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Capital and profitability in banking: Evidence from US banks

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Bank Regulation, Competition and Risk

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Motivation 1 macroeconomics of bank capital

1. Role in monetary transmission. Differing views

(a) Low capital constrains lending, accumulation (decumulation) of capital strengthens/ (weaken) response to m policy (franchise value, Van den Huevel, 2002, 2007)

(b) Others suggest low capital banks respond more to mon policy– more driven by liquidity/ reserves requirements (Kashyap and Stein,2000), risk shifting, searh for yield

Theory ambiguous. Empirical evidence for (a) Dell'Ariccia, Laeven & Suarez, JF 2017.

2. Higher capital promoting risk taking/ profits is there a bank capital policy conflict?

Practitioner concerns about high costs of capital requirements, but research finds impact small (Admati & Hellwig, 2013; Kisin & Manela RFS 2016), at least in long run

financial stability objective (requiring high levels of capital) v. role of credit as a channel of monetary policy (requiring flexibility)?

Motivation 2: Bank capital management

- Capital, portfolio decisions and earnings all interact
  - Essential to distinguish long term and short impacts
  - This can be done by modelling target buffer capital capture all
- The main theoretical stories can all be included
  - Buffer protects against costs of bankruptcy/ regulatory intervention
  - Shortfall ⇨ riskier portfolio/ higher earnings (if risk shifting dominates) OR cautious portfolio/ lower earnings (franchise v)
  - Relationships likely to be non-linear
  - Relationships likely to vary over the business cycle and with market strategy/ business model

Our contribution (still preliminary work)

- (re)-examine relationship between bank capital and profitability

  US banking data (at holding company level) 1976- 2013 for now

- in the context of a model of deviations from target capital $k - k^*$
  - Allowing for a range of bank specific controls
  - And different bank business models, currently idenfitied by size and risk
- We are alert to ‘behavioural’ findings paralleling those in Osborne, Fuertes and Milne (IRFA 2016)

Closely related papers

- **Berger JMCB, 1995** Theory –ve relationship between K/A and RoE, finds +ve association & two-way granger causality (US 83-89), but -ve relationship (US 90-92). Critiqued by Hutchinson and Cox (Annals FE, 1986)
- **Berger and Bouwman, JFE 2013)** +ve association capital (8 q before) and ΔRoE / Δ market share (during), for US small banks always, for medium/ large only during banking crises (90-92, 07-09) (main focus on survival/ market share not RoE)
- **Tran, Lin and Nguyen, Int Rev F A 2016)** VaR model 1996-2010, K/A -vely related to US banks RoE for higher capitalized banks but +vely for lower capitalized banks.
- **Chronopoulos, Liu, McMillan and Wilson, EJF 2013** Equity to assets –vely associated with RoA (US banks 1984-2010, larger and negative before ‘93, insignficant ‘94-’98, -ve significant but smaller 1999-2010). Emphasis on deregulation.
- **Lee and Hsieh, JIMF 2013** –ve relationship KA / RoE, +ve / RoA, Asian banks 94-08
- **Goddard, Liu and Molyneux, European FM 2010** –ve relationship KA / RoE, European banks 92-07

Figure 1: Capital to Assets Ratio trend:

Mean, median, 10th and 90th percentiles (all banks)

