Childless Aristocrats. Inheritance and the extensive margin of fertility

Paula E. Gobbi[1] Marc Goñi[2]

[1]Université libre de Bruxelles (ECARES) and CEPR

[2]Norwegian School of Economics (NHH) and FAIR

Motivation

- Inheritance practices can affect inequality, social mobility, or economic growth. ▸ A. Smith

- The economic effects of inheritance depend on fertility decisions.
  - If the rich have more children, inheritances can reduce inequality.

  Previous work on inheritance treats fertility as exogenous or considers decisions on the intensive margin.

- The extensive margin (the decision to have children or not):
  - Is crucial as some inheritance practices (ie. primogeniture) depend on the production of an heir.

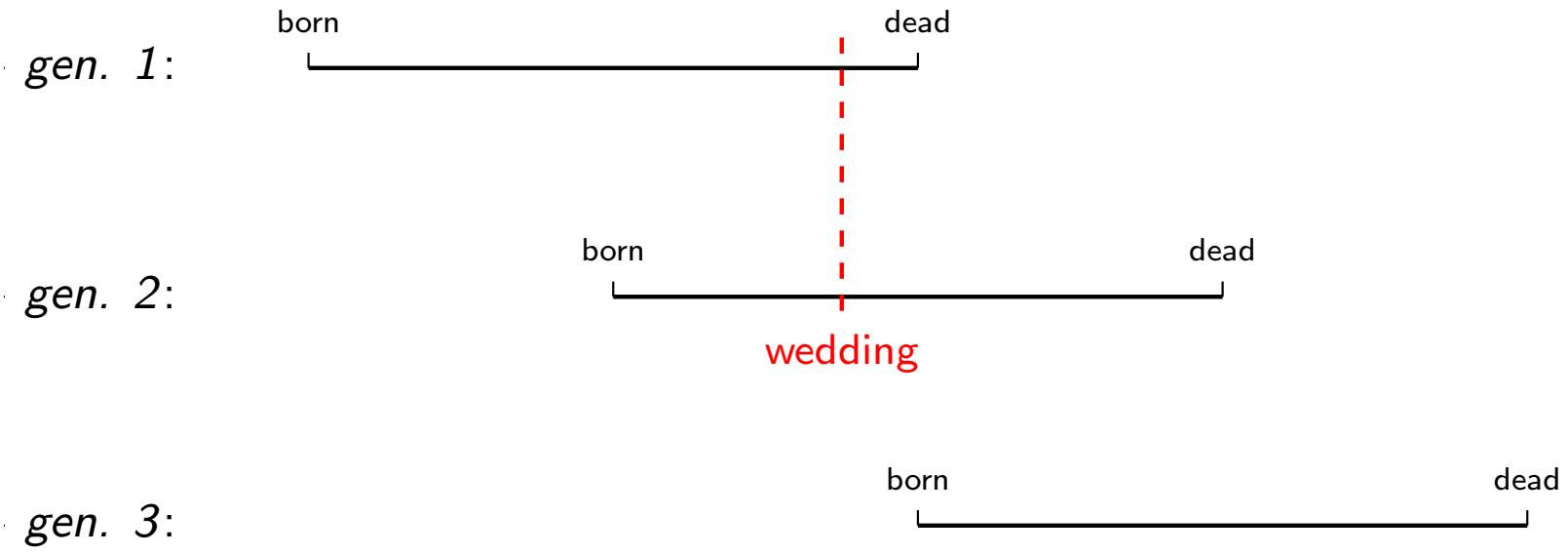
This paper: we analyze analyze how inheritance and the extensive margin of fertility relate.

Childlessness

* sample: married wom whose father is a peer: ** sources: Wrigley et al. (1997), Anderson (1998)

Intensive margin
Surviving children
Other peers

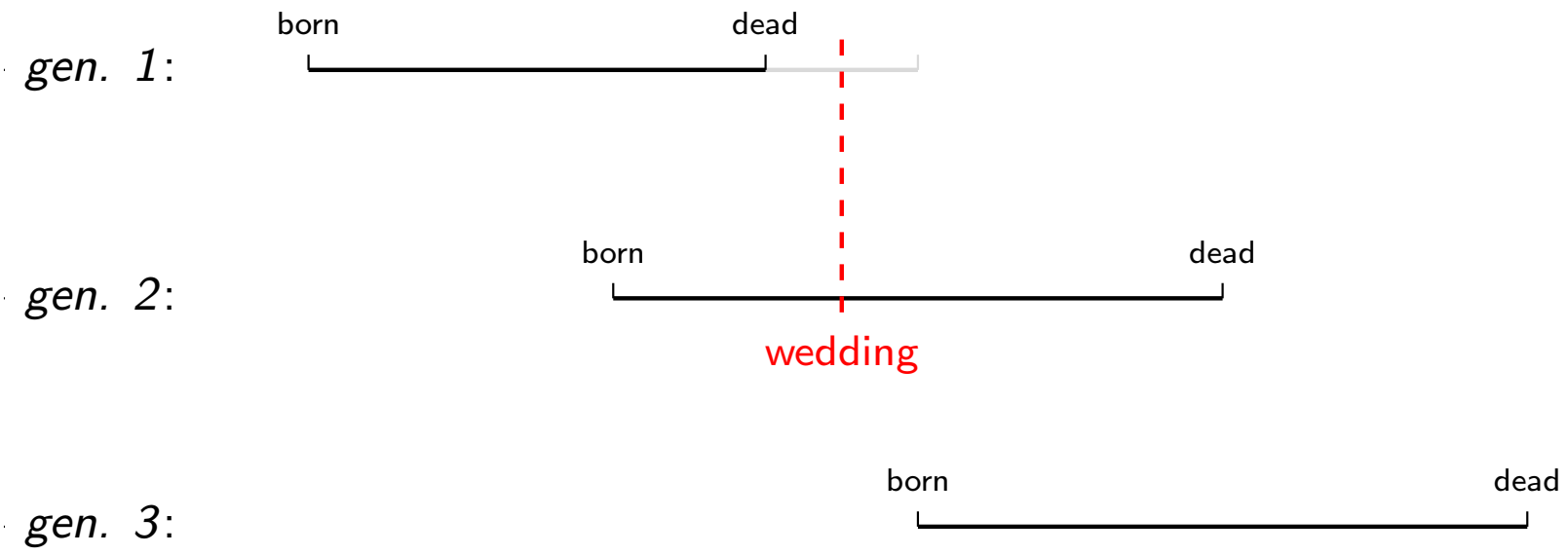
Settlement



Settlement is signed:

- Generation 3 is the beneficiary.
- The estate cannot be broken, sold, mortgaged...

Settlement



Settlement is NOT signed:

- Generation 2 is a free holder.
- He can sell parts of the estate, mortgage it, etc. before passing it down.

example prevalence

Contributions

Empirical: Settlements reduced childlessness by 15pp.

- Data for c. 1,150 peers and their offspring (1650-1882).
- Identification:
  - IV: gender of 1st birth.
  - DiD: comparison with similar samples not affected by settlements.

Theoretical: Hyperbolic discounting across generations explains:

- The effect of settlements on childlessness.
- Inheritance schemes that restrict successors can emerge endogenously due to fertility concerns.

Literature

Road map

1. Introduction
2. Historical background and the Hollingsworth dataset
3. Empirical analysis
4. Model
5. Conclusion

Institutional background

Before 1650,

- marriage settlements were mainly used to settle a provision for widows. ▸ Painting
- marriage settlements could not be used to entail the land because they were easy to break.

Interregnum period (1649 - 1660): ▸ In practice

- Settlements were developed to combat the threat of expropriation.
- Trustees to defend the interest of the unborn son.

Settled Land Act, 1882:

- Possibility to sell the land. The money from the sale is settled.

Data sources

VII. 1876. *5.* CHARLES GEORGE (LYTTELTON), LORD LYTTELTON, BARON OF FRANKLEY [1794] also BARON WESTCOTE OF BALLYMORE in the peerage of Ireland [1776] also *a Baronet* [1618], s. and h., by 1st wife, *b.* 27 Oct. 1842; ed. at Eton and at Trin. Coll., Cambridge; M.P. for East Worcestershire, 1868-74: *suc. to the peerage*, 18 April 1876; Land Commr., 1881-89; *suc.* as VISCOUNT COBHAM AND BARON COBHAM, on the death, 26 March 1889, of his distant cousin (the Duke of Buckingham and Chandos, Viscount Cobham, &c.), under the *spec. rem.* in the creation of that dignity, 23 May 1718. He *m.* 19 Oct. 1878, Mary Susan Caroline, 2d da. of William George (CAVENDISH), 2d BARON CHESHAM, by Henrietta Frances, da. of the Rt. Hon. William Saunders Sebright LASCELLES. She was *b.* 19 March 1853.

Source: Cokayne's Complete Peerage (1913)

Sum. stats. : matrimonies where husband is heir to English or Irish peerage

	mean	sd	min	max	N
A. Fertility variables					
% childless	0.17	0.37	0	1	1,141
All live births	4.64	3.82	0	17	1,141
All live births (if > 0)	5.57	3.51	1	17	951
Stillbirths	0.26	0.78	0	9	213
B. Other demographic variables					
Age at first marriage (wife)	21.88	4.84	11	52	1,141
Age at first marriage (husband)	27.02	6.79	8	62	1,141
Age at death (wife)	58.43	20.29	16	100	1,141
Age at death (husband)	60.55	16.85	16	97	1,141
C. Socioeconomic status variables					
Baron/Viscount heir	0.41	0.49	0	1	1,141
Duke/Earl/Marquis heir	0.59	0.49	0	1	1,141
English peerage	0.59	0.49	0	1	1,141
Irish peerage	0.41	0.49	0	1	1,141
Wife is commoner's daughter	0.61	0.49	0	1	1,141
Proxy for settlement *[i.e., father died after heir's wedding]*	0.58	0.49	0	1	1,141

▸ Hollingsworth dataset ▸ matching

Road map

Empirical analysis

$$\chi_{i,j,b,q} = \beta \cdot S_i + \mu_j + \mu_b + \mu_q + \mathbf{x}_i^{'}\gamma + \epsilon_{i,j,b,q}$$

- χ indicates if matrimony i, where the husband is heir to an English or Irish peerage, did not have any children.
- S is the proxy for signing a settlement (ie., indicates if i's father is alive at the wedding of his heir). proxy
- μ_j, μ_b, and μ_d are family, birth year, and marriage quarter century FE.
- $\mathbf{x}$: social status, age at marriage (wife), age at death, stillbirths in the family, and number of siblings.

