The incentive to use private health care

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1. Introduction

Approximately 11% of the British population are covered by private health insurance. Although this figure represents a fall of 2-3 percentage points over the past four years, it indicates considerable growth from the position twenty-five years ago, when 4.2% of the population held private health insurance. Gradual changes in NHS coverage and charges, along with favourable tax treatment under the previous Conservative administration have contributed to this growth. Additionally, the 1980s saw relaxed controls on the development of private hospitals, NHS doctors being allowed to work in both sectors, and district health authorities were allowed to contract with private suppliers. (Laing and Buisson, 1998; Calnan et al., 1993).

Despite these major changes, it is interesting that we still know very little about the use of private health insurance in the UK. Propper (1993) and Besley, Hall and Preston (1996, 1998) have done interesting work on the propensity to purchase such insurance and Laing and Buisson produce annual, and detailed, reports on the market, yet perhaps only Calnan et al's (1993) small interview study has considered the use made of such policies. This position contrasts with the study of health insurance in other countries, such as the US and Australia, where private insurance is somewhat more widely held. Thus, for example, the RAND study (Newhouse et al., 1993) presents a detailed analysis of purchase and utilisation of health insurance in the US. While Cameron et al. (1988) and Cameron and Trevidi (1991) consider the extent to which holding supplementary health insurance in Australia increases the propensity to use health care services. Holly et al. (1998) perform similar analysis for Switzerland.

The purpose of this paper is to provide the first analysis of health service utilisation by people with, and without, private health insurance in the UK, where health care is more heavily tax-funded than in systems previously studied, and where NHS care is available to all. Having analysed use, our study then goes further than others UK analyses in two respects. First, we consider whether having private insurance makes a patient more likely to pay for health care, as opposed to using the NHS; and second, we ask whether there are differences depending on who pays for the insurance (employer or policy holder). These questions are interesting for the following reasons. First, as we have seen, the 1980s saw increased "substitutability" between NHS and private care, yet an important reason for encouraging private health care may have been perceived as one of "reducing pressure" on the NHS. That private clients' use of the NHS should cause dispute was recently confirmed with Norwich Union offering policy holders cash sums if they choose to use the NHS. The interaction between public and private sector health care has recently been studied in the US by Cutler and Gruber (1996): they find evidence that the availability of Medicare reduces ("crowds out") use of private services. It is interesting to examine whether this happens in the UK, where the NHS is much more extensive than Medicare. Turning to our second innovation, it is possible that different exposure to the cost of one's policy may influence use. In particular, perhaps those who pay directly are more concerned about premium uprates following extensive use. In contrast, perhaps direct purchasers are more aware of their insured status and, therefore, make more use of their schemes.

For the first time, our analysis of differently funded policies throws light on this in the UK context.

We are able to consider such issues by using the British Household Panel Survey (BHPS). The BHPS makes it possible to examine these questions for the first time because it contains data on the presence of health insurance contracts, how they were funded, whether NHS health care was used; and a two-wave panel allowing problems of endogeneity to be addressed.

The paper is structured as follows: the data and methodology are introduced in the following section, results are given in the next section and the paper ends with a short discussion.

2. Methods and Data

The data used in the paper are drawn, primarily, from the 7th wave of the BHPS. Some data, relating to health checks and health problems, were drawn from the 6th wave. These are appropriate for the current study because each contains questions about individual possession of private health insurance policies. The survey was designed as an annual survey of each adult member of a nationally representative sample of more than 5,000 households, giving a total of over 10,000 individuals. The survey attempts to maintain data on a re-sampling basis and has a core of 6,420 individuals.

The data we use contain 5,842 individuals (because we rely on the panel element for instrumentation), 2,769 are male and 3,073 are female. Age ranges from 18 to 96 with a mean of 46. Average income is £11,657 and ranges from £0 to £245,298. 12.6 per cent of the sample have private health care insurance held in their own name. The financing of this insurance is either "direct", i.e. paid for by the individuals themselves (7 per cent of the total sample), or paid for by their employer (6.4 per cent). Table 1 gives the characteristics of those with either type of insurance.

