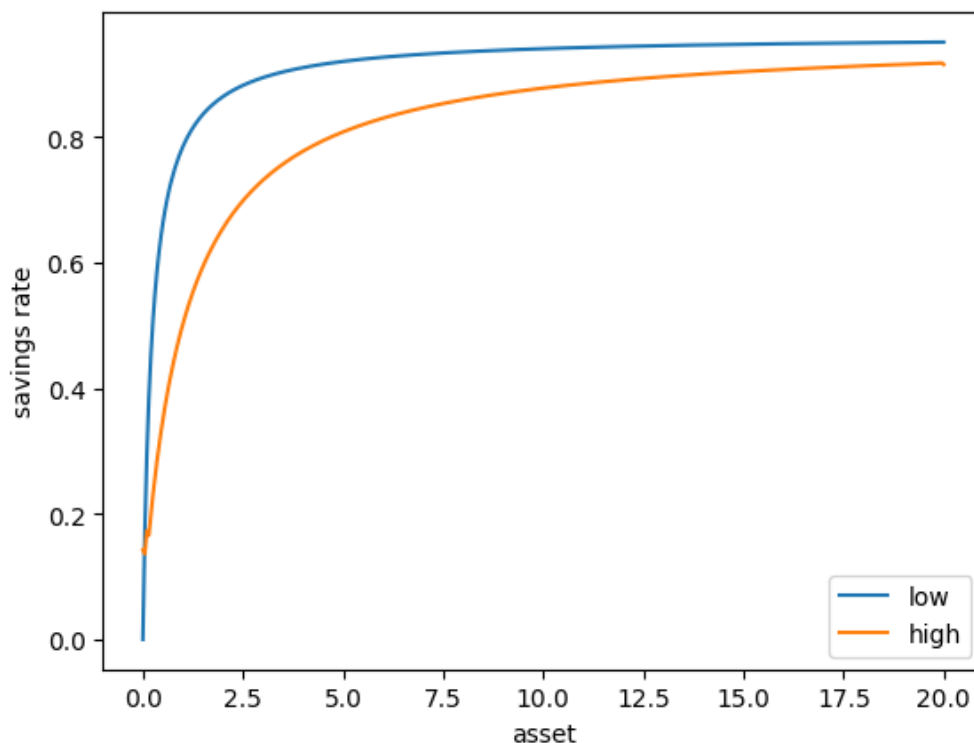


1.



グラフから、貯蓄率は現在の資産の増加関数といえる。利子率や生産性当たりの賃金が一定の下、横軸にある現在の資産が増加すると、縦軸の貯蓄率も上昇する。ただ、その増加量は逓減する。

現在の資産が増えるほど、人々はより多くの収入を貯蓄に割く。これは無限期間生きことを想定したとき、資産が多ければ貯蓄に回す割合が増えても消費の平準化が可能になることが要因であると考えられる。

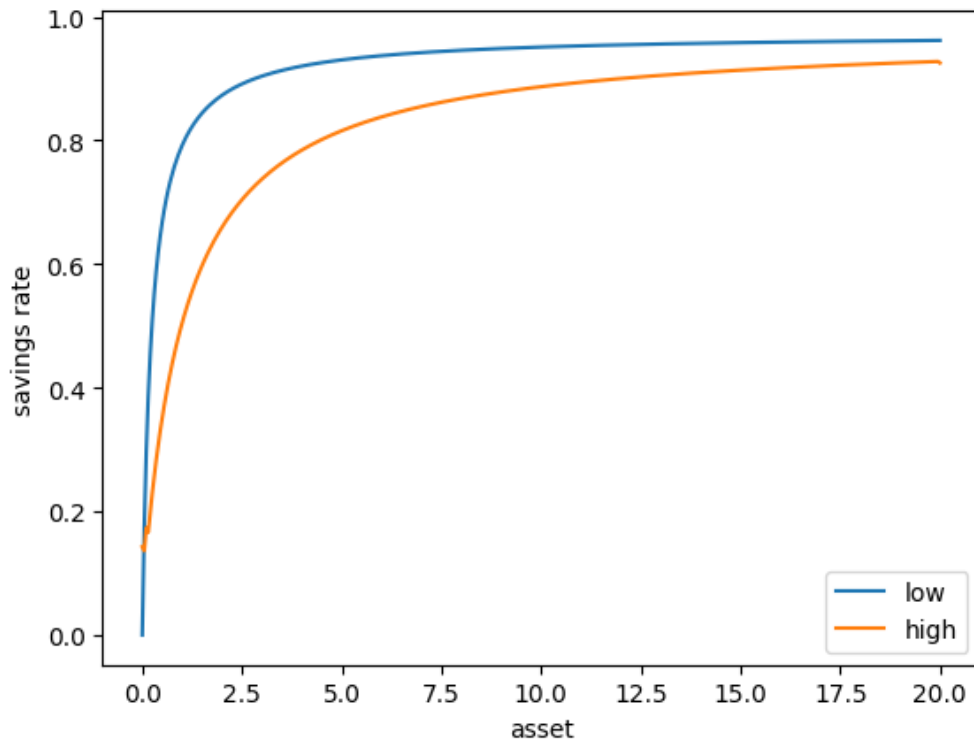
また、現在の資産が等しい場合、生産性が低い家計は生産性が高い家計より貯蓄率が高いことがわかる。ライフサイクル仮説によれば、家計の現在の消費は生涯における所得に依存する。生産性が低い家計は、生産性が高い家計に比べ、将来の収入の見込みが低い。具体的には、生産性の高い家計に比べ生涯収入、所得の上昇が見込みにくい。結果、消費の平準化を図るために収入のより多くの割合を貯蓄に回すことになると考えられる。

現在の資産 $a(t)$ が増加すると貯蓄率が上昇するということは、現在の資産の増加によって予算制約式の右辺が増加した時（ここでは利子率や生産性当たりの賃金は一定）、左辺の $a(t+1)/c(t)+a(t+1)$ において $a(t+1)$ が $c(t)$ よりも上昇しやすいということになる。人々は現在の資産が増えても、その多くを消費に回すわけではなく、翌期に資産を残しておく傾向がある。このような家計の反応を描写できることは動学的なモデルを用いるメリットであり、

例えば新型コロナ流行に際して行われた 10 万円の給付等、政策効果を分析するうえでも重要となる。(給付金による消費の押し上げは限定的で想定を下回った)

上述したようにこの問題では利子率や生産性あたり賃金が外生的に与えられていることに注意が必要である。これらが内生的に決定される場合、消費の平準化はこれらの変数の影響を受けることになる。例えば利子率の変化は、代替効果や所得効果といった形で消費と貯蓄の決定に影響を及ぼすことになる。

2.



