* people vote for the marriage regime, at each date.

Way of aggregating social preferences

∃ institutions relaying the interest of the poor

or Fathers decide for their children (Doepke - Tertilt)
Intuition of the results in an example

\[ v(y) = \ln(y) \]

\[ s = 1/20, \ \rho = 1/10, \ \omega = 1/5, \ p = 1/3, \ g = 2, \ z = 3/10. \]

\[ d = 6/10, \ m = 4/10, \ \text{and} \ b = 1 \text{ satisfy Assumptions 2 to 5}. \]
Intuition in an example

Rich Males

Rich Females

Poor Males

Poor Females

Yellow - P
Orange - M
Red - S.
Intuitions

Rich males: Balance between taste for variety (P) and benefit from divorce (S)

Rich females: Rich enough to afford divorce (S)

Poor males: Always prefer monogamy (M)

Poor females:
- Polgyyny P if few rich males, only way to have a chance to get one;
- Monogamy M if enough rich males;
- Serial Monogamy S when many couples with rich males, who prefer divorce
Results

If the poor are the majority, the outcome of the vote is the system preferred by poor females.

**Proposition**

If $\phi_t + \mu_t < 1$, there exist $\hat{\mu}(\phi_t)$ and $\tilde{\mu}(\phi_t)$ such that the equilibrium regime is:

- **polygyny**, if $0 < \mu_t < \hat{\mu}(\phi_t)$,
- **monogamy**, if $\hat{\mu}(\phi_t) < \mu_t < \tilde{\mu}(\phi_t)$,
- **serial monogamy** if $\tilde{\mu}(\phi_t) < \mu_t < 1 - \phi_t$. 
Political equilibrium - The poor are the majority
\((\phi_t + \mu_t < 1)\)

A rise in \(\mu_t\) can explain the shift \(P \rightarrow M \rightarrow S\)
A rise in \(\phi_t\) can drive a transition \(M \rightarrow S\)
Political equilibrium - The rich are the majority 

\( \phi_t + \mu_t > 1 \)

**Proposition**

*If the probability \( p \) is not too low, i.e. \( p > \max[\hat{p}, \tilde{p}] \), and if the rich are the majority, monogamy cannot be the political equilibrium.*
Dynamics

We assume that the probability for a child to become rich is a logistic function of lifetime household’s income per child $y$:

$$
\pi(y) = \frac{1}{1 + e^{\frac{\tau - y}{\beta}}} \text{ for boys, and } \bar{\pi}(y) = \frac{1}{1 + e^{\frac{\bar{\tau} - y}{\beta}}} \text{ for girls}
$$

→ divorce hampers social mobility as it consumes resources,

→ polygyny also lowers social mobility, as the resources of the single males are not used for education.
The dynamic function mapping $(\mu_t, \phi_t)$ into $(\mu_{t+1}, \phi_{t+1})$

\[
\mu_{t+1} = \begin{cases} 
\phi_t \pi \left( \frac{6}{4} \right) + (2\mu_t - \phi_t) \pi \left( \frac{2 + 4\rho}{4} \right) + (1 - 2\mu_t) \pi \left( \frac{2\omega + 2\rho}{2} \right) & \text{if } P \text{ and } \mu_t < 1/2 \\
(1 - 2\mu_t + \phi_t) \pi \left( \frac{6}{4} \right) + (2\mu_t - 1) \pi \left( \frac{4}{2} \right) + (1 - \phi_t) \pi \left( \frac{2 + 4\rho}{4} \right) & \text{if } P \text{ and } \frac{1}{2} \leq \mu_t < \frac{1 + \phi_t}{2} \\
\phi_t \pi \left( \frac{4}{2} \right) + 2(1 - \mu_t) \pi \left( \frac{2 + 4\rho}{4} \right) + (2\mu_t - 1 - \phi_t) \pi \left( \frac{2 + 2\rho}{2} \right) & \text{if } P \text{ and } \mu_t \geq \frac{1 + \phi_t}{2} \\
\phi_t \pi \left( \frac{4}{2} \right) + (\mu_t - \phi_t) \pi \left( \frac{4 - 2d}{2} \right) + (1 - \mu_t) \pi \left( \frac{2 + 2\rho}{2} \right) & \text{if } M \\
\phi_t \pi \left( \frac{4}{2} \right) + (1 - p) \pi \left( \frac{4 - 2d}{2} \right) + (\mu_t - \phi_t) \left[ p \pi \left( \frac{2 + 2\rho}{2} \right) \right] + (1 - \mu_t) \pi \left( \frac{2 + 2\rho}{2} \right) & \text{if } S \text{ and (a)} \\
\phi_t \pi \left( \frac{4}{2} \right) + (1 - p) \pi \left( \frac{4 - 2d}{2} \right) + (\mu_t - \phi_t) \pi \left( \frac{2 + 2\rho - 2d}{2} \right) & \text{if } S \text{ and (b)} \\
\phi_t \pi \left( \frac{4}{2} \right) + (1 - p) \pi \left( \frac{4 - 2d}{2} \right) + (\mu_t - \phi_t) \pi \left( \frac{2 + 2\rho - 2d}{2} \right) & \text{if } S \text{ and (c)} \\
\phi_t \pi \left( \frac{4}{2} \right) + (1 - p) \pi \left( \frac{4 - 2d}{2} \right) + (\mu_t - \phi_t) \pi \left( \frac{2 + 2\rho - 2d}{2} \right) & \\
+ (1 - \mu_t) \pi \left( \frac{2\omega + 2\rho}{2} \right) & \\
\phi_{t+1} = \ldots 
\end{cases}
\]
A case with little social mobility and strong gender bias

\[ \beta = 0.05, \tau = 0.42 \text{ and } \bar{\tau} = 1.25. \]