Dep. variable: Childlessness				
Settlement	-0.053**	-0.056**	-0.040*	-0.110**
[i.e., father died after wedding]	(0.024)	(0.023)	(0.022)	(0.048)
Husband's siblings	0.001	0.001	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.005)
Duke/Earl/Marquis heir	.	0.016	0.018	-0.001
		(0.022)	(0.021)	(0.057)
Baron/Viscount heir		ref.	ref.	ref.
Wife's age at marriage	.	.	0.014***	0.010**
			(0.003)	(0.004)
Wife's age at death	.	.	0.001	0.001
			(0.001)	(0.001)
Husband's age at death	.	.	-0.003***	-0.004***
			(0.001)	(0.001)
Still to live births (fam.)	.	.	0.149	-0.729
			(0.308)	(0.722)
Wife's social status	NO	YES	YES	YES
Family FE	NO	NO	NO	YES
Birth year FE	NO	NO	NO	YES
M. quarter-century FE	NO	NO	NO	YES
Observations	1,157	1,156	1,141	1,141
% correctly predicted	80.4	80.4	81.8	91.5

Standard errors clustered by family; *** p<0.01, ** p<0.05, * p<0.1.
Sample are matrimonies in 1650–1882 where the husband is heir to an English or Irish peerage.

▸ Selection in OLS

Instrumental variables

First stage:

$$S_i = \beta_g \cdot G_i + \beta_z \cdot Z_i + \mu_q + \mathbf{x}_i^{'}\gamma + \epsilon_{i,q}$$

- $G_i = 1$ if first-born is a girl.
- Z_i age at death of i's father.
- μ_q are marriage quarter-century fixed effects.
- $\mathbf{x}$: social status, age at marriage (wife), age at death, and stillbirths in the family.

Second stage:

$$\chi_{i,j,b,q} = \beta \cdot \hat{S}_i + \mu_j + \mu_b + \mu_q + \mathbf{x}_i^{'}\gamma + \epsilon_{i,j,b,q}$$

	heirs	non-heirs	Scotland
Second stage	Dep. variable: Childlessness		
Settlement	-0.146***	0.009	0.026
[i.e., father died after heir wedding]	(0.046)	(0.065)	(0.078)
Ho:	.	$\beta(1) = \beta(2)$	$\beta(1) = \beta(3)$
prob $>$ chi2	.	0.036**	0.055*
Observations	1,141	1,154	364
% correctly predicted	93.7	88.3	98.1
First stage	Dep. Variable: Settlement *[i.e., father died after heir's wedding]*		
Gender of first birth:			
son	reference	reference	reference
daughter	-0.054**	-0.062*	-0.146***
	(0.024)	(0.035)	(0.041)
Observations	1,141	1,154	364
% correctly predicted	84.5	72.6	71.1
F-stat	85.7	46.0	38.7

Difference-in-differences

$$\chi_i = \alpha \cdot S_i + \delta \cdot Heir_i + \beta \cdot (S_i \times Heir_i) + \mu_b + \mu_q + \mu_{j,Heir_i} + \mathbf{x}_i^{'}\gamma + \epsilon_{i,j,b,q}$$

- χ indicates if matrimony i did not have any children.
- S is the proxy for signing a settlement (the treatment).
- *Heir* indicates if matrimony i is part of the treatment group (the husband is an English or Irish heir) or not (the husband is not an heir or is a Scottish heir).
- μ_b, μ_q, and μ_j are birth year, marriage quarter-century, and family FE.
- $\mathbf{x}$: social status, age at marriage (wife), age at death, stillbirths in the family, and number of siblings (all interacted with *Heir*).

	Dep. Variable: Childlessness		
	heirs vs. non-heirs + Scotland	heirs vs. non-heirs	heirs vs. heirs' siblings
Settlement	0.019	0.033	0.055
[i.e., father died after heir wedding]	(0.041)	(0.056)	(0.063)
Heir (*treatment group*)	-0.726**	-0.725**	-0.656*
	(0.290)	(0.308)	(0.337)
Heir × Settlement	-0.111**	-0.124*	-0.147**
	(0.051)	(0.063)	(0.073)
Controls	YES	YES	YES
Family FE	YES	YES	YES
Birth year FE	YES	YES	YES
M. quarter-century FE	YES	YES	YES
Observations	2,659	2,295	2,094
% correctly predicted	87.2	88.4	88.8

Robustness

- Settlements signed at age 21 more
- IV specification more
- Alternative IV (birth order of the heir) more
- Size and value of the inherited estates more
- Industrial revolution more

Road map

Set up

3-period sequential move game played by individuals of a same dynasty, $i = \{1, 2, 3\}$.

Each individual i makes decisions regarding:

- fertility, $n_i = \{0, 1\}$,
- consumption, x_i,
- bequests to the next generation(s), b_{i+1}.

Dynastic structure:

- The dynasty is endowed with a fixed wealth K (e.g., land),
- Hyperbolic discounting preferences,
- If $n_i = 0$, the dynasty becomes extinct at $i + 1$.

Utilities

1. $$u(x_1) + n_1 \ \left[\beta\delta u(x_2) + n_2 \ \beta\delta^2 u(x_3)\right]$$

2. $$u(x_2) + n_2 \ \beta\delta \ \ u(x_3)$$

3. $$u(x_3)$$

▸ discount function

Heterogeneous dynasties

no-settlement ($\neg s$)

- Each generation i decides the bequests to the next generation (k_{i+1}).
- Budget constraints

$$K = x_1 + k_2$$
$$k_2 = x_2 + k_3$$
$$k_3 = x_3.$$

settlement (s)

- Generation $i = 1$ decides all bequests (k_2 and k_3).
- Budget constraints

$$K = x_1 + k_2 + k_3$$
$$k_2 = x_2$$
$$k_3 = x_3.$$

Definition (SPE)

The SPE is a strategy profile $\{k_2, k_3, x_1, x_2, x_3, n_1, n_2\}$ for the dynasty in the no-settlement regime and a strategy profile $\{k_2', k_3', x_1', x_2', x_3', n_1', n_2'\}$ for the dynasty in the settlement regime that maximizes each generation's utility function subject to their budget constraints and the inheritance regime.

Three possible equilibria:

- High fertility equilibrium
- Low fertility equilibrium
- No fertility equilibrium

Fertility: generation 2

Generation 2 will have children if and only if:

- No-settlement dynasty:

$$f_{2,\neg s}(k_2) := v_2\left(x_2{=}\frac{k_2}{1+\beta\delta}, x_3{=}\frac{\beta\delta k_2}{1+\beta\delta}, n_2{=}1\right) - v_2(x_2{=}k_2, x_3{=}0, n_2{=}0) > 0,$$

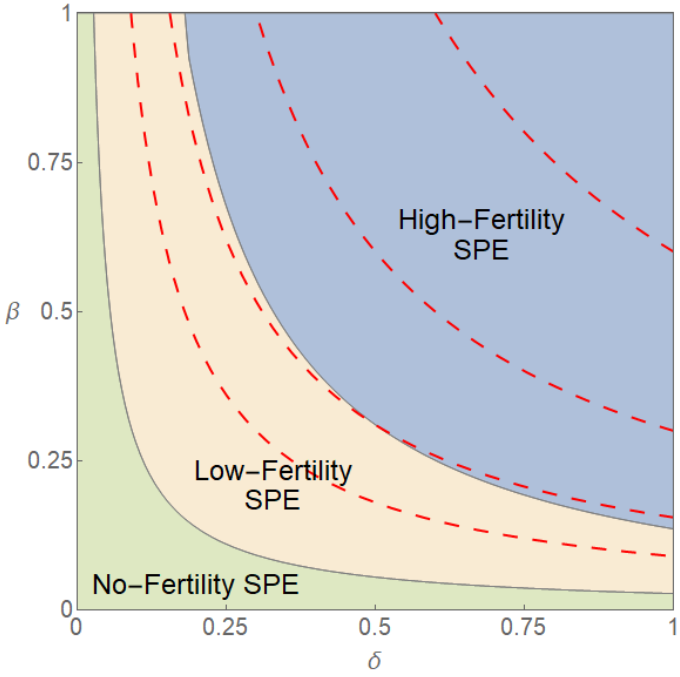
- Settlement dynasty:

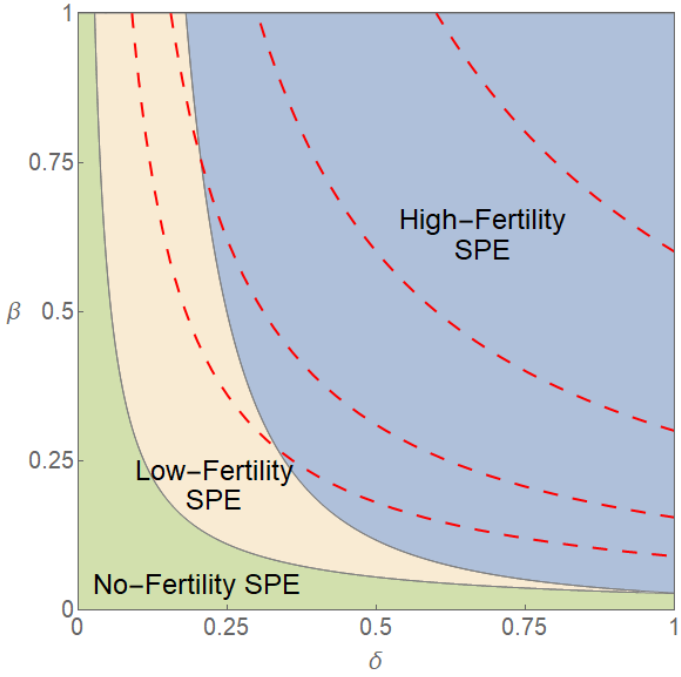
$$f_{2,s}\,(k_3) := v_2\,(x_2{=}k_2, x_3{=}k_3, n_2{=}1) - v_2(x_2{=}k_2, x_3{=}0, n_2{=}0) > 0.$$

