



Pjóðarspeglinn
2010

RANNSÓKNIR Í FÉLAGSVÍSINDUM XI

Hagfræðideild – Ritstýrðar greinar

Erindi flutt á ráðstefnu í október 2010

Ritstjóri
Daði Már Kristófersson

Félagsvíssindastofnun Háskóla Íslands



HÁSKÓLI ÍSLANDS

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Reykjavík 2010

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ISSN 1670-8725
ISBN 978-9935-424-04-4

Öll réttindi áskilin

Greinar í bók þessari má afrita í einu eintaki til einkanota, en efni þeirra er verndað af ákvæðum höfundalaga og með öllum réttindum áskildum.

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Höfundalisti

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Formáli

Ágæti lesandi

Ijóðarspegillinn, hin árleg ráðstefna um rannsóknir í félagsvísdum við Háskóla Íslands, er nú haldin í ellefta sinn. Ráðstefnan hefur vaxið jafnt og þétt frá upphafi og hefur aldrei verið umfangsmeiri en í ár.

Sérstakt ráðstefnurit fyrir hagfræði kemur nú út í fyrsta skipti. Jafnframt var í fyrsta skipti boðið upp á ritrýniferli við mat þeirra ritverka sem kynnt verða á ráðstefnunni og birtast í ráðstefnuritinu. Sú breyting miðar að því að bæta enn frekar gæði rannsókna og styrkja *Ijóðarspegillinn* sem vettvang vandaðra rannsókna á sviði félagsvínsinda hér á landi.

Í þessu ráðstefnuriti eru 9 greinar á sviði hagfræði. Það er mjög ánægjulegt hve margar greinar bárust á sviði hagfræði í þetta fyrsta sérrit og er það til marks um þá grósku sem er í rannsóknum í hagfræði við Háskóla Íslands um þessar mundir.

Nokkrar breytingar hafa verið gerðar á fyrirkomulagi rítsjórnar, eins og áður var vikið að. Haldið er í þá vinnureglu að einstakir fræðimenn ættu að hámarki tvær greinar á ráðstefnunni. Greinar til birtingar voru valdar á grundvelli útdráttar sem höfundar sendu inn. Markmiðið með forvali er að tryggja gæði þeirra greina sem kynntar eru á ráðstefnunni. Nokkrum greinum var hafnað í forvalinu. Að auki var höfundum boðið upp á að senda greinar sínar í ritrýningu tveggja fræðimanna á viðkomandi fræðasviði. Höfundum gafst síðan kostur á að taka tillit til þeirra athugasemda sem bárust frá ritrýnum. Einhverjum greinum var hafnað í þessum hluta ferlisins, vegna annmarka sem ritrýnar bentu á. Óhætt er að segja að þetta fyrirkomulag hafi gefist vel og þess sjái glögglega stað í umfangi og gæðum greina í ár. Fram kemur í ráðstefnuritinu hvort einstakar greinar fóru í ritrýni eða ekki. Nokkuð stífar kröfur voru gerðar til lengdar og uppsetningar greina eins og tíðkast hefur fyrri ár. Lengartakmarkanir setja umfangi og ýtarleik greina nokkrar skorður en nauðsynlegt hefur verið talið að beita slíkum takmörkunum til að halda aftur af heildarumfangi útgáfunnar.

Vinna við frágang og ritrýni greina hefur verið umtalsverð. Vil ég þakka höfundum, ritrýnum og þeim sem unnið hafa að útgáfu ráðstefnuritsins með einum eða öðrum hætti fyrir gott samstarf og vel unnin störf. Líkt og undanfarin ár hefur meginþungi vinnunnar við undirbúnings ráðstefnunnar og ráðstefnuritsins verið hjá Félagsvínsinstofnun og vil ég á þakka starfsfólk i hennar fyrir afar gott samstarf og góða vinnu. Sérstaklega vil ég þakka Gunnari Þór Jóhannessyni, Völu Jónsdóttur, Sóley Lúðvíksdóttur og Sigríði Kristínu Hrafnkelsdóttur fyrir vel unnin störf, en þau báru hitann og þungann af umbroti ráðstefnuritsins og umsýslu vegna þess.

Ísland gengur nú í gegnum mikla umbrotatíma í efnahagsmálum. Fullyrða má að þörfin fyrir hagrannsóknir hafi aldrei verið meiri. Mikil ábyrgð hvílir á hagfræðideild Háskóla Íslands að vera leiðandi í þeim rannsóknum. *Ijóðarspegillinn* er afar mikilvægur vettvangur til kynningar þeim rannsóknum sem fram fara í hagfræði hér á landi.

Reykjavík í október 2010
Daði Már Kristófersson

Bankahrunið 1930

Lærdómur sem ekki var dreginn

Ásgeir Jónsson

Að kvöldi sunnudagsins 2. febrúar 1930 var Alþingi kallað saman á lokaðan neyðarfund sem hófst klukkan 10. Það var aðeins eitt mál á dagskrá; beiðni um ríkisábyrgð fyrir Íslandsbanka, eina einkabanka landsins. Alþingismönnum voru settir skýrir kostir; ef ábyrgðin fengist ekki væri bankinn kominn í þrot. Það lá einnig fyrir að ríkisstjórn landsins treysti sér ekki til þess að mæla með ríkisábyrgð. Bankastjórar Íslandsbanka höfðu af þeim sökum tekið þá ákvörðun að leggja málið beint fyrir Alþingi. Alla nöttina deildi þingheimur um örlog Íslandsbanka þar sem afstaða til bankans fór eftir flokkadráttum en að lokum, klukkan sex að morgni, var gengið til atkvæða. Hjálpar-beiðninni var hafnað og viðskiptavinir Íslandsbanka komu að lokaðum dyrum daginn eftir. Þessi þingfundur boðaði því endalok Íslandsbanka en jafnframt bjarmaði á nýju skipulagi eftir pólitíkska yfirtöku á íslensku fjármálakerfi.

Í þessari grein verða færð rök fyrir því að grunnur íslenska fjármálakerfisins hafi verið skakkur við fullveldi landsins 1918. Seðlabanki landsins – Íslandsbanki – var með raun og réttu viðskiptabanki í erlendri eigu er reiddi sig á danska Seðlabankann. Íslandsbanki var mjög illa undir það búinn að taka að sér hið nýja ábyrgðarmikla hlutverk að stjórna sjálfstæðu myntsvæði m.a. vegna þess að bankinn hafði freistast til of mikillar peningaprentunar í ágóðaskyni í þenslu stríðsáranna. En þar að auki varð bankinn að munaðarleysingja strax þegar hann var skilinn frá dönsku myntsvæði þar landsmenn litu raunverulega ekki á hann sem sinn eigin seðlabanka. Um leið danskur myndugleiki var upphafinn hérlendis fór grundvöllurinn undan peningamálastjórn landsins.

Ráðamenn þjóðarinnar brugðust ekki við þeim þverbrestem sem voru til staðar 1918 og því hlaut Íslandsbanki að hrynda á sínum skakka grunni. Aðfaranótt 10. febrúar 1930 varð því vendipunktur fyrir íslenska þjóð sem aðeins rúmum áratug áður hafði fengið fullveldi og hafði reynt að fóta sig að á opnum og frjálsum alþjóðamörkuðum. Það sem á eftir fylgdi var uppgjöf, höft og einangrunarhyggja en nýr grundvöllur fyrir peningamálastjórn í sjálfstæðu myntkerfi varð ekki byggður enda er árangur landsmann Eftir því. Við fullveldi var íslenska krónan jafngild þeirri dönsku en nú þarf 2000 íslenskar krónur (ef myntbreytingin 1980 er tekin með í reikninginn) til að kaupa eina danska. Ísland lenti í sinni fyrstu gjaldeyriskrísu árið 1920 og bjargaðist rétt með naumindum. Næsta gjaldeyriskrísa 1931 sem sigldi í kjölfar gjaldþrots Íslandsbanka varð til þess að landinu var lokað 1931 með gjaldeyrishöftum. Höftin vörðu í 62 ár. Þannig skildist íslensk fjármálasaga frá öðrum löndum og nær alger stöðnun ríkti í bankabjónustu allt fram að lokum tuttugustu aldar. Ísland varð þróað land með vanþróaða fjármálastarfsemi.

Bankahrunið íslenska árið 2008 var að sönnu einstakur atburður þar sem heilt fjármálakerfi hjá þróuðu ríki fell í lausafjárhlaupi. En í ljósi sögunnar var þetta aðeins enn einn hlekkinn í langri keðju fjármálaóstöðugleika og gjaldeyrisvandreiða er hafa einkennt nútímasögu landsins. Þessa febrúarnótt fæddist því nýtt ríkisrekið bankakerfi hérlendis er hélt velli allt til loka tuttugustu aldar og á hvers grunni gríðarleg bankabóla

myndaðist á fyrsta áratug tuttugustu og fyrstu aldar. Og enn (frá árinu 2008) hafa íslensk yfirvöldi gripið til þess ráðs að loka landið inni í fjármagnshöftum líkt og eftir bankahrunið 1931. Hefur sagan gengið í hrung? Er með nokkrum hætti hægt að læra af bankahruninu 1930?

Peningaprentun og framþróun Íslands

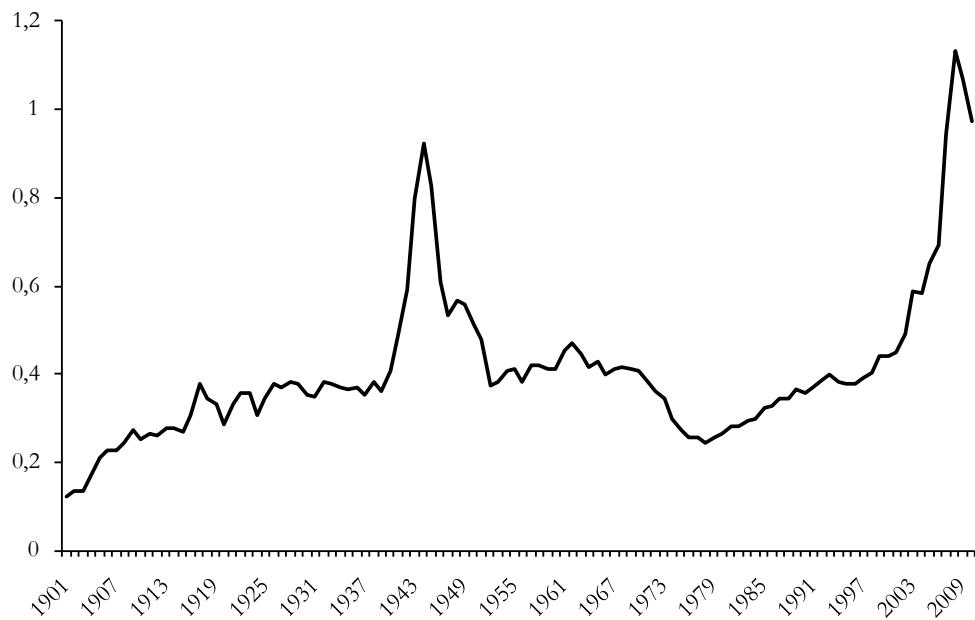
Að kvöldi 24. nóvember 1903 sigldi danska póstskipið Laura inn á Reykjavíkurhöfn. Meðal farþega á skipinu voru Hannes Hafstein, nýskipaður ráðherra og Emil Schou, nýráðinn bankastjóri Íslandsbanka. Þannig komu bæði framkvæmdavaldið og fjármagnið í höfn fyrir Íslendinga á sama ári og á sama skipi. Til hliðar við hinn danska aðalbankastjóra Íslandsbanka voru ráðnir tveir íslenskir aðstoðarbiskupastjórar. Hinir dönsku eigendur fóru fram á að annar væri valtýringur en hinn heimastjórmarmaður – svo tveir helstu stjórnsmálflokkar landsins í þann tíma kæmu að stjórn bankans. Til að innsigla enn frekar hið pólitíkska samband varð forsætisráðherra landsins ávallt stjórnarformaður bankans og þingið skipaði síðan þrjá fulltrúa til viðbótar í bankaráðið. Þannig réðu Íslendingar ætíð yfir meirihluta í hinu sjö manna bankaráði og höfðu þannig formleg völd yfir bankanum þó hluthafarnir væru danskir. Íslandsbanki flutti með sér gífurlega mikið af dönsku og norsku fjármagni – bæði sem hlutafé og bein lán að utan. Þessu til viðbótar var Íslandsbanki ekki aðeins viðskiptabanki, heldur einnig Seðlabanki landsins, þar sem hann fékk í vöggugjöf einkarétt á seðlaútgáfu á Íslandi.

Stofnun Íslandsbanka olli byltingu hérlendis þar sem fjármálakerfi með nútímasniði komst loks á laggirnar – þ.e. fjármálakerfi þar sem innlásstofnanir sinna greiðsluþjónustu og fjármálalega milligöngu (Ásgeir Jónsson 2004, 2009). Landsmenn höfðu mikið forskot að vinna upp við aðrar þjóðir svo frumstæður sem hérlendur fjármálamarkaður var við upphaf tuttugustu aldar (Guðmundur Jónsson, 2004). Um aldamótin 1900, eins og aldirnar á undan, geymdu landsmenn sparnað sinn á heimilum eða reikningum verslana í innskriftarviðskiptum. Þar lá féð og safnaði ryki á kistubotnum eða fjármagnaði rekstur danskra kaupmanna á sama tíma og vanþróað efnahagslíf landsins bráðvantaði lánsfé. Íslandsbanki hafði meðferðis gríðarlega mikið af skotfærum til þess að hrinda þessari byltingu af stað með erlendu fjármagni og peningaprentun. Áhrif Íslandsbanka sjást best á því að um aldamótin 1900 voru 70 prósent sparifjár landsmanna varðveitt á heimilum þeirra, í reiðufé en aðeins 30% á bankareikningum eins og sést á mynd 1 hér að neðan. Hins vegar eftir stofnun bankans árið 1904 féll þetta hlutfall niður í 30% á aðeins sex árum. Bankarnir höfðu þannig tekið við hlutverki greiðsluþjóna í íslensku efnahagslífi og nú fóru ávísanir í umferð.



Mynd 1. Hlutfall seðlar og myntar af peningamagni (M1) 1901 til 1939 (Hagstofa Íslands, 1997)

Um leið og almenningur fer að nota bankainnistæður sem bæði gjaldmiðil og geymslu fyrir fjármuni sína lyftist fjármálaþjónustan upp á nýtt stig með myndun peningamargfaldara. Það er þegar innlánsfé er lagt inn í banka er það síðan lánað út en þeir sem fá síðan peningana í hendur leggja það aftur inn í bankann sem ný innlán og svo koll að kolli. Þannig leiðir peningamargfaldari til innlánamyndunar og almennar lausafjársköpunar í hagkerfinu. (Chick, 1986; Dow, 1999). Þannig er hægt að losa svo um sparnað fólks að hægt er að veita honum til framleiðslu og fjárfestingar. Þetta sést vel af neðangreindri mynd 2 sem sýnir peningamagn í umferð (M3) sem hlutfall af landsframleiðslu.

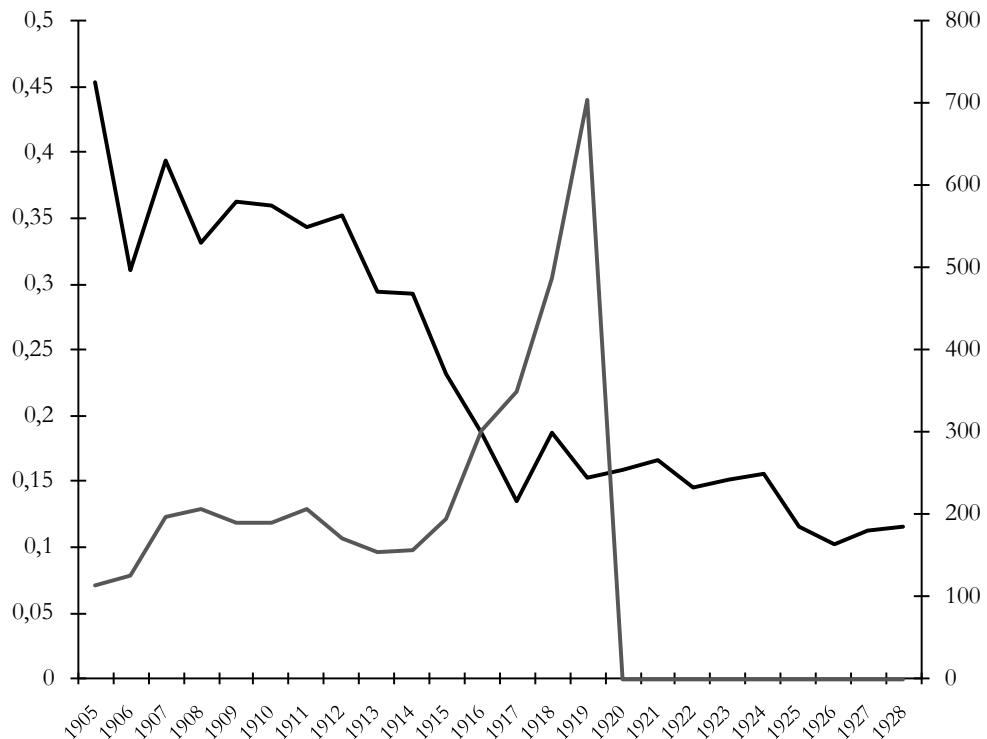


Mynd 2. Hlutfall peningamagns (M3) af landsframleiðslu 1901-2010 (Hagstofa Íslands, 1997)

Frá því að Íslandsbanki var stofnaður jókst peningamagn í umferð – mælt sem M3 – frá því að vera rúmlega 10% af landsframleiðslu og upp í 30-40% áratug seinna. M3 er vitaskuld að mestu leyti innlán í bankakerfinu og áhrif peningamargfaldarans sjást því vel af þeiri staðreynd að heildarinnlán á Íslandi tíffölduðust á árunum 1905 til 1917. Þar af hafði Íslandsbanki um 50% markaðshlutdeild en að öðru leyti sköpuðu þessi peningamargföldunaráhrif ný innlán fyrir bæði Landsbankann og sparisjóði hérlandis.