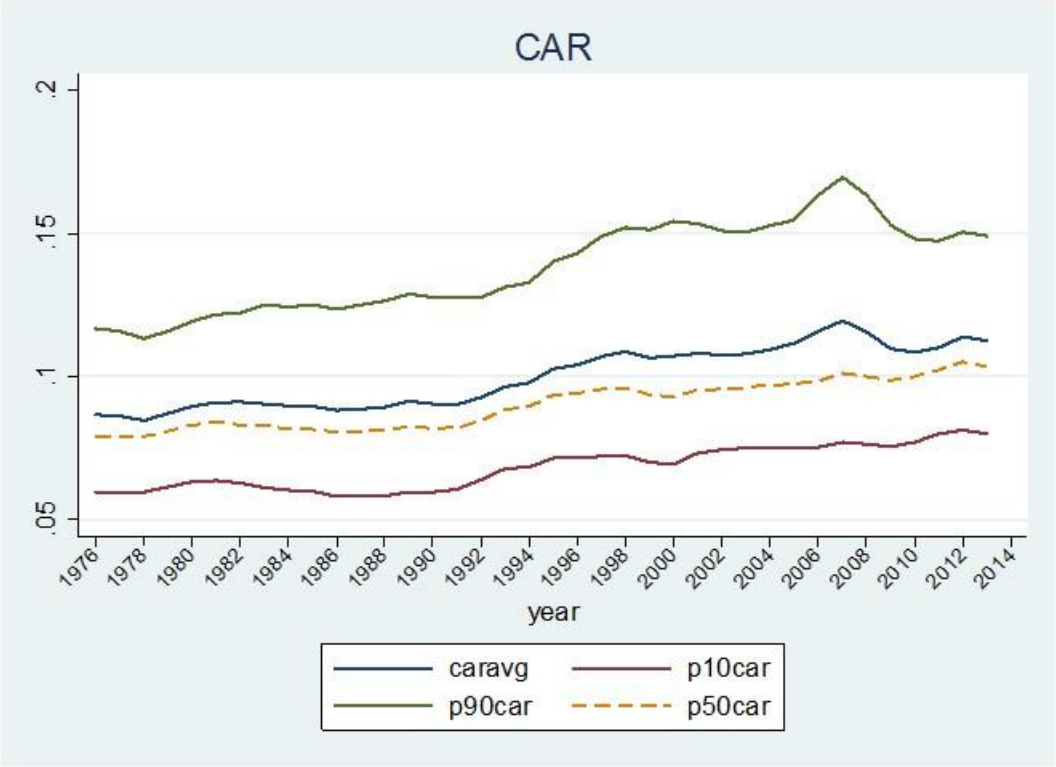
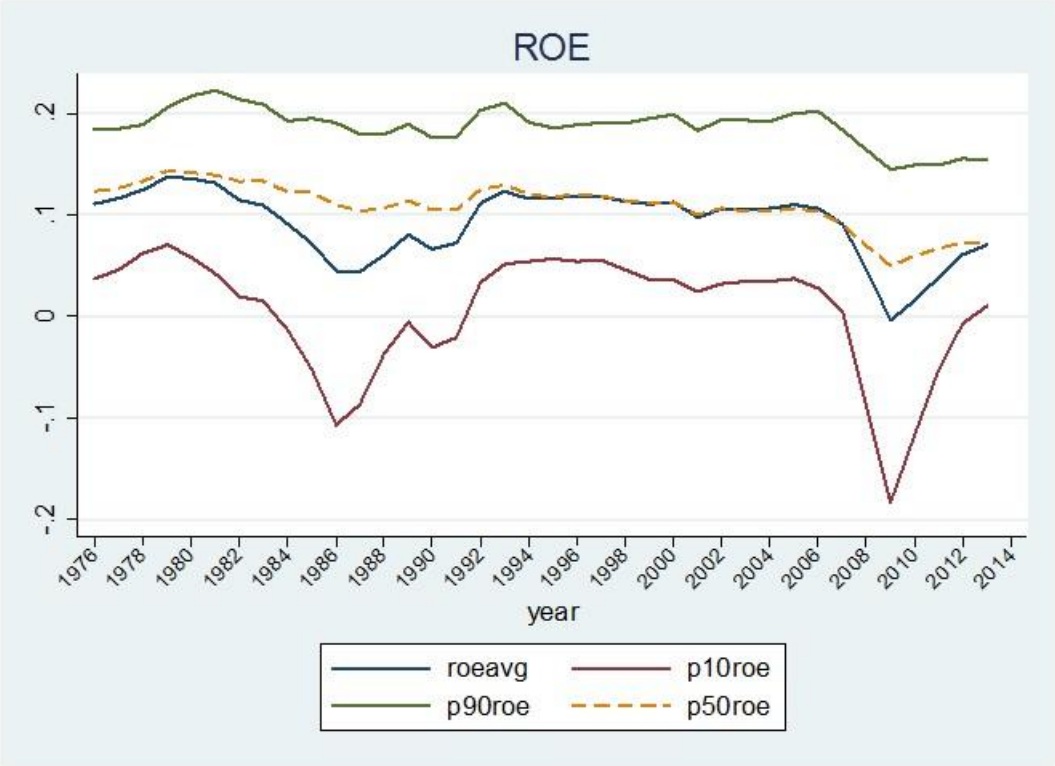


