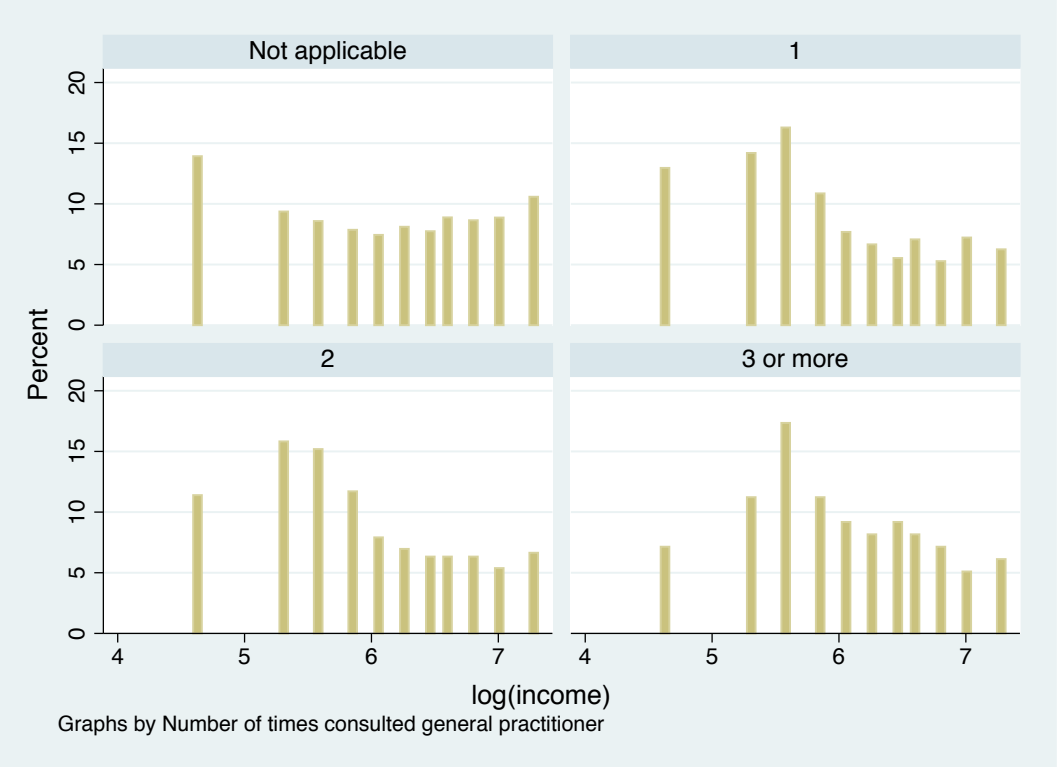
Exercise 2
ETC4420 Microeconometrics

Task A

Figure 1 Histogram investigating the relationship between 'logincome' with 'GP visits'



Question 1

Table 1 Linear regression model

Linear regression model

GP visits	Coefficients	Standard Deviation	T-stats	P-value	95% CI	
age3039	-0.001	(0.018)	-0.029	0.977	-0.036	0.035
age4049	-0.003	(0.018)	-0.161	0.872	-0.039	0.033
age5059	0.014	(0.019)	0.747	0.455	-0.023	0.052
age6069	0.095***	(0.021)	4.595	0.000	0.055	0.136
age70up	0.194***	(0.021)	9.461	0.000	0.154	0.235
male	-0.084***	(0.011)	-7.510	0.000	-0.105	-0.062
logincome	0.003	(0.007)	0.441	0.659	-0.011	0.017
mcity	0.027**	(0.011)	2.324	0.020	0.004	0.049
poor	0.459***	(0.028)	16.562	0.000	0.405	0.513
fair	0.297***	(0.020)	14.617	0.000	0.257	0.337
good	0.094***	(0.016)	5.714	0.000	0.062	0.127
verygood	0.023	(0.016)	1.483	0.138	-0.007	0.054
Constant	0.152***	(0.047)	3.247	0.001	0.060	0.244

Table 2 Poisson Regression model

Poisson regression	Number of obs=10,000
	LR Chi2=785.60
	Prob>Chi2=0.00
log likelihood=-6464.3469	Pseudo R2=0.0573

