Marriage, **Markets and Money**:
A Coasian Theory of Household Formation

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Becker: “For centuries marriages, births, and other family behavior have been known to respond to fluctuations in aggregate output and prices.”

Family Economics and Macrobehavior

Milton and Rose Friedman (on waiting six years to marry): “We regarded marriage as ‘till death us do part.’ As a result we did not want to take that step until we had a reasonable prospect of being able to support ourselves and a family.”

Two Lucky People: Memoirs

Introduction

We build a dynamic GE model of *household formation* and take it to the data.

By household formation, in theory, we mean more than getting married – e.g., it could involve taking on roommates, living with one's parents or other family, etc.

... although in practice, we may use marriage data.

A household is an institution, i.e., *a way of organizing economic (and other) activity*.

To think about households, it helps to ask how economists think about other organizations, such as firms.

The Coasian Approach

Coase: Why is some economic activity organized within business firms, instead of having self-employed agents who contract with each other as needs arise?

If markets had no transaction costs, or frictions, we would not need firms.

Firms emerge when entrepreneurs begin to hire people, rather than contracting out individual tasks.

Coase says it makes sense to start a firm *iff* markets have sizable frictions, explicitly mentioning taxation, search and bargaining costs.

‘[The reason] it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism.’

Search: ‘The most obvious cost of organizing production through the price mechanism is that of discovering what the relevant prices are.’

Bargaining: ‘The costs of negotiating and concluding a separate contract for each exchange ... must also be taken into account.’

Taxation: ‘A sales tax... is a tax on market transactions and not on the same transactions organised within the firm ... [and so] brings into existence firms which otherwise would have no raison d’etre.’

Examples

Entrepreneurs may need legal, accounting or secretarial services, all of which are available on the market.

If market frictions are big, they bring this activity *in house* by setting up a legal team, accounting dept or secretarial pool.

Similarly, we as individuals need cooking, cleaning, child care, companionship ...

If frictions are big, we are more inclined to bring these activities *in house* by getting ‘married,’ especially if:

market and home production are good substitutes;

home production is enhanced through partnership.

Ingredients to a Model

To capture the Coasian tradeoff, we need markets for goods plus endogenous decisions to enter partnerships.

We use search-and-bargaining theory because:

- search and bargaining are leading Coasian frictions;
- it has been successfully applied to marriage and goods markets separately, so why not together?

We include tax frictions because of data considerations:

- consumption (sales) tax;
- income taxes;
- the inflation tax.

Environment

Large number of ∞-lived indiv's, men and women.

Large numbers of production and retail firms.

Three types of economic activity each period:

- AD market: indiv's and firms trade labor and assets
- KW market: indiv's and retailers trade goods
- BC market: single indiv's participate in a for partners

BC has search frictions (as seems natural).

KW has search, bargaining and taxation (as in Coase).

Preferences: $U(\mathbf{x}) - B\ell + u(y, z)$, where

AD labor $\ell \in [0, 1]$

AD goods $\mathbf{x} \in \mathbb{R}^n_+$

KW good $y \in \mathbb{R}_+$

BC nontraded good $z \in [\underline{z}, \overline{z}] \cup \{s\}$.

If $u_{12}(y, z) < 0$ then y and z are substitutes.

For now assume (general case is in paper):

$$u(y, s) = \varepsilon_0 v(y) \text{ and } u(y, z) = \varepsilon_1 v(y) + z \ \forall z \neq s.$$

Households *per se* are substitutes for markets if $\varepsilon_0 > \varepsilon_1$.

Home Production: z can be 'love' – a warm glow?

Paper also provides an explicit Beckerian model of 'love' in the sense of 'caring and sharing.'

It can also be the reduced form of an explicit HP model:

$$z = g(h, h', k, \xi) - h - h'$$

where g is the HP function, h and h' are home hours of the couple, and k is home capital (all endogenous).

Random ξ across matches induces randomness in z, and agents form partnerships when $z \geq R$.

Here we assume an exogenous distribution $F(z)$.