The paper is concerned with the use of health services by insureds and non-insureds, and with the use of private and NHS-funded care by each type (as well as by type of insurance: paid "direct" or "employer" paid). The utilisation variables recorded by the BHPS include routine check-ups, diagnostic tests, inpatient stays and out-patient visits. We confine attention to in-patient, out-patient, and consultant visits, and an amalgam of seven forms of health check-up. Sample sizes were too small to consider some individual check-ups and NHS supply of eye and dental checks is limited. Tables 2 and 3 give an indication of the proportion of individuals in the sample who utilised the various forms of health care as recorded by the sample and by whether or not they hold insurance. Table 3 also distinguishes between the use of private and NHS-funded care. Table 4 provides information on the proportion of individuals using different forms of available health care characterised by the manner in which their private health care was financed.

Utilisation of health care services and whether such utilisation is in the public or private sector is considered in a model in which individuals have private health care insurance. We are interested in whether the manner of private health care insurance purchase, with more or less direct financial cost to the purchaser, influences the utilisation

decision. The propensity to hold private health insurance is considered to be endogenous. While the problems this creates could be tackled using a simultaneous equation system, we have, following Cameron et al. (1988), used a two-stage model with logistic equations. There are a number of reasons for adopting this approach. First problems of multicollinearity were encountered in the simultaneous equation approach which appear to be due to the variables picking up influence from the form of insurance payment. This problem was overcome in the two-stage modelling as these variables were instrumented. Second the two-stage model requires weaker stochastic assumptions than the simultaneous model, which is important given that both our dependent variables are dichotomous. While the joint distribution could be specified as, for example, a bivariate probit, it is likely that a logit error distribution is more logical given the skew in utilisation. Finally it is not clear that the simultaneous model has greater efficiency properties than the two-stage approach.

The model was therefore estimated in the following form:

$$y_i = \beta_i X_i + u_i$$

where y_i was a dichotomous variable measuring whether or not health care utilisation took place, and the X_i are the independent regressor vectors. If utilisation were positive, this was then related to public or private sector utilisation as a second stage as follows:

$$\gamma_i = \beta_i X_i + u_i$$

where γi is a dichotomous variable measuring public or privates health care utilisation, and the X_i again relate to the independent regressor vectors. Both models were estimated as logistic functions and the parameter vectors were estimated through maximisation of the log-likelihood function.

In both stages the independent regressors included measures of how private insurance was purchased: either as an employer payment or as a direct purchase. As private health insurance is considered an endogenous variable instruments were used. Thus a third instrumental variable equation was also estimated.

The independent variables in the various equations are as follows. For the instrumental variables equation, i.e. for both direct and employer payment of health care insurance, the independent variables were: age, age squared, income, income squared, educational attainment, employment status, satisfaction with health, marital status, sex, whether a smoker or not, SIC division of employment, voting intent, whether health problems and health checks were recorded in wave 6 of the BHPS, firm size, managerial status, size of waiting list in locality, and a lag of the form of insurance payment.

For the utilisation of health care equation the independent variables were age, age squared, income, income squared, satisfaction with health, SIC division of employment, size of waiting list in locality, sex, instrumented variable for direct health insurance payment, instrumented variable for employer paid health insurance.

For the utilisation of private or NHS health care the independent variables were exactly the same as for the utilisation equation.

3. Results

These equations were estimated using the data source described above. The results are given in the following Tables. Tables 5 and 6 report the instrumental variable results. Tables 7 and 8 report the utilisation and sector utilisation results. In the latter Tables three or four sets of results are recorded relating to the dependent variables used: in-patient stay utilisation, out-patient/consultant visit and health care check-up. For the utilisation results a fourth set of equations relating to doctor visits is also reported. The accompanying private/public sector utilisation was not undertaken for doctor visits as this variable generally relates to GP visits in the UK which are predominately in the NHS with private GP visits returning an extremely small sample.

Also reported, were applicable, are McFaddens psuedo R^2, Davidson and MacKinnon (1984) misspecification tests for heteroscedasticity and omitted variables, and, for the instrumental variables, the Hausman test for exogeniety. Generally all equations are well behaved as defined by this range of diagnostics.

The instrumental variables computed for the private health care insurance payment variables were amended as the estimated equations calculate a range of probabilities which determine whether or not an individual in the sample was likely to have either direct or employer-paid insurance. To create a dichotomous variable from the continuous range of predicted probabilities a cut-off value was chosen. The most obvious cut-off is 0.5 and this was used in the present case, although a number of other cut-off values were assessed with no improvement in performance. These dichotomous variables, one for the direct health insurance payment and one for employer paid insurance, were then entered into the utilisation equations.