GP visits	Coef.	Std. Err.	z	P>|z|	ME	Std. Err.	z
age3039	0.011	(0.071)	0.150	0.881	0.003	0.020	0.150
age4049	0.008	(0.071)	0.107	0.915	0.002	0.020	0.107
age5059	0.090	(0.072)	1.246	0.213	0.026	0.021	1.246
age6069	0.344***	(0.072)	4.790	0.000	0.099***	0.021	4.790
age70up	0.544***	(0.068)	8.028	0.000	0.157***	0.020	8.028
male	-0.297***	(0.039)	-7.657	0.000	-0.086***	0.011	-7.657
logincome	0.003	(0.025)	0.128	0.898	0.001	0.007	0.128
mcity	0.088**	(0.039)	2.268	0.023	0.025**	0.011	2.268
poor	1.199***	(0.079)	15.207	0.000	0.345***	0.024	15.21
fair	0.941***	(0.069)	13.579	0.000	0.271***	0.021	13.58
good	0.434***	(0.066)	6.588	0.000	0.125***	0.019	6.588
verygood	0.135**	(0.066)	2.023	0.043	0.039**	0.019	2.023
Constant	-1.801***	(0.173)	-10.405	0.000			

*** p<0.01, ** p<0.05, * p<0.1

Table 3 Negative binomial model

Negative binomial regression			Number of obs=10,000				
			LR chi2(12)=718.40				
Dispersion=mean			Prob>chi2=0.0000				
Log likelihood=-6459.9093			Pseudo R2=0.0527				
gpvisit	Coef.	Std. Err.	z	P>|z|	ME	Std. Err.	Z
age3039	0.010	0.072	0.14	0.889	0.003	0.021	0.14
age4049	0.006	0.072	0.08	0.936	0.002	0.021	0.08
age5059	0.089	0.073	1.21	0.225	0.026	0.021	1.21
age6069	0.344	0.073	4.7	0	0.099	0.021	4.68
age70up	0.548	0.069	7.91	0	0.158	0.020	7.81
male	-0.300	0.040	-7.56	0	-0.086	0.012	-7.47
logincome	0.003	0.026	0.12	0.904	0.001	0.007	0.12
mcity	0.089	0.040	2.22	0.027	0.026	0.012	2.21
poor	1.202	0.081	14.83	0	0.346	0.024	14.21
fair	0.940	0.071	13.3	0	0.271	0.021	12.85
good	0.432	0.067	6.47	0	0.124	0.019	6.42
verygood	0.133	0.067	1.98	0.048	0.038	0.019	1.98
_cons	-1.799	0.177	-10.18	0			
/lnalpha	-1.992	0.361					
alpha	0.136	0.049					
Likelihood-ratio test of alpha=0:			chibar2(01)=8.88		Prob>=Chibar2=0.001		

Question 2

Table 4 Prediction using Poisson model

Poisson Model						
	Variable	obs	Mean	Std. Dev.	Min	Max
Observed mean count	gpvisit	10,000	0.288	0.572	0	3
Predicted mean count	p_gpvisit	10,000	0.288	0.166	0.124	1.053
Observed prob of count	0	7,634	0.763	0.004		
	1	1,952	0.195	0.004		
	2	316	0.032	0.002		
	3	98	0.010	0.001		
Predicted prob of count	p_visitspr0	10,000	0.759	0.109	0.349	0.883
	p_visitspr1	10,000	0.201	0.066	0.110	0.368
	p_visitspr2	10,000	0.034	0.034	0.007	0.194
	p_visitspr3	10,000	0.005	0.009	0.000	0.068

Table 5 Prediction using Negative Binomial model

NegBin2 Model						
	Variable	obs	Mean	Std. Dev.	Min	Max
Observed mean count	gpvisit	10,000	0.288	0.572	0	3
Predicted mean count	p_gpvisit	10,000	0.288	0.167	0.124	1.063
Observed prob of count	0	7,634	0.763	0.004		
	1	1,952	0.195	0.004		
	2	316	0.032	0.002		
	3	98	0.010	0.001		
Predicted prob of count	nb_visitspr0	10,000	0.764	0.105	0.371	0.884
	nb_visitspr1	10,000	0.194	0.061	0.108	0.345
	nb_visitspr2	10,000	0.035	0.033	0.007	0.181
	nb_visitspr3	10,000	0.006	0.010	0.000	0.071

Task B

Figure 2 Histogram of 'wscei' looks like exponential distribution instead of normal