AD Market (monetary version):

Let V_j be value function in market $j = 1, 2, 3 =$ AD, KW, BC

Starting with AD,

$$V_1(m, z) = \max_{\mathbf{x}, \ell, \hat{m}} \{U(\mathbf{x}) - B\ell + V_2(\hat{m}, z)\}$$

$$\text{s.t. } \mathbf{px} = \ell w(1 - \eta) + \Delta + \psi(m - \hat{m})$$

Lemma: $(\mathbf{x}, \hat{m}) \perp (m, z)$.

Lemma: V_1 is linear in m with slope $\psi B / w(1 - \eta)$.

From now on normalize $B = w = 1$.

KW Market

$$V_2(\hat{m}, z) = A\alpha_z[u(y_z, z) + V_3(0, z)] + (1 - A\alpha_z)[u(0, z) + V_3(\hat{m}, z)]$$

where $\alpha_z = \alpha_0$ if $z = s$ and $\alpha_z = \alpha_1$ otherwise.

Retail surplus:

$$S_z = \varepsilon_z v(y_z) - g_z(y_z)$$

where y_z is given by the bargaining soln

$$\beta\hat{m}\psi_+ = g_z(y_z)(1 - \eta)$$

and $\hat{m}$ is given by the FOC $\psi = \partial V_2/\partial\hat{m}$, or

$$i = A\alpha_z\left[\frac{\partial u(y_z)}{\partial d(y_z)} - 1\right].$$

BC Market

At rate λ, singles meet & draw z reflecting:

the drudgery (or joy) of cooking & cleaning,

the joy of sex & companionship (or drudgery, as the case may be).

Reservation Strategy

$$R + A\alpha_1 S_1 - ig_1 = 0 + A\alpha_0 S_0 - ig_0 + \frac{\lambda}{r+\delta}\int_R [1 - F(z)]dz$$

Compare with

$$R + b_1 = b_0 + \frac{\lambda}{r+\delta}\int_R [1 - F(w)]dw$$

Steady state: Given R, we have

marriage hazard $H = \lambda[1 - F(R)]$;

stock of singles $\sigma = \delta/(\delta + H)$;

flow of new marriages $\phi = \sigma H$ (data).

Defn: SSE is (R, y_z, d_z, σ) and $(\ell, \mathbf{x}, \mathbf{p})$ such that:

R solves reservation marriage eqn;

(y_z, d_z) solves bargaining problem $\forall z$;

σ solves the steady state conditions;

$(\ell, \mathbf{x}, \mathbf{p})$ satisfy GE-101 conditions.

Results

Prop. $\exists!$ equilibrium value of $R \in (\underline{z}, \overline{z})$.

Prop: R is increasing in λ, decreasing in r and δ.

Prop: if $\varepsilon_0 \geq \varepsilon_1$ or $\alpha_0 \geq \alpha_1$, with one strict, then R is increasing in α_0/α_1, A and θ.

Prop: if $\varepsilon_0 \geq \varepsilon_1$ or $\alpha_0 \geq \alpha_1$, with one strict, then R is decreasing in τ and η.

Prop: R is decreasing in i *iff* $m_0 > m_1$.

Prop: if $\varepsilon_0 \geq \varepsilon_1$ or $\alpha_0 \geq \alpha_1$, with one strict, then $m_0 > m_1$.

Prop: the flow ϕ moves opposite to R wrt α_z, ε_z, A, θ, τ, η and i.

Key Economic Ideas

If H & M are substitutes then

taxation, search or bargaining frictions $\uparrow \Rightarrow R \downarrow \phi \uparrow$

Intuition: frictions and taxes impinge more on singles because they buy more market goods

on the extensive margin when $\alpha_0 > \alpha_1$;

on the intensive margin when $\varepsilon_0 > \varepsilon_1$.

Inflation impinges more on singles *iff* $m_0 > m_1$ and $m_0 > m_1$ if H & M are substitutes.

If H & M are complements, reverse signs on the derivatives.