In terms of the results themselves most of the variables used to instrument the direct purchase of health insurance were significant and of a priori expected sign. The SIC division of employment and the educational attainment variables did not add to explanatory power. In predicting those who had employer-paid insurance the firm specific variables were significant. Those who were employed by larger firms were more likely to have employer-paid insurance.

Turning to the utilisation equations, we begin with the non-sector specific health care utilisation results reported in Table 7. As noted above four sets of results are reported covering utilisation of in-patient, out-patient, “any check-up” and GP facilities with each equation determining the likelihood of an individuals using any of these three services. Generally the variables are of correct a priori sign. Age and income are significant and exhibit a quadratic relationship with the dependent variable. Females appear more likely to use health services than males. Individuals who recorded higher satisfaction with their health in the survey used less health care. Waiting lists are only

significant in the out-patient utilisation equation, although note that the dependent variable in these equations relate to any service use. The insurance variables are generally insignificant apart from the employer paid for insurance variable in the check-up equation. It is worth noting that the private health insurance variables were all reported to be endogenous by the Hauseman test: the endogeneity problem does not appear to have been solved.

In the sector utilisation equations (Table 8), a dependent variable value of 1 indicates use of the NHS and zero indicates use of the private sector. The results here are less uniform than in Table 7. Age and age squared are insignificant, as are income and income squared. Those who are satisfied with their health are less likely to use the NHS for any check-up or in-patient utilisation. Females are more likely to use the private sector.

Of greater interest the insurance variables are generally significant. The odds ratios indicate that, given use of health services per se, those with private health care insurance are less likely to use the NHS than those without. The odds ratios range from 0.06 for individuals with direct payment of insurance in the in-patient equation to 0.77 for individuals with employer paid insurance in the out-patient/consultant equation. It is noticeable that in each equation, those individuals with employer paid insurance have a higher odds ratio compared to individuals without insurance, than those individuals with directly paid insurance. Thus although direct comparison cannot be made it is implied that, while individuals who hold private health insurance are less likely to use the NHS generally, those who pay directly for their insurance have a greater propensity to use private health care services than those who have employer funded insurance. Note that the insurance funding variables fail the Hauseman test in the check-up utilisation equation.

4.Discussion

This study presents a two-stage model of utilisation of health care and relates this to the manner in which private health care insurance is funded. In genral, our results suggest that possession of private health insurance does not influence the use of health services, but that it makes the use of private service considerably more likely. The first of these results differs from studies of other health care systems where insureds appear to make greater use of health care. It is possible that the UK's universal provision via the NHS "equalises" access relative to the insurance-based systems studies elsewhere.

Our second interesting result is that those who paid for private health care insurance directly made more use of private health care than the NHS. Referring back to the Introduction, this suggests that those with directly paid schemes are more aware of their opportunities, or more determined to use them, as opposed to being deterred by the prospect of uprating as a result of heavy use. An interesting alternative interpretation would be that our result indicates a degree of adverse selection: at the margin, those who buy their own policies do not qualify for employer-paid ones because they represent higher risks of use. Unfortunately, at present, we can only speculate on this possibility. Indeed, in general, it is inevitable that the preliminary stage of our work leads it to raise more questions than it answers. Hopefully,

however, it indicates the potential for two-stage econometric modelling, using the BHPS, to illuminate several important (under-researched) issues in UK health policy.

Table 1 Characteristics by form of PHI payment

Category	% with PHI	% direct	% employer paid
Higher education	18.9	10.1	10.7
A-Levels	13.9	6.6	8.3
O-Levels	14.1	8.6	6.5
Other Qualifications	6.9	4.3	2.9
No qualifications	5.2	3.7	1.7
Self employed	21.3	19.4	2.8*
Employed	16.0	6.2	11.1
Unemployed	4.4	3.4	1.1*
Retired	9.2	8.5	0.9
Not in work	2.6	2.3	0.3
Dissatisfied with health	9.6	6.4	3.6
Indifferent to health state	10.9	6.5	5.0
Satisfied with health	13.7	7.3	7.4
Married	14.5	7.7	7.9
Single	8.7	5.7	3.5
Male	17.7	9.5	10.0
Female	8.0	4.9	3.3
Smoker	8.9	5.0	4.2
Non-smoker	14.1	7.8	7.3
Conservative	20.4	13.2	9.5
Labour	9.2	4.4	5.2
Liberal Democrats	13.7	7.7	6.9
Other party	8.2	4.1	4.5

* slightly peculiar results but nevertheless given by the BHPS.