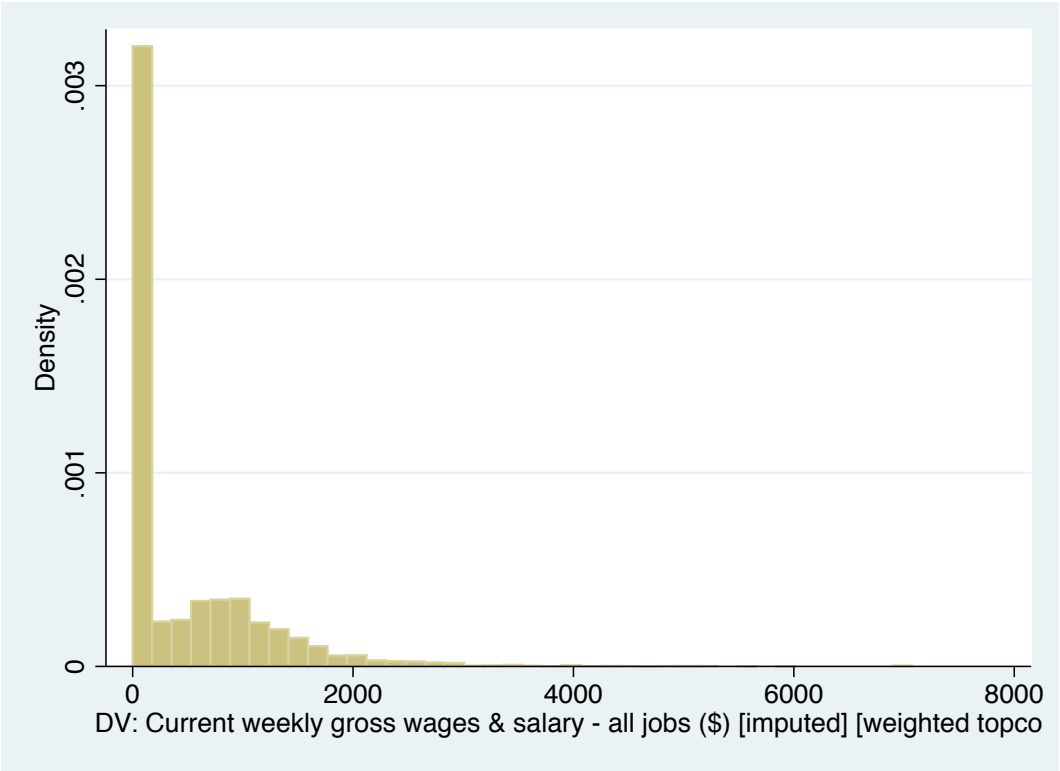
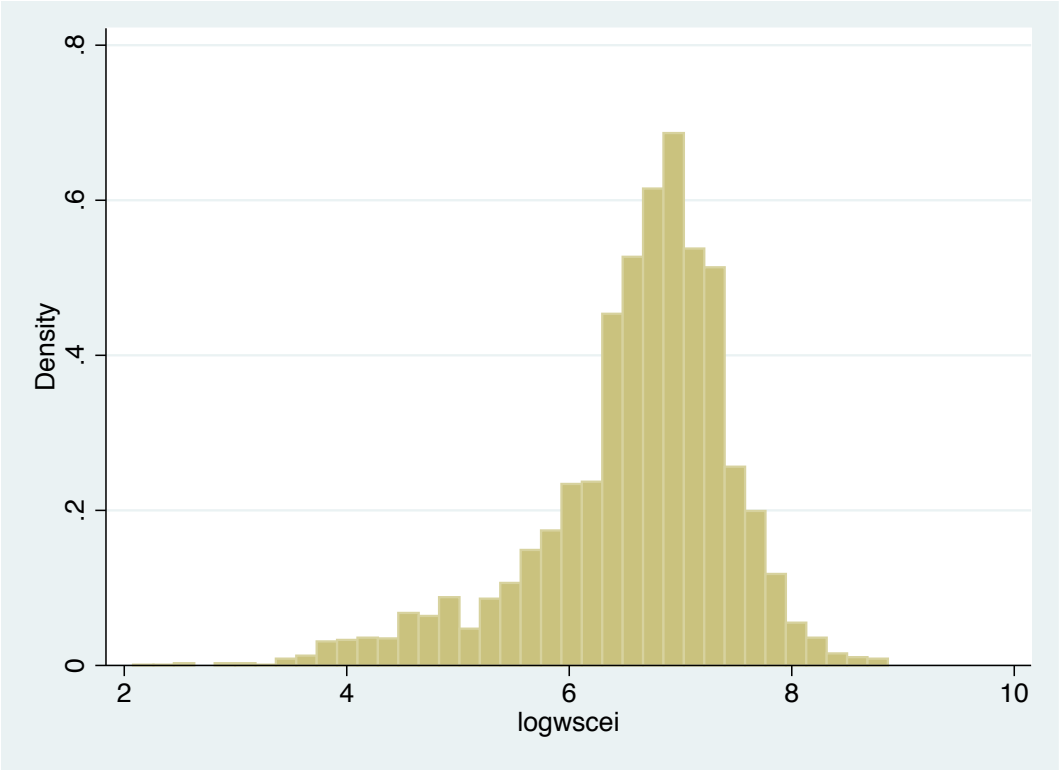