Evidence Part I: **Micro**

Hypothesis: because singles engage more in market activity they hold more (broadly defined?) money.

Previously, Klee (2008) finds in using scanner data + census data:

> Controlling for # items, values, income, age etc., marriage decreases pr(cash) and increases pr(credit).
>
> pr(cash) increases and pr(credit) decreases on weekends, consistent with the idea that 'going out' is cash intensive, and since singles go out more ...

While suggestive, we perform an extensive new analysis that speaks more directly to the hypothesis $m_0 > m_1$.

Table 1a: Cash Holding per Adult – Italy

	1993	1995	1998	2000	2002	2004	mean
$N = 1$	293	298	317	326	313	318	311.567
obs	1220	1274	1131	1446	1757	1837	
$N = 2$	197	227	203	194	191	199	201.711
obs	3243	3195	2834	3249	3147	3280	
$N = 3$	147	166	148	142	148	153	150.828
obs	1430	1452	1207	1384	1363	1239	
$\frac{N=1}{N=2}$	1.489	1.313	1.563	1.678	1.641	1.593	1.545
$\frac{N=1}{N=3}$	1.991	1.793	2.147	2.289	2.111	2.079	2.066

Std devs not reported – but tiny (all differences are ***)

Table 1b: Cash/Expend per Adult – Italy

	1993	1995	1998	2000	2002	2004	mean
$N = 1$	11.33	10.93	11.50	11.39	11.41	9.720	10.978
obs	1220	1274	1131	1446	1757	1837	
$N = 2$	8.69	9.79	9.47	8.66	8.76	8.400	8.949
obs	3243	3195	2834	3249	3147	3280	
$N = 3$	8.32	8.87	8.68	8.38	8.68	8.301	8.541
obs	1430	1452	1207	1384	1363	1239	
$\frac{N=1}{N=2}$	1.304	1.116	1.213	1.316	1.302	1.157	1.227
$\frac{N=1}{N=3}$	1.361	1.231	1.325	1.360	1.315	1.171	1.285

Std devs not reported – but tiny (all differences are ***)

Table 3a: Boston Fed Survey

	cash in wallet			total cash holding		
	(1)	(2)	(3)	(4)	(5)	(6)
single	83.151	3.439	9.067	337.760	13.114	42.123
divorced/separated	63.896	3.020	5.151	190.207	8.858	15.188
widowed	85.740	2.610	3.284	411.389	11.216	13.636
all nonmarried	76.909	3.195	7.028	318.393	11.434	29.482
married/common law	64.340	1.802	4.179	284.912	5.633	12.996
observations	2132	2125	2125	2062	2056	2056

Std devs not reported – but tiny (all differences are ***)

Table 3a: Canada – Diary (not truncated)

	cash holding			cash spending		
	(1)	(2)	(3)	(4)	(5)	(6)
single	68.978	2.077	3.509	96.129	3.301	5.730
divorced/separated	119.575	4.022	5.090	147.093	6.024	11.599
widowed	107.686	3.326	3.830	94.315	3.294	4.455
all nonmarried	85.525	2.694	3.936	109.398	4.018	7.124
married/common law	83.445	1.412	2.940	111.855	2.026	4.279
obs	3219	3219	2715	3241	3241	2737

Std devs not reported – but tiny (most differences are ***)

Table 3b: Canada – Diary (truncated)

	cash holding < $1000			cash spending < $1000		
	(7)	(8)	(9)	(10)	(11)	(12)
single	68.796	2.072	3.488	83.790	2.657	4.955
divorced/separated	93.212	3.377	4.574	147.093	6.024	11.599
widowed	107.686	3.326	3.830	94.315	3.294	4.455
all nonmarried	78.366	2.515	3.789	101.435	3.602	6.612
married/common law	77.263	1.373	2.825	103.687	1.947	4.129
obs	3213	3213	2710	3225	3225	2722

Std devs not reported – but tiny (most differences are ***)

Table 5: OLS Results – Canadian Diary (truncated)

	(1) CH	(2) CS	(3) CH	(4) CS	(5) CH_r	(6) CS_r
constant	2.825***	4.129***	1.202**	-.039	1.343***	0.297
nonmarried	0.964***	2.483**	0.967***	1.751*	0.752***	1.500***
male			0.292	0.407	0.168	0.142
unemployed			1.723***	1.150	1.067***	0.889**
< college			1.164***	3.037***	0.624***	1.511***
	age	and	other	controls	omitted	
obs	2710	2722	2429	2438	2429	2438

Summary: the average married Canadian woman has $Y = 27,000$ and $m = 77$ in her wallet.