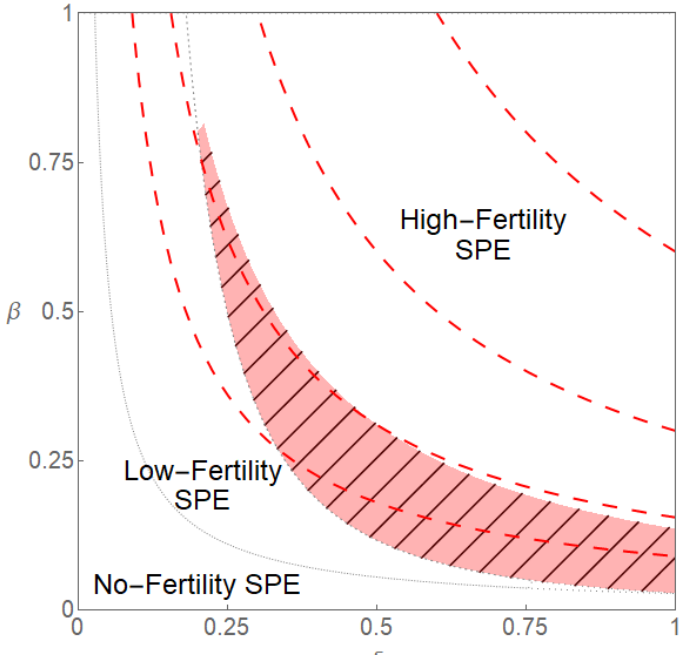
where $\dfrac{\partial f_{2,\neg s}}{\partial k_2} > 0$ and $\dfrac{\partial f_{2,s}}{\partial k_3} > 0$.

consumption in $\neg s$ consumption in s generation 1

The effect of settlements on fertility (K fixed)







Proposition (The effect of settlements on fertility)

The set of parameters supporting a high-fertility equilibrium strategy for the dynasty in the settlement regime nests the corresponding set for the dynasty in the no-settlement regime.

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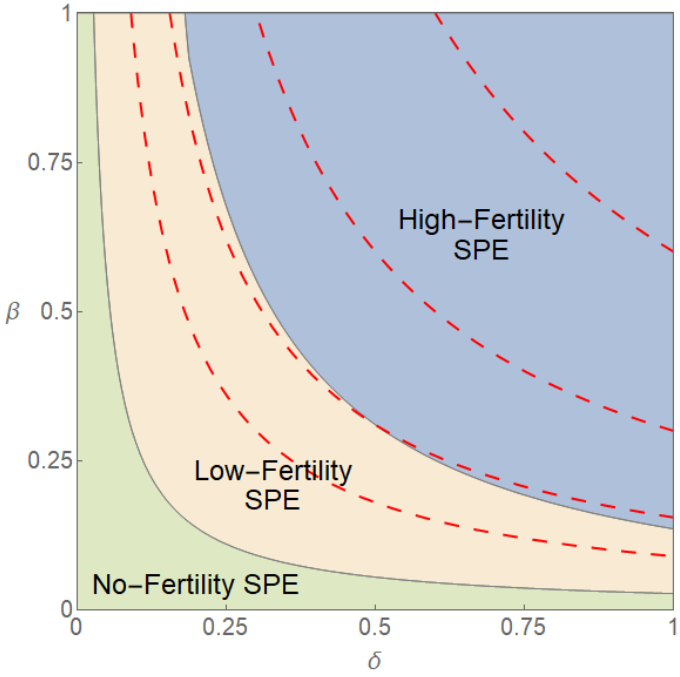
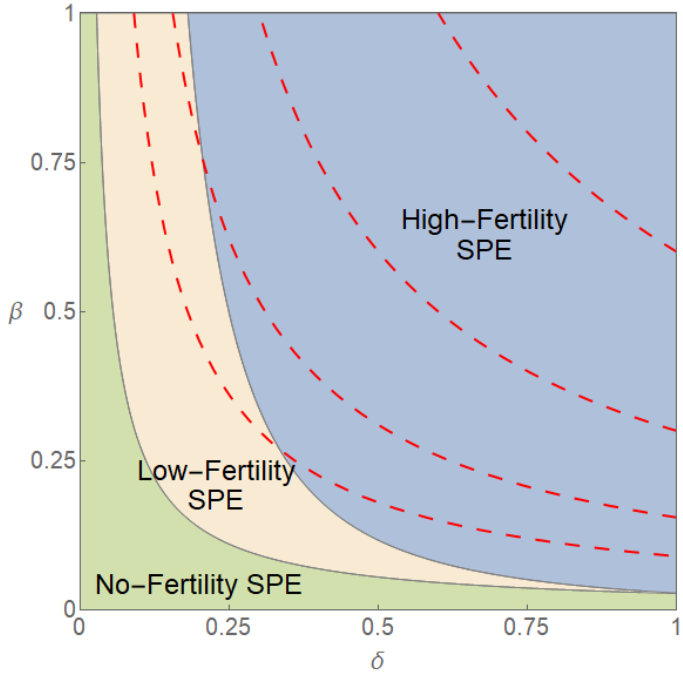
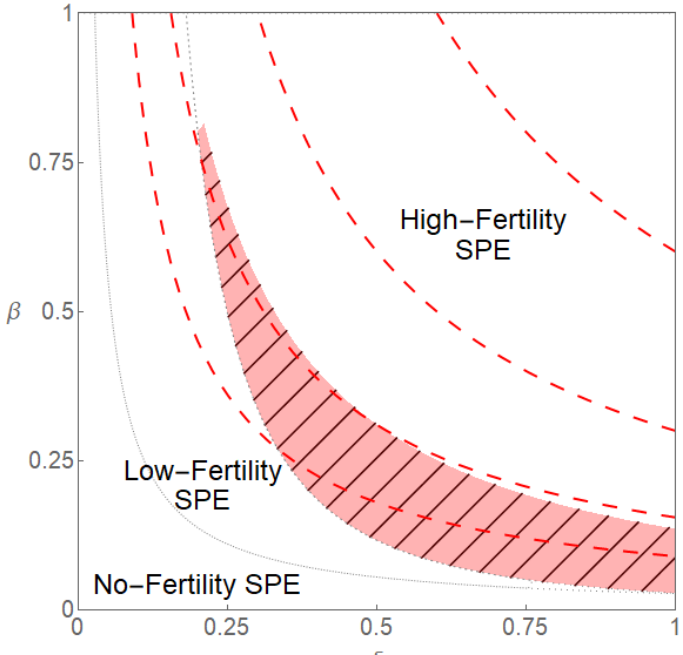
The set of parameters supporting a high-fertility equilibrium strategy for the dynasty in the settlement regime nests the corresponding set for the dynasty in the no-settlement regime.

- This proposition rationalizes the reduced-form effect of settlements on fertility.

Hyperbolic discounting







Proposition (Exponential discounting)

Assume that the discount function is exponential, i.e., $\beta = 1$. The equilibrium strategies of dynasties in the settlement and no-settlement inheritance regime are identical for all δ and K.

Proposition (Hyperbolic discounting)

For more hyperbolic discount functions, fertility is weakly larger in the dynasty under the settlement regime than in the dynasty under the no-settlement regime.

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Proposition (Hyperbolic discounting)

For more hyperbolic discount functions, fertility is weakly larger in the dynasty under the settlement regime than in the dynasty under the no-settlement regime.

- Hyperbolic discounting explains the reduced-form effect of settlements on fertility.

Endogenous settlements

Proposition (Welfare)

Consider the parameter region where a dynasty in the no-settlement regime follows a low-fertility strategy and a dynasty in the settlement regime follows a high-fertility strategy. All generations are better off in the settlement regime.

Endogenous settlements

Proposition (Welfare)

Consider the parameter region where a dynasty in the no-settlement regime follows a low-fertility strategy and a dynasty in the settlement regime follows a high-fertility strategy. All generations are better off in the settlement regime.

- This proposition rationalizes inheritance schemes that restrict successors (i.e., why father and heir sign a settlement).
- This proposition suggests that settlements emerged among aristocrats/wealthy people because these exhibit stronger dynastic preferences.

Road map

Conclusion

1. Inheritance models treating fertility as exogenous can be misleading: inheritance schemes affect fertility decisions which, in turn, can shape inheritance practices.

2. Models of bequests assuming exponential discounting are inconsistent with a broad range of inheritance systems that restrict successors' powers to manage inherited wealth.

3. Inheritances schemes used by elites contribute to the persistence of inequality also through the extensive margin of fertility.