Figure 2: Return on Equity trend:

Mean, median, 10th and 90th percentiles (all banks)

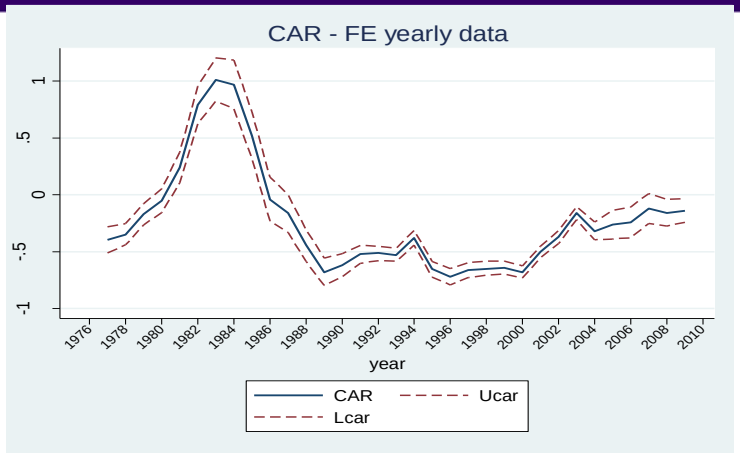


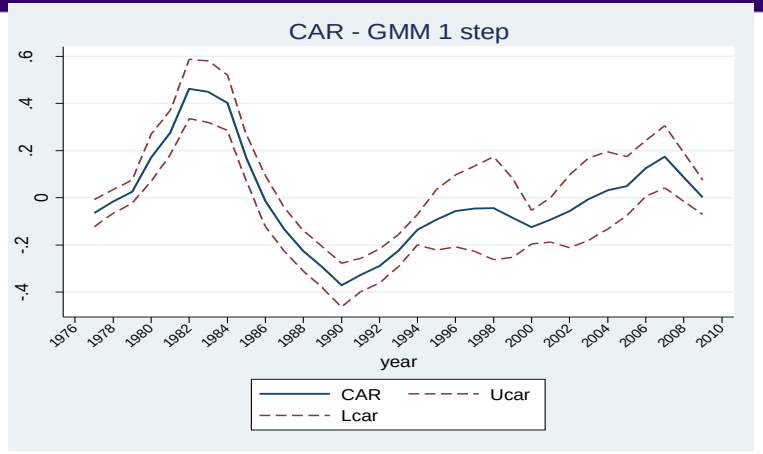
1. Reproducing Berger (1995) FE & GMM

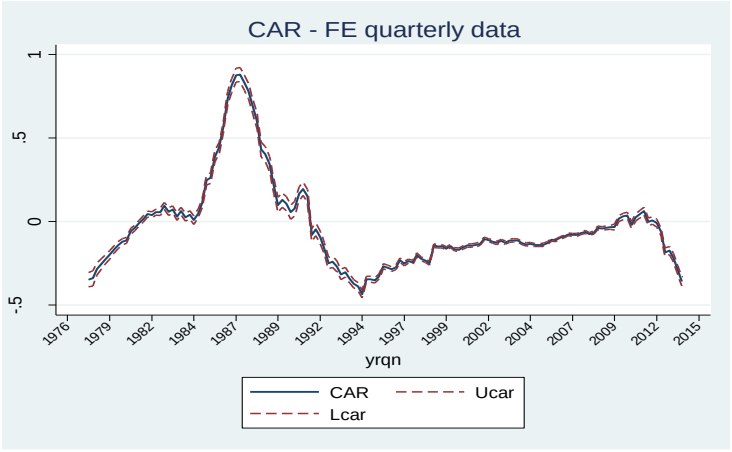
Around 15,000 banks in 1977, dropping to about 6,700 in 2013.
Failed banks and banks under special analysis are removed from the sample.