Suppose the coefficient on *nonmarried* is 1.5, which is in the range of our estimates.

Then, if the same woman were single she would have $m = 118$ (53% more).

This is for wallet m; it would be good to know results for demand deposits or liquid assets more generally.

Similar for Boston Fed data, but it shows that total m is 3-4 times higher than wallet m.

Conclusion: clearly, being single is cash intensive.

Evidence Part II: Macro

Data	Source	Time Period	# Countries
Marriages	UNCDB	1950 – 2004	252
Population	UNCDB	1950 – 2004	252
Output	IFS	1948 – 2009	161
CPI	UNCDB	1951 – 2004	156
GDP Deflator	UNCDB	1971 – 2004	214
Unemployment	IFS	1950 – 2004	73
Unemployment	OECD	1951 – 2003	22
Sales Tax	OECD	1976 – 2011	33
Sales/Income Tax	Mendoza et al	1965 – 1992	18

Table 6: GLS w/o taxes, raw data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.002	0.006	0.008	0.011**				
π_D^2	0.000	0.000*	0.000***	0.000***				
π_C					0.000	0.002	0.000	0.001
π_C^2					0.000	0.000	0.000	0.000
γ		0.135		0.105		0.213		-.023
u			-.079***	-.078***			-.085***	-.088***
obs	3315	2282	1072	965	3453	2817	1023	932
NC	152	99	78	71	116	91	74	67

Table 7: GLS w/ OECD taxes, raw data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.007	0.036***	0.006	0.042***				
π_D^2	0.001	0.000	0.000	0.000				
π_C					0.031***	.032***	.043***	.043***
π_C^2					-.000***	-.000***	-.000**	-.000*
γ		2.469***		3.367***		0.408		0.453
u			-.036***	-.034***			-.035***	-.035***
τ	-.089***	-.062***	-.050***	-.049***	-.080***	-.055***	-.045***	-.045***
obs	320	307	246	245	314	302	245	245
NC	32	31	30	30	32	31	30	30

Table 8: GLS w/ Mendoza taxes, raw data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.032***	0.045**	0.038***	0.040*				
π_D^2	-.001***	-.001***	-.001***	-.001***				
π_C					0.009	0.023	0.010	0.018
π_C^2					-.001	-.002	-.002	-.002
γ		1.389		0.295		6.225***		3.654
u			-.037	-.037			-.067***	-.060**
τ_c	-.048***	-.049***	-.073***	-.073***	-.040***	-.044***	-.071***	-.072***
τ_h	-.058***	-.056***	-.056***	-.055***	-.080***	-.075***	-.067***	-.065***
τ_k	0.012**	0.012**	0.007	0.007	0.011**	0.015***	0.006	0.009
obs	310	310	241	241	330	330	236	236
NC	18	18	17	17	17	17	16	16

Table 9: GLS, Mendoza sample w/o taxes, raw data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.048***	0.121***	0.041***	0.107***				
π_D^2	-.001***	-.002***	-.001***	-.002***				
π_C					0.094***	0.119***	0.246***	0.241***
π_C^2					-.003	-.003**	-.009***	-.009***
γ		8.657***		7.705***		9.928***		4.547**
u			-.066***	-.058***			-.083***	-.080***
obs	587	587	483	483	906	890	481	481
NC	18	18	18	18	18	18	18	18