【生産性の低い家計における資産所得税導入の効果】

Saving rates for low h:						Saving rates for low h:					
[0.	0.17484334	0.29641022	0.38583195	0.45436961	0.50857427	[0.	0.17447726	0.29535964	0.38405379	0.45190562	0.50548932
0.55251642	0.58885851	0.61941531	0.64546641	0.66793995	0.68752553	0.54887726	0.58472665	0.61484517	0.64050531	0.66262879	0.68189965
0.70474623	0.72000597	0.73362167	0.74584543	0.75688031	0.76689172	0.6988362	0.71383836	0.72721962	0.73922922	0.75006777	0.7598986
0.77601574	0.78436534	0.79203511	0.79910483	0.80564226	0.81170533	0.76885601	0.77705144	0.78457815	0.79151479	0.79792812	0.80387522
0.81734388	0.82260097	0.82751406	0.83211583	0.83643497	0.84049674	0.80940513	0.81456028	0.8193775	0.82388898	0.82812292	0.83210417
0.84432348	0.84793501	0.85134899	0.85458121	0.85764579	0.86055545	0.83585469	0.83939399	0.84273941	0.84590646	0.84890903	0.85175962
0.86332166	0.86595475	0.86846412	0.87085829	0.873145	0.87533134	0.85446947	0.85704877	0.85950671	0.86185168	0.86409128	0.86623246
0.87742378	0.87942823	0.88135013	0.88319447	0.88496587	0.88666856	0.86828157	0.87024442	0.87212634	0.87393225	0.87566665	0.87733371
0.88830646	0.88988321	0.89140216	0.89286643	0.89427893	0.89564236	0.87893727	0.8804809	0.8819679	0.88340132	0.88478401	0.88611861
0.89695922	0.89823187	0.89946249	0.90065313	0.90180571	0.90292202	0.8874076	0.88865327	0.88985776	0.8910231	0.89215114	0.89324367
0.90400375	0.90505249	0.90606971	0.90705683	0.90801515	0.90894591	0.89430232	0.89532866	0.89632413	0.89729011	0.89822789	0.89913869
0.9098503	0.91072941	0.91158429	0.91241593	0.91322526	0.91401317	0.90002366	0.90088387	0.90172036	0.90253409	0.90332598	0.90409689
0.9147805	0.91552804	0.91625656	0.91696676	0.91765933	0.91833491	0.90484766	0.90557905	0.90629181	0.90698664	0.90766421	0.90832515
0.91899413	0.91963758	0.9202658	0.92087935	0.92147871	0.92206439	0.90897008	0.90959955	0.91021414	0.91081434	0.91140068	0.91197361
0.92263684	0.9231965	0.92374381	0.92427916	0.92480295	0.92531554	0.91253359	0.91308107	0.91361644	0.91414012	0.91465247	0.91515387
0.92581729	0.92630853	0.92678961	0.92726082	0.92772247	0.92817484	0.91564465	0.91612516	0.91659571	0.91705661	0.91750815	0.91795062
0.92861822	0.92905287	0.92947904	0.92989698	0.93030693	0.93070911	0.91838428	0.9188094	0.91922622	0.919635	0.92003594	0.92042929
0.93110375	0.93149104	0.9318712	0.93224442	0.93261089	0.93297079	0.92081525	0.92119403	0.92156584	0.92193085	0.92228925	0.92264123
0.9333243	0.93367158	0.9340128	0.93434811	0.93467767	0.93500162	0.92298695	0.92332657	0.92366027	0.92398819	0.92431048	0.92462728
0.93532011	0.93563327	0.93594123	0.93624413	0.93654208	0.93683522	0.92493874	0.92524499	0.92554615	0.92584236	0.92613373	0.92642038
0.93712364	0.93740748	0.93768682	0.93796179	0.93823248	0.93849899	0.92670243	0.92697998	0.92725315	0.92752203	0.92778672	0.92804733
0.93876142	0.93901986	0.9392744	0.93952513	0.93977213	0.94001549	0.92830395	0.92855666	0.92880556	0.92905073	0.92929226	0.92953022
0.94025528	0.94049159	0.94072449	0.94095405	0.94118034	0.94140344	0.92976469	0.92999575	0.93022348	0.93044794	0.93066921	0.93088735
0.9416234	0.94184031	0.94205421	0.94226517	0.94247325	0.94267852	0.93110243	0.93131451	0.93152366	0.93172993	0.93193339	0.93213408
...
0.92527168	0.92539058	0.92550887	0.92562658	0.9257437	0.92586024	0.91513749	0.91525372	0.91536936	0.91548444	0.91559894	0.91571287
0.92597621	0.9260916	0.92620643	0.92632069	0.92643439	0.92654754	0.91582624	0.91593905	0.9160513	0.91616301	0.91627416	0.91638477
0.92666013	0.92677218	0.92688368	0.92699465	0.92710508	0.92721498	0.91649485	0.91660438	0.91671339	0.91682187	0.91692982	0.91703726
0.92732435	0.92743319	0.92754152	0.92764933	0.927754302]	...	0.91714417	0.91725058	0.91735648	0.91746187	0.917567856]	...

【左】 資本所得税導入後（問題 2）

【右】 資本所得税導入前（問題 1）

グラフ自体に大きな変化はない。変化が見づらかったので数値を出力した。数値は生産性が低い家計において、現在の資産 $a(t)$ を増やしていった時の貯蓄率を示している。現在の資産が等しい点において、資本所得税導入後には貯蓄率が上昇していることがわかる。