Frá vexti til þenslu

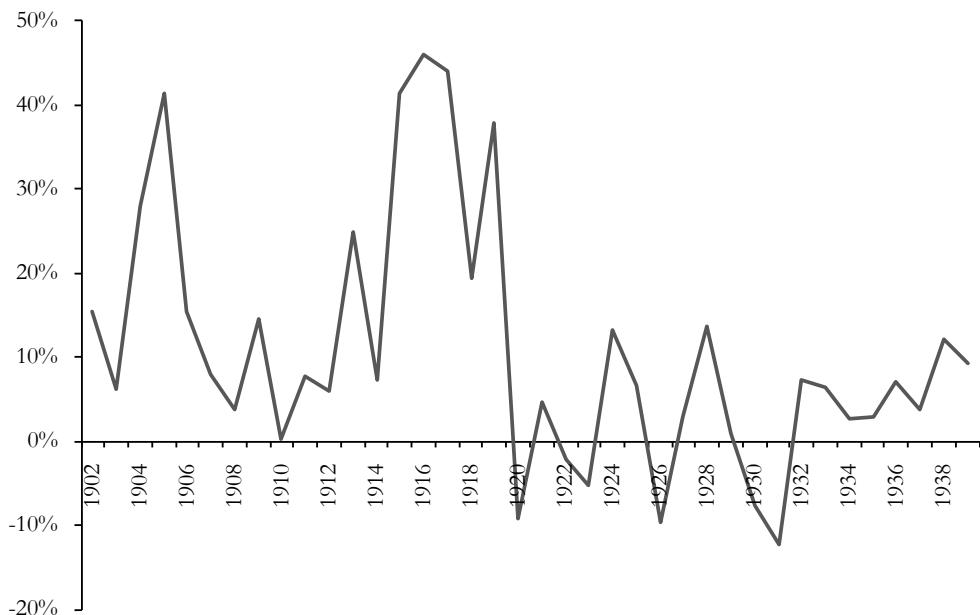
Hægt er líta á bankamarkaðinn á Íslandi á árunum fyrir fyrra stríð sem framlengingu af samkeppni tveggja helstu banka Danmerkur, Landmandbanken (síðar Danske Bank) er studdi Landsbankann og Privat banken er studdi Íslandsbanka. (Sjá nánar um danska bankasamkeppni hjá Cohn (1958). Raunar voru tengsl Íslandsbanka og Privat banken verulega náið þar sem hinn dansk var ekki aðeins helsti viðskiptabanki Íslandsbanka, heldur einnig stofnaðili, helsti lánadrottinn og líklega helsti eigandi einnig. (Sjá nánar um stofnun Íslandsbanka hjá Sumarliða Ísleifssyni, 2004) Þessi tengsl voru svo náið að Sveinn Kaaber bankastjóri Landsbankans lýsti því yfir í viðtali við Morgunblaðið þann 27. apríl 1921 að Íslandsbanki væri með raun og rétti dótturfélag Privat banken. Það er til marks um þetta að árið 1913 var einn af starfsmönnum Privat Banken, H. Tofte að nafni, skipaður bankastjóri við Íslandsbanka. Í kjölfarið virðist áherslur hafa gjörþreyst í rekstri Íslandsbanka eins og sést á neðangreindri mynd. Í fyrsta lagi lækkaði eiginfjárlutfall bankans lækkað um helming frá því að vera 30-35% af eignum og til þess að vera um 15% af eignum. Samhlíða hóf Íslandsbanki að greiða eigendum sínum verulegan arð og framkvæmdastjórninni veltutengda bónusa. Breytingar í arðgreiðslustefnunni sjást vel af því að á fyrstu 10 starfsárum bankans var útgreiddur arður yfirleitt um 5% af eigin fé bankans en þetta hlutfall hækkaði rúm 20%.



Mynd 3. Eiginfjárhlfall Íslandsbanka (vinstri ás) og arðgreiðslur bankans (hægri ás)
(Ársreikningar Íslandsbanka; Hagstofa Íslands, 1997)

Samhliða aukinni gírun bankans urðu töluverðar breytingar á útlánastefnu bankans þar sem Íslandsbanki hóf að kaupa víxla að viðskiptamönum sínum í stórum stíl. Þessir víxlar virðast hafa verið keyptir af lántakendum með afföllum og því skilaði þessi útlánastefna töluverðum skammtímahagnaði. Umfang þessara víxilkaupa sést af því að óveðtryggðir víxlar uxu frá því að vera um 30-40% af lánabók bankans fyrsta áratug starfsemi og til þess að 60-70% á stríðsárunum. Sjá nánar hjá Bjarna Jónssyni, 1920.

Lokabreytingin á starfsemi bankans varð síðan við upphaf heimstyrjaldar árið 1914 þegar gullinnlausnarskylda bankans á seðlaútgáfu var afnumin vegna stríðsins og bankanum var síðan veitt nær frítt spil við seðlaútgáfu. Á næstu 4 árum sjöfaltaði bankinn seðlaútgáfu sína (Landsbankinn, 1961). Þetta var að vísu ekki seðlaprentun í einhverju tómi. Fyrra stríðið leiddi til mikilla verðhækkaná á bæði innflutnings og útflutningsvörum landsins og allí þannig bæði miklum verðhækkunum á mörgum nauðsynjavörum og gríðarlegum hagnaði í útflutningsgreinum (Magnús Jónsson, 1926).



Mynd 4. Árleg breyting á seðlum og mynt í umferð 1900-1939 (Hagstofa Íslands, 1997)

Eins og sést á mynd hér að ofan má greina two toppa í seðlaprentun Íslandsbanka, annan við stofnun bankans og hinn í fyrra stríði. Samt hafði seðlaprentunin gerólík áhrif á þessum tveimur tímaskeiðum. Í hið fyrra skiptið drakk efnahagslífið vætuna í sér eftir langvarandi fjárskort en í hið seinna skiptið var einfaldlega verið að bera í bakkafullan lækinn og hvetja yfirþanið hagkerfi. Verðlag á Íslandi fjórfaldaðist á milli áranna 1914 og 1920.

Fullveldi og þverbrestir

Árið 1903 var Ísland enn hluti danska ríkisins og danskir seðlar í umferð hérlendis. Jafnframt tilókaðist þá að seðlabankar væru í einkaeigu; Englandsbanki var sennilega þekktasta samtímadæmið um þetta. Því var jafnvel haldið fram, að einkaaðilar væru líklegri til að umgangast peningaprentvélar af meiri ábyrgð en konungar og ríkisstjórnir. Auk þess byggði allt peningakerfi þess tíma á gullfæti, og hinn nýi Íslandsbanki var skuldbundinn til að tryggja alla útgefna peningaseðla með gulli (Sumarliði Ísleifsson, 1992a, 1992b, 1992c). Ef bankinn prentaði of mikið af seðlum, fengi hann þá jafnvel aftur í hausinn og yrði að leysa þá út með gulli. Samt sem áður verður aldrei litið framhjá því, að það eru hagsmunaárekstrar á milli starfsemi viðskiptabanka og Seðlabanka, því seðlaprentun jafngildir fjármögnun með 0% vöxtum fyrir útlánum.

Á styrjaldarárunum voru seðlabankar Evrópu leystir undan innlausnarskyldu peningaseðla í gulli og fengu þeir því frjálsar hendur við peningaprentvélarnar. Það var í sjálfu sér ekki óvenjulegt. Það eru vitaskuld gömul sannindi og ný að verðbólga og stríðsrekstur fylgjast gjarnan að verðlag í Danmörku hafði til að mynda tvöfaldast á stríðsárunum. Hins vegar virðist Íslandsbanki hafa litið á sig sem viðskiptabanka undir verndarvæng danska seðlabankans og á dönsku myntsvæði en ekki sem sjálfstæðan seðlabanka á sjálfsteðu myntsvæði. Íslensk stjórnvöld virðast hafa verið á sömu línu í sínum hugsunargangi og alls ekki átt að sig þeirri ábyrgð sem fullveldi lagði þeim á hendur. Þeim datt til að mynda ekki annað í hug en að íslenska krónan gæti haldið

jafnvirði sínu við dönsku krónuna þrátt fyrir að verðlag hefði hækkað helmingi meira hérlandis en í Danmörku á stríðsárunum. Varla er hægt að orða það öðruvísí en íslenskir stjórnálamenn og bankastjórar hafi flotið sofandi að feigðarósi í því uppgjöri sem brátt nálgadist (Jóhannes Nordal, 2002).

Í kjölfar stríðsloka skall kreppa á í Evrópu og fiskverð lækkaði skarpt á erlendum mörkuðum. Íslandsbanki, sem enn var í raun seðlabanki landsins, lenti í greiðsluvanda þar sem útflutningstekjur dugðu ekki lengur fyrir innflutningsþörfum landsins. Mjög hratt gekk á gjaldeyrisforða bankans og árið 1920 var Ísland komið í alvarlega gjaldeyrisvanda. Íslandsbanki var þá á þeim tíma mjög gagnýndur fyrir að hafa notað dýrmætan gjaldeyri til þess að greiða niður skuldir sínar við Privatbankan danske en hafa mjög takmarkað færslur fyrir aðra aðila á sama tíma (Fjárhagsörðugleikar, 1920). Stjórnendum bankans heppnaðist að vísu að fá lán frá danske fjármálaráðuneytinu til að fylla á forðann. En meira þurfti til. Íslenska ríkisstjórnin samdi einnig um lán frá Hambro's banka á Englandi með veði í tolltekjum landsins, en á óhagstædum kjörum, og endurlánaði Íslandsbanka. Ennfremur var gripið til innflutningshafta til þess að takmarka gjaldeyrisútstreymi. Hins vegar myndaðist brátt svartur markaður með gjaldeyri og árið 1922 var svo komið að útflytjendur voru nánast hættir að selja bönkunum gjaldeyri, heldur áttu öll sín viðskipti á óopinberum markaði. Og að lokum var fátt annað til ráða en að láta gengið falla, eða stýfa krónuna eins og það var þá kallað. Hið óopinbera frjálsa gengi var tekið til viðmiðunar og var krónan því lækkuð um 23%. Þá tókan kreppan að líða hjá ytra og jafnvægi komst aftur á gjaldeyrisviðskipti við útlönd.

Lengi býr að fyrstu gerð

Í 100 ár hafði íslensk pólitík snúist um aðskilnað frá Danaveldi með öllum ráðum og því ekki góð byrjun að lenda í fjármálakrísu svo stuttu eftir fullveldi og þurfa að gengisfella íslensku krónuna. Allir virtust sammála um að fyrirkomulagið frá 1903 gæti ekki gengið upp á nýju fullvalda Íslandi en engin samstaða var um það hvað gæti tekið við. Eðlilegast hefði verið að ríkisstjórnin leggði Íslandsbanka til nýtt hlutafé og styrkti hann sem Seðlabanka. Þá eða nýr sérstakur seðlabanki yrði stofnaður. En hvorugt var gert (Ólafur Björnsson, 1981). Árið 1921 var réttur bankans til seðlaprentunar takmarkaður og Alþingi tók sér vald til þess að skipa two af þremur bankastjórum bankans. Tveimur árum seinna var hinn danski aðalbankastjóri, H. Tofte leystur frá störfum, en að vísu með rausnarlegum starfslokasamningi. Hér eftir voru það Íslendingar sem skyldu stýra bankanum þrátt fyrir að bankinn væri enn í eigu erlendra hluthafa.

Íslandsbanki var lengi að sleikja sárin eftir þenslu stríðsárranna og kollsteypuna í kjölfarið. Bankinn þurfti að afskrifa stóran hluta af víxillánum sínum á næstu árum, auk þess að bera kostnað af þeim erlendu neyðarlánum sem tekin voru til þess að styrkja gjaldeyrisforða landsins. Stjórnvöld gerðu einnig illt verra með því að hækka gengið aftur um leið og færí gafst, eða árið 1925. Næstu ár tók verðhjöðnun við en alls lækkaði verðlag hérlandis um 50-60% á árunum 1921 til 1933, en þannig var um 6% árleg lækkun verðlags á tímabilinu. Vextir á almennum víxlum voru um 6-8% á þessum tíma, en það fól í sér að raunveruleg vaxtabyrði, þ.e. raunvextir, stóðu í tveggja stafa tölu og hlaut því að íþyngja skuldunautum bankans. Hér mætti þó hafa í huga að Landsbankinn kom engu betur út stríðsbólunni og lenti í verulegum útlánatöpum, enda var allt eigið fé bankans afskrifað samhlíða því að ríkisstjórnin kom með nýtt eiginfjárfamlag til bankans. Það sama stóð til fyrir Íslandsbanka, en þegar til átti að taka var íslenska ríkið ekki tilbúið til þess að leggja fram hlutafé. Erlendir eigendur bankans voru ekki heldur tilbúnir til að hætta meiru fjármagni til nýja Íslands, aðskildu

frá Danmörku og þar við sat. Loks árið 1926 var Landsbankanum afhent seðlaprentunarvaldið en Íslandsbanka gert að kalla inn sína seðla. Eftir það var bankinn heillum horfinn og vafamál hvort hann hefði yfir höfuð haft burði til þess að framkvæma þá innköllun til loka þrátt fyrir að kreppan mikla hefði ekki orðið honum að aldurtila.

Stofnun Íslandsbanka sem bæði viðskiptabanka og seðlabanka árið 1903 náði markmiðum að nútímaþæða bæði fjármálakerfi og efnahagslíf með undraverðum hraða. Það hefur án alls efa skapað gríðarlegan ábata fyrir landið. Þetta fyrirkomulag hlaut þó að fela í sér hagsmunárekstra á milli seðlabankastarfsemi annars vegar og viðskiptabankastarfsemi hins vegar. Það gerðist í þenslu fyrra stríðs áranna. Hægt er að færa sterk rök fyrir því að þenslan hafi þá komið að utan en jafnframt liggur fyrir að Íslandsbanki hallaði sér ekki á móti vindi. Bankinn kynti undir þenslunni bæði með útlánum og peningaprentun. Það bendir fátt til annars en hluthafar og stjórnendur bankans hafi nýtt sér þessa tvöföldu stöðu bankans sem seðlabanki og viðskiptabanki til hagnast verulega á stríðinu. Hægt er að deila um það hve mikil skynsemi fólst í hinum upphaflega samningi við Íslandsbanka árið 1903 um að bankinn skyldi þjóna sem Seðlabanki landsins. Hins vegar breytti fullveldi og aðskilnaður við Danmörku árið 1918 öllum forsendum. Stofnaumgjörð fjármálamarcaðarins hérlendis var verulega gölluð þegar landsmenn tók ábyrgð á eigin málum að fullu árið 1918 og þjóðþingið létt undir höfuð leggjast að framkvæma þær stofnanaumbærur sem þurfti til þess að tryggja greiðsluhæfi gjaldmiðilsins og stöðugleika hagkerfisins – s.s. með því að stofna sjálfstæðan seðlabanka. Það sem verra var, hið upprunalega fyrirkomulag var látið fara í þrot með gjaldþrotti Íslandsbanka árið 1930. Með þessu sköpuðu Íslendingar sér sérstöðu sem lokað fjármálakerfi á forræði ríkisins sem leiddi bæði til fjármálaþegrar vanþróunar á tuttugustu öld sem og ofvaxtar og hruns á þeirri tuttugustu fyrstu. Í flestum nágrannalöndum eiga bankar uppruna sinn hjá frumkvöðlum úr einkageiranum og bankaþjónusta hefur þróast áfram líkt og hver önnur atvinnugrein. Hérlendis voru bankarnir upphaflega stofnaður af ríkinu eða með sérstöku samningum á milli ríkis og einkaaðila líkt og Íslandsbanki forðum daga. Það fer hins vegar að vera kominn tími til þess að landsmenn skoði söguna í þessu samhengi svo mistök fortíðar verði ekki endurtekin.

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Eiga Íslendingar sér þjóðhagsleg markmið?

Bolli Héðinsson

Fréttir berast af því frá Grænlandi að þar gæti verið að finna olíu í nægu magni til að hana megi vinna með arðbærum hætti. Hvarflar að einhverjum að landsstjórnin þar hyggist afhenda einkafyrirtæki þessar olíulindir til frjálsrar ráðstöfunar án þess að fyrir þær komi afgjald eða leiga? Á Íslandi hafa í hálfan þriðja áratug örfá einkafyrirtæki, að mestu í eigu manna sem eru handhafar íslenskra vegabréfa, haft einkaleyfi á þeirri auðlind sem Ísland er einna ríkast af, sjávarútveginum, án þess að fyrir það hafi verið greitt afgjald eða leiga til samfélagsins. Eiga Íslendingar sér þá engin þjóðhagsleg markmið, t.d. um hámarkságóða af sameiginlegum auðlindum eða réttmæti skattlagningar sem gæti stuðlað að jöfnuði milli þegna samfélagsins? Spurningar á bordi við þessar hafa gerst áleitnari eftir efnahagshrunið þegar öll umræða um framtíðarmótun íslensks samfélags tekur mið af því hvað megi lera af reynslunni og hvernig megi reyna að marka nýtt upphaf fyrir íslenskt samfélag. Önnur markmið en þjóðhagsleg hafa verið til umræðu oftar og lengur þ.a.m. umfjöllun Páls Skúlasonar (2009) sem hann sækir í *Ríkið* eftir Platón (bls. 39).