Table 10: GLS w/o taxes, smoothed data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.076***	0.077***	0.077***	0.111***				
π_D^2	-.004***	-.003***	-.006***	-.008***				
π_C					0.005	0.009***	0.006	0.022***
π_C^2					0.000	-.000***	0.000	-.000***
γ		0.652***		0.668***		1.424***		0.229
u			-.098***	-.094***			-.119***	-.118***
obs	1726	1405	689	636	2291	1991	707	654
NC	54	45	39	36	50	45	39	36

Table 11: GLS w/ Mendoza taxes, smoothed data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.064**	0.075**	0.076**	0.067				
π_D^2	-.003*	-.003*	-.004*	-.004				
π_C					0.183***	0.191***	0.234***	0.237***
π_C^2					-.012***	-.012***	-.015***	-.015***
γ		0.901		-.681		14.876***		7.879*
u			-.041*	-.041*			-.064***	-.052**
τ_c	-.044***	-.045***	-.069***	-.068***	-.046***	-.053***	-.080***	-.081***
τ_h	-.064***	-.063***	-.061***	-.062***	-.076***	-.067***	-.060***	-.058***
τ_k	0.012**	0.012**	0.009	0.008	0.009*	0.016***	0.003	0.006
obs	310	310	242	242	330	330	237	237
NC	18	18	17	17	17	17	16	16

Table 12: GLS, Mendoza sample w/o taxes, smoothed data

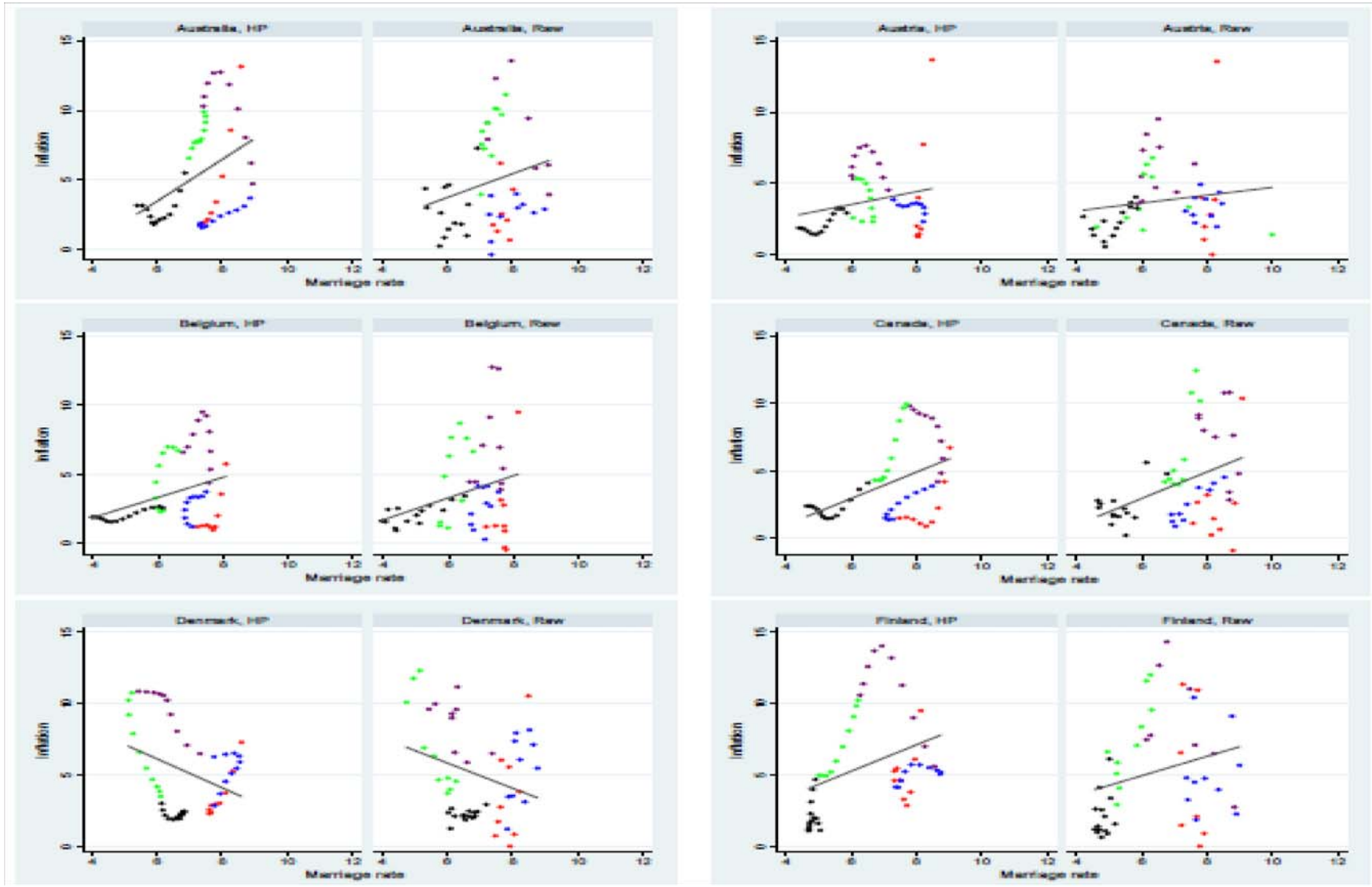
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_D	0.125***	0.177***	0.126***	0.174***				
π_D^2	-.003**	-.004***	-.004***	-.005***				
π_C					0.264***	0.224***	0.394***	0.390***
π_C^2					-.013***	-.010***	-.018***	-.018***
γ		7.570***		6.614***		22.68***		2.267
u			-.054***	-.057***			-.081***	-.080***
obs	587	587	489	489	906	890	487	487
NC	18	18	18	18	18	18	18	18