【生産性が高い家計における資本所得税導入の効果】

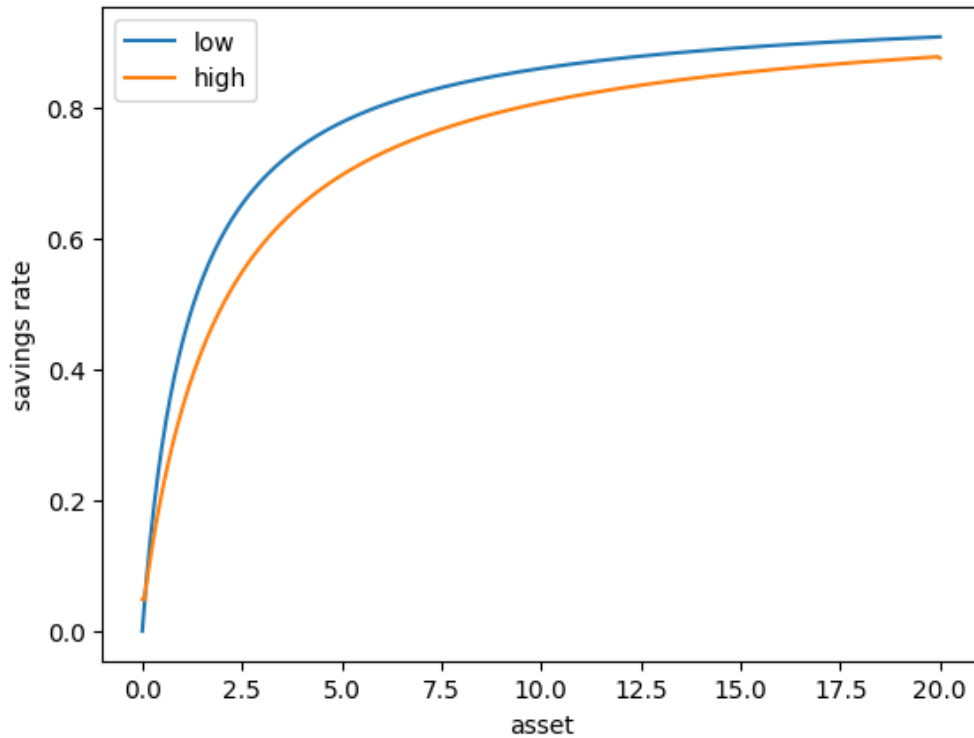
Saving rates for high h:					Saving rates for high h:				
[0.14268441	0.13603331	0.17329955	0.16591024	0.19890663	0.22931027	0.14268441	0.13595933	0.17311954	0.16566287
0.25741519	0.28347261	0.30769839	0.33027911	0.35137683	0.3711133	0.25673544	0.28263136	0.30669179	0.32910519
0.38967164	0.40710193	0.42352038	0.43901262	0.45365486	0.4675152	0.3879969	0.40526354	0.42152093	0.43685504
0.48065464	0.49312799	0.50498466	0.51626926	0.52702224	0.53728029	0.47804248	0.49037129	0.50208699	0.51323419
0.54707681	0.55644227	0.56540451	0.57398901	0.58221916	0.59011647	0.54365055	0.55289243	0.56173438	0.5702018
0.59770072	0.60499016	0.61200167	0.61875082	0.62525209	0.63151888	0.59358065	0.60076498	0.60767413	0.61432362
0.63756364	0.64339799	0.6490327	0.65447787	0.65974289	0.66483655	0.6328527	0.63859727	0.64414449	0.64950436
0.6697671	0.67454223	0.6791692	0.68365478	0.68800535	0.69222694	0.66455018	0.66924812	0.67379974	0.67821178
0.69632517	0.7003054	0.70417263	0.70793162	0.71158684	0.71514254	0.69067177	0.69458508	0.69838693	0.70208201
0.71860273	0.72197119	0.72525154	0.72844718	0.73156135	0.73459713	0.71256979	0.71587981	0.71910297	0.72224264
0.73755745	0.74044508	0.74326266	0.74601272	0.74869765	0.75131974	0.73119199	0.73402818	0.73679538	0.73949608
0.75388118	0.75638403	0.75883029	0.76122186	0.76356055	0.76584809	0.74722227	0.74967955	0.75208112	0.75442886
0.76808615	0.77027631	0.7724201	0.77451896	0.77657431	0.77858747	0.76116656	0.76331609	0.76541998	0.76747969
0.78055974	0.78249234	0.78438647	0.78624326	0.7880638	0.78984915	0.77340715	0.77530332	0.77716164	0.77898325
0.79160031	0.79331825	0.79500393	0.79665822	0.79828201	0.79987613	0.78423831	0.7859234	0.78757677	0.78919929
0.80144138	0.80297855	0.80448837	0.80597158	0.80742888	0.80886092	0.79389021	0.79539761	0.79687814	0.79833253
0.81026838	0.81165186	0.81301199	0.81434934	0.81566449	0.81695799	0.8025455	0.8039019	0.80523535	0.80654643
0.81823035	0.8194821	0.82071374	0.82192574	0.82311857	0.82429269	0.81035095	0.81157796	0.81278521	0.81397317
0.82544852	0.8265865	0.82770703	0.82881051	0.82989733	0.83096786	0.81742589	0.81854117	0.81963931	0.82072072
0.83202246	0.8330615	0.83408531	0.83509421	0.83608855	0.83706862	0.82386827	0.82488641	0.82588961	0.82687818
0.83803474	0.8389872	0.83992629	0.84085228	0.84176546	0.84266607	0.8297593	0.83069247	0.83161252	0.83251971
0.84355439	0.84443066	0.84529512	0.84614802	0.84698958	0.84782002	0.83516685	0.83602526	0.83687208	0.83770755
0.84863957	0.84944844	0.85024683	0.85103495	0.851813	0.85258117	0.8401481	0.84094038	0.84172239	0.84249431
0.85333964	0.85408859	0.85482821	0.85555867	0.85628013	0.85699277	0.84475155	0.84548506	0.84620941	0.84692478
...						...			
0.92527168	0.92539058	0.92550887	0.92562658	0.9257437	0.92586024	0.91513749	0.91525372	0.91536936	0.91548444
0.92597621	0.9260916	0.92620643	0.92632069	0.92643439	0.92654754	0.91582624	0.91593905	0.9160513	0.91616301
0.92666013	0.92677218	0.92688368	0.92699465	0.92710508	0.92721498	0.91649485	0.91660438	0.91671339	0.91682187
0.92732435	0.92743319	0.92754152	0.92764933	0.927754302]		0.91714417	0.91725058	0.91735648	0.91746187

【左】 資本所得税導入後（問題 2） 【右】 資本所得税導入前（問題 1）

この関係は、生産性の高い家計においても変わらない。現在の資産が等しい点において資本所得税導入後には貯蓄率が上昇している。

現在の資産 $a(t)$ が等しい点では、資本所得税導入によって予算制約式の右辺が減少する。問題のモデルでは資本所得税がパラメータ $\tau = 0.3$ として導入される。家計は一定の資本所得税が無限期間導入されると考え、資本所得税の導入はそのまま無限期間の収入の低下を意味する。よって消費の平準化のために、生産性の高低を問わず貯蓄率が上昇することになる。なお、ここでも利子率と生産性あたり賃金は一定である。

3.