Model estimated as FE and GMM on 33 5-year rolling windows with yearly data (NT =412,640) and as FE on 143 5-year rolling windows with quarterly data (NT = 1.648,170).

$$ROE_{it} = \alpha_0 + \alpha_i + \alpha_t + \sum_{j=1}^{3} \beta_{1j} k_{i,t-j} + \sum_{j=1}^{3} \beta_{2j} ROE_{i,t-j}$$
$$+ \beta' \boldsymbol{X_{i,t-1}} + \gamma' \boldsymbol{size_{it}} + \varepsilon_{it}$$


CAR - FE yearly data
-1
-.5
0
.5
1
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
year
CAR
Ucar
Lcar


CAR - GMM 1 step
-.4
-.2
0
.2
.4
.6
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
year
CAR
Ucar
Lcar


CAR - FE quarterly data
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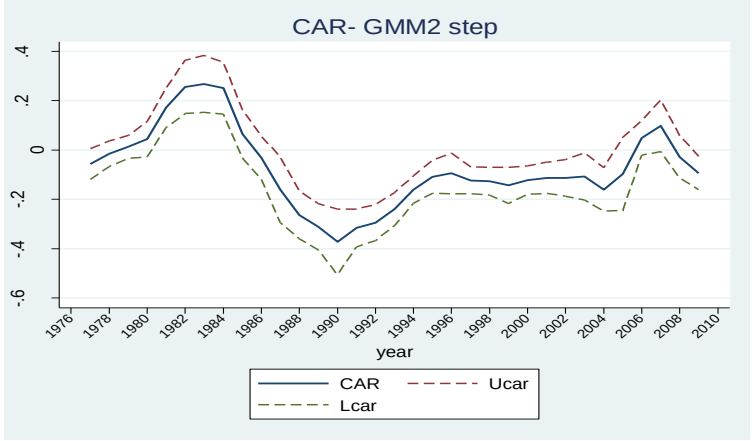
0
.5
1
1976
1979
1982
1984
1987
1989
1992
1994
1997
1999
2002
2004
2007
2009
2012
2015
yrqn
CAR
Ucar
Lcar


CAR- GMM2 step
-.6
-.4
-.2
0
.2
.4
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
year
CAR
Ucar
Lcar

2. Exploring role of capital targets

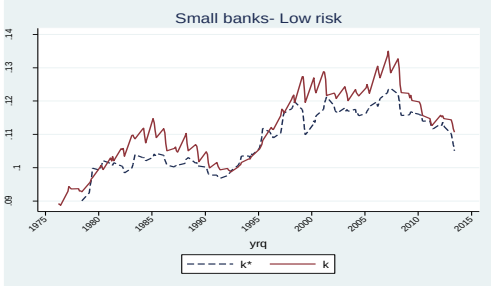
Stage 1 – Estimate long run capital ratios – PA model

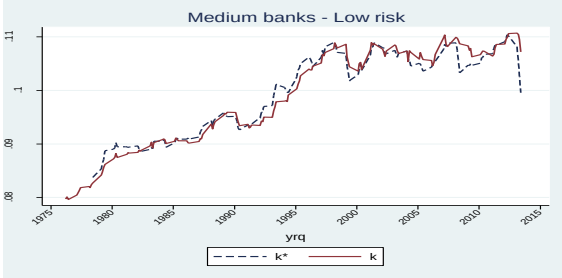
$$k_{it} = a_1 + a_2 k_{i,t-1} + \boldsymbol{b'_{\kappa\tau} X_{i,t}} + \varepsilon_{it}$$

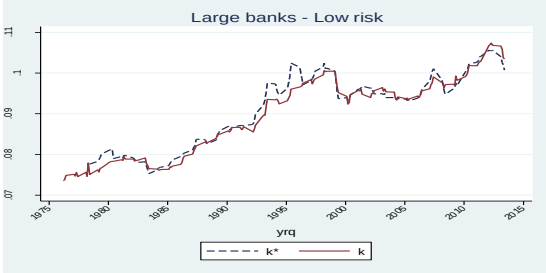
for nine groups of banks, by size and risk