Table 14: GLS, US, raw data

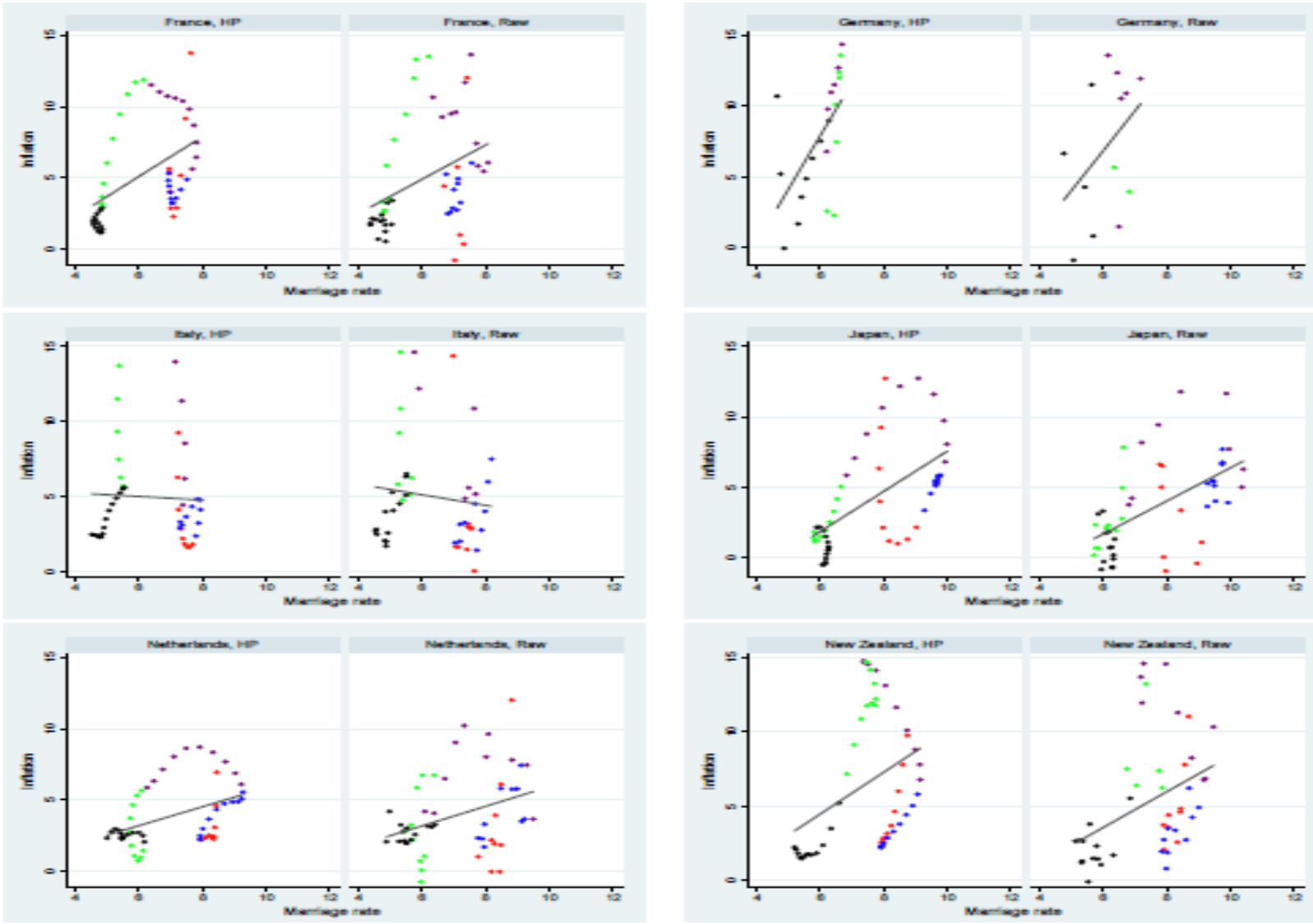
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_C	0.395***	0.390***	0.670***	0.617***	0.101	0.035	-.058	-.086
π_C^2	-.017**	-.014*	-.036***	-.029**	-.005	0.000	0.006	0.008
γ		9.600**		10.601*		4.974		2.615
u			0.126	0.127			-.017	-.019
τ_c					0.751***	0.686***	0.675***	0.666***
τ_h					0.086***	0.094***	0.027	0.042
τ_k					0.004	0.035	-.021	0.000
obs	54	54	36	36	27	27	23	23