【生産性の低い家計における一括補助金導入の効果】

Saving rates for low h:										Saving rates for low h:									
[0.	0.03886301	0.07470657	0.10786941	0.13864142	0.16727216	0.1939776	0.21894564	0.24234048	0.26430627	0.28497006	0.30444429	0.32282879	0.34021256	0.35667512	0.37228783	0.38711483	0.40121397	0.41463757	0.42743305
0.43964348	0.45130809	0.46246268	0.47313999	0.48337	0.49318025	0.50259605	0.51164072	0.52033578	0.52870113	0.53675515	0.54451492	0.55199627	0.55921393	0.56618158	0.57291201	0.57941712	0.58570804	0.59179517	0.59768827
0.60339647	0.60892832	0.61429189	0.61949473	0.62454396	0.62944629	0.63420803	0.63883515	0.64333327	0.64770773	0.65196353	0.65610546	0.66013802	0.66406549	0.66789191	0.67162115	0.67525685	0.6788025	0.68226139	0.68563668
0.68893135	0.69214827	0.69529015	0.69835959	0.70135906	0.70429093	0.70715746	0.70996081	0.71270305	0.71538615	0.71801201	0.72058243	0.72309916	0.72556386	0.72797813	0.73034349	0.73266143	0.73493335	0.73716061	0.73934451
0.74148631	0.74358721	0.74564837	0.74767092	0.74965592	0.75160442	0.7535174	0.75539583	0.75724065	0.75905273	0.76083296	0.76258215	0.76430112	0.76599064	0.76765146	0.7692843	0.77088988	0.77246885	0.77402189	0.77554963
0.77705267	0.77853161	0.77998703	0.78141948	0.7828295	0.78421762	0.78558434	0.78693016	0.78825554	0.78956096	0.79084685	0.79211366	0.7933618	0.79459168	0.79580371	0.79699826	0.79817572	0.79933645	0.8004808	0.80160912
0.80272173	0.80381897	0.80490116	0.80596859	0.80702158	0.80806041	0.80908536	0.81009671	0.81109473	0.81207969	0.81305183	0.81401141	0.81495866	0.81589383	0.81681714	0.81772882	0.81862908	0.81951814	0.82039621	0.82126349
0.82212017	0.82296646	0.82380253	0.82462857	...	0.90471441	0.9048555	0.9049959	0.9051356	0.90527461	0.90541294	0.90555059	0.90568756	0.90582387	0.90595952	0.9060945	0.90622883	0.90636251	0.90649555	0.90662795
0.90675971	0.90689084	0.90702134	0.90715123	0.90728049	0.90740914	0.90753719	0.90766463	...	0.91513749	0.91525372	0.91536936	0.91548444	0.91559894	0.91571287	0.91582624	0.91593905	0.9160513	0.91616301	0.91627416
0.91638477	0.91649485	0.91660438	0.91671339	0.91682187	0.91692982	0.91703726	0.91714417	0.91725058	0.91735648	0.91746187	0.91756726	0.91767265	0.91777804	0.91788343	0.91798882	0.91809421	0.9181996	0.918305	0.91841039
0.91851578	0.91862117	0.91872656	0.91883195	0.91893734	0.91904273	0.91914812	0.91925351	0.9193589	0.91946429	0.91956968	0.91967507	0.91978046	0.91988585	0.91999124	0.92009663	0.92020202	0.92030741	0.9204128	0.92051819