<table>
<thead>
<tr>
<th>Family type</th>
<th>total income $y$</th>
<th>$\pi^\mu(y)$</th>
<th>$\pi^\phi(y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich harems</td>
<td>$6/4$</td>
<td>1.00</td>
<td>0.99</td>
</tr>
<tr>
<td>Poor harems</td>
<td>$(2 + 4\rho)/4$</td>
<td>0.97</td>
<td>0.00</td>
</tr>
<tr>
<td>Rich couples</td>
<td>$4/2$</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Rich/poor couples</td>
<td>$(2 + 2\rho)/2$</td>
<td>1.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Poor couples</td>
<td>$(2\omega + 2\rho)/2$</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>Divorcing rich couples</td>
<td>$(4 - 2d)/2$</td>
<td>1.00</td>
<td>0.95</td>
</tr>
<tr>
<td>Divorcing rich/poor couples</td>
<td>$(2 + 2\rho - 2d)/2$</td>
<td>0.83</td>
<td>0.00</td>
</tr>
</tbody>
</table>

To become rich, having a rich father is necessary for girls, sufficient for boys.
Growth first driven by rise in $\mu_t$, then by rise in $\phi_t$ once monogamy has been implemented.
A “unified” framework of analysis.

The model has some relevance to explain marriage patterns over time and across countries.

Main driving force: Both dimensions of inequality: among males \((\mu_t)\) and between genders \((\mu_t - \phi_t)\)
Unequal distribution of political power is not a necessary condition to have a transition from polygyny to monogamy and to serial monogamy.

Polygyny could emerge as an political equilibrium in a democracy, provided that the share of rich males and of rich females are close enough.

Monogamy arises as an intermediate regime (if poor are a majority)

$M$ makes transition towards $S$ faster
More on the timing

380: Christianity as Roman state
   religion
   Saint Augustine discourages polygamy

534: Justinian code
   criminalizes all but monogamous man/woman sex

845: Council in Meaux
   against right of illegitimate children to become priest

1088: Pope Urban II confirms irregularity of bigamy
   Judaism: Polygamy forbidden
   by Rabbinic leadership to Eastern European Jews (Ashkenazi)

1215, Fourth Lateran Council
   regulates marriage

1530: Danish protestants prohibit concubinage;
   illegitimate children inheritance rights abolished

1563: Council of Trent,
   Canon law of marriage,
   against Lutheran’s supposed tolerance for bigamy

1560: Scotland allows divorce if adultery

1701: Divorce legalized in Maryland

1792: French revolution: divorce legal

1857: Matrimonial Causes Act (UK)

1875: Personal Status Act (Germany)

1974: Italian referendum on divorce

2011: Maltese referendum on divorce
The demise of polygyny

380: Christianity as Roman state religion
Saint Augustine discourages polygamy

534: Justinian code
criminalizes all but monogamous man/woman sex

845: Council in Meaux
against right of illegitimate children to become priest

1088: Pope Urban II confirms irregularity of bigamy

1215, Fourth Lateran Council
regulates marriage

1563: Council of Trent,
Canon law of marriage,
against Lutheran’s supposed tolerance for bigamy.
The rise of divorce

- 1560: Scotland allows divorce if adultery
- 1701: Divorce legalized in Maryland
- 1792: French revolution: divorce legal
- 1857: Matrimonial Causes Act (UK)
- 1875: Personal Status Act (Germany)
- 1974: Italian referendum on divorce
- 2011: Maltese referendum on divorce
Marriage across countries

Polygyny

- IND, EGY, IDN, DZA, IRN: polygyny by civil law.
- ZAF, KEN: polygyny by customary law.
- AUS, UK: "foreign" polygynous marriages are recognized.
- KAZ, AZE, UZB: arguments in favour of re-legalizing polygyny.
- LBY: polygyny will be reinstated.

Divorce

- Usually introduced as a "bourgeois" institution, divorce is legal almost everywhere (still banned in the HS and PHL).
- Recent referendums: MLT (2011, 52.67% of yes), IRL (1995, 50.28%), ITA (1974, 59.26%).

Polyandry

- Present in a tiny fraction of traditional society.
Political economy

Reasonable to use a political economy model before democracy was established?

Evidence of (MacDonald, 1995, Stone, 1990):
(i) political activity of lower status males,
(ii) political activity of females and their relatives,
(iii) Church as a powerful collectivist institution trying to impose monogamy to the ruling secular elite.

+ female support crucial for success of the early Christian Church

“male compromise” theory (Betzig), implicitly recognizes that lower status males might detain de facto some political power

Fathers decide for their daughters: women have some political power (Doepke & Tertilt)
Excluding voluntary singleness

In the literature, one assumes that people do not choose singleness.

Here we look at the conditions depending on the marriage regime:

**P**: A rich female prefers a polygynous marriage, in which she shares a rich husband with a rich female, to remaining single.

**M**: Both rich and poor males prefer to marry a poor female for life to staying single.

**S**: A rich male prefers marrying a poor female for life to being single for one subperiod, and marrying a rich wife in the second subperiod. (strategic singleness)

Same for poor female.
Lower bound on the utility of an unhappy marriage $b$: 

**Assumption**

\[
g > b > \frac{1}{p} \max \left[ v(2\omega) - v(\omega + \rho) - (2 - p)g, \right.
\]

\[
m - (2 - p)g, \quad v(2) - v(1 + \rho) - (1 - p)g,
\]

\[
v \left( \frac{3\rho + 1}{2} \right) - v(\omega + \rho) - (1 - p)g \right] \]