Table 15: GLS, US, smoothed data

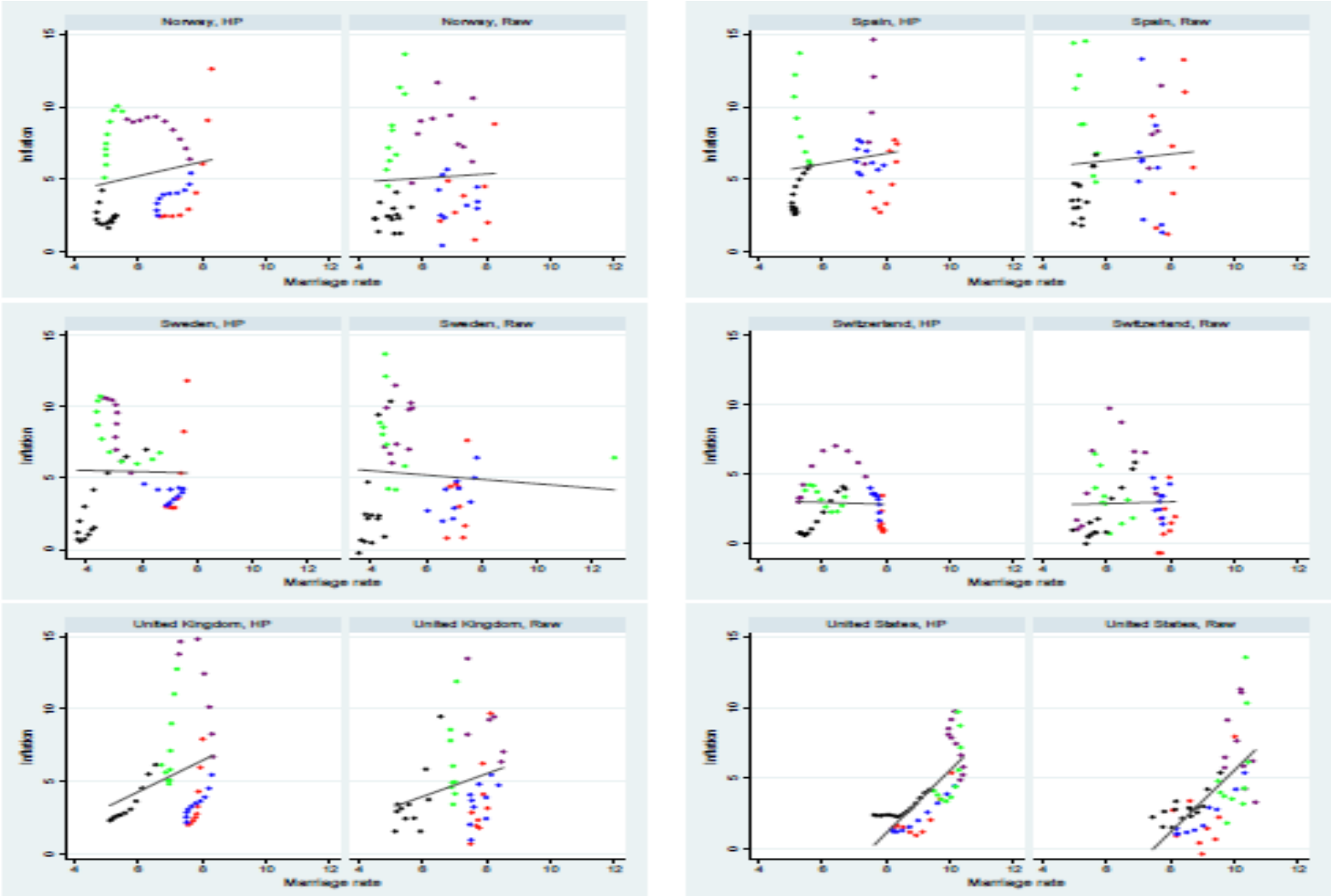
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π_C	0.729***	0.705***	1.475***	1.368***	-.171**	-.164**	-.052	-.053
π_C^2	-.046***	-.039***	-.106***	-.094***	0.007	0.006	0.000	0.001
γ		22.83***		20.36**		-1.217		-.554
u			0.038	0.071			-.066**	-.062
τ_c					1.226***	1.23***	1.282***	1.273***
τ_h					0.168***	0.166***	0.194***	0.188***
τ_k					0.111***	0.107***	0.085***	0.081**
obs	54	54	36	36	27	27	23	23



Austria, Australia, Belgium, Canada, Denmak, Finland



France, Germany, Italy, Japan, Neth., New Zeeland



Norway, Spain, Sweden, Swiss., UK, US

Examples

	low π	high π	low ϕ	high ϕ
Canada	2	6	5	9
US	2	6	8	10
Germany	3	10	5	7

Plausible? Yes, if we interpret π as a proxy for poorly functioning markets in a much broader sense.

Literally π taxes liquidity, which is bad for market activity.

But π may be a symptom of much more general economic problems – which is fine from our Coasian perspective.

Conclusions: **1**

We built a GE theory of household formation.

Our retail markets have tax, search and bargaining frictions, in the spirit of Coase.

Households, like firms, emerge (in part) as a response to the costs and inconveniencies of using the market.

Model is flexible, tractable and makes sharp predictions.

If, e.g., households and markets are substitutes then singles should carry more cash (more generally, liquidity).

New data on currency usage and other method-of-payment information corroborates this prediction.

Conclusions: **2**

When we measure household formation by marriage rates, in a multi-country panel of macro data, we find:

growth (unemp) increases (decreases) marriage;

tax effects are ambiguous, but positive for the US;

inflation increases marriage, but reasons are subtle.

Future work may use a broader notion of households – *we are not wed to marriage*.

One can ask, e.g., why households are shrinking over time:

has there been a secular decline in Coasian frictions?

how much can this explain?