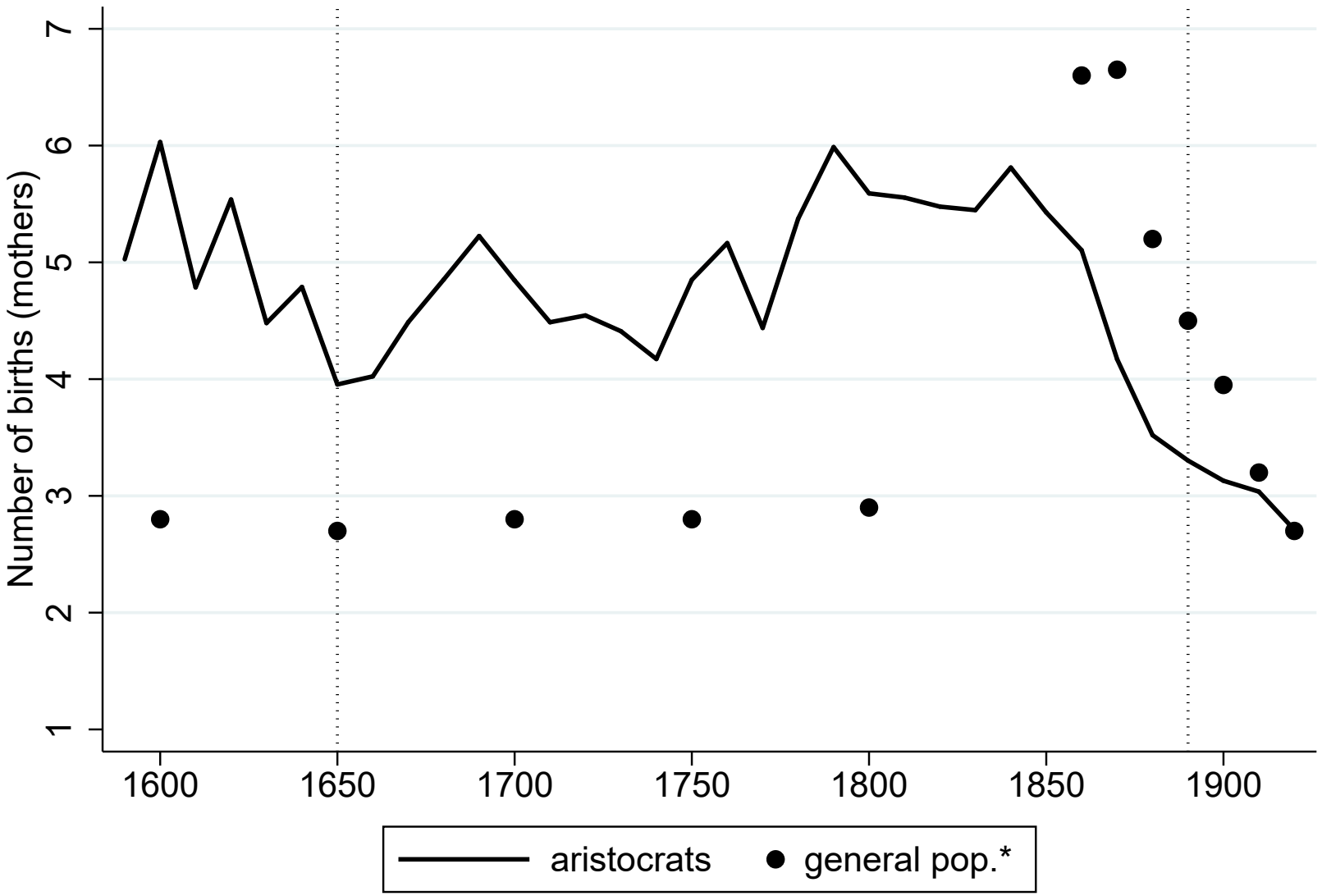
Back up slides

The right of primogeniture, however, still continues to be respected, and as of all institutions it is the fittest to support the pride of family distinctions, it is still likely to endure for many centuries. In every other respect, nothing can be more contrary to the real interest of a numerous family than a right which, in order to enrich one, beggars all the rest of the children.

Adam Smith (1776), The Wealth of Nations (Book III, Chapter II)

Back

Fertility of mothers

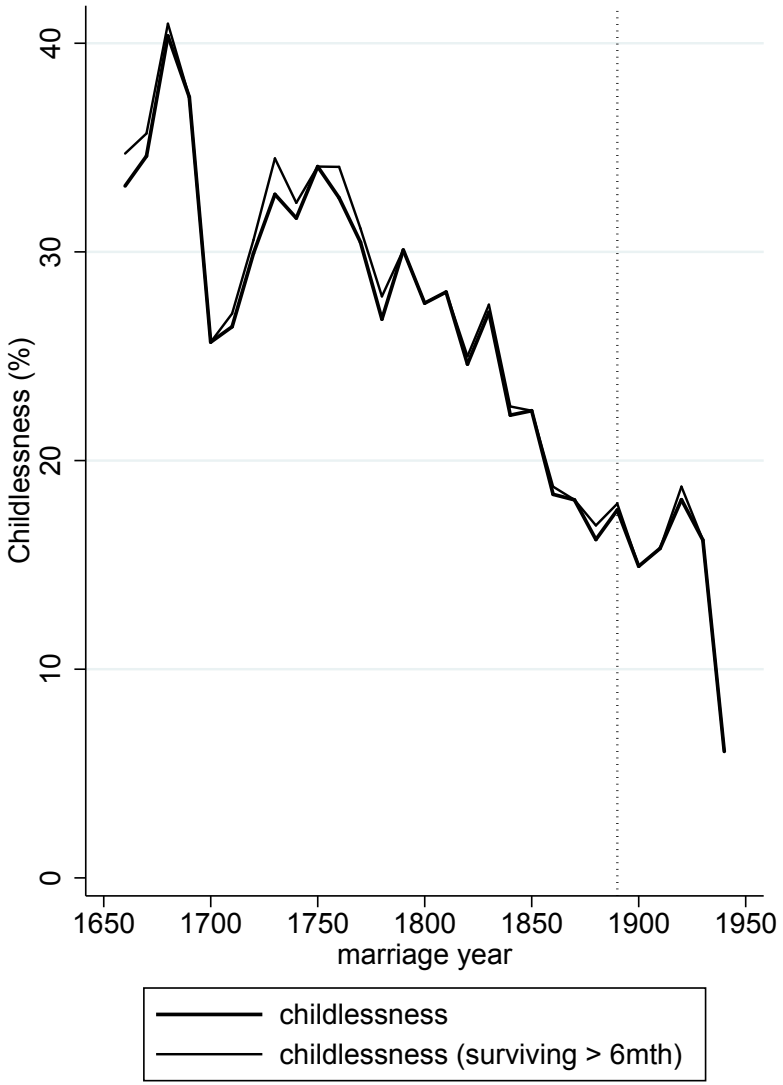


* sources: de la Croix et al (2017), Galor (2011)

back

Surviving children

* sample: married women whose father is a peer



* sample: married women whose father is a peer

back

Comparison with other nobilities

	Childlessness				
	1650-99	1700-49	1750-99	1800-49	1850-99
Henry and Lévy (1960)[a] *Ducs et Pairs de France*	9% (N=34)	21% (N=24)	35% (N=20)	-	-
Pedlow (1982)[b] Nobility of Hesse-Kassel	5% (N=39)	14% (N=51)	9% (N=56)	8% (N=121)	8% (N=84)
Hollingsworth (1964)[a] (dukes only)	12% (N=122)	18% (N=115)	17% (N=138)	12% (N=146)	8% (N=166)
Hollingsworth (1964)[a] (all peers)	14% (N=218)	18% (N=192)	16% (N=217)	12% (N=281)	9% (N=308)

Notes: The sample are: *a*) women marrying before 20 years old for whom the marriage did not break because either she or the spouse died before 45 years old; *b*) for whom the marriage did not break because either she or the spouse died before 45 years old.

back

Examples

Settlement

Father: Robert Brudenell, 2nd Earl of Cardigan (**died in 1703**)
Heir: Francis Brudenell, Lord Brudenell (**married in 1668**)

> *Robert, second Earl of Cardigan, strictly settled the Brudenell estates in 1668 on the marriage of his eldest son with Frances, daughter of the Earl of Sussex. (Habakkuk 1994: p. 19)*

No settlement

Father: William Craven, 6th Baron Craven (**died in 1791**)
Heir: William Craven, 1st Earl of Craven (**married in 1807**)

> *The sixth Lord Craven, whose principal estates had been settled on his marriage in 1767, died on 26 September 1791. The eldest son came of age on 1 September [and he did not marry until 1807]. There was no time for a resettlement [...]. He married in December 1807, at the advanced age of 37, a celebrated actress, Louisa Brunton [...]. (Habakkuk 1994: p. 45, 46)*

back

Relevance of settlement

"... about one-half of the land of England was held under strict settlement in the mid-eighteenth century." (Habakkuk 1950)

"the full force of social convention and family custom ... [made it such that] ... only an unusually independent or unusually irresponsible young man ... would be able to stand up to such psychological pressures." (Stone and Stone 1984, p. 78)

back

Literature

1. Historical demography
   - Clark and Cummins (2009); Goñi (2015); Marcassa, Pouyet and Trégouet (2016); de la Croix, Schneider and Weisdorf (2016)

2. Demographic economics - Fertility
   - Number of children: Deaton and Paxton (1997); Caucutt, Guner and Knowles (2002); Kremer and Chen (2002); de la Croix and Doepke (2003); Bar, Hazan, Leukhina, Weiss and Zoabi (2017)
   - Childlessness: Aaronson, Lange, and Mazumder (2014); Baudin, de la Croix, and Gobbi (2015)

3. Inheritance and inequality
   - Habakkuk (1950); Chu (1991); Bertochi (2006); Allen (2009); Piketty (2011)

4. Intergenerational altruism and hyperbolic discounting
   - Phelps and Pollack (1968); Doepke and Zilibotti (2017); Laibson (1997); Wigniolle (2008) back

Marriage A-la-Mode: 1, The Marriage Settlement by William Hogarth (1697-1764) back

Institutional background

Heir (first son) received all the land, younger brothers and sisters received an allowance.

If a peer has no son inheritance goes to the closest male relative.

In Scotland land could be entailed *ad perpetuum*.

back

Hollingsworth dataset

Hollingsworth's Peerage Data Ref No: 0 New Record

Ref No: 0 Child S Parent: 1B Pai Rank: 1E Title: Abercorn(S)
Surname: Hamilton Comment:
First Names: James

Highest titles succeeded to.

Father Succ.	Father Heir	Father Cr.	Mother Succ.	Mother Heir	Mother Cr.	Self Succ.	Self Heir	Self Cr.
1	1	8	1	1	1	1	8	5

Illegitimate: Males 0 Created: 10 July 160
Females 0 Violent Death
Died
Notes: dvp

Sex/Death: 1 Sole Heirship: X

	Day	Month	Year	Acc	After	Before	Comment
Birth	12	5	1575	y			
Death	23	0	1618	y			

N of Marriages 1 No of this Marriage 1

Children: This Marriage, Live 9
All Marriages, STILL All Marriages, LIVE 9

	First Names	Surname	Comment	Child	Parent	Rank	Title	Address
Spouse	Marion		eld. dau.					
Widow/er of								
Spouse's Father	Thomas	Boyd				6B	Boyd	Kilmarnock
Spouse's Mother	Margaret or Marian							
Mat. Gr'Father	Matthew	Campbell				Sir		London

Parent Origin 8 Spouse 1 Heir 3

Notes:

	Marriage	Spouse's Birth	Spouse's Death	Divorce
Day	12	1	26	
Month	x	1	5	
Year	1599	1579	1632	
Acc.	6	7	y	
After				
Before				
Comment				

Children Set No: 0 Average accuracy of birth dates 6

Num	Name	Remarks	Da	Montl	Yee	Surviva	Accure	Ref Nc
1	Anne		19	9	1599	1	5	0
2	James	2E	22	x	1601	0	5	0
3	Claude	2B Strabane	21	2	1602	0	5	0
4	William		16	6	1603	0	5	0
5	George		9	x	1605	0	5	0
6	Margaret		28	4	1606	1	6	0
7	Lucy		11	x	1608	1	6	0
8	Isabel		20	6	1609	1	6	0
9	Archibald		24	2	1611	0	6	0
0					0			0

Hollingsworth's Peerage Data

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Surname: Hamilton Comment:

First Names: James

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Father			Mother			Self		
Succ.	Heir	Cr.	Succ.	Heir	Cr.	Succ.	Heir	Cr.
1	1	8	1	1	1	1	8	5

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Before				
Comment				

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5	George		9	x	1605	0	5	0
6	Margaret		28	4	1606	1	6	0
7	Lucy		11	x	1608	1	6	0
8	Isabel		20	6	1609	1	6	0

Hollingsworth dataset

Hollingsworth's Peerage Data Ref No: 0 New Record

Ref No: 0 Child S Parent: 1B Pai Rank: 1E Title: Abercorn(S)
Surname: Hamilton Comment:
First Names: James

Highest titles succeeded to.