Table 2: Proportion of those having a range of checks, split into those with and without insurance.

Check up under taken	Has not got insurance %	Has got insurance %
Dental	57.2*	72.1*
Eye Test	35.1*	42.4*
Chest or other x-ray	12.2	10.9
Blood Pressure	43.2	43.8
Cholesterol Test	9.7*	12.4*
Other Checks	3.8*	6.4*
Cervical Smear[w]	25.1	30.6
Breast Screen[w]	9.8	12.2
Blood Test	29.5	27.0
Consultant	26.6	24.6
Hospital inpatient	10.3	8.7
Visits to GP	75.9	72.1

[w] women only; * significant difference between the two columns at the 5% level.

Table 3 Sector use by those with and without PHI

Check up under taken	No insurance; used private %	Has insurance; used NHS %
Dental	21.7	60.0
Eye Test	30.3	42.5
Chest or other x-ray	3.8	67.1
Blood Pressure	3.8	75.7
Cholesterol Test	8.8	64.0
Other Checks	11.4	39.1
Cervical Smear[w]	0.3	94.5
Breast Screen[w]	0.7	89.7
Blood Test	2.6	72.3
Consultant	2.5	63.1
Hospital inpatient	1.8	63.3

[w]Women only

Table 4 Proportions of those with either type of insurance using the NHS.

Check up under taken	Has “direct”; used NHS %	Has “employ”; used NHS %
Dental	59.1	61.0
Eye Test	46.6	37.9
Chest or other x-ray	71.1	61.8
Blood Pressure	81.4	69.0
Cholesterol Test	77.1	47.4
Other Checks	56.0	19.0
Cervical Smear[w]	96.8	92.9
Breast Screen[w]	100.0	62.5
Blood Test	78.3	63.8
Consultant	68.0	56.6
Hospital inpatient	59.0	71.4

[w]Women only

Table 5 - The Direct IV equation, $\underline{e^{b_j}}$ reported.

Number of Observations	5492
Chi2 (35)	844.08 (0.000)
Pseudo R^2	0.4574
log likelihood	-758.0620
Heteroscedasticity Test	1.70 (0.4264)
Misspecification Test	19.26 (0.5047)

Variable	$\underline{e^{b_j}}$	Robust S.E	Significance.
Age	1.0625	0.0319	0.044
Age squared	0.9993	0.0003	0.017
Income[1]	1.0000	0.0000	0.000
Income squared[2]	1.0000	4.35e-10	0.015
Female	0.9074	0.1546	0.568
Single	1.1206	0.2016	0.527
Indifferent	1.1558	0.2917	0.566
Satisfied	1.0659	0.2042	0.739
Health problems wave 6	0.9794	0.1664	0.903
Checks in wave 6	1.7090	0.4390	0.037
Waiting Lists	1.1100	0.0675	0.086
Labour	0.4151	0.7300	0.000
Liberal	0.7789	0.1810	0.282
Other Party	0.4859	0.1357	0.010
Non-smoker	1.0860	0.2031	0.659
A-Levels	0.9425	0.2556	0.827
O-Levels	1.3342	0.2760	0.163
Other qualifications	0.6628	0.2118	0.198
None	0.7924	0.1922	0.337
Employed	0.3686	0.0855	0.000
Unemployed	0.2493	0.1796	0.054
Retired	0.4377	0.2610	0.166
Not in work	0.1739	0.1047	0.004
SIC division 1	0.2050	0.2110	0.124
SIC division 2	0.3353	0.4097	0.371
SIC division 3	0.6676	0.5009	0.590
SIC division 4	0.8093	0.4917	0.728
SIC division 5	0.8258	0.4885	0.746
SIC division 6	0.4360	0.2953	0.220
SIC division 7	0.4509	0.2612	0.169
SIC division 8	0.4803	0.3177	0.270
SIC division 9	0.6506	0.3607	0.438
SIC division 10	0.5191	0.2922	0.244

[1] The coefficients reported for Income and Income squared do differ but not by more than 4 decimal places.