„Tilgáta míni eða kenning er sí að lífsgildi þóðarinnar megi flokka í þrennt í samræmi við þá greiningu á lífsverkefnum okkar sem ég minni á. Fyrst má nefna þau gildi sem varða efnahaginn og þau verðmæti og varning sem við þurufm að tryggja okkur með því sem við framleiðum eða kaupum af öðrum; þessi gildi eru að sjálfsögðu afar marvísleg eftir þörfum fólks og markmiðum, og vitaskuld skipta þau okkur miklu máli. Næst koma *stjórnunargildin* sem við þurum að huga að þegar við skipuleggjum samlíf okkar og tökum ákvárdanir í sameiginlegum málum. Hér ber öryggi, frelsi og frið vafalaust hæst í flestum þjóðfélögum, en þessi gildi eiga að tryggja að við gætum vel að samskiptum okkar og samfélagi. Loks eru þau gildi sem tengjast beint *andlegu lífi* okkar þar sem þekking og trú, list og fergurð, sannleikur og ást eru meðal þess sem okkur þykir nokkru skipta og raunar ýmis önnur gildi sem hugur okkar kann að standa til.“

Að fengnu fullveldi 1918 tók íslenskt samfélag, stjórnmálastraumar og flokkamynundun að mótaðist í þá veru sem við þekkjum enn þann dag í dag. Þrátt fyrir ábyrgð útrásarvíkinga á hrúninu 2008 þá er orsakanna ekki síður að leita í athöfnum og athafnaleysi stjórnmálamanna og því stjórnkerfi sem þeir hafa byggt upp umliðna áratugi. Í skyrslu Rannsóknarnefndar Alþingis (Páll Hreinsson, Sigríður Benediktsdóttir og Tryggvi Gunnarsson, 2010) er vandlega rakið vanhæfi stjórnmála- og embættismanna í aðdraganda hrunsins.

Hver ættu þjóðhagslegu markmiðin að vera?

Tilraunir til að skoða og móta það sem gæti fallið undir þjóðhagsleg markmið hefur ekki farið fram á Íslandi í fullri alvöru en birst með fremur ómarkvissum hætti í stefnum stjórnmálaufokka og samtaka sem láta sig varða einstök hagsmunamál allt frá upphafi íslenska flokkakerfisins (Guðmundur Hálfdanarson, 1999). Hvernig gætu þjóðhagsleg markmið Íslendinga hljóðað ef þeim væri til að dreifa og þau mótuð með formlegum hætti svipað því og gerist hjá samtökum og fyrirtækjum? Dæmi um þau

gætu verið yfir- og undirmarkmið. Yfir-yfir markmið gæti t.d. verið að hið hagræna meginmarkmið íslensks samfélags væri að skapa öllum þegnum samfélagsins bestu mögulegu fjárhagslegu afkomu. Yfirmarkmiðið sem atvinnuvegi varðar gæti verið að allir atvinnuvegir skuli reknir af sem mestri hagkvæmni svo þeir hafi greiðslugetu til að skila sem mestum fjármunum til samfélagsins. Markmið fyrir einstaka atvinnugrein gæti hljóðað á þann veg að t.a.m. landbúnaður skuli rekinn þannig að hver sem hann stundi megi haga rekstri sínum á þann veg sem hann telur bestan til mestrar verðmaetaskópunar og gangi hann á landsins gæði þurfi hann að greiða fyrir þau afnot. Þetta kann að þykja full nákvæm útfærsla á slíkum hugmyndum en þó óhjákvæmileg svo ljóst sé hvaða tilgangi markmiðasetning af þesu tagi þjónar.

Vangaveltur um þetta fóru fram á áttunda áratug síðustu aldar og meðal þeirra sem tóku málefnið til umfjöllunar þá voru einstaklingar sem tuttugu árum áður höfðu staðið fyrir því að fera íslenskan þjóðarbúskap nær því sem tíðkaðist í nágrannalöndum okkar. Þannig segir í umfjöllun Gylfa Þ. Gíslasonar (1987) um *Þjóðfélagsleg markmið Íslendinga*:

„Lífskjör almennings geta ekki batnað né heldur hagur atvinnuvega blómgazt nema þjóðarframleiðsla aukist, en í því er einmitt hagvöxtur fólginn. Þetta þarf hins vegar ekki að jafngilda því, að stefna ríkisvaldins á Íslandi hafi ávallt verið með þeim hætti, sem vænlegastur hafi verið til þess að efla hagvöxt.“ ... „Nú ... eru þeir [Íslendingar] ekki aðeins orðnir bjargálna, heldur í hópi þeirra þjóða í heiminum, sem hæstar hafa þjóðartekjur á mann. Þessi breyting hefur hins vegar átt sér stað með byltingarkerndum hætti, en hefur ekki haft á sér yfirbragð og einkenni jafnarar og stöðugrар þróunar. Það er meginmunurinn, sem er á þróun efnahagsmála á Íslandi og í nágrannalöndunum“ (bls. 37)

Hér saknar Gylfi þess að raunveruleg markmið hafi verið sett og þeim svo fylgt eftir með viðeigandi aðgerðum. Aðferðin hafi frekar líkst einhverskonar happa- og glappaáðferð þar sem hagvöxtur og tilhögun á dreifingu þeirrar velferðar sem af honum leiðir, fyrst og fremst orðið til sem afgangsstærð en ekki með meðvituðum hætti. Á þessu hefur lítil breyting orðið en Jónas Haralz telur að á árunum 1995-2010 hafi ekki verið um neina eiginlega hagstjórn að ræða á Íslandi (Jónas Haralz, 2010). Við sama tækifæri og áðurnefnd grein Gylfa Þ. Gíslasonar var samin lét Jónas Haralz einnig eftirsarandi í ljósi:

„Við ásælumst ekki hagvöxt sjálfs hans vegna. Að baki hans er eitthvað annað, hin raunverulegu markmið, og þau geta verið margs konar. Þar getur verið um efnahagslega farsæld að ræða, það getur getur líka verið, að við viljum t.d. sækjast eftir jafnari skiptingu tekna, og að við sjáum fram á, að ekki sé unnt að ná jafnari tekjum nema með því að allar tekjur hækki. Hagvöxtur er því í raun tæki til að ná fjölda annarra markmiða, sem hafa meiri grundvallarþýðingu en hann. Samt sem áður er full ástaða til þess að tal um hagvöxt sem markmið vegna þess að hann opnar leiðir að svo mörgum öðrum markmiðum“ (Jónas Haralz, 1978, bls. 34).

Hér er komið að kjarna umfjöllunarinnar, ef sett eru þjóðhagsleg markmið, þá verði þau að þjóna einhverjum tilgangi t.d. á bord við þann að auka á almenna velferð. Þegar þjóðhagslegt markmið hefur verið sett fram þá kemur að útfærslu þess og sú spurning sem varpað er fram í upphafi þessar greinar, þegar ekki er krafist afnotagjalds af notkun takmarkaðrar auðlindar á bord við sjávarfangs. Sú spurning er viljandi sett í samhengi við aðra spurningu sem lýtur að því hvort önnur takmörkuð auðlind, olía í jörð, í öðru landi, Grænlandi, mundi verði metin með sama hætti og sjávarfang. Viðbúið er að svarið við seinni spurningunni sé nokkuð afdráttarlaust, þ.e. að sjálf sögðu komi ekki annað til álita en þeir sem ætli sér að vinna olíu úr jörð þurfi að

greiða einhvers konar afgjald til eigandans. Svarið við fyrri spurningunni um greiðslu afnotagjalds af fiskimiðum er ekki jafn afdráttarlaust, heldur talið að þar gildi önnur sjónarmið. Erfitt, eða nær útilokat, er að koma auga á hagræn rök að baki því að líta með mismunandi hætti á olíulindir eða auðlindir sjávar í þessu tilliti svo álykta verður að rökin fyrir mismunandi afstöðu til þessara tveggja auðlinda séu eingöngu tilfinningaleg; rök byggð á sögulegri hefð. Leiða má líkum að því að vegna þess að vinnsla olíu er ný starfsemi á því svæði sem um ræðir en fiskveiðar verið stundaðar um árabil, þá skýri það að einhverju leyti hina mismunandi afstöðu.

Þjóðernið eða þjóðin?

Þjóðhagslegt markmið hlýtur samkvæmt orðanna hljóðan að fela í sér nálgun að því hvernig hátti verðmætasköpun í landinu og fyrst og fremst hagnýtingu hennar, í þágu herra hún verði nýtt. Í þeim efnum hefur orðræða á opinberum vettvangi verið óskýr og ekki víst að allir hafi áttað sig á því hvað felst annars vegar í orðinu Íslendingur og hins vegar þjóðin. Við gerð alþjóðasamninga á borð við gerð samningsins um Evrópska efnahagssvæðið (EES), í byrjun tíunda áratugarins, varð mönnum tíðrætt um aðgang að fiskimiðum, jarðhita og eignarhald á landi. Umræðan gekk út á að auðlindir ættu að vera í eigu Íslendinga. Hvað fólgjð er í því að vera í eigu Íslendinga var ekki skilgreint frekar og ljóst að tvennis konar skilningur er ríkjandi um það hvort í eigu Íslendinga þýðir í eigu þjóðarinnar eða í eigu einstaklinga með íslenskt vegabréf? Ljóst er að margir leggja þann skilning í að Íslendingur í þessu tilliti þýði þjóðin. Ef sagt er að Íslendingar eigi að njóta afraksturs sameiginlegra auðlinda þá er vafalaust hinn almenni skilningur á Íslendingar að um þjóðina sé að ræða en ekki fáeina einstaklinga. Ekki er spurt hvernig hátti meðferð auðlindarinnar, hvert arðurinn af henni rennur, hverjir fái vinnu við að nýta hana, heldur einvörðungu það, að sá sem er skráður eigandi hennar sé handhafi íslensks vegabréfs. Þjóðhagslegt markmið taki af allan vafa um hvað hvaða hugsun býr að baki kröfum á borð við þær hvort nægi að auðlindir séu í eigu einstaklinga með íslensk vegabréf eða þjóðarinnar.

Skýrslur frá liðnum tíma

Viðleitni stjórvalda á borð við ýmsar ímyndarskýrslur t.d. *Ímynd Íslands*, (Forsætisráðuneytið, 2008) ber vott um ákveðna viðleitni til þjóðfélagslegrar markmiðasetningar. Þar er á vissan hátt verið að örva umræðu um þjóðhagsleg markmið án þess að fjallað sé nákvæmlega um með hvaða hætti sú verðmætaaukning skuli notuð, t.d. hvort hana eigi að nýta til að auka almenna velferð, þ.e. hækka útgjöld ríkisins án þess að nýjir skattar komið til.

Viðleitni til framsetningar á þjóðhagslegum markmiðum má sjá í skýrslu Viðskiptaráðs Íslands (2006), *Ísland 2015* sem telja verður markvissa leiðbeiningu að auknum hagvexti þó ekki sé skýrt að orði kveðið í þágu herra hagyöxturinn skuli nýttur. Þar er farið um nokkuð víðan völl um framtíðarskipan flestra málefna íslensks samfélags. Ekki er sagt berum orðum að hvatinn að gerð skýrslunnar sé til að auka á velferð, heldur fyrst og fremst verðmætasköpun án frekari útlistana hennar. Um margt verður að skoða þessa skýrslu sem minnisvarða um stórhug en jafnframt áminningu um á hve veikum grunni hann var byggður. Stöku umfjöllun í skýrslunni ber vott um sérstöðu tíðarandans, sem vakti athygli strax þegar voru settar á blað, ekki síður en nú. Víða er fast að orði kveðið í skýrslunni með orðalagi á borð við: „Viðskiptaráð leggur til að Ísland hætti að bera sig saman við Norðurlöndin, enda stöndum við þeim framar á flestum sviðum“ (Viðskiptaráð Íslands, 2006, bls. 22). Annað sem er til þess

fallið að draga úr trúverðugleika skýrslunnar er hversu margir af höfundum hennar sæta nú rannsókn af hálfu *sérstaks saksóknara*. Slíkt getur vart talið skýrsluna sem heppilegan leiðarvísí til framtíðar eins og mál standa nú.

Nokkur lykilorð er að finna í skýrslu Viðskiptaráðs og sem hefur orðið fleirum til umhugsunar sbr.: „Sú staðreynd að einkenni eins og „áræðni“, „agaleysi“, „hvatvísi“ og „sterk innbyrðis tengsl“, sem þóttu meðal helstu kosta íslenskra viðskiptajöfра á meðan þeir gerðu sig gildandi á hinum hnattvædda heimsmarkaði, eru nú talin ein helsta rót þess að spilaborgir útrásarvíkinganna hrundu í október 2008“ (Guðmundur Hálfdanarson, 2009, bls. 6-7).

Geta þjóðhagsleg markmið skilað einhverju?

Spyrja má hvort þjóðhagsleg markmið greipt í þjóðarvitund hefðu breytt einhverju um hvernig fór í hrúninu. Þjóðhagsleg markmið sem tækju til velferðar almennings og ráðstöfunar afraksturs sameiginlegra auðlinda hefðu vafalítið náð að halda aftur af þeirri eignabólu og hröðun sem varð í hagkerfinu þegar ný- einkavæddir bankar áttuðu sig á möguleikum á stórfelldri aukningu útlána til útgerða. Skipti þá engu hvað verið var að lána til, oftar en ekki í verkefni eða eignir, sem höfðu ekkert með útgerð og fiskvinnslu að gera en voru þrátt fyrir það með veði í afnotarétti útgerðarmanna í hinni sameiginlegu auðlind þjóðarinnar. Ráðstafanir til þess fallnar að draga úr þeim sviptingum sem skuldsetning sjávarútvegsins hefur leitt yfir þann atvinnuveg og þjóðarbúið í heild hefði haft sitt að segja.

Markmiðasetning þykir almennt til þess fallin að skapa stöðugleika. Almenn markmiðasetning í samfélaginu sem stuðlar að velferð almennings væri til þess fallin að stuðla að jafnvægi. Stöðugleiki skilar almenningi mestum ávinnungi. Í hagrænum skilningi myndi markmiðasetning óhjákvæmilega verða nokkurskonar sjálfvirkur sveiflujafnari, (*e. stabiliser*) sem hefði getað dregið úr áfallinu sem íslenskt þjóðarbú varð fyrir ef til slíkrar markmiðasetningar hefði verið vandað og ráðamenn fylgt þeim eftir af fullri einurð.

Þjóðir sem þurfa að takast á við mikla erfiðleika eru líklegrir til markmiðasetningar, jafnvel þó hún sé ómeðvituð, heldur en aðrar þjóðir. Dæmi um slíkt eru Þjóðverjar eftir hremmingar tveggja heimsstyrjalda og efnahagslegt hrun á árunum þar á milli. Þegar Þýskaland reis úr rústum seinni heimstyrjaldarinnar mótaðist þar efnahagsstefna sem miðaði meðvitað og ómeðvitað að því að stuðla að hröðum hagvexti með velferð almennings að leiðarljósi (*þ. sozialer Marktwirtschaft*). Það mátti þó ekki undir neinum kringumstæðum verða á kostnað stöðugleika eða þess að verðmæti hins nýja gjaldmiðils (DM) væri teft í tvísýnu. Frá því þessi markmið urðu ríkjandi í þýsku samfélagi hafa þau haldist að mestu. Mikil áhersla hefur verið lögð á næga atvinnu, þó það markmið hafi ekki alltaf náðst, örlátt almannatryggingakerfi og almannapjónustu. Til að stuðla að öllum þessum þáttum hefur gjaldmiðillinn leikið lykilllutverk og því varð hann að nokkurs konar tákni um þjóðhagslegt markmið sem náðist í þeim skilningi að það skilaði Þjóðverjum meira ríkidæmi í kjölfar þeirrar styrjaldar sem þeir töpuðu, meiru en sigurvegurunum. Þrátt fyrir að svo hafi vel tekist til þá kom það ekki í veg fyrir að Þjóðverjar voru reiðubúnir að fórnar hinum verðmæta gjaldmiðli sínum fyrir sameiginlegan gjaldmiðil þjóða Evrópu, evruna. Ástæðu þess má rekja til yfir-markmiðs sem alltaf hefur svifð yfir vötnum, meðvitað og ómeðvitað, en það er hin efnahagslega samtenging Evrópu sem stuðlað geti að friði í álfunni um ókomin ár. Þannig mátti fórnar hinni verðmætu mynt í þágu markmiða sem voru mikilvægari og snertu sjálfan lífsgrundvöll þjóðarinnar sem var spurningin um varanlegan frið en án hans væri ekkert samfélag að byggja.

Eiga Íslendingar sér þjóðhagsleg markmið?

Hvort þær þrengingar sem íslensk þjóð gengur nú í gegnum geri að verkum að einhver ómeðvituð markmiðasetning muni eiga sér stað til framtíðar í þá veru sem hér hefur verið gerð að umtalsefni er full snemmt að segja til um en fyrstu vísbindingar benda ekki til þess.

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Ecosystem services and human-wellbeing

Valuing ecosystem services

Brynhildur Davíðsdóttir

Today society finds itself confronted with difficult trade-offs between some of its most important activities and ideals, in particular when it comes to allocation of natural capital and its associated services. In virtually any community, natural capital and its services are being allocated to various activities resulting in a widespread loss of such natural systems to agricultural, industrial and urban purposes. The extent of this appropriation was in 1986 as assessed in a landmark paper by Vitousek, Ehrlich, Ehrlich and Matson (1986), to be close to 40% of global net primary productivity (NPP).