【左】一括補助金導入後（問題 3） 【右】一括補助金導入前（問題 1）

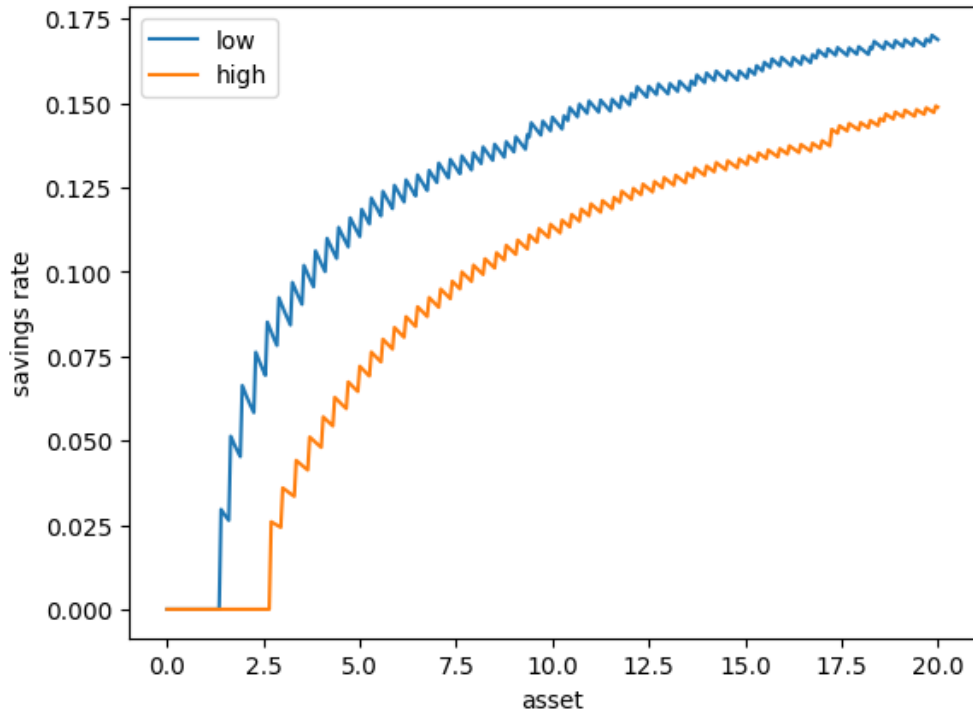
【生産性の高い家計における一括補助金導入の効果】

Saving rates for high h:										Saving rates for high h:									
[0.04875026	0.04754499	0.06959681	0.09060962	0.11065516	0.12979871	0.14268441	0.13595933	0.17311954	0.16566287	0.19852755	0.22878564	0.25673544	0.28263136	0.30669179	0.32910519	0.35003508	0.36962403	0.3879969	0.40526354
0.14809981	0.16561288	0.18238774	0.19847011	0.21390199	0.22872207	0.25673544	0.28263136	0.30669179	0.32910519	0.35003508	0.36962403	0.3879969	0.40526354	0.42152093	0.43685504	0.45134235	0.46505112	0.47804248	0.49037129
0.24296603	0.25666682	0.26985493	0.2825586	0.29480405	0.30661563	0.32910519	0.35003508	0.36962403	0.3879969	0.40526354	0.42152093	0.43685504	0.45134235	0.46505112	0.47804248	0.49037129	0.50208699	0.51323419	0.5238533
0.318016	0.32902626	0.3396661	0.34995391	0.35990686	0.36954106	0.3879969	0.40526354	0.42152093	0.43685504	0.45134235	0.46505112	0.47804248	0.49037129	0.50208699	0.51323419	0.5238533	0.53398097	0.54365055	0.55289243
0.37887156	0.38791252	0.39667719	0.40517805	0.41342684	0.4214346	0.43685504	0.45134235	0.46505112	0.47804248	0.49037129	0.50208699	0.51323419	0.5238533	0.53398097	0.54365055	0.55289243	0.56173438	0.5702018	0.578318
0.42921175	0.43676811	0.44411295	0.45125502	0.45820261	0.46496356	0.47804248	0.49037129	0.50208699	0.51323419	0.5238533	0.53398097	0.54365055	0.55289243	0.56173438	0.5702018	0.578318	0.58610438	0.59358065	0.60076498
0.47154529	0.47795482	0.48419884	0.49028367	0.49621532	0.5019995	0.50935806	0.51687649	0.52458508	0.53249367	0.54050226	0.54861085	0.55681944	0.56512803	0.57353662	0.58204521	0.5906538	0.59936239	0.60817098	0.61707957
0.50764165	0.51314693	0.51852027	0.52376634	0.52888963	0.53389439	0.53890315	0.54391191	0.54892067	0.55392943	0.55893819	0.56394695	0.56895571	0.57396447	0.57897323	0.58398199	0.58899075	0.59399951	0.59899951	0.60399951
0.53878468	0.54356439	0.54823723	0.55280675	0.55727632	0.56164921	0.5659221	0.570195	0.57446789	0.57874078	0.58291367	0.58708656	0.59125945	0.59543234	0.59960523	0.60377812	0.60795101	0.6121239	0.61629679	0.62046968
0.5659285	0.57011717	0.57421808	0.57823395	0.58216739	0.58602093	0.58979697	0.59349782	0.59712571	0.60068278	0.60417107	0.60759258	0.61094918	0.61424272	0.61747496	0.62064759	0.62376224	0.62682049	0.62982386	0.63277381
0.58979697	0.59349782	0.59712571	0.60068278	0.60417107	0.60759258	0.61094918	0.61424272	0.61747496	0.62064759	0.62376224	0.62682049	0.62982386	0.63277381	0.63567175	0.63851906	0.64131703	0.64406693	0.64677004	0.6494275
0.61094918	0.61424272	0.61747496	0.62064759	0.62376224	0.62682049	0.62982386	0.63277381	0.63567175	0.63851906	0.64131703	0.64406693	0.64677004	0.6494275	0.65204045	0.65461002	0.65713727	0.65963234	0.66206894	0.66447533
0.62982386	0.63277381	0.63567175	0.63851906	0.64131703	0.64406693	0.64677004	0.6494275	0.65204045	0.65461002	0.65713727	0.65963234	0.66206894	0.66447533	0.66684336	0.66917393	0.67146793	0.67372621	0.6759496	0.6781389
0.64677004	0.6494275	0.65204045	0.65461002	0.65713727	0.65963234	0.66206894	0.66447533	0.66684336	0.66917393	0.67146793	0.67372621	0.6759496	0.6781389	0.68029489	0.68241832	0.68450993	0.68657043	0.6886005	0.69060081
0.66206894	0.66447533	0.66684336	0.66917393	0.67146793	0.67372621	0.6759496	0.6781389	0.68029489	0.68241832	0.68450993	0.68657043	0.6886005	0.69060081	0.69257202	0.69451475	0.69642962	0.69831722	0.70017814	0.70201292
0.6759496	0.6781389	0.68029489	0.68241832	0.68450993	0.68657043	0.6886005	0.69060081	0.69257202	0.69451475	0.69642962	0.69831722	0.70017814	0.70201292	0.70382212	0.70560627	0.70736589	0.70910148	0.71081353	0.71250251
0.6886005	0.69060081	0.69257202	0.69451475	0.69642962	0.69831722	0.70017814	0.70201292	0.70382212	0.70560627	0.70736589	0.70910148	0.71081353	0.71250251	0.71416888	0.71581311	0.71743562	0.71903685	0.7206172	0.72217709
0.70017814	0.70201292	0.70382212	0.70560627	0.70736589	0.70910148	0.71081353	0.71250251	0.71416888	0.71581311	0.71743562	0.71903685	0.7206172	0.72217709	0.72371691	0.72523705	0.72673788	0.72821976	0.72968305	0.73112811
0.71081353	0.71250251	0.71416888	0.71581311	0.71743562	0.71903685	0.7206172	0.72217709	0.72371691	0.72523705	0.72673788	0.72821976	0.72968305	0.73112811	0.73255526	0.73396484	0.73535718	0.73673258	0.73809135	0.7394338
0.7206172	0.72217709	0.72371691	0.72523705	0.72673788	0.72821976	0.72968305	0.73112811	0.73255526	0.73396484	0.73535718	0.73673258	0.73809135	0.7394338	0.74076021	0.74207088	0.74336607	0.74464607	0.74591114	0.74716153