Father Succ.	Father Heir	Father Cr.	Mother Succ.	Mother Heir	Mother Cr.	Self Succ.	Self Heir	Self Cr.
1	1	8	1	1	1	1	8	5

Illegitimate: Males 0 Created: 10 July 160
Females 0 Violent Death
Died
Notes: dvp

Sex/Death: 1 Sole Heirship: X

	Day	Month	Year	Acc	After	Before	Comment
Birth	12	5	1575	y			
Death	23	0	1618	y			

N of Marriages 1 No of this Marriage 1

Children: This Marriage, Live 9
All Marriages, STILL All Marriages, LIVE 9

	First Names	Surname	Comment	Child	Parent	Rank	Title	Address
Spouse	Marion		eld. dau.					
Widow/er of								
Spouse's Father	Thomas	Boyd				6B	Boyd	Kilmarnock
Spouse's Mother	Margaret or Marian							
Mat. Gr'Father	Matthew	Campbell				Sir		London

Parent Origin 8 Spouse 1 Heir 3

Notes:

	Marriage	Spouse's Birth	Spouse's Death	Divorce
Day	12	1	26	
Month	x	1	5	
Year	1599	1579	1632	
Acc.	6	7	y	
After				
Before				
Comment				

Children Set No: 0 Average accuracy of birth dates 6

Num	Name	Remarks	Da	Montl	Yee	Surviva	Accure	Ref Nc
1	Anne		19	9	1599	1	5	0
2	James	2E	22	x	1601	0	5	0
3	Claude	2B Strabane	21	2	1602	0	5	0
4	William		16	6	1603	0	5	0
5	George		9	x	1605	0	5	0
6	Margaret		28	4	1606	1	6	0
7	Lucy		11	x	1608	1	6	0
8	Isabel		20	6	1609	1	6	0
9	Archibald		24	2	1611	0	6	0
* 0					0			0

Hollingsworth's Peerage Data Ref No: 50 New Record

Ref No: 50 Child S Parent: 1E Rank: 2E Title: Abercorn(S)
Surname: Hamilton Comment:
First Names: James

Highest titles succeeded to.

Father Succ.	Father Heir	Father Cr.	Mother Succ.	Mother Heir	Mother Cr.	Self Succ.	Self Heir	Self Cr.
1	8	5	1	1	1	5	5	9

Illegitimate: Males 0 Created:
Females 0 Violent Death
Died
Notes:

Sex/Death: 1 Sole Heirship: X

	Day	Month	Year	Acc	After	Before	Comment
Birth	22	x	1601	5			
Death	1	4	1670	5	1621		d. about 1670

N of Marriages 1 No of this Marriage 1

Children: This Marriage, Live 3
All Marriages, STILL All Marriages, LIVE 3

	First Names	Surname	Comment	Child	Parent	Rank	Title	Address
Spouse	Catharine					2Bs	Clifton	
Widow/er of						3D	Lomax	
Spouse's Father	Gervase	Clifton				1B	Clifton	Leighton Bromswold
Spouse's Mother	Catharine							
Mat. Gr'Father	Henry	Darcy				Sir		Leighton

Parent Origin 8 Spouse 1 Heir 3

Notes:

	Marriage	Spouse's Birth	Spouse's Death	Divorce
Day	21	21	21	
Month	x	5	5	
Year	1631	1592	1637	
Acc.	5	5	y	
After				
Before				
Comment				

Children Set No: 0 Average accuracy of birth dates 6

Num	Name	Remarks	Da	Montl	Yee	Surviva	Accure	Ref Nc
1	James	"V Hamilton"	1	9	1631	0	5	50
2	William		1	y	1633	0	5	50
3	George	3E Abercorn	1	7	1635	0	5	50
* 0					0			50

Hollingsworth dataset

Hollingsworth's Peerage Data Ref No: 0 New Record

Ref No: 0 Child S Parent: 1B Pai Rank: 1E Title: Abercorn(S)
Surname: Hamilton Comment:
First Names: James

Highest titles succeeded to.

Father Succ.	Father Heir	Father Cr.	Mother Succ.	Mother Heir	Mother Cr.	Self Succ.	Self Heir	Self Cr.
1	1	8	1	1	1	1	8	5

Illegitimate: Males 0 Females 0 Died
Created: 10 July 160 Violent Death
Notes: dvp
Sex/Death: 1 Sole Heirship: X

	Day	Month	Year	Acc	After	Before	Comment
Birth	12	5	1575	y			
Death	23	0	1618	y			

N of Marriages 1 No of this Marriage 1

Children: This Marriage, Live 9
All Marriages, STILL All Marriages, LIVE 9

	First Names	Surname	Comment	Child	Parent	Rank	Title	Address
Spouse	Marion		eld. dau.					
Widow/er of								
Spouse's Father	Thomas	Boyd				6B	Boyd	Kilmarnock
Spouse's Mother	Margaret or Marian							
Mat. Gr'Father	Matthew	Campbell				Sir		London

Parent Origin 8 Spouse 1 Heir 3
Notes:

	Marriage	Spouse's Birth	Spouse's Death	Divorce
Day	12	1	26	
Month	x	1	5	
Year	1599	1579	1632	
Acc.	6	7	y	
After				
Before				
Comment				

Children Set No: 0 Average accuracy of birth dates 6

Num	Name	Remarks	Da	Montl	Yea	Surviva	Accure	Ref No
1	Anne		19	9	1599	1	5	0
2	James	2E	22	x	1601	0	5	0
3	Claude	2B Strabane	21	2	1602	0	5	0
4	William		16	6	1603	0	5	0
5	George		9	x	1605	0	5	0
6	Margaret		28	4	1606	1	6	0
7	Lucy		11	x	1608	1	6	0
8	Isabel		20	6	1609	1	6	0
9	Archibald		24	2	1611	0	6	0
*	0				0			0

Hollingsworth's Peerage Data Ref No: 50 New Record

Ref No: 50 Child S Parent: 1E Rank: 2E Title: Abercorn(S)
Surname: Hamilton Comment:
First Names: James

Highest titles succeeded to.

Father Succ.	Father Heir	Father Cr.	Mother Succ.	Mother Heir	Mother Cr.	Self Succ.	Self Heir	Self Cr.
1	8	5	1	1	1	5	5	9

Illegitimate: Males 0 Females 0 Died
Created: Violent Death
Notes:
Sex/Death: 1 Sole Heirship: X

	Day	Month	Year	Acc	After	Before	Comment
Birth	22	x	1601	5			
Death	1	4	1670	5	1621		d. about 1670

N of Marriages 1 No of this Marriage 1

Children: This Marriage, Live 3
All Marriages, STILL All Marriages, LIVE 3

	First Names	Surname	Comment	Child	Parent	Rank	Title	Address
Spouse	Catherine					2Bs	Clifton	
Widow/er of						3D	Lomax	
Spouse's Father	Gervase	Clifton				1B	Clifton	Leighton Bromswold
Spouse's Mother	Catherine							
Mat. Gr'Father	Henry	Darcy				Sir		Leighton

Parent Origin 8 Spouse 1 Heir 3
Notes:

	Marriage	Spouse's Birth	Spouse's Death	Divorce
Day	21	21	21	
Month	x	5	5	
Year	1631	1592	1637	
Acc.	5	5	y	
After				
Before				
Comment				

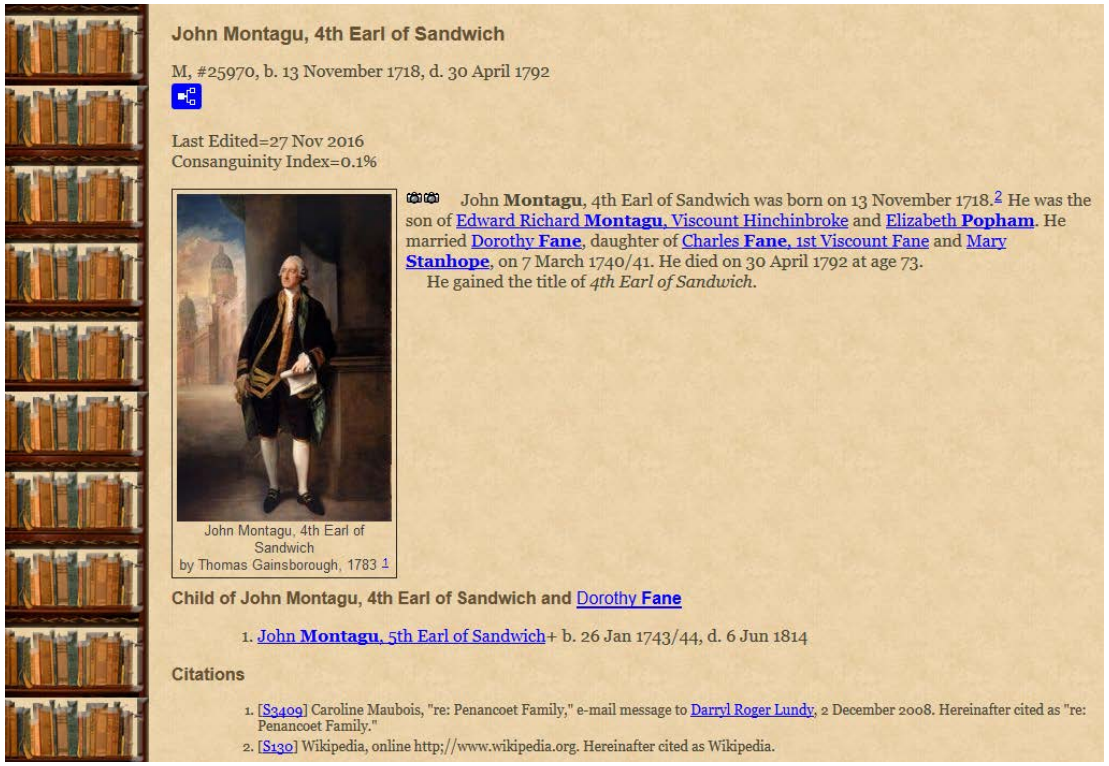
Children Set No: 0 Average accuracy of birth dates 6