The choice of whether and how to appropriate natural capital and its associated services in practice is reduced to the question of tradeoffs, where the aim is to chose the appropriation that will maximize net benefits. For example, should a farmer drain a wetland, with its associated economic benefits for the farmer, or should the wetland be allowed to persist and thereby maintain its multiple ecosystem services, such as carbon sequestration, hydrological and thermal buffering in addition to water filtration services to name a few. Economic agents involved in such allocation try to achieve the best (or most efficient) allocation of the wetland and when doing so consciously or unconsciously evaluate which option is most valuable economically to the nation, firm or the individual in the long run, as measured by social welfare, profits or utility, respectively.

This presents a practical dilemma for economic agents as many of the benefits derived from natural systems or natural capital are classified as non-market goods and services, and as such are external to the market. Consequently, such services remain external to formal decision-making processes resulting in their suboptimal allocation. This seems to imply that such benefits contribute little to profits, utility or economic welfare. However nothing could be further from the truth. As illustrated for example by the Millennium Ecosystem Assessment (MEA, 2005) and Costanza et al. (1997) among many others continued provision of those essential and valuable services is necessary for continued human well-being and economic prosperity. Therefore they must be properly accounted for. A failure to do so will result in suboptimal allocation of ecosystem services and potential depletion of natural capital stocks (Daly & Costanza, 1992).

This paper provides an introductory overview of the relationship between ecosystem services and human well being, with a particular focus on the services provided by the site chosen for the first ecosystem services study in Iceland, the Economic evaluation of ecosystem services: Heiðmörk.

The first section of the paper explains the concepts natural capital and ecosystem services. The second section provides an overview over the methods used when valuing ecosystem services. The last section introduces the first Icelandic ecosystem services research project.

Natural Capital and Ecosystem Services

What is natural capital and ecosystem services?

According to the first law of thermodynamics, energy and materials can neither be created nor destroyed. This implies a finite amount of materials on earth, continuous waste flows, reliance of human economies on materials from natural systems and absolute temporal limits on material use. As a result, human economies can be viewed as subsystems of nature, reliant on its continuous provisioning of goods and services such as material and energy flows.

Natural systems consist of what is called natural capital, which similar to man-made capital yields through its multiple functions a flow of goods and services into the future. Such goods and services, which provide direct or indirect benefits to humans, and thereby support human well-being, are collectively called ecosystem services (Daly & Costanza, 1992; MEA, 2005). The same natural capital can provide multiple services at the same time, yet tradeoffs occur between the provisioning of different ecosystem services. Since the flow of services requires proper maintenance of natural capital, the protection of natural capital is fundamentally important to ensure continued human and economic well-being (Costanza et al. 1997; MEA, 2005). Table 1, below, provides a list of various ecosystem services and their corresponding ecosystem functions.

Table 1. Examples of ecosystem functions and ecosystem services (from Costanza et al., 1997)

Ecosystem Goods and Services	Ecosystem Functions
Gas regulation	Regulation of atmospheric chemical composition
Climate regulation	Regulation of global temperature and precipitation and other biologically mediated climatic processes at global or local levels
Disturbance regulation	Damping and integrity of ecosystem response to environmental fluctuations
Water regulation	Regulation of hydrological flows
Water supply	Storage and retention of water
Erosion control and sediment retention	Retention of soil within an ecosystem
Soil formation	Soil formation process
Nutrient cycling	Storage, internal cycling processing and acquisition of nutrients
Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess nutrients and compounds
Pollination	Movement of floral gametes
Biological control	Trophic-dynamic regulation of populations
Refugia	Habitat for resident and transient populations
Food production	Proportion of gross primary productivity extractable as food
Raw materials	Proportion of gross primary productivity extractable as raw materials
Genetic resources	Sources of unique biological materials and products
Recreation	Providing opportunities for recreation activities
Cultural	Providing opportunities for non-commercial use

A forest is an example of such service-providing natural capital, and provides both direct and indirect benefits through various goods and services. Direct services include those that are easily defined such as fibers, timber or apples. They in many cases are exchanged in markets, have a market price and as a result quite frequently provide the value of the natural capital in question, as seen by decision-makers.

Indirect services include essential life-support services that are necessary for continued human wellbeing. These include services such as water filtration and regulation, air quality regulation, flood and erosion prevention, habitat for biodiversity

and climate regulation at various scales, in addition to essential waste assimilative services such as carbon sequestration. In addition, humans derive what is called cultural services from forests as they provide a place to socialize, play and exercise, a place to recuperate from stress, and a place to learn. Thus cultural services include educational, spiritual and recreational services in addition to existence benefits that capture the value derived from the forest simply due to its existence.

In this example, tradeoffs exist between indirect and direct services, as it is not possible to simultaneously extract timber benefits and life-support services such as water filtration or carbon sequestration from the same tree. In order to assess such tradeoffs, direct and indirect benefits must be internalized and compared by assessing their relative value by assigning a monetary value to the flow of benefits. The next section reviews the main methods used in the valuation of ecosystem services.

Valuing Ecosystem Services

Classifying Ecosystem Goods and Services

The term ecosystem services was originally designed to bridge the ecological and economic perspective of value by clearly illuminating that the structure and functions of ecosystems or natural capital provide benefits or value to humans (Daly & Costanza, 1992). Ecological/economic valuation begins by identifying for the capital in question, its key structures, functions and their derived services (see examples of functions and services in Table 1). The next step is to classify the various services. Various classification schemes have been devised for ecosystem services such as by Goulder and Kennedy, (1997), De Groot et al. (2002) and in the Millennium Ecosystem Assessment (MEA, 2005). One of the most commonly used classification scheme today is the one devised in the Millennium Ecosystem Assessment (MEA, 2005), which divides ecosystem services to four groups:

1. **Provisioning services;** are the products people obtain from ecosystems, including the food, wood, fresh water, fuel and genetic resources.
2. **Supporting services;** are those services necessary for the production of all other services, such as primary production and soil formation.
3. **Regulating services;** are the benefits people obtain from the regulation of ecosystem processes, including climate regulation, flood regulation, air quality maintenance, water purification, regulation of biogeochemical cycles such as the carbon cycle and erosion control.
4. **Cultural and amenity services;** are the nonmaterial benefits people obtain from ecosystems through cognitive development, reflection, recreation, spiritual enrichment and aesthetic experience.

Each group contributes directly and indirectly to human wellbeing (MEA, 2005) but supporting and regulating services embody the services referred to above as life-support services.

Valuation

After ecosystem services have been identified, each service type is matched with appropriate valuation method. Broadly, economic values of ecosystem services are broken to use and non-use values. Use values include direct use, indirect use and option values. Direct use refers to the services that are used directly by human beings such as consumption of food or use of an ecosystem for recreation. Indirect use refers to benefits that are indirectly used such as maintaining air and water quality, carbon sequestration or primary production. Option values are derived from retaining the

capability to use ecosystem goods and services in the future, even if they are not currently used.

Non-use values are derived from the enjoyment people can experience from the knowledge that a natural environment exists and is maintained, and include bequest value, altruistic value and existence values.

The total value of the benefits derived from natural capital, is the sum of use and non-use values. Several methods exist to assess use and non-use value (see Freeman, 2003 for an overview of valuation methodology) and the most common ones, apart from using direct market prices, are briefly described below.

Use values

The travel cost method is based on using travel expenses as a proxy for the value of e.g. recreational services of a particular site. The underlying rationale is that travel is a complementary good to recreation for most individuals. A statistical relationship between observed visits and the cost of visiting is used to approximate a demand curve for visits to the site. Once a demand curve has been estimated, consumer surplus can be calculated as a measure of the welfare effect of the environmental service the visitor is seeking. The method has been widely used to estimate recreational value (Bowes & Krutilla, 1989). A survey of the method can be found in Flecher et al. (1990).

The hedonic pricing method is based on the theory of characteristics value, first proposed by Lancaster (1966) where the value of an ecosystem service is captured through the contribution of the service to the price of associated products such as housing. The approach has three stages. The first step involves the estimation of the hedonic price function. It is a function that describes the unit price of a commodity as a function of its characteristics. The second step involves calculating implicit characteristic prices as the derivative of the hedonic price function with respect to the ecosystem service of interest. The third step involves estimating the demand curve for the chosen service. Examples of applications of the hedonic pricing method include O' Bryne, Nelson and Seneca (1985) and Zabel and Kiel (2000). The value of Esjan was the subject of the only hedonic pricing study performed so far in Iceland (Sigurður Johannesson, 2003).

Net factor income or derived value method is based on estimating the contribution of the chosen ecosystem service to output such as tourism or fish yield, using a conventional production function. Examples include assessments of how much of the added value generated by tourism is attributable to the existence of a particular ecosystem, as opposed to other inputs such as produced capital, material inputs, and labor, or the contributing value of water quality to fish yield.

Preventive cost avoided, defensive expenditures and replacement cost, involve estimating the value of ecosystem services based on the costs of avoiding damages due to lost services, the cost incurred due to necessary purchases due to lost services and the cost of replacing ecosystem services. These methods do not provide strict measures of economic value. Instead, they assume e.g. that the cost of avoiding damages or replacing ecosystems and thus their services; provide useful estimates of economic value. This is based on the assumption that if people incur costs to avoid damages caused by lost ecosystem services then those services must be worth at least what people paid to avoid the damage. Consequently, those methods are most appropriately applied in cases where damage avoidance or replacement expenditures have actually been, or will actually be made, or where perfect substitutes can be found.

Non-use values

The contingent valuation (CV) method is a survey-based technique for eliciting stated preferences for non-marketed goods, and is the most commonly used method

to assess non-use values. A CV is conducted by asking a sample of the affected population questions on well-specified hypothetical scenarios to identify the preferences of each respondent with respect to a defined environment. The key part of any CV study is the description of the scenario, the hypothetically planned change in environmental quality, and the question eliciting the individual respondent's willingness to pay (WTP) or willingness to accept compensation (WTA) for set change. This enables the estimation of an environmental service demand function. The CV methodology is well known and is extensively described in numerous textbooks in environmental economics (e.g. Bateman & Willis, 1999; Hanley & Spash, 1993). Rigorous guidelines on the implementation of CV's were given in the NOAA panel report (Arrow et al., 1993). Three CV studies have been performed in Iceland (Sigridur Ágústa Ásgrímsdóttir, 1998; Bothe, 2003; Lienhoop & MacMillan, 2007). Sigridur Ágústa Ásgrímsdóttir assessed the value of an area proposed for a hydroelectric project in Skagafjörður. Bothe (2003) assessed the willingness to prevent the potential environmental impact of the Kárahnjukar hydroelectric dam and Lienhoop and Macmillan (2007) assessed the willingness to pay and the willingness to accept payment for environmental impact due to the Kárahnjukar hydroelectric dam.

As can be seen from this short overview, valuation of ecosystem services was until recently largely an unexplored subject in Iceland and as a result the concept ecosystem services has not yet been used in environmental and resource management in the country. To change course in this regard, the first comprehensive ecosystem services research project in Iceland was initiated with the aim to assess the ecosystem services derived from Heiðmörk, a popular recreational area at the outskirts of the Icelandic capital area. The next section provides an overview over the study, but subsequent chapters describe individual study components.

Estimating the Value of Ecosystem Services: the Heiðmörk project

Introduction

The first research project on ecosystem services in Iceland is a multi-year, multi partner project. The partners include The University of Iceland, University of Vermont, The Agricultural College, Icelandic Forest Service, Reykjavik Forest Society, The Institute of Freshwater Fisheries, Reykjavik Energy, The city of Reykjavik and Gardabær municipality.

The overall objective is to provide the first comprehensive evaluation study for ecosystem services in Iceland, which can serve as a benchmark for future studies. It is expected to lay the foundation for classification of ecosystem services in Iceland, to build capacity in applying appropriate valuation methods for each service and thereby enable the use of the term in economic decision-making. Finally, it is intended to increase awareness of the importance of the multiple services we derive from natural capital, and thereby enrich the national discourse on resource use by swaying the discussion away from the conventional one-dimensional view of nature.

The Site

When selecting an appropriate site for a comprehensive ecosystem evaluation study that fulfills those aims, several criteria must be fulfilled. The most important criteria are (1) system boundaries must be clearly identifiable (2) the system must be diverse and multifunctional and thus provide a variation of different ecosystem goods and services (3) the geology and the ecology of the system must be somewhat known such to provide a solid foundation for the valuation study. Our chosen study site, Heiðmörk, fulfilled all those criteria.

Heiðmörk is an extensive, yet clearly defined nature reserve, bordering Reykjavík, Garðabær and Kópavogur. It encompasses around 3500 hectares of forests, lava fields, lakes and open areas. Use of Heiðmörk as a source of drinking water for the capital area started as early as 1909 from the Gvendarbrunnar Wells. In 1949 Heiðmörk was gazette as a nature reserve and recreational area. Later the area was extended to its current size.

The area provides an outstanding example of a multifunctional ecosystem, where a range of services can be identified. Some of the obvious services the Heiðmörk ecosystem provides can be identified as drinking water and recreational services. The area is a key water supply area for the Great Reykjavík area, harboring the Gvendarbrunnar wells that supply drinking water to more than half of the Icelandic population. Also, the area is a widely popular recreational area with accessible forests, lakes and open spaces, attracting over 500,000 visitors the year around. Other less obvious services are educational and cultural, carbon sequestration services and habitat services for various bird and fish species. Finally, the area provides the outer range/backdrop sheltering the capital settlement areas.

Being in such close vicinity to the Capital area also poses challenges, such as those relating to urban expansion and land disputes. A range of actors has a stake in Heiðmörk. Heiðmörk is currently the property of the city of Reykjavík, Garðabær and Reykjavík Energy. Land tenure is therefore communal, historically aimed at multi-functionality and collective use. Reykjavík Energy is responsible for the management of the drinking water resources, while the Reykjavík Forest Society has the mandate to manage the forests and recreational services. Further, the area is highly popular recreational area where many user groups such as fishermen, horse riders, hikers etc. can be identified as important stakeholders. Management of Heiðmörk is therefore a demanding multi-stakeholder exercise, where different tradeoffs, involving the value of different services need to be addressed simultaneously.

Identifying and valuing ecosystem services in Heiðmörk

Heiðmörk provides a specific set of ecosystem services, of which we chose to focus on a selected set of services, defined by identifiable system components. Within each system component the MEA classification scheme was used to define individual services, and then state-of-the-art valuation methods were used to value the identified ecosystem goods and services.

The system components and its associated services are as follows:

- The Water Catchment Area; which has a water supply function, as the area is an important catchment area for Reykjavík, providing clean drinking water and thereby providing provisioning services. To assess the value of the water provisioning services two separate valuation methods were used: replacement cost and cash flow analysis. A subsequent chapter in this issue describes this analysis (Hildur Sigurðardóttir & Daði Már Kristófersson, 2010).
- The Forest and Vegetation; which provides multiple services such as: (a) provisioning services such as timber, Christmas trees, medicinal herbs, mushrooms and berries (b) support and regulating services such as carbon sequestration services and water filtration and (c) cultural and amenity services such as recreation. Cultural and amenity services are assessed as their own component of the study (see below), and water filtration services were evaluated as part of the water catchment component. As a result the forest component involves two parts: provisioning services and support services with a sole focus on carbon sequestration at this time (Pick, 2009).

- The lakes Elliðavatn/Vífilstaðavatn; which provide (a) provisioning services such as fish harvest as well as serving as a reservoir for a hydro-power plant, (b) supporting services such as maintenance of nutrition for Elliadar river (c) regulating services such as pollution dilution for the surrounding habited areas in addition to (d) cultural services such as education and recreation. In order to prevent double counting the value of fish harvest was excluded from the assessment, as most fish in the lakes for recreation purposes. A subsequent chapter in this issue describes this analysis (Halla M. Johannesdottir, 2010).

Due to the nature of the area, specific services transcend each system component and thus to prevent double counting those are identified as specific cross-cutting system components and assessed separately. Those-cross-cutting system components are:

- Recreational services. A series of travel cost surveys were conducted from the summer of 2008 to the end of September 2009, to capture this value. In addition, measurements of traffic flow were captured in cooperation with the Icelandic Road Authority. A subsequent chapter in this issue describes this analysis (Daði Már Kristófersson & Kristín Eiriksdottir, 2010).
- Cultural services as captured by existence value. The valuation of this component is perfumed using contingent valuation surveys. The survey was designed in 2009, implemented in 2010 and the results are currently being analyzed. The results derived from the CV assessment will support the results found in other components of the assessment.
- Bio- (e.g. plant and animal species), and geodiversity in the area in addition to heritage value is also included. The cultural and recreational value of those services is assessed in the study components described above. However careful inventory assessment of those components was conducted as well.

Conclusion

Data collection in the Heiðmörk project has been completed, and the study is quickly moving through its analysis phase. However, the project is already fulfilling its objective. Awareness of the importance of ecosystem services has increased in Iceland, and its incorporation into national and local decision-making has been proposed. Multiple young scholars have been introduced to the valuation methodology and interest is the valuation of ecosystem services is mounting.

Yet more work needs to be done, as assessing of the value of ecosystem services and the potential impact of planned projects on the provisioning of such services must become a routine part of any project appraisal.

Three additional papers in this volume will describe three separate components of the Heiðmörk ecosystem services project.

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Valuing recreational demand

The case of Heiðmörk

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To this day the full social cost of proposed projects in Iceland has not been taken into account in the decision making process since environmental goods being sacrificed have not been valued in monetary terms. Therefore, the monetary impact of socially desirable goods, such as unspoiled nature and access to outdoor recreational areas, is unknown. This paper is a part of a comprehensive environmental valuation study of the largest recreational area in the greater Reykjavik area, Heidmork. The project is funded by Rannis, the city of Reykjavik, the municipality of Gardabaer and Reykjavik Energy and its primary objective is to improve the current situation in Iceland and serve as a point of reference for future research of valuable Icelandic environmental goods and services.