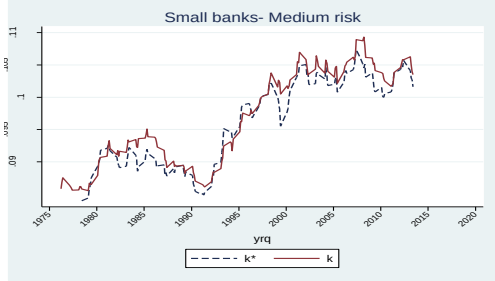
Stage 2 – include target and deviations (+ve, -ve) in RoA

$$ROA_{it} = \alpha + \theta_t + \upsilon_i + \sum_{j=1}^{4} \delta_{t-j} ROA_{t-j} + \sum_{j=1}^{4} \pi_j^1 \, k_{it}^* + \sum_{j=1}^{J} \pi_j^2 \, k_{i,t-j}^{Deficit} + \sum_{j=1}^{J} \pi_j^3 \, k_{i,t-j}^{Surplus} + \beta' Z_{it} + e_{it}$$

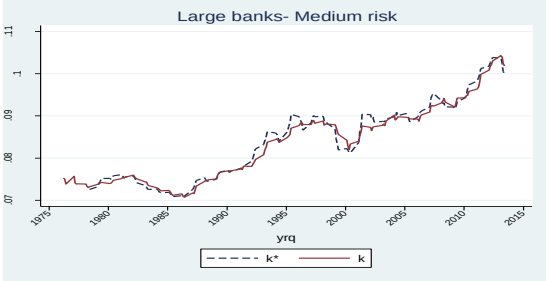

Small banks- Low risk
yrq
k*
k

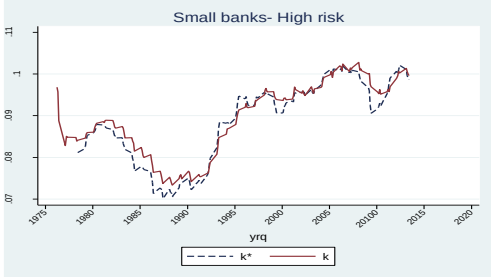

Medium banks - Low risk
yrq
k*
k

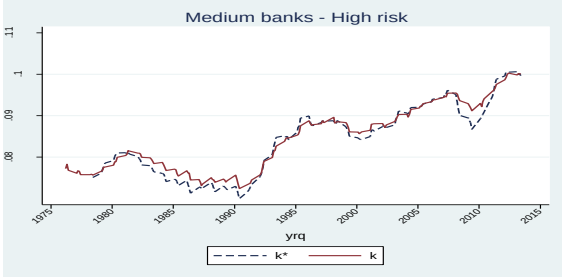

Large banks - Low risk
yrq
k*
k


Small banks- Medium risk
yrq
k*
k


Medium banks - Medium risk
yrq
k*
k


Large banks- Medium risk
yrq
k*
k


Small banks- High risk
yrq
k*
k


Medium banks - High risk
yrq
k*
k

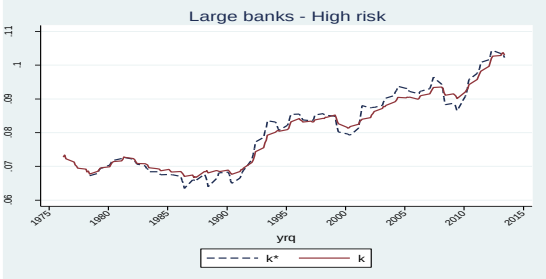

Large banks - High risk
yrq
k*
k

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Table 6: estimated coefficients from ROA Equation: small banks (p values in parenthesis, sig. in green)

	Low risk				Medium risk				High risk			
	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013
ROA_{lags}	0.701 (0.000)	0.817 (0.000)	0.980 (0.000)	0.889 (0.000)	0.682 (0.000)	0.051 (0.000)	0.805 (0.000)	0.788 (0.000)	0.617 (0.000)	0.678 (0.000)	0.730 (0.000)	0.737 (0.000)
TGT	0.024 (0.000)	-0.015 (0.604)	-0.006 (0.628)	0.003 (0.789)	0.033 (0.000)	0.050 (0.745)	0.004 (0.234)	0.007 (0.491)	0.157 (0.000)	0.036 (0.003)	0.007 (0.266)	0.051 (0.000)
Cardef	-0.047 (0.000)	0.008 (0.854)	-0.010 (0.462)	-0.033 (0.116)	-0.037 (0.006)	-0.057 (0.773)	-0.007 (0.334)	-0.031 (0.096)	0.081 (0.001)	-0.049 (0.021)	-0.012 (0.565)	-0.032 (0.226)
Carsurp	0.000 (0.950)	-0.075 (0.322)	-0.044 (0.045)	-0.024 (0.167)	-0.005 (0.683)	-0.123 (0.364)	-0.020 (0.010)	-0.043 (0.002)	-0.146 (0.000)	-0.145 (0.000)	-0.091 (0.000)	-0.089 (0.000)
N	29335	29897	19845	19162	27883	23345	16361	13492	30907	20863	14054	9550
R2 (overall)	0.904	0.887	0.966	0.965	0.853	0.562	0.952	0.943	0.788	0.855	0.919	0.909