Figure 3 Histogram of log(wscei) looks more like normal distribution than 'wscei'



Question 1

Table 6 Heckman sample selection model two-step

Heckman selection model--two-step estimates (regression model with sample selection)					Number of obs=7,773 Censored obs=3,188 Uncensored obs=4,585 Wald chi2(13)=1520.84 Prob>chi12=0.000		
		Coef.	Std. Err.	z	P>|z|	95%	CI
wscei							
	age1819	20.991	91.965	0.23	0.819	-159.258	201.239
	age2021	171.343	87.004	1.97	0.049	0.817	341.868
	age2224	314.053	96.150	3.27	0.001	125.603	502.504
	age2534	485.439	86.325	5.62	0	316.246	654.633
	age3544	653.017	80.330	8.13	0	495.573	810.461
	age4554	636.744	83.339	7.64	0	473.402	800.086
	age5564	693.607	56.373	12.3	0	583.118	804.095
	age6574	728.428	234.068	3.11	0.002	269.663	1187.193
	a75above	473.485	420.102	1.13	0.26	-349.900	1296.870
	male	414.516	29.142	14.22	0	357.399	471.632
	bachabv	476.812	72.075	6.62	0	335.548	618.077
	dipcert	83.872	54.600	1.54	0.125	-23.143	190.887
	year12	31.120	51.832	0.6	0.548	-70.469	132.708
	_cons	279.403	217.158	1.29	0.198	-146.218	705.024
working							
	age1819	0.473	0.102	4.65	0	0.274	0.673
	age2021	0.403	0.105	3.84	0	0.197	0.608
	age2224	0.595	0.099	6.01	0	0.401	0.789
	age2534	0.561	0.084	6.7	0	0.397	0.725
	age3544	0.539	0.084	6.43	0	0.375	0.703
	age4554	0.544	0.081	6.73	0	0.386	0.703
	age5564	-0.136	0.080	-1.69	0.091	-0.293	0.022
	age6574	-1.422	0.095	-15.01	0	-1.608	-1.237
	a75above	-2.219	0.149	-14.89	0	-2.512	-1.927
	male	0.193	0.033	5.93	0	0.129	0.257
	bachabv	0.562	0.048	11.69	0	0.468	0.657
	dipcert	0.381	0.044	8.69	0	0.295	0.467
	year12	0.323	0.053	6.04	0	0.218	0.427
	married	0.075	0.039	1.92	0.054	-0.001	0.151
	depkid	-0.200	0.043	-4.65	0	-0.285	-0.116
	_cons	-0.219	0.064	-3.41	0.001	-0.345	-0.093
mills							
	lambda	-354.234	228.668	-1.55	0.121	-802.415	93.947
	rho	-0.540					
	sigma	655.902					