This paper focuses on the attributes of data gathered on recreational behavior in Heidmork in the years of 2008 to 2010 and the apparent problems of immensely heterogeneous user groups, the existence of heavy users and to a large extent a lack of variance in the individual travel costs. When left unattended, any one of those problems could cause a conventional recreational demand estimation with a count data model specification to break down or to at least give biased welfare estimates. This paper proposes a comprehensive plan that combines revealed and stated preference data, calibrations of recreational demand with real time traffic counts and finally by estimating a recreational demand model with a latent-class negative binomial model to address the above mentioned problems. Such an approach can potentially shed light on and handle both the observed and unobserved factors of user group heterogeneity, the thick upper tail problem of heavy users and the lack of distribution in individual travel costs.

Advances in the Travel Cost Method

Intuitively, the use of a recreational site and the trip to the site are complimentary goods and therefore travel cost can serve as an implicit price for recreation. The travel cost method (TCM), simplistically described above, dates back to Hotelling who laid down the foundation of the method in his 1947 letter to the National Park Service (Phaneuf and Smith, 2005). Ever since, the TCM has proven to be a powerful tool to estimate recreational demand and its welfare implications. Early applications focused on single site count data travel cost models to estimate recreational demand but as advances were made in discrete choice theory with McFadden's random utility model (RUM) (see McFadden, 1974) the TCM literature gradually shifted towards site choice models with Hanemann's dissertation (see Hanemann, 1978) setting the stage.

Applications and the theoretical foundation of the single site count data travel cost model are well documented in Shaw (1988), Creel and Loomis (1990), Haab and McConnell (2002), Parsons (2003) and Herriges and Kling (2003). The endogenously

stratified, zero-truncated, negative binomial model is the predominant estimation model for travel cost count data gathered on-site due to the tendency of data to be overdispersed (see Martinez-Cruz, 2010). For a theoretical treatment the reader is referred to Cameron and Trivedi (1998), Haab and McConnell (2002) and Hilbe (2007).

Advances in the site choice model have on the one hand focused on fitting models with ever better prediction power and on the other hand on ways to improve the quality of datasets by combining revealed and stated preference data. Site choice models have evolved from the multinomial logit RUM model, first applied by McFadden et al. (1977) on transport choice data, to more complicated mixed logit models that can better model unobserved heterogeneity and substitution patterns with different mixing distributions for the underlying parameters (see Hensher, Rose, & Greene, 2005; Train, 1999, 2009). Recent empirical work in the nonmarket valuation literature focuses on the use and evidence in the support of latent-class models (see Scarpa & Thiene, 2005; Train, 2008), also called finite mixture models. Latent-class models take advantage of the EM algorithm, first proposed by Dempster, Laird and Rubin (1977) for handling missing data, to estimate flexible distributions of preferences which is undeniably convenient in the presence of immense heterogeneity. Applying latent-class models to recreational demand data has tremendous policy implications since the EM algorithm is capable of mapping the preferences of different user groups by dealing with inter- and intra-class heterogeneity simultaneously. The reader is referred to McLachlan and Krishnan (1997) and Train (2009) for theoretical treatment and applications of the EM algorithm.

Combining revealed and stated preference datasets is a way of data enrichment (see Louviere, Hensher, & Swait, 2000) and gaining more information on relative weights of different user groups and observed heterogeneity across users than would be possible with an on-site sample alone. To combine datasets the researcher imposes the restriction of equality of parameters of common attributes across datasets given the difference in scaling. For a site choice model the problem of different scales can be solved with a nested logit model. For readings on combining stated and revealed preference data see Ben-Akiva and Morikawa (1990), Adamowicz, Louviere and Williams (1994), Louviere et al. (2000) and Haab and McConnell (2002).

Recently, the focus of the travel cost literature has been turned back on single site estimation with latent-class count data estimation with applications by Scarpa, Thiene and Tempesta (2007) and Martinez-Cruz (2010). These applications suggest evidence in support of estimating single site recreational demand with finite mixture models.

Data

Heidmork is an open access urban park owned by the city of Reykjavík, the municipality of Gardabaer and Reykjavík Energy. It is by far the largest recreational area in the vicinity of the greater Reykjavík area and is used by diverse types of user groups year round. The park encompasses around 3200 hectares of forests, lava fields, lakes, a water basin and open areas as well as over 40 kilometers of walk paths. Some of the different recreational activities the park has to offer include walking/hiking, running, biking, horseback riding, cross-country skiing, fishing, picnicing, picking berries and mushrooms and nature watching as well as being popular amongst residents of the capital area for going for a drive. Two datasets were gathered along with hourly traffic counts from the entry and exit points of the park. The user groups are observably heterogeneous with respect to different recreational activities, different seasons of the year, residency and socio-economic standing such as age, family size, job participation and income.

On-site survey

Several pilots were carried out on-site in Heidmork in June of 2008. Their objective was twofold: Firstly, the questionnair in its entirety was tested as well as phrasing and ordering effects of individual questions. Secondly, the pilots were used to determine the optimal locations for data gathering in terms of cost effectiveness and to maximize the participation rate in whole and across different user groups. Both the entry and exit points to Heidmork and the vast number of parking areas posed a problem for the sampling methodology. Heidmork can be reached by foot, bycycle or horse in numerous locations but there are only two points of entry and exit available for vehicles to the main recreational area. There are dozens of parking areas in Heidmork and two of those are located on the outskirts of the park.

With the seasonal aspects of recreation in Heidmork and the heterogenous distribution of users within the park in mind data from the users was gathered through a self administrated survey from the beginning of July of 2008 until the end of September 2009. Survey days were chosen at random with 3-4 survey days a month during the summer months, May through September, and 1-2 survey days a month during rest of the year. Within each survey day a 4 hour continuous survey period was chosen at random given the constraint of daylight hours. Users were surveyed at both of the entry and exit points for traffic and at the two parking areas at the outskirts of Heidmork when they were leaving the park and they were asked to report, among other things, the number of trips taken to the park in the last calander month and their street adress and zip code. The process resulted in approximately 2500 observations and an overall participation rate of 67%. The roundtrip distance in kilometers and roundtrip travel time in minutes was measured with a traffic GPS system provided by www.ja.is. By analysing some of the descriptive statistics from the dataset a lack of variation in the travel cost and the problem of heavy users becomes apparant, e.g.:

- 99% of participants reside in the capital area (including Reykjanes),
- the average roundtrip distance for participants reciding in the capital area is 18.8 kilometers and the standard deviation is 10.52 kilometers,
- the standard deviation of roundtrip distance within each zip code is in most cases around 1 kilometer, which is well within the range that could usually be attributed to mere measurement error,
- 73% of participants take 4 trips, the average, or fewer,
- 90% of participants take 10 trips or fewer,
- 2.2% of participants take 25 trips or more per month,
- 44% of participants report other recreational activities besides the core activities of walking/hiking, running, biking, going for a drive and horseback riding.

Online survey

The sampling methodology of the on-site survey failed to capture certain user groups such as horseback riders, runners and bikers. Horseback riders in Heidmork tend to ride in groups which makes it dangerous to try and stop them. Both runners and bikers were in general reluctant to participate in the survey since often times they were still in the midst of their timed excercise routine. To gain more information on those user groups as well as to reveal the relative weights of different user groups in the underlying population, an online survey was designed.

In June of 2010 four thousand individuals, randomly sampled from the population of Iceland, were asked to participate in an online survey about Heidmork carried out by Capacent, an Icelandic market research company. The participants were unaware of the survey topic until they were well on their way with answering the questions. Of the approximately three thousand individuals that participated in the survey 59% had visited the park in the year 2009. Even though the sampling procedure excludes the self-selection of heavy users into the sample the descriptive statistics from the dataset reveal the same pattern of heavy users as the on-site sample did. The following are highlights from the above mentioned descriptive statistics of sampled users:

- The average number of trips taken by participants lies in the range of 6-11 times in the year 2009,
- 91% of participants visit the park on average less than once a month in the year 2009,
- 41% of participants take two or fewer trips in the year 2009,
- 2% of participants visit the park on average at least once a week the entire year of 2009,
- 29% of sampled visitors report other recreational activities besides the core activities of walking/hiking, running, biking, going for a drive and horseback riding.

Traffic Counts

To gain reliable information on total use of Heidmork, The Icelandic Road Administration implanted traffic censors into the Asphalt of both of the entry and exit points to the park. The censors provided data that can be broken down into hourly intervals for the entire year of 2009 and can easily be cross-referenced with the travel cost data gathered on-site further aiding the mapping of heterogenous user groups with respect to travel.

Discussions

After consulting with experts in matters concerning Heidmork it was evident that in order to get representative and unbiased welfare estimates associated with recreational use of the park a straight forward on-site sample would not suffice due to seasonal aspects of the user groups as well as the difficulty of reaching certain user groups while on-site. Therefore, a dataset including an on-site sample, online survey data and hourly traffic counts in Heidmork was collected.

Since several steps were taken in the sampling methodology of the on-site sample to ensure a representative sample of heterogenous user groups, the authors are lead to believe that the problem of heavy users cannot be solved by endogenously stratifying the model but rather is explained by the nature of the urban park in question. In other words, we believe that the overdispersion in the data is due to unobserved heterogeneity of users rather than statistical properties of data gathering process. This belief is reinforced with the online survey data where it is noteworthy to mention that 91% of sampled users report a number of trips taken in the year 2009 that lies in the same range as the average reported trips. Furthermore, to solve estimation problems likely to arise due to the lack in variation of travel costs across individual users of Heidmork with any measures other than a model that is well suited for preference mapping would be missing the point of welfare estimation.

By combining all the best approaches the TCM literature has to offer the problems of heterogenous user groups, existence of heavy users and lack of variation in travel costs can be addressed simultaneously by estimating a latent-class negative binomial

model of recreational demand for Heidmork. The next step in this research is to formalize a latent-class count data model that will incorporate the data collected on-site as well as the online survey data. After estimation of a recreational demand model the traffic counts will then be used to estimate the total value of recreation in Heidmork.

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Labour supply in the Icelandic labour market

Eyjólfur Sigurðsson

As to what extent taxation changes will affect labour markets is beforehand unclear, but with detailed micro-data and proper models it is possible to estimate some probable outcomes. The aim of this paper is to assess the behaviour of the supply side of the Icelandic labour market.

It has been popular to estimate labour supply with the Maximum Likelihood approach of Burtless and Hausman (1978). The model utilized is then often the standard textbook model of the utility-maximizing consumer, first formalized in Hausman (1980). This method is based on researcher-selected functional form for preferences, which the researcher must select. Imposing full economic rationality and a functional form for preferences imposes restrictions on the estimate (see MaCurdy, Green, & Parasch, 1990).

Methods that have been developed or suggested to overcome the known shortcomings of the traditional ones are related to the discreteness of the labour market participation decisions, the dynamism of labour market participation choice as participation in one period can be a substitute for participation in another period, or that experience gained early on can affect the probability of finding gainful employment later on (see Blundell & MaCurdy (1999) for a review of alternative approaches to estimating labour supply).

In this paper, labour supply is treated as a discrete choice problem, following van Soest (1995). This solves the problem with the traditional model when budget sets are not piece-wise linear or convex. In addition, it does not assume quasi-concavity of preferences a priori.

Economic Model and Empirical Specifications

The utility maximising individual draws pleasure from consumption and leisure. The trade-off is thus between working more in order to consume more or working less in order to gain more leisure. His set of options is confined by his wage rate, his non-labour income and taxation. One inherent problem with this type of models is that the wage rate is not observed for every individual. Notably, when individuals are not working there are no wages to be observed.

The wage model is used to predict the wage rate for individuals who are not working. The alternative (ad hoc) approach is to use wage rate predictions in the labour supply model for the entire population. Though this would yield consistent estimates, it is based on the econometrician's predictions instead of observed wage rates.

Standard empirical wage specification is used. The wage equation is of the following general form

$$\log w_{it} = X'_{it}\beta + \alpha_i + \varepsilon_{it}, \quad (1)$$

where w_{it} is the real hourly wage rate of individual i at time t , X_{it} is a vector of measurable individual characteristics, and α_i is unobserved individual characteristics.

Observations are divided into four groups and the wage equation is estimated separately for each group. The groups are single males, single females, males in a two-adult household, and females in a two-adult household.

The direct utility function quadratic in logarithms, follows van Soest (1995), is presented as

$$U(v) = v'Av + b'v, \quad v = (\log c, \log(T - h_h), \log(T - h_w))', \quad (2)$$

where A is a 3x3 matrix of unknowns, b is a vector of parameters (β_c , β_h and β_w), c is consumption (disposable income), T is time endowment, h_h is hours of work by the husband and h_w is hours of work by the wife. This utility function is locally second order flexible without any restriction on the parameters. Utility is assumed to be increasing with consumption and leisure (decreasing with hours of work). Quasi-concavity of preferences is not imposed beforehand, as is subject of critique in MaCurdy et al. (1990).

For a single headed household, the utility function would only consist of consumption and leisure by that individual. In the two-adult household it is assumed that consumption is shared within the household while the leisure is separate. It is feasible to construct some sort of game theory setting between the two individuals, but not practical for the purpose of this analysis.

Individual total time endowment (T) is set to 4,000 hours per year. In the model, each household member is faced with having to choose between seven different working hour options, ranging from 0 to 3,000 hours per year in 500 hour intervals. If we put this into context of a regular 40 hour workweek (i.e. the typical 8.00 to 16.00 day job), disregarding vacations within the work, that makes about 2,086 hours per year (or 2,091 hours if it is a leap year).

In the case of single headed households, the model is thus comprised of the seven discrete choices of hours to work. But in the case of two-adult households we have the seven discrete choices of each in combination with the other one, which makes a total of 49 discrete choices of hours to work for the two-adult households.

A fixed cost of working is introduced into the model as an entry cost to the labour market. The base line model is known to under predict the number of part time workers and a number of methods have been developed in order to adjust this. Including a fixed cost is one way to repair it. In van Soest and Das (2001); van Soest, Das and Gong (2002); Flood, Pylkkänen and Wahlberg (2003); and Flood, Hansen and Wahlberg (2004) it is introduced log-linearly depending on geographic location, but as a dummy variable in Pylkkänen (2001). In this paper it is introduced as a dummy variable, but separately for husband and wife in the two-adult households.

If we drop the matrix notation of Equation 1 and write the full functional form used in the estimation, then for any given household the trans-log specification of the direct utility function is

$$\begin{aligned} U(c, l_h, l_w) = & \beta_c \log(c) + \beta_h \log(T - h_h) + \beta_w \log(T - h_w) \\ & + \beta_{ch} \log(c) \log(T - h_h) + \beta_{cw} \log(c) \log(T - h_w) \\ & + \beta_{hw} \log(T - h_h) \log(T - h_w) + \beta_{cc} (\log(c))^2 \\ & + \beta_{hh} (\log(T - h_h))^2 + \beta_{ww} (\log(T - h_w))^2 + \beta_{fc,h} D_h \\ & + \beta_{fc,w} D_w, \end{aligned} \quad (3)$$

where D_h is the indicator variable for husband working and D_w is the indicator variable for wife working.

Each household chooses the combination of leisure ($l_i = T - h_i$, $i = h, w$) and consumption (or net income) by maximizing household utility subject to the budget constraint:

$$c = w_h h_h + w_w h_w + y_h^* + y_w^* - t(\cdot), \quad (4)$$

where c is household consumption (net income), w_i is the wage rate and y_i^* is non labour income. The function $t(\cdot)$ determines taxation, it is a function of income, capital, spouse and other individual characteristics that determine taxation.

Heterogeneity in individual preferences for leisure is introduced as

$$\beta_i = \sum_{k=1}^K \beta_{i,k} x_{i,k}, \quad i = h, w, \quad (5)$$

where x is observed individual characteristics, such as age, education, number of children and nationality.

It is assumed that the utility carries a random disturbance that follows a type I extreme value distribution, more specifically the standard Gumble distribution. Then the probability that an individual chooses alternative i , conditional of wage rate, potential benefits, exogenous variables, and partner's number of hours worked, is given by

$$P_i = \frac{\exp(U_i)}{\sum_j \exp(U_j)}. \quad (6)$$

The main disadvantage of using discrete choice to model hours of work is the introduction of classification error. Following MacCurdy (1990), Flood et al. (2003), Flood et al. (2004) and Pylkkänen (2001), the measurement error specification is assumed a multiplicative classification error, given as

$$H_i = h_i e^{\varepsilon_i} \quad \text{where } \varepsilon_i \sim N(-\frac{1}{2}\sigma_i^2, \sigma_i^2) \quad \text{and } i = h, w, \quad (7)$$

where H_i is the observed hours of work and h_i the optimal discrete hours. This implies that zero hours are observed with certainty, but when optimal hours are positive they differ by a factor of proportionality. This can be interpreted as a “within group” error which weights up the observations where the classification error is small.

The classification error in Equation 7 has a density function of the form

$$g_i = \begin{cases} 1, & \text{if } H_i = 0 \text{ or } h_i = 0 \\ \frac{1}{\sigma_i} \phi \left(\frac{\log H_i - \log h_i + \frac{1}{2}\sigma_i^2}{\sigma_i} \right), & \text{else} \end{cases}, \quad (8)$$

where $i = h, w$.

In presence of the classification error, the contribution of a household to the likelihood function is

$$l = \sum_{i=1}^s d_i \log P_i g_i, \quad (8)$$

where s is the number of choices of hours to work, d_i is an indicator variable for whether the individual chooses alternative i , P_i is given in Equation 6 and g_i in Equation 8.

Data

The data used in the analysis is taken from the Icelandic Longitudinal Income Database (ICELID). This is a registry-based database developed and maintained by Statistics Iceland (*Hagstofa Íslands*). One of the main advantages with ICELID is that given the detail and length of the data, it still has the rare feature that it is not a sample, but covers the entire population. The small size of the nation is an appealing aspect when it comes to population wide estimations. At the time of writing there exist no public documentation of ICELID, but for a discussion of longitudinal models and data with an introduction of the development of ICELID and an overview of its core variables (see Eyjólfur Sigurðsson & Helgi Tómasson, 2008).