0.72968305	0.73112811	0.73255526	0.73396484	0.73535718	0.73673258	0.73809135	0.7394338	0.74076021	0.74207088	0.74336607	0.74464607	0.74591114	0.74716153	0.74839751	0.74961931	0.75082719	0.75202138	0.7532021	0.7543696
0.73809135	0.7394338	0.74076021	0.74207088	0.74336607	0.74464607	0.74591114	0.74716153	0.74839751	0.74961931	0.75082719	0.75202138	0.7532021	0.7543696	0.75552408	0.75666576	0.75779487	0.75891159	0.76001691	0.76111093
0.74591114	0.74716153	0.74839751	0.74961931	0.75082719	0.75202138	0.7532021	0.7543696	0.75552408	0.75666576	0.75779487	0.75891159	0.76001691	0.76111093	0.76219455	0.76326687	0.7643279	0.76537773	0.76641627	0.7674436
0.7532021	0.7543696	0.75552408	0.75666576	0.75779487	0.75891159	0.76001691	0.76111093	0.76219455	0.76326687	0.7643279	0.76537773	0.76641627	0.7674436	0.76845939	0.76946431	0.77045843	0.77144175	0.77241427	0.77337599
0.76001691	0.76111093	0.76219455	0.76326687	0.7643279	0.76537773	0.76641627	0.7674436	0.76845939	0.76946431	0.77045843	0.77144175	0.77241427	0.77337599	0.77432691	0.77526713	0.77619665	0.77711547	0.77802359	0.77892091
0.7674436	0.76845939	0.76946431	0.77045843	0.77144175	0.77241427	0.77337599	0.77432691	0.77526713	0.77619665	0.77711547	0.77802359	0.77892091	0.77980743	0.78068315	0.78154807	0.78240219	0.78324551	0.78407813	0.78489995
0.77241427	0.77337599	0.77432691	0.77526713	0.77619665	0.77711547	0.77802359	0.77892091	0.77980743	0.78068315	0.78154807	0.78240219	0.78324551	0.78407813	0.78489995	0.78571107	0.78651149	0.78729121	0.78806023	0.78881855
0.77892091	0.77980743	0.78068315	0.78154807	0.78240219	0.78324551	0.78407813	0.78489995	0.78571107	0.78651149	0.78729121	0.78806023	0.78881855	0.78957597	0.79032259	0.79105841	0.79178353	0.79249795	0.79320167	0.79389469
0.78489995	0.78571107	0.78651149	0.78729121	0.78806023	0.78881855	0.78957597	0.79032259	0.79105841	0.79178353	0.79249795	0.79320167	0.79389469	0.79457721	0.79524933	0.79591105	0.79656237	0.79720329	0.79783381	0.79845393
0.78881855	0.78957597	0.79032259	0.79105841	0.79178353	0.79249795	0.79320167	0.79389469	0.79457721	0.79524933	0.79591105	0.79656237	0.79720329	0.79783381	0.79845393	0.79906355	0.79966267	0.80025129	0.80082941	0.80139703
0.79249795	0.79320167	0.79389469	0.79457721	0.79524933	0.79591105	0.79656237	0.79720329	0.79783381	0.79845393	0.79906355	0.79966267	0.80025129	0.80082941	0.80139703	0.80195465	0.80250227	0.80303989	0.80356751	0.80408513
0.79783381	0.79845393	0.79906355	0.79966267	0.80025129	0.80082941	0.80139703	0.80195465	0.80250227	0.80303989	0.80356751	0.80408513	0.80459275	0.80509037	0.80557799	0.80605561	0.80652323	0.80698085	0.80742847	0.80786609
0.80082941	0.80139703	0.80195465	0.80250227	0.80303989	0.80356751	0.80408513	0.80459275	0.80509037	0.80557799	0.80605561	0.80652323	0.80698085	0.80742847	0.80786609	0.80829371	0.80871133	0.80912895	0.80953657	0.80993419
0.80356751	0.80408513	0.80459275	0.80509037	0.80557799	0.80605561	0.80652323	0.80698085	0.80742847	0.80786609	0.80829371	0.80871133	0.80912895	0.80953657	0.80993419	0.81033181	0.81071943	0.81110705	0.81148467	0.81185229
0.80652323	0.80698085	0.80742847	0.80786609	0.80829371	0.80871133	0.80912895	0.80953657	0.80993419	0.81033181	0.81071943	0.81110705	0.81148467	0.81185229	0.81221991	0.81258753	0.81294515	0.81329277	0.81363039	0.81395801
0.80953657	0.80993419	0.81033181	0.81071943	0.81110705	0.81148467	0.81185229	0.81221991	0.81258753	0.81294515	0.81329277	0.81363039	0.81395801	0.81427563	0.81458325	0.81488087	0.81516849	0.81544611	0.81571373	0.81597135
0.81185229	0.81221991	0.81258753	0.81294515	0.81329277	0.81363039	0.81395801	0.81427563	0.81458325	0.81488087	0.81516849	0.81544611	0.81571373	0.81597135	0.81621897	0.81645659	0.81668421	0.81690183	0.81710945	0.81730707
0.81427563	0.81458325	0.81488087	0.81516849	0.81544611	0.81571373	0.81597135	0.81621897	0.81645659	0.81668421	0.81690183	0.81710945	0.81730707	0.81749469	0.81767231	0.81784003	0.81799775	0.81814537	0.81828299	0.81841061
0.81621897	0.81645659	0.81668421	0.81690183	0.81710945	0.81730707	0.81749469	0.81767231	0.81784003	0.81799775	0.81814537	0.81828299	0.81841061	0.81852823	0.81863585	0.81873347	0.81882109	0.81890871	0.81898633	0.81906395
0.81730707	0.81749469	0.81767231	0.81784003	0.81799775	0.81814537	0.81828299	0.81841061	0.81852823	0.81863585	0.81873347	0.81882109	0.81890871	0.81898633	0.81906395	0.8191315				