Num	Name	Remarks	Da	Montl	Yea	Surviva	Accure	Ref No
1	James	"V Hamilton"	1	9	1631	0	5	50
2	William		1	y	1633	0	5	50
3	George	3E Abercorn	1	7	1635	0	5	50
*	0				0			50

back

Matching sons with fathers in Hollingsworth's dataset

- Using name, surname, date of birth, accuracy, etc. we matched 94.54% of the individuals
- For the remaining 5% (1,503 observations), we used `www.thepeerage.com`



John Montagu, 4th Earl of Sandwich

M, #25970, b. 13 November 1718, d. 30 April 1792

Last Edited=27 Nov 2016
Consanguinity Index=0.1%

John Montagu, 4th Earl of Sandwich
by Thomas Gainsborough, 1783 [1]

John **Montagu**, 4th Earl of Sandwich was born on 13 November 1718.[2] He was the son of Edward Richard **Montagu**, Viscount Hinchinbroke and Elizabeth **Popham**. He married Dorothy **Fane**, daughter of Charles **Fane**, 1st Viscount Fane and Mary **Stanhope**, on 7 March 1740/41. He died on 30 April 1792 at age 73.
He gained the title of *4th Earl of Sandwich*.

Child of John Montagu, 4th Earl of Sandwich and Dorothy Fane

1. John **Montagu**, 5th Earl of Sandwich+ b. 26 Jan 1743/44, d. 6 Jun 1814

Citations

1. [S3409] Caroline Maubois, "re: Penancoet Family," e-mail message to Darryl Roger Lundy, 2 December 2008. Hereinafter cited as "re: Penancoet Family."
2. [S130] Wikipedia, online http;//www.wikipedia.org. Hereinafter cited as Wikipedia.

- Final checks if Levenshtein distance between surnames > 1

Levenshtein distance back

Levenshtein distance

Definition

The Levenshtein distance between two words is the minimum number of single-character edits (i.e. insertions, deletions or substitutions) required to change one word into the other.

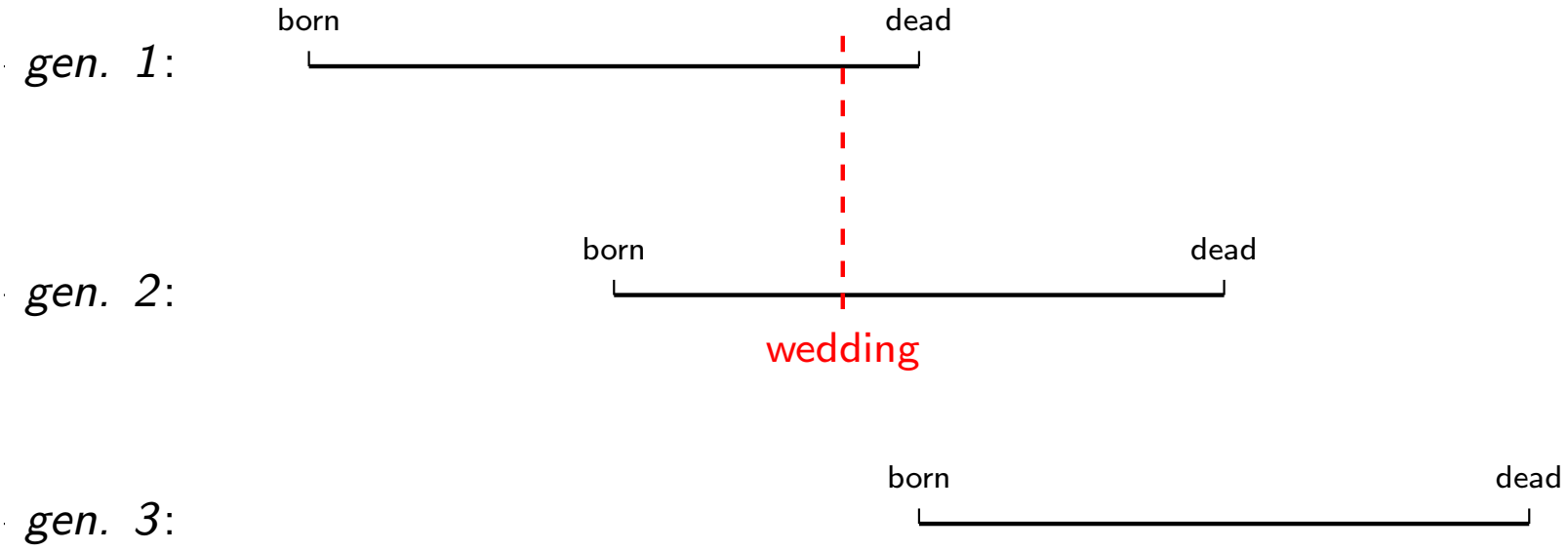
Example: "Lyttelton?" vs. "Lyttleton"

Lyttelton? $\rightarrow$ Lyttelton $\rightarrow$ Lyttleton

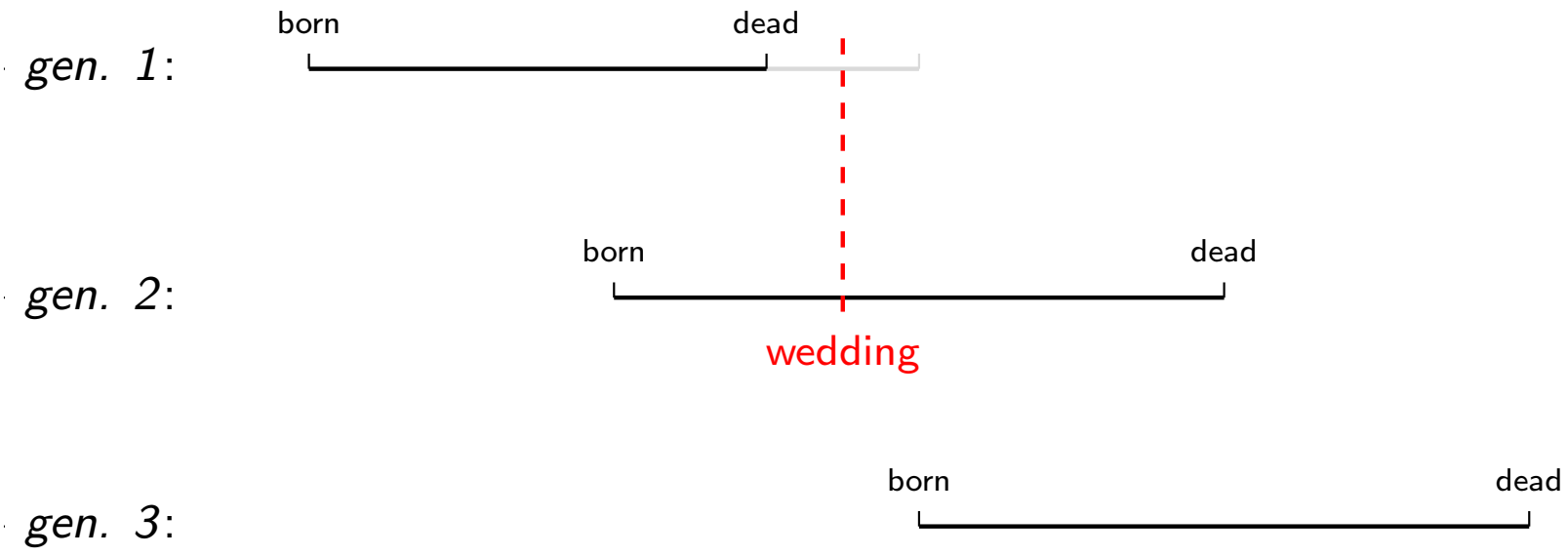
Levenshtein distance $= 3$.

back

Settlement is signed ($S = 1$)