The data consists of every individual eligible for taxation in Iceland during the years 2003 to 2008. Included are individual aged between 18 and 67 years old, that are not living abroad during the year or in a retirement home, and are not receiving student loans or assessed disabled. Furthermore, observations are excluded if the tax authorities estimate income and/or other relevant figures (these observations are flagged in the data), individuals are self-employed or have income from own business, or the tax assessment is made by hand or is abnormal (given by code in the data). And lastly, since various parts in the taxation framework are calculated jointly for married or cohabiting couples, those that have spouse that falls within an exclusion criterion or are otherwise missing are also excluded.

If individuals do not report on their tax declaration (either by not declaring or neglecting) the figures are estimated by the tax authorities. Estimated figures are in general excluded from statistics and analysis that is based on this data, since it is deemed unreliable. In estimation the incentive is to come up with a high enough figure in order to coerce the individual to either comply to an (estimated to be) overly high figure or report their true figures in an appeal posterior to tax assessment.

When individuals are self employed or/and have their own business they are to report a certain sum as their income. This is in most cases a regulated figure by the tax authorities and cannot be assumed to reflect the true opportunity cost of the individuals.

When tax declarations are made by hand the figures do in some cases not match up. This is due to the fact that some calculations are not put into the database. In some cases these figures do not comply with law (a simple example, a lump-sum tax figure appears to be in accordance to the previous years), be that due to some abstruse regulations or human err. In either case, it is impossible to account for such discrepancies.

The wage rate is normally not available in register data, since for administrative reasons the focus is on total wages during a period (i.e. week, month or year). Wage rates are commonly derived by dividing annual wages by annual hours. The relationship between hours of work and the wage rate causes a spurious negative correlation between them when hours of work are measured with error (Borjas, 1980). Although observations in ICELID are on an annual basis it contains information based on monthly observations for every individual that received income that is due for taxation (this is through the pay-as-you-earn system). Hourly wage rates are calculated by dividing monthly wages with full time (cohort mean) hours of work adjusting for hours of duty (when it applies). Annual hours of work are then calculated by dividing annual labour income with the wage rate. By doing so we avoid the division bias,

hours of work used in the estimation is paid hours of work rather than actual hours of work, albeit a sufficient measure of output.

For the wage model there are a total of 757,479 observations, or on average 126,247 observations each year from 2003 to 2008. Number of observations by year in each of the four groups – single males, single females, males in a two-adult household and females in a two-adult household – is presented in Table 1.

Table 1. Number of observations by year for the wage model

Year	Single		Two-adults		Total
	Male	Female	Male	Female	
2003	27.333	26.840	31.867	31.924	117.964
2004	27.227	26.466	31.872	31.953	117.518
2005	28.857	27.224	33.361	33.627	123.069
2006	31.487	28.130	34.302	34.578	128.497
2007	33.010	29.103	35.287	35.532	132.932
2008	34.146	30.675	36.200	36.478	137.499
Total	182.060	168.438	202.889	204.092	757.479

Observations of individuals in the first two groups, single males and single females, are on average ten years younger than the individuals in the second two groups, males in two-adult households and females in two-adult households. 34.6 percent of the single male observations have a secondary school degree as their highest earned degree, and 8.6 percent have a university degree. That means that the remaining 56.8 percent have less than a secondary school degree (typically having only the compulsory education). A similar fraction of the single female observations have a secondary school as their highest earned degree, but more observations have a university degree, or 14.3 percent. For both male and females in the two-adult household have a higher percentage of observations with secondary and university as their highest earned degree than their single counterparts, which comes as no surprise since they are on average older. Although there is a higher percent of observations with a university degree for the females in a two-adult household than there is for males, 52.0 percent of the female observations have less than a secondary school degree compared to 38.3 percent of the males in a two-adult household. Of the two single groups, female observations have on average more children. For the individuals in two-adult households the number of children is roughly equal for males and females. Of the four groups, the single males have the highest percent of observations where the individuals do not have an Icelandic nationality, and comparing singles with two-adult households the former is higher. Note also the relatively high within variation for both males and females in two-adult households, which means that a large number of those individuals changed their nationality to or from being Icelandic during the observation period. Around 64.4 percent of all observations are of individuals living in and around the capital area, with the single highest within group percentage being that of single females. Real hourly wage rate (in 2008 ISK) is on average 1,658 ISK for the observations of single males, while it is 1,553 ISK for single females. Of the observations of males in a two-adult household the average real hourly wage rate is 2.578 ISK and 1.748 ISK for females. Note that the number of observations where the wage rate is missing is due to the individual not receiving labour income, proportionately less observations among individuals in a two-adult household than among singles. Summary statistics for each group is presented in Tables 2 to 5.

Table 2. Summary statistics of single males, for the wage model

Variable	Median	Mean	Standar deviation		
			Overall	Between	Within
Age	27,000	31,890	12,647	10,271	0,889
Secondary school	0,000	0,346	0,476	0,382	0,112
University	0,000	0,086	0,281	0,233	0,063
Children (< 7 years)	0,000	0,004	0,066	0,053	0,025
Children (> 7 years)	0,000	0,017	0,155	0,120	0,042
Foreign nationality	0,000	0,110	0,313	0,305	0,029
Capital area	1,000	0,624	0,484	0,400	0,087
Hourly wage rate	1.451	1.658	1.050	823	306
Number of observations	182.060				
Missing wage rate	84.267				

Table 3. Summary statistics of single females, for the wage model

Variable	Median	Mean	Standar deviation		
			Overall	Between	Within
Age	28,000	33,448	13,834	11,514	0,953
Secondary school	0,000	0,328	0,469	0,381	0,136
University	0,000	0,143	0,350	0,289	0,083
Children (< 7 years)	0,000	0,153	0,419	0,340	0,115
Children (> 7 years)	0,000	0,222	0,553	0,453	0,117
Foreign nationality	0,000	0,076	0,265	0,240	0,038
Capital area	1,000	0,686	0,464	0,391	0,092
Hourly wage rate	1.382	1.553	821	629	255
Number of observations	168.438				
Missing wage rate	74.559				

Table 4. Summary statistics of males in a two-adult household, for the wage model

Variable	Median	Mean	Standar deviation		
			Overall	Between	Within
Age	44,000	44,247	11,273	10,262	1,078
Secondary school	0,000	0,429	0,495	0,428	0,049
University	0,000	0,188	0,391	0,354	0,044
Children (< 7 years)	0,000	0,456	0,701	0,591	0,217
Children (> 7 years)	0,000	0,644	0,847	0,710	0,215
Foreign nationality	0,000	0,039	0,194	0,196	0,033
Capital area	1,000	0,632	0,482	0,416	0,064
Hourly wage rate	2.195	2.578	1.840	1.477	645
Number of observations	202.889				
Missing wage rate	79.781				

Table 5. Summary statistics of females in a two-adult household, for the wage model

Variable	Median	Mean	Standar deviation		
			Overall	Between	Within
Age	42,000	42,183	11,299	10,010	0,966
Secondary school	0,000	0,233	0,423	0,354	0,071
University	0,000	0,247	0,431	0,365	0,064
Children (< 7 years)	0,000	0,458	0,701	0,564	0,188
Children (> 7 years)	0,000	0,645	0,847	0,682	0,185
Foreign nationality	0,000	0,048	0,215	0,207	0,039
Capital area	1,000	0,633	0,482	0,406	0,057
Hourly wage rate	1.542	1.748	990	747	270
Number of observations	204.092				
Missing wage rate	99.575				

The labour supply estimation is for the year 2008. The reason for the reduction in the number of observations is in either due to some observations deemed unusable due to unsound calculated hours of work or due to observations being excluded for individuals missing their spouse afterwards or being in a same sex household (given that labour supply of individuals in a same sex household is no different than of any other, the rather few observations did not justify the added complication to the data manipulation process this would have entailed).

The summary statistics of the individual characteristics variables used in the labour supply estimation differ not much that for the wage model. An exception is that the number of children is now ungrouped. The hourly wage rate is slightly higher now that we are using only the year 2008, which might reflect normal wage increases during the years. The figures for the wage rate and hours worked conform to official national statistics. Disposable income appears to be rather varied amongst the individuals. Summary statistics for each group is presented in Tables 6 to 9.

Table 6. Summary statistics of single males, for the labour supply model

Variable	Median	Mean	St.dev
Age	28,000	32,260	12,799
Secondary school	0,000	0,355	0,479
University	0,000	0,097	0,296
Capital area	1,000	0,641	0,480
Foreign nationality	0,000	0,151	0,358
Number of children	0,000	0,021	0,178
Not working	0,000	0,067	0,251
Hourly wage rate	1.414	1.659	1.036
Hours worked	2.219	1.904	936
Disposable income	2.476.239	2.910.602	2.987.710
Number of observations	33.363		

Table 7. Summary statistics of single females, for the labour supply model

Variable	Median	Mean	St.dev
Age	29,000	33,578	14,019
Secondary school	0,000	0,339	0,473
University	0,000	0,163	0,369
Capital area	1,000	0,683	0,465
Foreign nationality	0,000	0,102	0,303
Number of children	0,000	0,366	0,726
Not working	0,000	0,056	0,230
Hourly wage rate	1.353	1.592	914
Hours worked	1.878	1.675	841
Disposable income	2.382.897	2.747.841	2.409.232
Number of observations	30.399		

Table 8. Summary statistics of males in a two-adult household, for the labour supply model

Variable	Median	Mean	St.dev
Age	46,000	45,611	11,043
Secondary school	0,000	0,430	0,495
University	0,000	0,201	0,401
Capital area	1,000	0,632	0,482
Foreign nationality	0,000	0,053	0,224
Number of children	1,000	1,144	1,093
Not working	0,000	0,021	0,143
Hourly wage rate	2.329	2.593	1.685
Hours worked	2.494	2.306	741
Disposable income	4.363.677	5.502.868	5.088.178
Number of observations	32.557		

Table 9. Summary statistics of females in a two-adult household, for the labour supply model

Variable	Median	Mean	St.dev
Age	44,000	43,535	11,140
Secondary school	0,000	0,240	0,427
University	0,000	0,286	0,452
Capital area	1,000	0,632	0,482
Foreign nationality	0,000	0,063	0,243
Number of children	1,000	1,144	1,093
Not working	0,000	0,053	0,225
Hourly wage rate	1.689	1.815	890
Hours worked	2.040	1.777	814
Disposable income	2.905.590	3.630.599	4.071.879
Number of observations	32.557		

The Icelandic Tax Benefit Micro Simulation Model (ICETAXSIM) is used in order to generate net income for the various combinations of hours of work. Access to a simulation-model is essential for calculating taxation and benefits, especially when taxation and benefits are dependent on spouse income and/or capital and tax credits are transferable between couples. As of writing ICETAXSIM is a work in progress, but the set of rules and algorithms that have been developed so far are fully suited for this task. The goal is for a tax and benefit microsimulation model comparable with TAXBEN in the UK or FASIT in Sweden.

Results

The estimation results from the four wage models seem to be consistent with earlier studies. The logarithm of wages seems to follow a parabolic shape, central in the Mincer (1974) type regressions. Higher education degrees are typically associated with an increased wage rate (note that since these are indicator variables the parameter estimates are not a direct percentage). Interestingly a having secondary school as the highest earned degree seems to have no association with wages for individuals in a two-adult household. Each child is associated with a reduction in the wage rate for females, and greater for the younger age group, while it seems to have a marked less or no association for males. This implies a gender based difference in preferences. Having a nationality other than Icelandic does not seem to have any link with the wage rate for females, while nationality is associated with a higher wage rates for Icelandic males. Living in or around the capital area is associated with a higher wage rate for all the groups. Parameter estimates for the single males and single females is presented in Table 10, and parameter estimates for males in a two-adult household and females in a two-adult household is presented in Table 11.

Table 10. Parameter estimates from the wage model for single individual households

Variable	Male		Female	
	Estimate	Std. Error	Estimate	Std. Error
Constant	5,022		5,054	
Age	0,096	0,002	0,085	0,002
Age^2/100	-0,079	0,003	-0,059	0,002
Secondary school	0,038	0,007	0,013	0,006
University	0,299	0,012	0,263	0,010
Children (< 7 years)	-0,064	0,024	-0,095	0,006
Children (> 7 years)	-0,005	0,015	-0,038	0,006
Foreign nationality	0,022	0,021	0,016	0,016
Capital area	0,078	0,007	0,066	0,007

Table 11. Parameter estimates for the wage model for two-adult households

Variable	Male		Female	
	Estimate	Std. Error	Estimate	Std. Error
Constant	4,549		4,796	
Age	0,114	0,002	0,090	0,002
Age^2/100	-0,095	0,002	-0,067	0,003
Secondary school	-0,005	0,011	-0,001	0,008
University	0,218	0,013	0,256	0,009
Children (< 7 years)	-0,007	0,002	-0,096	0,003
Children (> 7 years)	0,001	0,002	-0,045	0,003
Foreign nationality	0,047	0,013	0,006	0,012
Capital area	0,103	0,006	0,076	0,008

The estimated parameters of the labour supply models for households with a single male are presented in Table 12, for single female households in Table 13, and the model for households with two-adults in Table 14. The first eight variables, coefficients named β_{x1} to β_{x8} for the single male and female households and $\beta_{x1,h}$ to $\beta_{x8,h}$ for the male and $\beta_{x1,w}$ to $\beta_{x8,w}$ for the female in the two-adult households, are associated with observed heterogeneity in preferences for leisure. We can see that heterogeneity in preferences for leisure is convexly associated with age for all the different types of households. Individuals with higher educational degrees tend to have less preference for leisure, while individuals living in or around the capital area have more. Foreign nationality does not seem to have any association to preference for leisure for single male households, while it has a positive association for all individuals in the other household types. Number of children does not seem to have any significant link with preferences for leisure for single female households, while it has a positive association for females in a two-adult household. Male individuals, both singles and in a two-adult household, seem to have a negative association in preferences to leisure with the number of children.

Since the parameter for leisure is not constant, but varies with the introduction of heterogeneity for leisure, it is commonly not presented with results. For sake of completion the average of it is presented lastly for all the models. The estimated parameters for the quadratic form – consumption, consumption squared, hours, hours squared and consumptions times hours – indicate a concave form of the utility function.

Table 12. Estimated parameters of the labour supply model for single male households

Variable	Coeff.	Estimate	Std..Error
Constant	β_{x1}	7,242	0,148
Age	β_{x2}	-0,243	0,007
Age^2/100	β_{x3}	0,296	0,009
Secondary school	β_{x4}	-0,016	0,030
University	β_{x5}	-0,320	0,049
Capital area	β_{x6}	0,666	0,030
Foreing nationality	β_{x7}	-0,012	0,042
Number of children	β_{x8}	-0,198	0,075
Consumption	β_c	1,263	0,039
Consumption squared	β_{cc}	-0,409	0,014
Hours squared	β_{hh}	-2,740	0,055
Hours * consumption	β_{ch}	-0,348	0,016
Fixed cost of working	β_{fc}	-1,952	0,037
Classification error	σ_ϵ	0,116	0,000
Hours (at the average)	mean β_h	3,365	

Table 13. Estimated parameters of the labour supply model for single female households

Variable	Coeff.	Estimate	Std..Error
Constant	β_{x1}	8,527	0,186
Age	β_{x2}	-0,297	0,009
Age^2/100	β_{x3}	0,341	0,012
Secondary school	β_{x4}	0,032	0,038
University	β_{x5}	-0,621	0,049
Capital area	β_{x6}	0,682	0,036
Foreing nationality	β_{x7}	0,271	0,060
Number of children	β_{x8}	0,000	0,025
Consumption	β_c	0,755	0,052
Consumption squared	β_{cc}	-0,301	0,017
Hours squared	β_{ww}	-2,268	0,063
Hours * consumption	β_{cw}	0,056	0,019
Fixed cost of working	β_{fc}	-1,263	0,035
Classification error	σ_ϵ	0,130	0,001
Hours (at the average)	mean β_w	3,465	

Table 14. Estimated parameters of the labour supply model for two-adult households

Variable	Coeff.	Estimate	Std.Error
Husband:			
Constant	$\beta_{x1,h}$	1,886	0,293
Age	$\beta_{x2,h}$	-0,083	0,013
Age^2/100	$\beta_{x3,h}$	0,138	0,015
Secondary school	$\beta_{x4,h}$	-0,303	0,039
University	$\beta_{x5,h}$	-1,211	0,051
Capital area	$\beta_{x6,h}$	0,753	0,037
Foreing nationality	$\beta_{x7,h}$	0,726	0,079
Number of children	$\beta_{x8,h}$	-0,154	0,020
Wife:			
Constant	$\beta_{x1,w}$	8,005	0,261
Age	$\beta_{x2,w}$	-0,266	0,012
Age^2/100	$\beta_{x3,w}$	0,348	0,015
Secondary school	$\beta_{x4,w}$	0,026	0,042
University	$\beta_{x5,w}$	-0,768	0,041
Capital area	$\beta_{x6,w}$	0,413	0,035
Foreing nationality	$\beta_{x7,w}$	0,200	0,069
Number of children	$\beta_{x8,w}$	0,202	0,019
Consumption	β_c	-1,583	0,071
Consumption squared	β_{cc}	-0,223	0,016
Husband's hours squared	β_{hh}	-5,148	0,056
Husband's hours * consumption	β_{ch}	0,355	0,019
Wife's hours squared	β_{ww}	-4,100	0,047
Wife's hours * consumption	β_{cw}	0,292	0,014
Husband's hours * Wife's hours	β_{hw}	0,538	0,026
Husband's fixed cost of working	β_{fc_h}	-2,176	0,060
Wife's fixed cost of working	β_{fc_w}	-0,841	0,032
Classification error, husband	$\sigma_{\epsilon h}$	0,110	0,000
Classification error, wife	$\sigma_{\epsilon w}$	0,162	0,001
Husband's hours (at the average)	mean β_h	1,128	
Wife's hours (at the average)	mean β_w	3,747	

The affect of a wage change can be predicted by the model. Wage elasticity of labour supply is found by increasing the wage rate for each individual by one percent and calculating their optimal number of hours of work. Everything else constant, for a 1 percent increase in the wage rate, single male individuals would on average increase their hours with 2.52 percent and single females with 1.12 percent. In the case of two-adult household we have the added cross effect of wage increases. The interpretation is as such, for a 1 percent increase in the wage rate of males in a two-adult household they would increase their hours of work by 0.16 percent, while females would similarly

increase their hours of work by 0.782 percent. In the case where all wages were to increase by 1 percent the cross effect of the increase for the spouse is added to this effect. That is, when the wage rate of both the husband and the wife increase by 1 percent, the husband would increase his hours of work by 0.12 percent and the wife by 0.71 percent. These results for two-adult households are much akin to the results in van Soest & Das (2001). Wage elasticity of labour supply is presented in Table 15.