Direct lag	77.1148	12.6695	0.000

Table 6 - the Employer-paid IV equation, $\underline{e^{b_j}}$ reported.

Number of Observations	2891
Chi2 (35)	473.10 (0.000)
Pseudo R^2	0.5943
log likelihood	-411.4909
Heteroscedasticity Test	2.03 (0.3616)
Misspecification Test	3.58 (0.8271)

Variable	$\underline{e^{b_j}}$	Robust S.E	Significance.
Age	1.0512	0.0585	0.370
Age squared	0.9993	0.0007	0.280
Income[2]	1.0000	0.0000	0.000
Income squared[2]	1.0000	5.09e-11	0.000
Indifferent	1.0692	0.4585	0.876
Satisfied	0.9374	0.3201	0.850
Health problems wave 6	0.7051	0.1518	0.105
Checks in wave 6	0.9911	0.2994	0.976
Waiting Lists	0.9239	0.0765	0.339
Non-smoker	1.2579	0.2900	0.320
Firm Size 51-99	2.4587	0.8266	0.007
Firm Size 100-199	2.8608	0.9310	0.001
Firm Size 200-499	3.6473	1.0477	0.000
Firm Size 500-999	1.3173	0.5314	0.495
Firm Size 1000+	1.9240	0.6905	0.068
Supervisor/Foreman	0.5383	0.1705	0.051
No managerial duties	0.3642	0.0901	0.000
SIC division 2	0.5664	0.3798	0.397
SIC division 3	2.7544	1.6154	0.084
SIC division 4	1.3119	0.7250	0.623
SIC division 5	0.5248	0.3139	0.281
SIC division 6	0.8061	0.5217	0.739
SIC division 7	0.8330	0.4421	0.731
SIC division 8	0.7187	0.4433	0.592
SIC division 9	1.8142	0.9298	0.245
SIC division 10	0.1964	0.1058	0.003
Employ lag	138.8003	39.1923	0.000

Table 7 Health utilisation regression results using IV estimates, e^{b_j} reported.

	Hospital	Consultant	Any checks	Visits to Doctor
Age	0.9516*	1.0286*	1.0151	0.9609*
	0.0125	*0.0103*	*0.0983*	*0.0112*
Age squared	1.0004*	0.9998*	0.9999	1.0004*
	0.0001	*0.0001*	*0.0001*	*0.0001*
Income^2	1.0000*	1.0001*	1.0001*	1.0000*
	7.35e-06	*8.21e-06*	*5.24e-06*	*4.96-e06*
Income squared^2	1	1**	1	1.0000*
	6.00e-11	*1.46e-10*	*5.28e-11*	*3.17e-11*
Indifferent to health status	0.5721*	0.5993*	0.6225*	0.5221*
	0.0775	*0.0598*	*0.0669*	*0.0805*
Satisfied with health status	0.3337*	0.3164*	0.4196*	0.2246*
	0.0345	*0.0243*	*0.0352*	*0.0278*
Waiting Lists	0.9935	1.0589*	1.0506	1.0487*
	0.0377	*0.0281*	*0.0243*	*0.0276*
Female	1.3947*	1.2619*	2.5548*	2.1168*
	0.1382	*0.0884*	*0.1604*	*0.1512*
SIC division 1	0.7085	0.5623**	0.5260*	0.5437*
	0.3054	*0.1841*	*0.1387*	*0.1391*
SIC division 2	0.4581	0.9385	0.9442	1.0987
	0.2817	*0.3532*	*0.3138*	*0.4147*
SIC division 3	0.6829	0.6992	1.0699	0.7175
	0.2542	*0.1823*	*0.2328*	*0.1687*
SIC division 4	0.2879*	0.7791	0.6386*	0.7669**
	0.0931	*0.1291*	*0.0939*	*0.1199*
SIC division 5	0.3995*	0.8381	0.6183*	0.6443*
	0.1067	*0.1329*	*0.0839*	*0.0988*
SIC division 6	0.4210*	0.7713	0.6296*	0.7123**
	0.1463	*0.1522*	*0.1049*	*0.1291*
SIC division 7	0.4947*	0.7327*	0.5924*	0.6579*
	0.0878	*0.0844*	*0.0589*	*0.0749*
SIC division 8	0.4169*	0.7315**	0.8847	0.7174**
	0.1293	*0.1364*	*0.1361*	*0.1254*
SIC division 9	0.4147*	0.5397*	0.6607*	0.5779*
	0.0962	*0.0811*	*0.0796*	*0.0779*
SIC division 10	0.5172*	0.6974*	0.7325*	0.6969*
	0.0772	*0.0755*	*0.0704*	*0.0767*
Employ	0.6885	0.8326	1.3102**	0.9219
	0.2324	*0.1469*	*0.1885*	*0.1389*
Direct	1.3199	0.9712	1.0980	1.2582
	0.2477	*0.1317*	*0.1355*	*0.1855*
Number of Observations	5842	5841	5842	5482
Chi2 (21)	253.97 (0.00)	380.29 (0.00)	503.81 (0.00)	385.14(0.00)
Pseudo R^2	0.0665	0.0598	0.0746	0.0781
Log-likelihood	-1786.7455	-3166.0051	-3676.849	-3005.567
Heteroscedasticity Test	4.18 (0.1237)	0.78 (0.6775)	25.91 (0.00)	5.56 (0.0622)
Misspecification Test	5.51 (0.1378)	1.04 (0.5949)	5.16 (0.0757)	3.03 (0.2194)
Hausman Test	5.57 (0.0618)	2.40 (0.3011)	9.16 (0.0103)	2.11 (0.3479)