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Table 7: estimated coefficients from ROA Equation: medium banks (p values in parenthesis, 1% sig in green)

	Low risk				Medium risk				High risk			
	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013
ROA_{lags}	0.700 (0.000)	0.787 (0.000)	0.450 (0.000)	0.811 (0.000)	0.710 (0.000)	0.790 (0.000)	0.826 (0.000)	0.767 (0.000)	0.652 (0.000)	0.738 (0.000)	0.807 (0.000)	0.735 (0.000)
TGT	0.025 (0.000)	0.016 (0.108)	0.025 (0.122)	0.025 (0.058)	0.021 (0.000)	0.002 (0.691)	0.004 (0.191)	0.008 (0.068)	0.140 (0.000)	0.047 (0.000)	0.001 (0.732)	0.052 (0.001)
Cardef	-0.0.25 (0.052)	-0.016 (0.005)	-0.010 (0.682)	-0.016 (0.112)	-0.060 (0.000)	-0.012 (0.190)	0.008 (0.389)	-0.015 (0.188)	0.034 (0.177)	-0.053 (0.008)	-0.18 (0.113)	-0.051 (0.023)
Carsurp	-0.020 (0.015)	-0.016 (0.012)	-0.009 (0.626)	-0.005 (0.565)	-0.027 (0.001)	-0.027 (0.000)	-0.019 (0.001)	-0.037 (0.003)	-0.108 (0.000)	-0.057 (0.000)	-0.029 (0.000)	-0.070 (0.000)
N	30978	26104	16002	12563	32482	25466	17828	15114	32839	23654	18260	14593
R2 (overall)	0.922	0.950	0.695	0.916	0.909	0.940	0.973	0.935	0.817	0.916	0.947	0.929

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Table 8: estimated coefficients from ROA Equation: large banks (p values in parenthesis, 1% sig in green)

	Low risk				Medium risk				High risk			
	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013	1981-1985	1991-1995	2001-2005	2009-2013
ROA_{lags}	0.699 (0.000)	0.764 (0.000)	0.863 (0.000)	0.834 (0.000)	0.747 (0.000)	0.690 (0.000)	0.760 (0.000)	0.735 (0.000)	0.770 (0.000)	0.799 (0.000)	0.839 (0.000)	0.740 (0.000)
TGT	0.012 (0.026)	-0.008 (0.346)	-0.002 (0.760)	-0.007 (0.659)	0.016 (0.000)	-0.017 (0.092)	0.004 (0.033)	0.017 (0.001)	0.083 (0.000)	0.027 (0.000)	0.024 (0.065)	0.081 (0.000)
Cardef	-0.036 (0.001)	-0.027 (0.008)	-0.036 (0.085)	-0.025 (0.211)	-0.038 (0.000)	-0.025 (0.014)	0.005 (0.408)	0.006 (0.650)	0.022 (0.310)	-0.003 (0.820)	-0.010 (0.421)	0.017 (0.304)
Carsurp	0.007 (0.421)	-0.008 (0.579)	-0.008 (0.604)	-0.012 (0.399)	-0.021 (0.003)	-0.032 (0.003)	-0.020 (0.001)	-0.045 (0.016)	-0.150 (0.000)	-0.044 (0.000)	-0.025 (0.026)	-0.101 (0.000)
N	26904	17196	15709	8987	36312	27196	18512	14422	32469	31564	20538	19765
R2 (overall)	0.949	0.897	0.917	0.958	0.937	0.878	0.959	0.917	0.841	0.922	0.953	0.910

Summary and tentative conclusions

Thank you!