Table 15. Wage elasticity of labour supply

	Male	Female
Single	2,519	1,116
Couples	0,157	0,782
Cross	-0,036	-0,070

It is possible to conduct wage elasticity estimation for the various sub-groups. The results of Table 15 subdivided by the different educational levels are presented in Table 16. The wage elasticity for single male individuals is the highest for those with a university degree, while it is the lowest for those with a secondary school degree. But it is reversed for males in a two-adult household. Single females appear to have less wage elasticity the higher their educational degree is, while females in a two-adult household are that reversed.

Table 16. Wage elasticity of labour supply by education levels

	Male	Female
Primary school:		
Single	2,782	1,921
Couples	0,150	0,667
Cross	-0,025	-0,070
Secondary school:		
Single	1,914	0,601
Couples	0,183	0,844
Cross	-0,039	-0,059
University:		
Single	3,228	0,019
Couples	0,113	0,864
Cross	-0,048	-0,095

Conclusions

This paper presents an estimation of labour supply in Iceland with a discrete choice model. The main advantage with such models is that they allow for all kinds of non-linear and non-convex budget sets. In so doing we are able to take full account to the intricate nature of Icelandic taxation.

Although general equilibrium effects are ignored, the model provides a valuable insight into how the supply side might react to an external influence to the wage rate. If we, for the sake of illustration, assume a hypothetically tax-revenue maximizing

government agent for instance, then his most profiting strategy would be to raise taxes on individuals in a two-adult household, while his least promising target are single males. Any proposed change to the tax system could of course readily be put through the model in order to estimate what particular effect the change might have.

Acknowledgements

I am grateful to Lennart Flood for providing examples which shortened the development of the data manipulation and estimation processes considerably. Statistics Iceland provided resources and facilities for conducting the analysis. Financial support for this study was obtained from the University of Iceland Research Fund and the Eðvarð Sigurðsson Memorial Fund.

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Economic valuation of ecosystem services

The case of lake Elliðavatn and lake Víflsstaðavatn

Halla Margrét Jóhannesdóttir

The biosphere and its natural ecosystems, through transformations of natural resources such as soil, water and living organisms, yield a flow of ecosystem goods and services, on which humanity ultimately depends (MEA, 2005; Daily et al., 2000). The benefits people derive directly or indirectly from ecosystems are, what is referred to as ecosystem services. These benefits include e.g.; basic life support services such as provision of clean air and water; maintenance of soil fertility; pollination of crops and other vegetation; control of potential pests; production of food and fiber; and provision of cultural experiences (Costanza et al., 1997; MEA, 2005).

Human societies mainly focus on provisioning services derived from ecosystems, followed by regulating, cultural and supporting services (Foley et al., 2005). This order is mostly based on the fundamental short-term needs of humans for food, fiber, timber and habitat. The intended consequences is therefore to appropriate primary production for human consumption (Vitousek, Mooney, Lubchenco, & Melillo, 1997) but the unintended consequences, often adversely affecting other ecosystem services, may remain hidden or just behind in the order of priorities (DeFries, Foley, & Asner, 2004). This reveals tradeoffs that in many cases remain outside of decision-making, possibly resulting in suboptimal appropriation of ecosystem services.

Over the past few decades the importance of ecosystem services has been highlighted. The earliest references regarding ecosystem functions and services date back to the 1960's (de Groot, Wilson, & Boumans, 2002). A certain climax was reached with the publication of the Millennium Ecosystem Assessment (MEA) in 2005. For over a decade now, assessing the flow of ecosystem goods and services and valuing them in terms of economic benefits has contributed substantially to decision-making in environmental-, land-use- and resource management. Despite this development in USA and Europe, Iceland has not followed, and is far behind in this field.

In 2008, the first Icelandic ecosystem services research project was initiated through collaborative efforts of four research entities (Brynhildur Davíðsdóttir, 2010). The project, "Estimating the value of economic services of Heiðmörk recreational area" contains six interdependent study components. This paper presents one of those components, and focuses on the economic value of the services provided by the two lakes located in the area, Lake Elliðavatn and Lake Víflsstaðavatn. More in depth information on the analysis presented in this paper is found in Halla Margrét Jóhannesdóttir (2010).

Study site

Ellidavatn

Lake Elliðavatn is the biggest lake in the capital area, with an area of 2,02 km² (Hilmar Malmquist & Gísli Már Gíslason, 2007). The volume of the lake is around 2 Gl, with

the average depth around 1m (deepest place 2,3 m). Surface influx is mainly through the river Bugða/Hólmsá and through the river Suðurá. Overall, the flow in and out of the lake is approximately 4,7 m³/s. The water exchange rate is around five days, which is fast compared to other lakes of this size. The conduction in Elliðavatn is about 80-90µS/cm, which is above average and indicates good viability for organisms. Most of the dissolved matter in Lake Elliðavatn is similar to what is seen in most Icelandic lakes. An exception from this is aluminum, which is of unusually high concentration in the lake and the highest seen in Icelandic lakes (Hilmar J. Malmquist, Finnur Ingimarsson, & Haraldur Rafn Ingvason, 2004).

Over the last century various changes have occurred in the water catchment of the lake. The most extensive change was when the Reykjavík Power Company (Rafmagnsveita Reykjavíkur) bought the land of Lake Elliðavatn, and the lake was turned into a reservoir for hydropower generation (Skógræktarfélag Reykjavíkur, 2009). It was first dammed in 1924 and the dam was improved in 1978. The lake doubled in size as adjacent areas went under water (Hilmar J. Malmquist et al., 2004).

In 1941 conventional farming ended at Ellidabær, but farming exists elsewhere in the water catchment. For example, stables are present at Heimsendi, a chicken farm at Elliðahvammur and sheepfarming at Vatnsendi and Kjóavellir (Kópavogsbær, 2000). The density of initially summerhouses and then later year round residences has increased considerably. In addition, the heavily traveled road, Suðurlandsvegur is situated in the water catchment. Water has been extracted from the Gvendarbrunnar wells since 1909 and the area is significantly forested. In April, 1964 all land owners around Lake Elliðavatn organized fishing and fish cultivation in the lake, forming the Elliðavatn Fishing Association (Guðmundur Marteinsson, 1975). Since then, this association has been in charge of all fishing in the lake and the rivers Bugða/Hólmsá and Suðurá.

Research of the ecology of the water catchment has mainly focused on salmonids, in particular salmon in the Elliðaár river. However several studies have focused on the trout species in Lake Elliðavatn and adjacent rivers. Five of the seven fresh-water fish species found in Iceland; Salmon (*Salmo salar*), Brown trout (*Salmo trutta*), Arctic Char (*Salvelinus alpinus*), Stickleback (*Gasterosteus aculeatus*) and Eel (*Anguilla anguilla*) are found in the lake. The most abundant fish species are the two trout species and stickleback, salmon is not abundant and eel is rare (Hilmar J. Malmquist et al., 2004). Research conducted by the Institute of Freshwater Fisheries indicate that the salmon and arctic char have been retreating in the water system over the last 15 years but the brown trout has maintained its status. The reasons for this decline in these stocks are not surely known, however a possible explanation is considered to be the increase in water temperature, particularly in the fall (Hilmar Malmquist et al., 2004; Þórólfur Antonsson & Friðþjófur Árnason, 2009)

Vífilsstaðavatn

Lake Vífilsstaðavatn is situated in the north-west end of Heiðmörk and is 0,27 km². Adjacent to the lake are heathlands and slopes, except for the south side where there is moorland, named Dýjakrókar. Springs in the moorland supply water to the lake in little streams. On the west side of the lake, Vífilsstaðalækur falls out from the lake (Jóhann Óli Hilmarsson & Ólafur Einarsson, 2009). The lake and surrounding area is property of the municipality of Garðabær, and were officially declared a protected area in November 2007.

Lake Vífilsstaðavatn is biologically rich. The benthic fauna is dense and conductivity is high, around 130µS/cm, indicating a high level of dissolved matter and good viability (Bjarni Jónsson, 1999). The lake is also fairly undisturbed compared to other lakes in the capital area and has for example not been threatened by residential

areas in the same way as Lake Elliðavatn. Fish species found in the lake include the arctic char, brown trout, eels and stickleback. European eel (*A. angilla*) and a hybrid from the European and the American eel (*A. rostrata*) migrate up the Vífilsstaðalækur and can be found in the lake (Þórólfur Antonsson, Guðni Guðbergsson, Bjarni Jónsson, & Hilmar J. Malmquist, 2007). The sticklebacks in Lake Vífilsstaðavatn are unique and have been the subject of evolutionary and genetic research both in Iceland and in the United States (Bjarni Jónsson, 2004).

Analysis and Results

Both lakes provide various ecosystem services, of which a selected set is economically valued in this study. Using the MEA classification scheme, the following services were valued:

- **Provisioning services;** including food, energy, freshwater, biochemicals, genetic material and biodiversity. In this study the value of Lake Elliðavatn as a reservoir for electricity production is assessed.
- **Regulating services;** including climate regulation, hydrological flow, pollution control and detoxification, services related to prevention of erosion and natural hazards services. In this study the value of the potential pollution dilution and eviction capacity of Lake Elliðavatn is assessed.
- **Cultural services;** including spiritual and inspirational, recreational, aesthetic and educational. In this study the recreational and educational services provided by both lakes were assessed.
- **Supporting services;** including sediment retention and accumulation, nutrient cycling and support for pollination. In this study the supporting services provided by Lake Elliðavatn for the Elliðá River were assessed.

Each of the service categories is addressed in some aspect for Lake Elliðavatn but only cultural services for Lake Vífilsstaðavatn. The analysis is divided into four main sections according to the MEA classification categories.

Provisioning services

Provisioning services are the products people obtain from ecosystems, such as food, fresh water, and genetic resources. Lake Elliðavatn, provides two main provisioning services. First, a non-consumptive service which is the electricity production supported by the lake as a reservoir. Second, a consumptive service, fish production as three fish species are fished by recreational fishermen in the lake, two trout species and salmon. The main catch of the lake is the Brown trout and Arctic char. Salmon is mostly fished in the rivers that run to and from the lake but few can be caught in the lake in autumn as it migrates (Friðþjófur Árnason & Þórólfur Antonsson, 2005). The Arctic char is caught in Lake Vífilsstaðavatn. Although an important provisioning service, fish catch of the two lakes was excluded from the economic assessment to prevent double-counting as fishers mainly fish in the lakes for recreational purposes and therefore this service was valued through the recreational services category (see below).

The final results indicate that provisioning services from Lake Ellidavatn are worth ISK 30.665.149 (constant ISK 2009). This number comprises the worth of electricity produced from Elliðaárvirkjun in the year of 2007.

Regulating services

Regulating services are the benefits people obtain from the regulation of ecosystem processes (MEA, 2005). In inland water systems the main regulating services include climate regulation, hydrological flows, pollution control and detoxification, erosion control and natural hazards control (Aylward, Bandyopadhyay, & Belausteguiotia, 2005). Given the limitations of this study, only one regulating service was economically evaluated for Lake Elliðavatn; pollution control and detoxification. For Lake Vífilsstaðavatn services of this category were not considered extensive enough for economic evaluation.

For assessing the value of pollution control and detoxification the defensive cost method was applied. The municipality of Kópavogsþær has invested in preventing storm water pollution from the residential areas and roads to enter the lake by building a pipeline and a sedimentation pond. By investing in these operations, the municipality has revealed defensive behavior. However, it shall be noted that these operations could also be considered as replacement cost.

The investment cost for the sedimentation pond is ISK 125.469.492 - 188.204.238. The estimated annual running cost is 2% of investment cost for things such as mechanical equipment and water exchange providing a value of ISK 2.509.390 – 3.764.085 (Brynjólfur Björnsson, personal communication, December 18, 2009). The final results illustrate a total annual cost for both the pipeline and the pending sedimentation pond in 2009 in the range of ISK 22.082.780 – 31.345.666 (constant ISK 2009), which reveals the value of the assessed regulating services.

An issue concerning this estimate is whether the classification is correct and if it possibly could be capturing the value of the recreational services of the lake. The ultimate reason for the defensive investment is to maintain the water quality and thereby to protect the biota, which is a great attraction for outdoor recreation. Thus there is a question of whether the constructions could possibly illustrate the value put on recreational use and therefore the inclusion of this value may represent double-counting.

Cultural services

According to the MEA, cultural ecosystem services are defined as “the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” (MEA, 2005). Nature is for many a unique source of astonishment and inspiration, peace and beauty, fulfillment and rejuvenation (Daily et al., 1997). In this sense, nature is a source of inspiration for different disciplines and makes available various opportunities for education and research and is essential as such (de Groot et al., 2002). In this study, both recreational and educational services of the two lakes were valued.

Recreational services

Lake Elliðavatn and Lake Vífilsstaðavatn provide recreational services mainly through recreational angling. In this study, a single-site travel cost method was applied to assess the values of those services. The survey performed was an on-site survey implemented during the summers of 2008 and 2009.

Lake Ellidavatn

In total 269 anglers were surveyed. Out of the total responses 164 or 61%, were usable for the analysis. Out of anglers surveyed 95% were men and 5% women with an average age 43,4 years. Most of the time or in 99% respondents came by car. In 50% of the cases observed, anglers came alone, 40% of the cases they came two together

and in 10 %, three or more. Approximately 99% of respondents stated that the trip had not been a multipurpose trip. Educational level varied considerably between respondents: 21% had completed elementary school, 8% had a high-school diploma, 26% had completed an apprenticeship, 15 % had completed some undergraduate studies and 30% had graduate degrees. The average expected disposable income of respondents was 5.327.000 ISK. Approximately 67% of respondents fished on a regular day-license, 21% on a day-license paid by the municipality and 12% had summer-licences. When asked about what they do with the fish they catch, 60% answered that they keep all the catch, 34% release part of the catch and 6% release the entire catch.

Average trip value ranged from 8620 ISK to 12315 ISK with a total of 2133 annual trips in 2009. The final result revealed a total value of recreational services provided by Lake Ellidavatn in the range of ISK 19.277.000 - 27.159.000.

Lake Vífilsstáðavatn

In total 72 anglers in total were surveyed but only 46 or 63% of the responses were useable for the analysis. Out of anglers surveyed, 97% were men and 3% women with an average age of 41,6 years. The anglers arrived alone in 66% of the cases, in 21% of the cases they came two together and in 9% of the cases they came three or more. 99% arrived by car and 96% stated that the trip had not been a multipurpose trip. The educational level varied where 14% had completed elementary school, 10% had a high school diploma, 37% had completed an apprenticeship, 21% an undergraduate degree and 18% had graduate degrees. The average expected disposable income of respondents was 6.531.965 ISK. When asked about the type of fishing license, 97% percent claimed to have the fishing license pass that allows access to 31 lakes around Iceland. Only two respondents claimed to have a day-license. Approximately 51% answered that they keep the catch, 36% release part of the catch and 13% release the entire catch.

Average trip value ranged from 11186 ISK to 11848 ISK with a total of 336 annual trips in 2009. Therefore, the final results indicated a value of recreational services provided by Lake Víflsstaðavatn in the range of ISK 3.736.124 - 3.957.232 (2009 ISK).

Educational services

Natural resources provide almost unlimited opportunities for nature studies, environmental education and function as field laboratories for scientific research (de Groot, Wilson, & Boumans, 2002). To estimate the value of the educational services of the two lakes, the use of the lakes for education by schools in the capital area was assessed through a questionnaire sent to all schools in the area. The time spent by students at the site was valued relative to total time spent at the school over the school year and the total cost per student. Official cost data from the annual school report (Samband íslenskra sveitafélaga, hag- og upplýsinga svið, 2008) were used in the estimation for elementary schools. Official cost data for high schools came from the ministry of educational affairs.

The results indicate a total educational value of Lake Ellidavatn to be in the range of ISK 3.816.155 - 4.716.711. In Lake Víflsstaðavatn the results indicated a total value that ranged between ISK 1.977.801 - 2.024.328. Those results indicate the lower bound on the actual educational value of the lakes. For example the University of Iceland has used both lakes for fieldwork in biology courses. But as this usage is not registered it was impossible to estimate its value. Moreover, according to lake managers preschools use both lakes for educational purposes. Since this usage was beyond the scope of this study it is clear that the value of educational services is somewhat higher than the results indicate.