* significant a 5%; ** significant at 10%, robust s.e in italics

Table 8 Sector use equations using the IV estimators, e^{b_j} reported.

	Hospital	Consultant	Any checks
Age	0.9209	1.0198	1.0140
	0.1040	*0.0424*	*0.0320*
Age squared[2]	1.0004	0.9997	1.0000
	0.0010	*0.0003*	*0.0003*
Income[2]	0.9999*	0.9999*	0.9999*
	0.0000	*0.0000*	*0.0001*
Income squared[2]	1.0000*	1.0000*	1.0000
	3.70e-10	*2.54e-10*	*7.34e-11*
Indifferent to health status	1.0147	1.5136	0.5346**
	0.7729	*0.6095*	*0.1839*
Satisfied with health status	0.4024**	1.0284	0.4424*
	0.1990	*0.2626*	*0.1169*
Waiting Lists	0.6359	0.7935**	0.9236
	0.1923	*0.0940*	*0.0654*
Female	1.4184	0.6463**	4.343*
	0.7637	*0.1695*	*0.9031*
SIC division 1	-	-	-
	-	-	-
SIC division 2	-	0.7887	0.2306*
	-	*0.8988*	*0.1198*
SIC division 3	-	0.5817	0.2971*
	-	*0.4117*	*0.1303*
SIC division 4	-	1.2958	0.8314
	-	*0.8145*	*0.3275*
SIC division 5	-	0.5334	0.5036**
	-	*0.2626*	*0.1895*
SIC division 6	-	1.6859	0.8455
	-	*1.1873*	*0.3997*
SIC division 7	-	1.2223	0.7759
	-	*0.6789*	*0.2806*
SIC division 8	-	1.4714	0.3977*
	-	*0.9972*	*0.1464*
SIC division 9	-	0.8746	0.6833
	-	*0.4672*	*0.2331*
SIC division 10	-	1.1667	0.7802
	-	*0.4919*	*0.2442*
Employ	0.2352	0.7761*	0.5958**
	0.2543	*0.0309*	*0.1726*
Direct	0.0696*	0.1039*	0.3672*
	0.0332	*0.0298*	*0.1004*
Number of Observations	551	1514	3333
Chi2 (21)	53.47 (0.00)	147.06 (0.00)	226.50 (0.00)
Pseudo R^2	0.3503	0.2187	0.2308
log likelihood	-77.5188	-287.7879	-575.5501
Heteroscedasticity Test	8.96 (0.0114)	5.16 (0.0605)	1.05 (0.5926)
Misspecification Test	4.71 (0.1940)	10.20 (0.6779)	6.60 (0.0858)
Hausman Test	3.60 (0.1653)	5.68 (0.0584)	8.77 (0.0125)

* significant a 5%; ** significant at 10%, robust s.e in italics.

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