Table 7 Heckman sample selection model MLE

Heckman selection model--MLE estimates (regression model with sample selection)					Number of obs=7,773 Censored obs=3,188 Uncensored obs=4,585 Wald chi2(13)=1793.60 Prob>chi12=0.000		
Log	likelihood=	-39939.52					
		Coef.	Std. Err.	z	P>|z|	95% CI	
wscei							
	age1819	100.770	64.800	1.56	0.12	-26.236	227.777
	age2021	239.596	66.143	3.62	0	109.957	369.234
	age2224	405.472	61.454	6.6	0	285.024	525.919
	age2534	568.352	54.814	10.37	0	460.919	675.786
	age3544	727.348	53.363	13.63	0	622.759	831.937
	age4554	716.491	53.024	13.51	0	612.567	820.415
	age5564	681.452	54.226	12.57	0	575.171	787.733
	age6574	457.078	92.591	4.94	0	275.602	638.554
	a75above	9.760	210.475	0.05	0.963	-402.764	422.283
	male	441.839	18.569	23.79	0	405.444	478.234
	bachabv	558.458	30.506	18.31	0	498.667	618.248
	dipcert	142.108	28.099	5.06	0	87.036	197.181
	year12	80.950	32.221	2.51	0.012	17.797	144.103
	_cons	16.864	61.329	0.27	0.783	-103.338	137.066
working							
	age1819	0.474	0.102	4.65	0	0.274	0.673
	age2021	0.403	0.105	3.85	0	0.198	0.608
	age2224	0.597	0.099	6.03	0	0.403	0.791
	age2534	0.560	0.084	6.69	0	0.396	0.724
	age3544	0.538	0.084	6.42	0	0.374	0.702
	age4554	0.542	0.081	6.7	0	0.384	0.701
	age5564	-0.139	0.080	-1.73	0.084	-0.296	0.019
	age6574	-1.426	0.095	-15.05	0	-1.612	-1.241
	a75above	-2.223	0.149	-14.91	0	-2.515	-1.931
	male	0.194	0.033	5.95	0	0.130	0.258
	bachabv	0.565	0.048	11.71	0	0.470	0.659
	dipcert	0.380	0.044	8.68	0	0.294	0.466
	year12	0.322	0.053	6.03	0	0.217	0.427
	married	0.081	0.039	2.07	0.039	0.004	0.157
	depkid	-0.204	0.043	-4.75	0	-0.289	-0.120
	_cons	-0.219	0.064	-3.42	0.001	-0.345	-0.094
mills							
	/athrho	-0.117	0.073	-1.59	0.111	-0.261	0.027
	/lnsigma	6.413	0.011	567.82	0	6.391	6.435
	rho	-0.117	0.072			-0.2554224	0.027
	sigma	609.701	6.886			596.3531	623.348
	lambda	-71.117	44.507			-158.3493	16.116
LR test of	Indep.	eqns.	(rho=0):	Chi2(1)	=1.22	Prob>chi2	=0.269

Question 2

Table 8 Marginal effect for E('wscei') based on MLE

Marginal effect for E('wscei') based on MLE						
	Std. Err.	z	P>|z|	[95%	Conf.	Interval]
age1819	100.770	64.800	1.56	0.12	-2624%	227.776
age2021	239.596	66.143	3.62	0	109.9574	369.233
age2224	405.472	61.454	6.6	0	285.024	525.919
age2534	568.352	54.814	10.37	0	460.919	675.786
age3544	727.348	53.363	13.63	0	622.759	831.937
age4554	716.491	53.024	13.51	0	612.567	820.415
age5564	681.452	54.226	12.57	0	575.171	787.733
age6574	457.078	92.591	4.94	0	275.602	638.554
age75above	9.760	210.475	0.05	0.963	-402.764	422.283
male	441.839	18.569	23.79	0	405.444	478.234
bachabv	558.458	30.506	18.31	0	498.667	618.248
dipcert	142.108	28.099	5.06	0	87.036	197.181
year12	80.950	32.221	2.51	0.012	17.797	144.103

Table 9 Marginal effect for E('wscei'|'working=1') based on MLE

Marginal effect for E('wscei'|'working=1') based on MLE						
	Std.	z	P>|z|	[95%	Conf.	Interval]
age1819	120.863	63.443	1.910	0.057	-3.482	245.208
age2021	256.705	65.130	3.940	0.000	129.052	384.358
age2224	430.789	59.652	7.220	0.000	313.873	547.705
age2534	592.103	53.154	11.140	0.000	487.924	696.283
age3544	750.184	52.035	14.420	0.000	648.198	852.171
age4554	739.496	51.448	14.370	0.000	638.660	840.332
age5564	675.561	54.115	12.480	0.000	569.497	781.624
age6574	396.561	82.194	4.820	0.000	235.463	557.658
age75above	-84.554	197.774	-0.430	0.669	-472.184	303.076
male	450.062	18.074	24.900	0.000	414.637	485.486
bachabv	582.426	27.795	20.950	0.000	527.948	636.903
dipcert	158.248	26.539	5.960	0.000	106.232	210.263
year12	94.616	31.207	3.030	0.002	33.451	155.781
married	3.418	2.823	1.210	0.226	-2.115	8.952
depkid	-8.675	5.810	-1.490	0.135	-20.062	2.711