一括補助金の導入によって貯蓄率を大きく変化（低下）させることができたことを意味する。つまり、この範囲にある家計は、一括補助金の導入に大きな恩恵を受けたと考えることができる。

一方、生産性の高い家計はその範囲において、生産性の低い家計ほど貯蓄率が変化していない。生産性の高い家計にとって、一括補助金（ $T=1$ ）は無限期間の所得にそこまで大きな恩恵をもたらさないのかもしれない。少なくとも、生産性の低い家計ほどの恩恵はもたらさなかったといえる。

4.



【生産性の低い家計における時間選好率低下の効果】

Saving rates for low h:										Saving rates for low h:									
[0.	0.03886301	0.07470657	0.10786941	0.13864142	0.16727216	0.1939776	0.21894564	0.24234048	0.26430627	0.28497006	0.30444429	0.32282879	0.34021256	0.35667512	0.37228783	0.38711483	0.40121397	0.41463757	0.42743305
0.43964348	0.45130809	0.46246268	0.47313999	0.48337	0.49318025	0.50259605	0.51164072	0.52033578	0.52870113	0.53675515	0.54451492	0.55199627	0.55921393	0.56618158	0.57291201	0.57941712	0.58570804	0.59179517	0.59768827
0.60339647	0.60892832	0.61429189	0.61949473	0.62454396	0.62944629	0.63420803	0.63883515	0.64333327	0.64770773	0.65196353	0.65610546	0.66013802	0.66406549	0.66789191	0.67162115	0.67525685	0.6788025	0.68226139	0.68563668
0.68893135	0.69214827	0.69529015	0.69835959	0.70135906	0.70429093	0.70715746	0.70996081	0.71270305	0.71538615	0.71801201	0.72058243	0.72309916	0.72556386	0.72797813	0.73034349	0.73266143	0.73493335	0.73716061	0.73934451
0.74148631	0.74358721	0.74564837	0.74767092	0.74965592	0.75160442	0.7535174	0.75539583	0.75724065	0.75905273	0.76083296	0.76258215	0.76430112	0.76599064	0.76765146	0.7692843	0.77088988	0.77246885	0.77402189	0.77554963
0.77705267	0.77853161	0.77998703	0.78141948	0.7828295	0.78421762	0.78558434	0.78693016	0.78825554	0.78956096	0.79084685	0.79211366	0.7933618	0.79459168	0.79580371	0.79699826	0.79817572	0.79933645	0.80048808	0.80160912
0.80272173	0.80381897	0.80490116	0.80596859	0.80702158	0.80806041	0.80908536	0.81009671	0.81109473	0.81207969	0.81305183	0.81401141	0.81495866	0.81589383	0.81681714	0.81772882	0.81862908	0.81951814	0.82039621	0.82126349
0.82212017	0.82296646	0.82380253	0.82462857	0.82545461	0.82627065	0.82707669	0.82787273	0.82865877	0.82943481	0.83020085	0.83095689	0.83170293	0.83243897	0.83316501	0.83388105	0.83458709	0.83528313	0.83596917	0.83664521
...
0.90471441	0.9048555	0.9049959	0.9051356	0.90527461	0.90541294	0.90555059	0.90568756	0.90582387	0.90595952	0.9060945	0.90622883	0.90636251	0.90649555	0.90662795	0.90675991	0.90689084	0.90702134	0.90715123	0.90728049
0.90740914	0.90753719	0.90766463	0.90779179	0.90791895	0.90804611	0.90817327	0.90830043	0.90842759	0.90855475	0.90868191	0.90880907	0.90893623	0.90906339	0.90919055	0.90931771	0.90944487	0.90957203	0.90969919	0.90982635
0.90995351	0.91008067	0.91020783	0.91033499	0.91046215	0.91058931	0.91071647	0.91084363	0.91097079	0.91109795	0.91122511	0.91135227	0.91147943	0.91160659	0.91173375	0.91186091	0.91198807	0.91211523	0.91224239	0.91236955
0.91249671	0.91262387	0.91275103	0.91287819	0.91300535	0.91313251	0.91325967	0.91338683	0.91351399	0.91364115	0.91376831	0.91389547	0.91402263	0.91414979	0.91427695	0.91440411	0.91453127	0.91465843	0.91478559	0.91491275
0.91503981	0.91516697	0.91529413	0.91542129	0.91554845	0.91567561	0.91580277	0.91592993	0.91605709	0.91618425	0.91631141	0.91643857	0.91656573	0.91669289	0.91682005	0.91694721	0.91707437	0.91720153	0.91732869	0.91745585
0.91758265	0.91770981	0.91783697	0.91796413	0.91809129	0.91821845	0.91834561	0.91847277	0.91859993	0.91872709	0.91885425	0.91898141	0.91910857	0.91923573	0.91936289	0.91949005	0.91961721	0.91974437	0.91987153	0.91999869
0.92012585	0.92025301	0.92038017	0.92050733	0.92063449	0.92076165	0.92088881	0.92101597	0.92114313	0.92127029	0.92139745	0.92152461	0.92165177	0.92177893	0.92190609	0.92203325	0.92216041	0.92228757	0.92241473	0.92254189
0.92266905	0.92279621	0.92292337	0.92305053	0.92317769	0.92330485	0.92343201	0.92355917	0.92368633	0.92381349	0.92394065	0.92406781	0.92419497	0.92432213	0.92444929	0.92457645	0.92470361	0.92483077	0.92495793	0.92508509
0.92521225	0.92533941	0.92546657	0.92559373	0.92572089	0.92584805	0.92597521	0.92610237	0.92622953	0.92635669	0.92648385	0.92661101	0.92673817	0.92686533	0.92699249	0.92711965	0.92724681	0.92737397	0.92750113	0.92762829
0.92775545	0.92788261	0.92800977	0.92813693	0.92826409	0.92839125	0.92851841	0.92864557	0.92877273	0.92889989	0.92902705	0.92915421	0.92928137	0.92940853	0.92953569	0.92966285	0.92979001	0.92991717	0.93004433	0.93017149
0.93029865	0.93042581	0.93055297	0.93068013	0.93080729	0.93093445	0.93106161	0.93118877	0.93131593	0.93144309	0.93157025	0.93169741	0.93182457	0.93195173	0.93207889	0.93220605	0.93233321	0.93246037	0.93258753	0.93271469
0.93284285	0.93296999	0.93309715	0.93322431	0.93335147	0.93347863	0.93360579	0.93373295	0.93386011	0.93398727	0.93411443	0.93424159	0.93436875	0.93449591	0.93462307	0.93475023	0.93487739	0.93500455	0.93513171	0.93525887
0.93538603	0.93551319	0.93564035	0.93576751	0.93589467	0.93602183	0.93614899	0.93627615	0.93640331	0.93653047	0.93665763	0.93678479	0.93691195	0.93703911	0.93716627	0.93729343	0.93742059	0.93754775	0.93767491	0.93780207
0.93792923	0.93805639	0.93818355	0.93831071	0.93843787	0.93856503	0.93869219	0.93881935	0.93894651	0.93907367	0.93920083	0.93932799	0.93945515	0.93958231	0.93970947	0.93983663	0.93996379	0.94009095	0.94021811	0.94034527
0.94047243	0.94059959	0.94072675	0.94085391	0.94098107	0.94110823	0.94123539	0.94136255	0.94148971	0.94161687	0.94174403	0.94187119	0.94199835	0.94212551	0.94225267	0.94237983	0.94250699	0.94263415	0.94276131	0.94288847
0.94301563	0.94314279	0.94326995	0.94339711	0.94352427	0.94365143	0.94377859	0.94390575	0.94403291	0.94416007	0.94428723	0.94441439	0.94454155	0.94466871	0.94479587	0.94492303	0.94505019	0.94517735	0.94530451	0.94543167
0.94555883	0.94568599	0.94581315	0.94594031	0.94606747	0.94619463	0.94632179	0.94644895	0.94657611	0.94670327	0.94683043	0.94695759	0.94708475	0.94721191	0.94733907	0.94746623	0.94759339	0.94772055	0.94784771	0.94797487
0.94810203	0.94822919	0.94835635	0.94848351	0.94861067	0.94873783	0.94886499	0.94899215	0.94911931	0.94924647	0.94937363	0.94950079	0.94962795	0.94975511	0.94988227	0.94999943	0.95012659	0.95025375	0.95038091	0.95050807
0.95063523	0.95076239	0.95088955	0.95101671	0.95114387	0.95127103	0.95139819	0.95152535	0.95165251	0.95177967	0.95190683	0.95203399	0.95216115	0.95228831	0.95241547	0.95254263	0.95266979	0.95279695	0.95292411	0.95305127
0.95317843	0.95330559	0.95343275	0.95355991	0.95368707	0.95381423	0.95394139	0.95406855	0.95419571	0.95432287	0.95445003	0.95457719	0.95470435	0.95483151	0.95495867	0.95508583	0.95521299	0.95534015	0.95546731	0.95559447
0.95572163	0.95584879	0.95597595	0.95610311	0.95623027	0.95635743	0.95648459	0.95661175	0.95673891	0.95686607	0.95699323	0.95712039	0.95724755	0.95737471	0.95750187	0.95762903	0.95775619	0.95788335	0.95801051	0.95813767
0.95826483	0.95839199	0.95851915	0.95864631	0.95877347	0.95890063	0.95902779	0.95915495	0.95928211	0.95940927	0.95953643	0.95966359	0.95979075	0.95991791	0.96004507	0.96017223	0.96029939	0.96042655	0.96055371	0.96068087
0.96080803	0.96093519	0.96106235	0.96118951	0.96131667	0.96144383	0.96157099	0.96169815	0.96182531	0.96195247	0.96207963	0.96220679	0.96233395	0.96246111	0.96258827	0.96271543	0.96284259	0.96296975	0.96309691	0.96322407
0.96335123	0.96347839	0.96360555	0.96373271	0.96385987	0.96398703	0.96411419	0.96424135	0.96436851	0.96449567	0.96462283	0.964750	0.96487716	0.96500432	0.96513148	0.96525864	0.9653858	0.96551296	0.96564012	0.96576728
0.96589444	0.9660216	0.96614876	0.96627592	0.96640308	0.96653024	0.9666574	0.96678456	0.96691172	0.96703888	0.96716604	0.9672932	0.96742036	0.96754752	0.96767468	0.96780184	0.967929	0.96805616	0.96818332	0.96831048
0.96843764	0.9685648	0.96869196	0.96881912	0.96894628	0.96907344	0.9692006	0.96932776	0.96945492	0.96958208	0.96970924	0.9698364	0.96996356	0.97009072	0.97021788	0.97034504	0.9704722	0.97059936	0.97072652	0.97085368
0.97098084	0.971108	0.97123516	0.97136232	0.97148948	0.97161664	0.9717438	0.97187096	0.97199812	0.97212528	0.97225244	0.9723796	0.97250676	0.97263392	0.97276108	0.97288824	0.9730154	0.97314256	0.97326972	0.97339688
0.97352304	0.9736502	0.97377736	0.97390452	0.97403168	0.97415884	0.974286	0.97441316	0.97454032	0.97466748	0.97479464	0.9749218	0.97504896	0.97517612	0.97530328	0.97543044	0.9755576	0.97568476	0.97581192	0.97593908
0.97606624	0.9761934	0.97632056	0.97644772	0.97657488	0.97670204	0.9768292	0.97695636	0.97708352	0.97721068	0.97733784	0.977465	0.97759216	0.97771932	0.97784648	0.97797364	0.9781008	0.97822796	0.97835512	0.97848228
0.97860844	0.9787356	0.97886276	0.97898992	0.97911708	0.97924424	0.9793714	0.97949856	0.97962572	0.97975288	0.97988004	0.9799992	0.98012636	0.98025352	0.98038068	0.98050784	0.980635	0.98076216	0.98088932	0.98101648
0.98114364	0.9812708	0.98139796	0.98152512	0.98165228	0.98177944	0.9819066	0.98203376	0.98216092	0.98228808	0.98241524	0.98254244</								