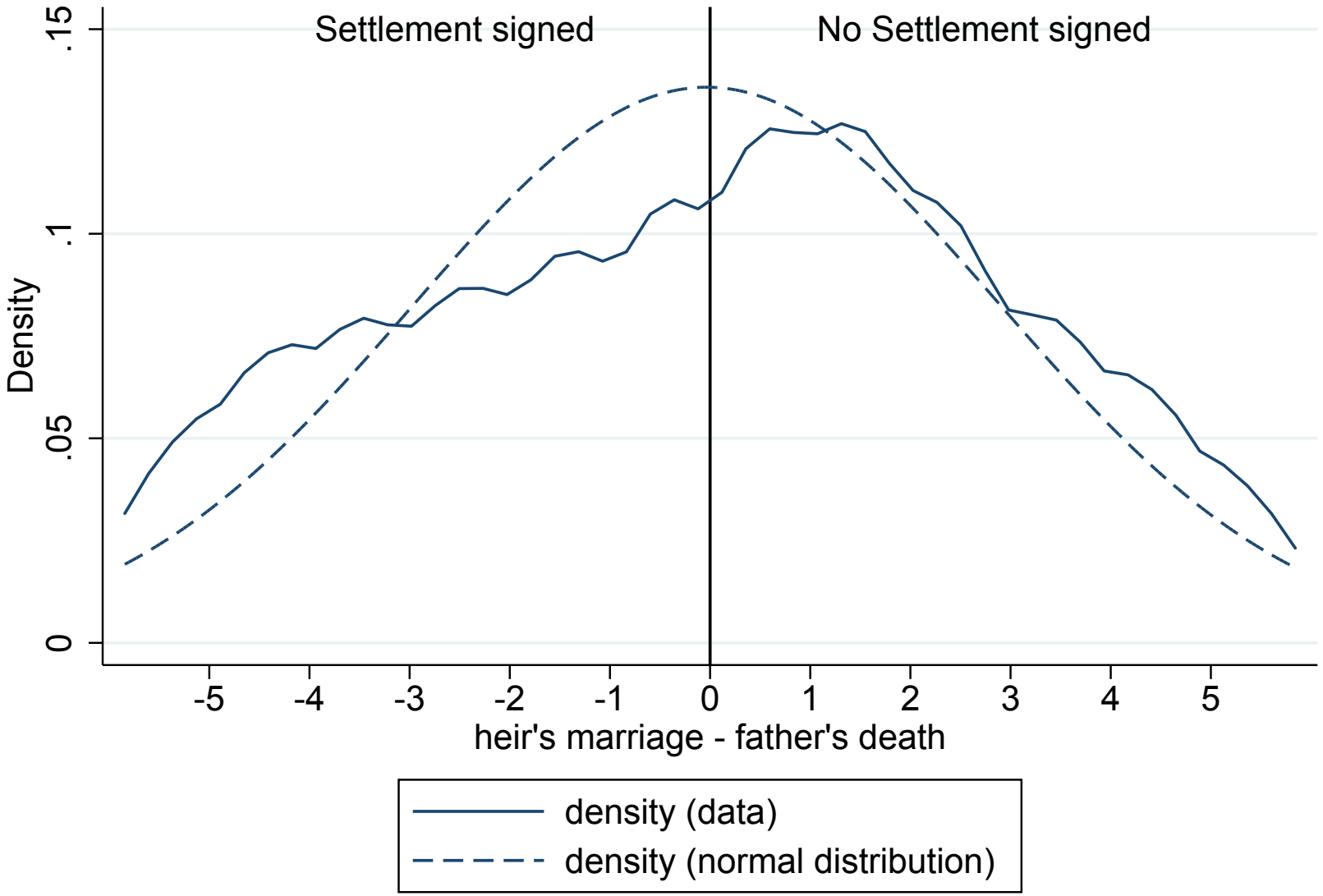


Settlement is not signed ($S = 0$)



back

Selection in OLS



kernel = epanechnikov, bandwidth = 0.8432

back

Alternative IV: birth order of the heir

First stage:

$$S_i = \sum_{n=2}^{15} \delta_n \mathbb{I}(r_i = n) + \delta_z Z_i + \mu_q + \mathbf{X}_i^{'}\gamma + \epsilon_i$$

- r_i is the **birth order** of individual i.
- Z_i age at death of i's father.
- μ_q are marriage quarter-century fixed effects.
- $\mathbf{X}$: social status, age at marriage (wife), age at death, and stillbirths in the family.

Second stage:

$$\chi_{i,j,b,q} = \delta \hat{S}_i + \mu_j + \mu_b + \mu_q + \mathbf{X}_{i,j,b,q}^{'}\gamma + \epsilon_{i,j,b,q}$$

	heirs	heirs	non-heirs	Scotland
Panel A: Second stage		Dep. Variable: Childlessness		
Settlement	-0.146***	-0.135***	0.014	0.015
	(0.046)	(0.048)	(0.068)	(0.104)
Ho:	.	.	$\beta(2) = \beta(3)$	$\beta(2) = \beta(4)$
prob > chi2	.	.	0.059*	0.185
Observations	1,141	1,141	1,154	364
% correctly predicted	93.7	93.8	88.2	98.1
Panel B: First stage		Dep. Variable: Settlement		
Gender of first birth:				
son	reference	.	.	.
daughter	-0.54**	.	.	.
	(0.024)	.	.	.
Birth order of the heir:				
1st	.	reference	reference	reference
2nd	.	-0.022	-0.023	-0.063
		(0.029)	(0.042)	(0.046)
3rd	.	-0.085***	-0.125**	-0.172***
		(0.031)	(0.052)	(0.047)
4th	.	-0.107***	-0.186***	-0.159**
		(0.037)	(0.062)	(0.077)
5th to 15th not reported				
Observations	1,141	1,141	1,154	364
% correctly predicted	84.5	84.0	84.9	86.3
F-stat	85.7	29.5	31.2	12.0

back

Robustness: inheritance at majority

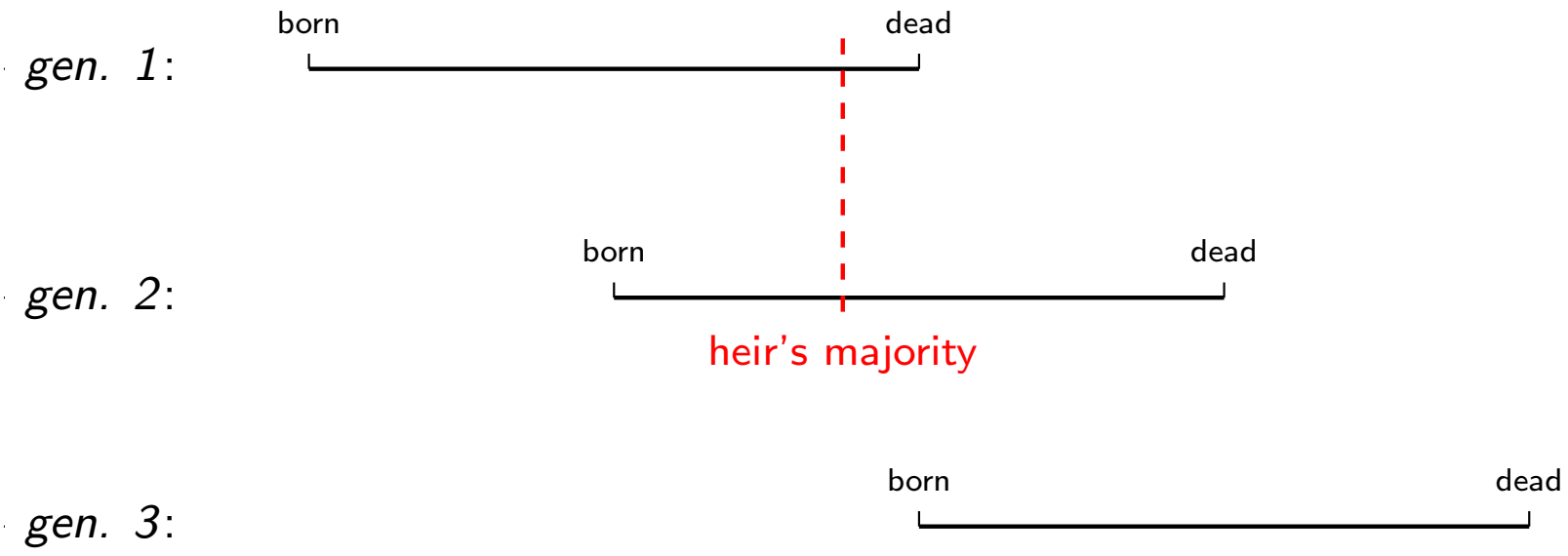
> *the father might find it advantageous to bargain with his eldest son before a marriage was in immediate prospect to avoid the pressure of the bride's family.*
> *(Habakkuk 1950: p. 26)*

Alternative proxy for signing a settlement: father died after the heir turned 21.

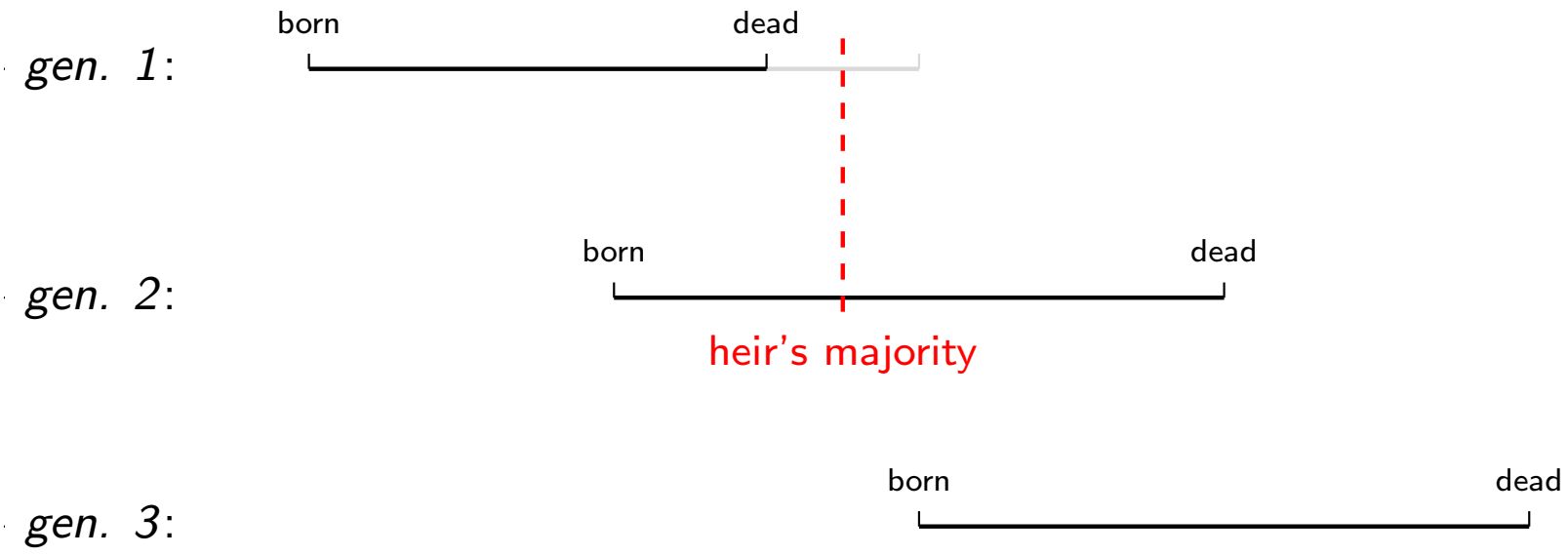
Settlements did not incorporate the interests of the bride's family concerning family provisions in case she became a widow.