Question 3

Table 10 Tobit regression model

Tobit regression				Number of obs = 7,773	
				LR chi2(13) = 3349.90	
				Prob > chi2 = 0.0000	
Log likelihood = -39549.646				Pseudo R2 = 0.0406	
wscei	Coef.	Std. Err.	t	P>|t|	95% CI
age1819	307.575	77.894	3.95	0	154.882 460.267
age2021	376.127	79.730	4.72	0	219.835 532.419
age2224	600.178	73.296	8.19	0	456.498 743.857
age2534	709.006	64.559	10.98	0	582.454 835.558
age3544	816.296	65.115	12.54	0	688.653 943.938
age4554	807.942	63.431	12.74	0	683.593 932.284
age5564	319.636	64.500	4.96	0	193.198 446.074
age6574	-945.761	78.898	-11.99	0	-1100.423 -791.098
a75above	-1774.085	133.86	-13.25	0	-2036.491 -1511.678
male	446.608	22.950	19.46	0	401.618 491.597
bachabv	757.177	34.293	22.08	0	689.953 824.401
dipcert	328.042	32.358	10.14	0	264.612 391.471
year12	243.188	38.889	6.25	0	166.956 319.420
married	-117.542	29.740	-3.95	0	-175.841 -59.241
depkid	-640.550	53.192	-12.04	0	-744.821 -536.279
_cons	-640.550	53.19214	-12.04	0	-744.821 -536.279
/sigma	897.773	10.0127			878.146 917.401
3188 left-censored observations at wscei <= 0.000					
4,585 uncensored observations					
0 right-censored observations					

Table 11 Marfinal effect for E('wscei') based on Tobit

Marginal effect for E('wscei') based on Tobit						
	Std.	z	P>|z|	[95%	Conf.	Interval]
age1819	307.5747	77.8936	3.95	0	154.906	460.243
age2021	376.1269	79.72989	4.72	0	219.8592	532.394
age2224	600.1776	73.29611	8.19	0	456.5199	743.835
age2534	709.0059	64.55868	10.98	0	582.4733	835.538
age3544	816.2957	65.11497	12.54	0	688.6727	943.918
age4554	807.9417	63.43126	12.74	0	683.6187	932.264
age5564	319.636	64.50042	4.96	0	193.2175	446.054
age6574	-945.7605	78.89844	-11.99	0	-1100.399	-791.122
a75above	-1774.085	133.8622	-13.25	0	-2036.45	-1511.71
male	446.6081	22.95076	19.46	0	401.6254	491.590
bachabv	757.1769	34.29345	22.08	0	689.963	824.390
dipcert	328.042	32.3577	10.14	0	264.6221	391.461
year12	243.1882	38.8888	6.25	0	166.9676	319.408
married	87.62388	27.63742	3.17	0.002	33.45553	141.792
depkid	-117.5416	29.74062	-3.95	0	-175.8321	-59.251

Table 12 Marginal effect for E('wscei'|'working=1') based on Tobit

Marginal effect for E('wscei'|'working=1') based on Tobit						
	Std.	z	P>|z|	[95%	Conf.	Interval]
age1819	177.138	44.869	3.95	0	89.196	265.079
age2021	216.618	45.954	4.71	0	126.550	306.687
age2224	345.653	42.330	8.17	0	262.688	428.619
age2534	408.329	37.414	10.91	0	334.999	481.660
age3544	470.120	37.804	12.44	0	396.025	544.214
age4554	465.308	36.832	12.63	0	393.120	537.497
age5564	184.084	37.235	4.94	0	111.105	257.063
age6574	-544.681	44.739	-12.17	0	-632.367	-456.995
age75above	-1021.728	72.121	-14.17	0	-1163.082	-880.373
male	257.210	13.346	19.27	0	231.052	283.367
bachabv	436.072	19.876	21.94	0	397.116	475.028
dipcert	188.925	18.582	10.17	0	152.505	225.345
year12	140.057	22.359	6.26	0	96.233	183.880
married	50.464	15.912	3.17	0.002	19.277	81.652
depkid	-67.694	17.129	-3.95	0	-101.267	-34.122