【生産性の高い家計における時間選好率低下の効果】

Saving rates for high h:	Saving rates for high h:
[0.04875026 0.04754499 0.06959681 0.09060962 0.11065516 0.12979871	[0.14268441 0.13595933 0.17311954 0.16566287 0.19852755 0.22878564
0.14809981 0.16561288 0.18238774 0.19847011 0.21390199 0.22872207	0.25673544 0.28263136 0.30669179 0.32910519 0.35003508 0.36962403
0.24296603 0.25666682 0.26985493 0.2825586 0.29480405 0.30661563	0.3879969 0.40526354 0.42152093 0.43685504 0.45134235 0.46505112
0.318016 0.32902626 0.3396661 0.34995391 0.35990686 0.36954106	0.47804248 0.49037129 0.50208699 0.51323419 0.5238533 0.53398097
0.37887156 0.38791252 0.39667719 0.40517805 0.41342684 0.4214346	0.54365055 0.55289243 0.56173438 0.5702018 0.578318 0.58610438
0.42921175 0.43676811 0.44411295 0.45125502 0.45820261 0.46496356	0.59358865 0.60076498 0.60767413 0.61432362 0.62072782 0.62690005
0.47154529 0.47795482 0.48419884 0.49028367 0.49621532 0.5019995	0.6328527 0.63859727 0.64414449 0.64950436 0.65468621 0.65969876
0.50764165 0.51314693 0.51852027 0.52376634 0.52888963 0.53389439	0.66455018 0.66924812 0.67379974 0.67821178 0.68249055 0.68664202
0.53878468 0.54356439 0.54823723 0.55288675 0.55727632 0.56164921	0.69067177 0.69458508 0.69838693 0.70208201 0.70567475 0.70916936
0.5659285 0.57011717 0.57421808 0.57823395 0.58216739 0.58602093	0.71256979 0.71587981 0.71910297 0.72224264 0.72530203 0.72828419
0.58979697 0.59349782 0.59712571 0.60068278 0.60417107 0.60759258	0.73119199 0.73402818 0.73679538 0.73949608 0.74213264 0.74470731
0.61094918 0.61424272 0.61747496 0.62064759 0.62376224 0.62682049	0.74722227 0.74967955 0.75208112 0.75442886 0.75672455 0.7589699
0.62982386 0.63277381 0.63567175 0.63851906 0.64131703 0.64406695	0.76116656 0.76331609 0.76541998 0.76747969 0.76949658 0.77147198
0.64677004 0.6494275 0.65204045 0.65461002 0.65713727 0.65962324	0.77340715 0.77530332 0.77716164 0.77898325 0.78076921 0.78252056
0.66206894 0.66447533 0.66684336 0.66917393 0.67146793 0.67372621	0.78423831 0.7859234 0.78757677 0.78919929 0.79079183 0.7923552
0.6759496 0.6781389 0.68029489 0.68241832 0.68450993 0.68657043	0.79389021 0.79539761 0.79687814 0.79833253 0.79976144 0.80116555
0.6886005 0.69060081 0.69257202 0.69451475 0.69642962 0.69831722	0.8025455 0.8039019 0.80523535 0.80654643 0.80783571 0.80910371
0.70017814 0.70201292 0.70382212 0.70560627 0.70736589 0.70910148	0.81035095 0.81157796 0.81278521 0.81397317 0.81514232 0.81629308
0.71081353 0.71250251 0.71416888 0.71581311 0.71743562 0.71903685	0.81742589 0.81854117 0.81963931 0.82072072 0.82178578 0.82283484
0.7206172 0.72217709 0.72371691 0.72523705 0.72673788 0.72821976	0.82386827 0.82488641 0.82588961 0.82687818 0.82785245 0.82881272
0.72968305 0.73112811 0.73255526 0.73396484 0.73535718 0.73673258	0.8297593 0.83069247 0.83161252 0.83251971 0.83341433 0.83429663
0.73809135 0.7394338 0.74076021 0.74207088 0.74336607 0.74464607	0.83516685 0.83602526 0.83687208 0.83770755 0.8385319 0.83934535
0.74591114 0.74716153 0.74839751 0.74961931 0.75082719 0.75202138	0.8401481 0.84094038 0.84172239 0.84249431 0.84325636 0.84400871
0.7532021 0.7543696 0.75552408 0.75666576 0.75779487 0.75891159	0.84475155 0.84548506 0.84620941 0.84692478 0.84763132 0.84832921
...	...
0.87297938 0.87319101 0.87340164 0.87361127 0.8738199 0.87402754	0.91513749 0.91525372 0.91536936 0.91548444 0.91559894 0.91571287
0.87423421 0.8744399 0.87464462 0.87484838 0.87505119 0.87525305	0.91582624 0.91593905 0.9160513 0.91616301 0.91627416 0.91638477
0.87545397 0.87565396 0.87585302 0.87605116 0.87624839 0.87644471	0.91649485 0.91660438 0.91671339 0.91682187 0.91692982 0.91703726
0.87664012 0.87683465 0.87702828 0.87722103 0.87741471 0.87760746	0.91714417 0.91725058 0.91735648 0.91746187 0.91756736 0.91767285

【左】時間選好率 $\beta = 0.1$ (問題 4) 【右】時間選好率 $\beta = 0.98$ (問題 1)

時間選好率は、将来の効用を割り引いて考える度合いのことである。今回のモデルでは効用は消費によって決まる。つまり、時間選好率が高ければ、現在の消費を将来の消費よりも高く評価するということになる。逆に、時間選好率が低くなればなるほど、現在の消費と将来の消費を無差別に評価するようになる。

時間選好率の大幅な低下により、現在の消費の評価が未来の消費とほとんど無差別になった結果、貯蓄をあまり行わなくても消費の平準化が可能になり、貯蓄率が低下したと考えられる。時間選好率が高い場合、消費の平準化を行うためには、将来の消費の評価が低い分しっかり貯蓄をして備えなければならない。しかし、時間選好率が大きく低下すれば、将来の消費の価値はそこまで割り引かれないうため、たくさん貯蓄をして備えるようなことをせずとも消費の平準化は可能になる。

グラフがギザギザしているのは、グリッドに確率的な、ランダムな要素が含まれているからであると予想する。