The effect of settlements on childlessness is due to the entailment motive of these contracts.

Alternative proxy: settlement is signed ($S = 1$)



Alternative proxy: settlement is not signed ($S = 0$)



Robustness: inheritance at majority	heirs	heirs	non-heirs	Scotland
Second stage	Dep. Variable: Childlessness			
	OLS	IV	IV	IV
Settlement	-0.078*	-0.158***	0.009	0.046
	(0.041)	(0.048)	(0.079)	(0.080)
Ho:	.	.	$\beta(2) = \beta(3)$	$\beta(2) = \beta(4)$
prob > chi2	.	.	0.051*	0.027**
Observations	1,141	1,141	1,154	364
% correctly predicted	91.4	93.7	88.2	98.1
First stage	Dep. Variable: Settlement			
Gender of first birth:				
son	.	reference	reference	reference
daughter	.	-0.077***	-0.051*	-0.142***
		(0.025)	(0.030)	(0.041)
Observations	.	1,141	1,154	364
F-stat	.	83.2	32.8	69.0
% correctly predicted	.	87.3	89.2	89.3

back

Robustness: IV specification

	(1)	(2)	(3)	(4)	(5)
	Dep. Variable: Childlessness				
	IV benchmark	IV classic			IV selected controls
	heirs	heirs	non-heirs	Scotland	heirs
Settlement	-0.146***	-0.144***	0.009	0.018	-0.085**
	(0.046)	(0.046)	(0.068)	(0.077)	(0.035)
Controls	YES	YES	YES	YES	(a)
Family FE	YES	YES	YES	YES	(a)
Birth year FE	YES	YES	YES	YES	(a)
M. q.-cent. FE	YES	YES	YES	YES	NO
Observations	1,141	1,141	1,154	364	1,141
% corr. predicted	93.7	93.7	88.1	98.1	84.3
F-stat first-stage	85.7	132.5	74.1	12.4	537.5

Column 5 presents the results from a classic IV including covariates pre-selected with LASSO. These covariates are (a): number of husband's siblings, wife's age at marriage, controls for 11 families, and a dummy for the year of birth 1685.

back

Heterogeneity: Size and value of the inherited estates

	Dep. Variable: Childlessness				
	Not Great Landowners†	Bottom 75% Great Landowners†		Top 25% Great Landowners†	
	not listed in Bateman (1883)	*size* *<30,000 acres*	*value* *<37,000 $*	*size* *>30,000 acres*	*value* *>37,000 $*
	IV	IV	IV	IV	IV
Settlement	-0.191	-0.114*	-0.147**	-0.339**	-0.276*
	(0.128)	(0.066)	(0.066)	(0.142)	(0.167)
Controls	YES	YES	YES	YES	YES
Family FE	YES	YES	YES	YES	YES
Birth year FE	YES	YES	YES	YES	YES
Marr. q.-cent FE	YES	YES	YES	YES	YES
Observations	285	631	632	225	224
Correctly predicted	100	97.5	96.8	99.6	100
F-stat from first stage	26.1	60.7	57.6	26.8	29.5

back

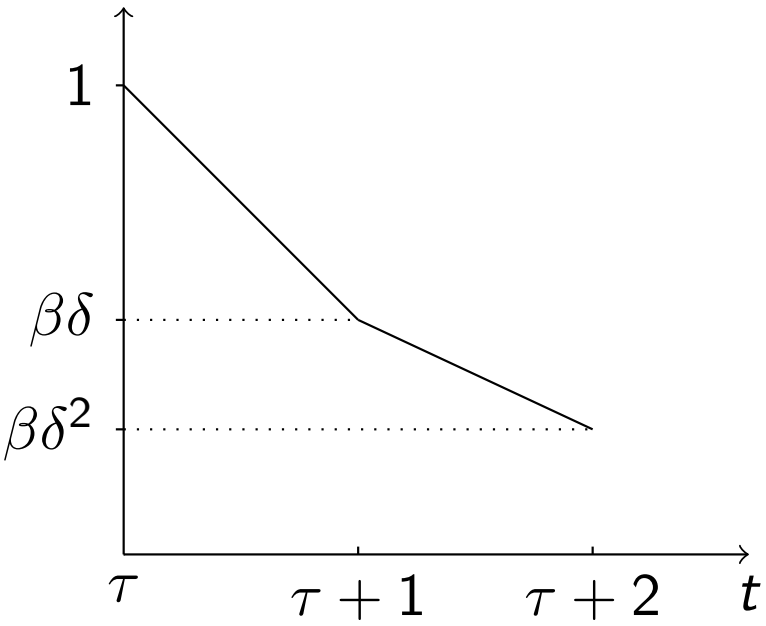
	Dep. Variable: Childlessness					
				Old Peerages†		
	benchmark sample	benchmark sample	benchmark sample	all marriages (1650-1882)	married before IR (1650-1769)	married after IR (1770-1882)
Settlement	-0.146***	-0.146***	-0.147***	-0.168***	-0.207**	-0.172*
	(0.046)	(0.046)	(0.048)	(0.053)	(0.098)	(0.090)
Settlement						
× *New Peerage*‡	.	.	0.003	.	.	.
	.	.	(0.068)	.	.	.
Title creation year	.	-0.001	-0.001	.	.	.
	.	(0.002)	(0.002)	.	.	.
Controls	YES	YES	YES	YES	YES	YES
Family FE	YES	YES	YES	YES	YES	YES
Birth year FE	YES	YES	YES	YES	YES	YES
M. quarter-cent. FE	YES	YES	YES	YES	YES	YES
Observations	1,141	1,141	1,141	868	453	415
% correct predicted	93.7	93.8	93.60	89.31	76.34	64.42
F-stat first stage	85.7	89.6	89.6-96.5	69.9	42.4	49.6
Total settlement effect for *New peerage*:	.	.	-0.144** [pval = 0.04]	.	.	.

† *Old Peerage*: title created before the Industrial Revolution (1770).
‡ *New Peerage*: title created after the Industrial Revolution (1770).

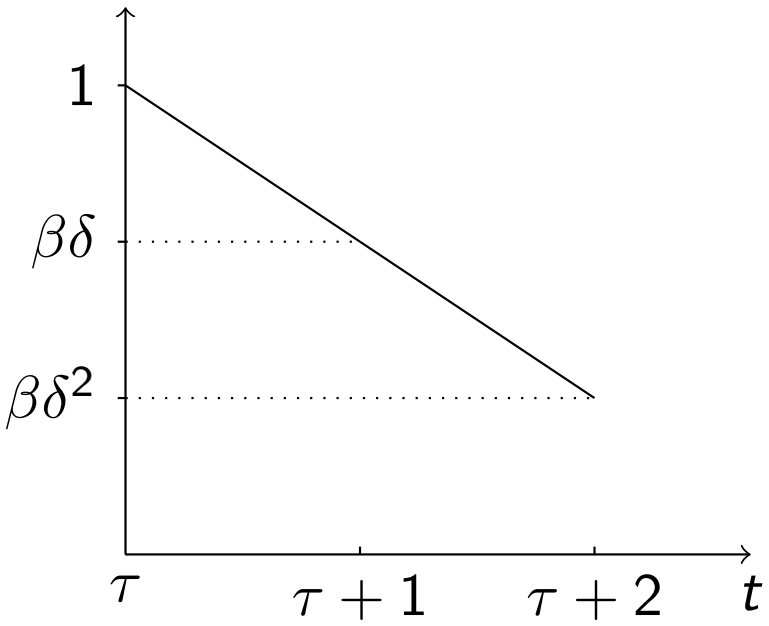
back

Quasi-hyperbolic discrete discount function

Low β



High β ($\beta \to 1$)



back

Consumption in the no-settlement inheritance regime

1. If $n_1 = 0$: $x_1 = K$.
2. If $n_1 = 1$ and $n_2 = 0$:
   - $x_1^* = \dfrac{K}{1+\beta\delta}$ and $x_2^* = \dfrac{\beta\delta\ K}{1+\beta\delta}$.
3. If $n_1 = 1$ and $n_2 = 1$:
   - $x_{1,\neg s}^{**} = \dfrac{K}{1+\beta\delta+\beta\delta^2}$,
   - $x_{2,\neg s}^{**} = \dfrac{1+\delta}{1+\beta\delta}\ \dfrac{\beta\delta\ K}{1+\beta\delta+\beta\delta^2}$, and
   - $x_{3,\neg s}^{**} = \dfrac{\beta(1+\delta)}{1+\beta\delta}\ \dfrac{\beta\delta^2\ K}{1+\beta\delta+\beta\delta^2}$.

back

Consumption in the settlement inheritance regime

1. If $n_1 = 0$: $x_1 = K$.
2. If $n_1 = 1$ and $n_2 = 0$:
   - $x_1^* = \dfrac{K}{1+\beta\delta}$ and $x_2^* = \dfrac{\beta\delta\ K}{1+\beta\delta}$.
3. If $n_1 = 1$ and $n_2 = 1$:
   - $x_{1,s}^{**} = \dfrac{K}{1+\beta\delta+\beta\delta^2}$,
   - $x_{2,s}^{**} = \dfrac{\beta\delta\ K}{1+\beta\delta+\beta\delta^2}$, and
   - $x_{3,s}^{**} = \dfrac{\beta\delta^2\ K}{1+\beta\delta+\beta\delta^2}$.

back

Fertility: generation 1

- Generation 1 will have children when $n_2{=}0$ if and only if:

$$f_1^{n_2=0}(K) := v_1(x_1^*, x_2^*, n_1{=}1) - v_1(x_1{=}K, n_1{=}0) > 0$$

- Generation 1 will have children when $n_2{=}1$ if and only if:

$$f_{1,\neg s}^{n_2=1}(K) := v_1(x_{1,\neg s}^{**}, x_{2,\neg s}^{**}, x_{3,\neg s}^{**}, n_1{=}1) - v_1(x_1{=}K, n_1{=}0) > 0,$$
$$f_{1,s}^{n_2=1}(K) := v_1(x_{1,s}^{**}, x_{2,s}^{**}, x_{3,s}^{**}, n_1{=}1) - v_1(x_1{=}K, n_1{=}0) > 0.$$

back