Supporting services

Supporting services are services that are necessary for the production of all other ecosystem services. They differ from provisioning, regulating and cultural services in that their impacts on people are indirect (Ozdemiroglu et al., 2006). According to the MEA (2005) support services of inland waters include sediment retention and accumulation, nutrient cycling services such as storage, recycling, processing and acquisition of nutrients and pollination services such as support for pollinators (MEA, 2005). Although Lake Ellidavatn and Vifilstadavatn provide multiple support services, in this study only the supporting services Lake Ellidavatn provides to the salmon-river, Ellidaár was evaluated. Other services were described but not valued (Halla M. Jóhannesdóttir, 2010).

When rivers are compared in terms of salmon production, rivers originating in lakes or overgrown watersheds generate more of salmon, proportionally to watershed size (Hákon Aðalsteinsson & Gíslí Már Gíslason, 1998; Gíslí Már Gíslason, Jón S. Ólafsson, & Hákon Aðalsteinsson, 1998). Such rivers carry a lot of organic drifting particles, which affect the composition of the benthic invertebrate community. In rivers that originate in lakes, benthic communities are generally characterized by the filter feeding blackfly larvae, which is an important food source for salmon. Lakes seem to have positive effects on fry and parr production and it has been demonstrated that lake outlets in Iceland are generally very productive compared to other stream areas. This is considered to be due to the high density of blackfly larvae (Vigfús Jóhannsson, 1988; Einarsson, Mills, & Jóhannsson, 1990). In the Ellidaár River watershed, fry and parr densities have been measured separately for the Hólmsá River and Suðurá River on one hand and for the Ellidaár River below Lake Ellidavatn on the other hand. Those measurements have demonstrated larger growth below the lake and higher density of all fry and parr year classes (Þrólfur Antonsson & Friðþjófur Árnason, 2009).

Net factor income was applied to value the benefits of nutrient cycling and provision of nursery habitat by Lake Ellidavatn for Ellidaár. To capture the extent of the service provided by lakes as a production factor, a comparison study was made between fifteen rivers, ten with lakes and five without lakes. A multiple regression was run with salmon yield per wetted area as the dependent variable against the presence of a lake and four other independent factors. Data were available for the period from 1974 to 2008 (Guðni Guðbergsson, 2009). The results indicate that 65% of the river yield per wetted area can be explained by the presence of a lake (see Halla M. Jóhannesdóttir, 2010).

According to Brynjar Örn Ólafsson (2009) the average annual number of sold salmon fishing licenses over the period 2005-2008 equaled 30.831. The annual average price of salmon fishing license during this period was ISK 30.049 at constant ISK 2009. In the Ellidaár River 380 “rod-days” (days of angling with one rod) are sold. Assuming that price of angling licenses are dependent on yield, gives the total value of supporting services provided to Ellidaár river equal to ISK 7.422.103 (constant ISK 2009) for the year 2009.

Summary

Tables 1 and 2 summarize the results for each lake.

Table 1. Total value of the ecosystem services of Lake Elliðavatn on an annual basis (constant ISK 2009)

Service type	Economic value		
	Lower bound	Upper bound	
Provisioning services		30.665.000	
Regulating services	22.083.000	31.346.000	
Cultural services	Recreational services	19.277.000	27.159.000
Cultural services	Educational services	3.816.000	4.717.000
Supporting services		7.422.000	
Total		83.264.000	101.309.000

Table 2. Total value of the ecosystem services of Lake Vífilsstaðavatn on an annual basis (constant ISK 2009)

Service type	Economic value		
	Lower bound	Upper bound	
Cultural services	Recreational services	3.736.000	3.958.000
Cultural services	Educational services	1.978.000	2.024.000
Total		5.714.000	5.982.000

Conclusion

The final results of this study illustrate that the overall value of ecosystem services provided by Lake Elliðavatn in 2009 is in the range of ISK 83.264.000 - 101.309.000 (constant ISK 2009). For Lake Vífilsstaðavatn this value is in the range of ISK 5.714.000 - 5.982.000 (constant ISK 2009). This study is based on many assumptions and rough calculations. Yet the final result can serve as an indicator of the potential value of good and services provided by these ecosystems. Evaluating ecosystem goods and services can never fall solely in the domain of the economist and monetary valuation is not the only appropriate metric of importance (Limburg & Folke, 1999). However by properly identifying and valuing ecosystem services we at a minimum can get a ballpark value of their economic importance which can serve as first baby steps towards properly incorporating ecosystem services into economic decision-making.

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Government transfers to families with children

Is it possible to increase the welfare of children by gaining more efficiency in government transfers?

Helga Kristjánsdóttir

The Icelandic economy was hit hard by the financial crisis, requiring the government to implement drastic cost saving measures on both local and state levels. The slowdown has of course effected spending within the social system. One would think that the saying “every crisis brings an opportunity” could apply here, and in the current situation the authorities might take the opportunity to cut cost by implementing efficiency measures. In order to do so, solid economic analysis needs to be available for sound economic policy making.

The objective of this research is to measure efficiency under the conditions of the current economic slowdown. This type of analysis is particularly important, since governments may have to implement drastic budget cuts during financial slowdown. In Iceland, the government has had to reconsider spending priorities on issues like for example maternity and paternity leave, child support and allowance. In the broad areas of cuts, it would be economically beneficial to see if these were implemented in the most efficient way. Would applying cuts in a different way create better savings and still retain the most valuable benefits of these payments?

Figure 1. Recipients of financial assistance and child support 1997-2009 (Statistics Iceland, 2010)

	Number of homes	New recipients	Expenditures in thousands of ISK	Average amount of financial assistance per month in ISK	Average number of months paid
1997	5.650	2.302	948.127	42.925	3,9
1998	4.797	2.300	825.445	38.300	4,5
1999	4.400	2.105	777.058	43.464	4,1
2000	4.653	1.747	845.211	44.796	4,1
2001	4.939	2.753	967.436	51.740	3,8
2002	5.971	3.321	1.353.718	57.071	4
2003	6.312	3.069	1.541.216	60.723	4
2004	5.613	2.586	1.535.462	64.654	4,2
2005	4.825	2.150	1.424.853	70.031	4,2
2006	4.579	2.139	1.348.550	70.135	4,2
2007	4.280	1.943	1.347.272	77.492	4,1
2008	5.029	2.677	1.685.399	86.490	3,9
2009	5.994	3.211	2.287.851	91.540	4,2

Footnote: New recipients did not get paid the previous year.

In order to contribute to governmental efforts in streamlining economic policy, the idea of this research is to provide some useful tools and find good measures for estimating the welfare of families with children, focusing primarily on the welfare of children. The main focus of this research is estimating Icelandic families in a manner

comparable to what has been done in recent international family economics studies. In order to find comparable societal and cultural situations, this research looks closely into what has been achieved in the other Nordic countries. Helpfully, Danish research in this field is some of the most comprehensive in the world.

Figure 2. Public spending on family benefits in cash, services and tax measures, in per cent of GDP, 2005 (OECD, 2010)

	Cash	Services	Tax breaks towards family	Total
France	1,39	1,62	0,77	3,79
Luxembourg	3,08	0,52	0,00	3,60
United Kingdom	2,21	0,99	0,35	3,55
Denmark	1,55	1,83	0,00	3,38
Sweden	1,52	1,69	0,00	3,21
Belgium	1,66	0,94	0,52	3,12
Hungary	1,89	1,22	-	3,11
Germany	1,43	0,74	0,87	3,04
Finland	1,60	1,37	0,00	2,97
Iceland	1,26	1,70	0,00	2,97
Norway	1,58	1,26	0,12	2,95
Austria	2,37	0,47	0,04	2,88
Australia	2,18	0,65	0,04	2,87
New Zealand	1,92	0,71	0,01	2,64
Ireland	2,21	0,27	0,10	2,58
Netherlands	0,64	1,01	0,61	2,26
Czech Republic	1,17	0,57	0,45	2,18
Slovak Republic	1,72	0,40	0,00	2,12
Cyprus 1,2	1,88	0,23	-	2,11
Slovenia	1,39	0,58	-	1,97
Portugal	0,68	0,80	0,18	1,67
Estonia	1,43	0,07	-	1,50
Romania	1,25	0,16	-	1,42
Switzerland	1,02	0,32	-	1,34
Italy	0,58	0,73	0,00	1,30
Latvia	1,08	0,22	-	1,30
Japan	0,35	0,46	0,48	1,29
United States	0,08	0,54	0,65	1,27
Spain	0,45	0,69	0,10	1,24
Lithuania	0,79	0,40	-	1,19
Poland	0,84	0,29	0,04	1,17
Canada	0,89	0,16	0,10	1,14
Greece	0,70	0,39	-	1,08
Bulgaria	0,96	0,09	-	1,05
Mexico	0,37	0,63	0,00	1,00
Malta	0,77	0,10	-	0,87
Korea	0,01	0,26	0,00	0,27
Turkey	0,02	0,01	-	0,02
OECD-26	1,30	0,82	0,21	2,33

Notes: Data on tax support for families is not available for Greece, Hungary, Luxembourg, Mexico, Switzerland, Turkey and the non-OECD countries. Data for Portugal concerns 2003.

1) Footnote by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

2) Footnote by all the European Union Member States of the OECD and the European Commission: The Republic of Cyprus is recognized by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Lundberg, Pollak and Wales (1997) analyzed the extent to which husbands and wives pool their resources and found it to matter for income allocation to children. However, Browning, Chiappori and Lechene (2006) based their study on a non-cooperative model of public and private goods provision, and found the outcome to be independent of which parent received the child benefits. Another very interesting research project by Bonke (2008) focused on the distribution of well-being and income within the household. In a later study, Bonke (2009) analyzed the well-being

of children during a period of welfare reforms to test how it affected poor families with children.

From an academic point of view, economic slowdown provides an opportunity to estimate changes in the economy of the family. One of the ways this can be observed is under the perspective of game theory. With a game theoretical family focus, it is possible to measure actions directed towards children and how it affects their welfare.

The research will be organized as the following: First I will take a look at a literature review. Then I observe the data selection and the methodology application, and finally end up with a summary of findings.

Literature

In their analysis Thomas (1990) and Schultz (1990) test for intra-household pooling empirically.

The literature in the field of family economics has been gradually increasing in recent decades. In the late 1970s Margaret Thatcher's government provided a natural experiment when it restructured the child benefit system in the U.K. by transferring resources from husbands to wives. This became the focus of Lundberg et al. (1997) who used U.K. data in their empirical work on resource pooling. They compared household expenditure patterns on clothes in the years after the change (1980-90) with the years before (1973-76), holding total family expenditures constant and found that the income received by each spouse has substantial and significant effects on family expenditure patterns and in particular the resources spent on children. The U.K. natural experiment therefore led to the rejection of the hypothesis of income pooling and common preferences guiding family behavior.

Also an interesting research by Browning et al. (2006) on collective and unitary models, and a research by Bonke and Uldall-Poulsen (2007) studying how and why families pool their income. Like Bonke and Uldall-Poulsen (2007), Bonke (2009) and Bonke and Fallesen (2010) this study seeks to measure the degree of income pooling within the household.

This current research seeks to analyze whether it is possible to improve efficiency in allocation of resources to families with children. Browning et al. (2006) analyzed provision of public and private goods under a non-cooperative model setting, and did not find it to matter for the outcome whether child benefits were directed towards the mother or the father. The results of this current research may prove to have useful policy implications concerning welfare program issues that are intended to improve the well-being of children. The research will also be based on a research by Bonke (2009) who analyzed the well-being of children during a period of welfare reforms period to test how poor families with children were affected.

Another important paper on this topic is by Browning and Crossley (2009) on consumption smoothing over temporary income losses. Browning and Crossley (2009) analyze expenditure cuts by households subject to temporarily straitened circumstances due to unemployment and their marginal dollar spending of unemployment insurance (UI) benefits. They find UI benefits cut to result in total expenditure reductions, with stronger impact on clothing than food expenditures.

Methodology and Data

The methodology applied in this research aims at presenting a project that is both academic and may have a practical value for policy making. The proposed study provides a valuable comparison of Icelandic household data to analogous Nordic data, concerning government transfers to children families. The research thus provides the opportunity to test similarities and differences between these countries, with the policy aim of designing optimal policies that improve the welfare of children families. Given recent economic developments that are unique to Iceland, the study also provides information about household resource distribution and redistribution in times of recession.

In his research Bonke (2009) obtained data from the Danish Household Expenditure Survey (DHES). And in order for the current investigation to be comparable to that of Bonke, data from the Icelandic Household Expenditure Survey 2006–2008 (Statistics Iceland, 2010) will be applied. Also the research design of the Danish Time Use and Consumption Survey DTUC-2008/9 by Bonke (2007) will potentially be used.

Like in the case of Bonke (2009) the intention is to restrict the sample as to exclude families with children about 17 years old. Also the plan is to follow the Bonke (2009) procedure in including only families headed with full-time employed spouses, thus implying excluding from the sample households were the family head is self-employed, attending some type of education full-time, or retired.

The analysis will be designed as to categorize goods and services in the Icelandic Household Expenditure Survey into three major groups, like done by Gregg, Waldfogel and Washbrook (2005), Waldfogel (2008) and Bonke (2009). More specifically the groups will be classified into three main areas:

- The first group consists of nine groups: Housing, fuel, heat and lighting; food; alcohol and tobacco; clothing and footwear; household goods and services; leisure goods, travels and services; motoring and communications; medicine, personal goods and services; miscellaneous.
- The second group consists of durables: car; mobile phone; washing machine, clothes dryer and dishwasher; fridge and freezer; oven and microwave; computer; TV and video; radio and CD player.
- Finally, the third group consists of goods that can be assigned to children as to improve their well being, these would be goods like children clothes and children shoes.

Like in the case of Bonke (2009) the intention is to consider differentials and to apply similar procedures.

Summary

A primary base for this research is several studies by the Danish researcher Bonke, both alone and in conjunction with other researchers.

This previous research mentioned is applied and then it is estimated to what degree the results from my analysis are consistent with earlier studies. The intent is to capture not only similarities to other societies, but also new potentials in efficiency gains in transfer cuts.

Hopefully the results obtained from this research and the conclusions drawn from it turn out to be economically meaningful for both the Icelandic society and other countries in need of saving money.

Government transfers to families with children

It should be of paramount importance for governments to increase efficiency in transfers to families with children, and this paper can potentially help in making useful policy suggestions for the governmental authorities.

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Verðmætamat á neysluvatnsauðlindinni í Heiðmörk

Hildur Erna Sigurðardóttir
Daði Már Kristófersson

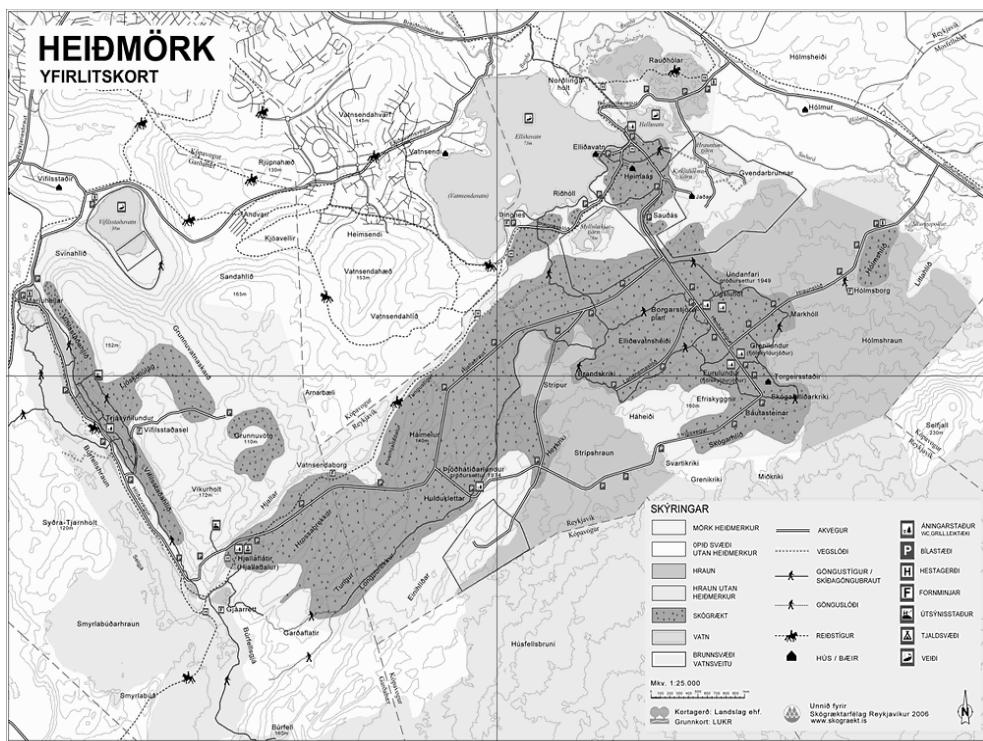
„Íslenska vatnið er ómetanlegt“ heyrist gjarnan þegar vatnsauðlindir Íslendinga ber á góma. Vatnið tilheyrir almannagæðum. Því er erfitt að útiloka aðgang (*non-competitive*) að því og lítl samkeppni er í neyslu (*non-rivalry*). Afleiðing þessa getur verið sú að verðmyndun verður bjöguð og markaður fyrir gæðin myndast ekki. Sökum þessa þarf að beita aðferðum umhverfishagfræðinnar til að finna hagrænt virði slíkra gæða. Markmið rannsóknarinnar var að verðleggja vatnsauðlindina í Heiðmörk. Meðhöfundur er Daði Már Kristófersson dósent í hagfræði við Háskóla Íslands. Rannsóknin er hluti af umfangsmiklu verkefni sem snýr að því að meta hagrænt virði þjónustu vistkerfa í Heiðmörk.

Auðlindin var metin á tvo vegu. Í fyrsta lagi var stuðst við staðkvæmdaraðferð (*replacement cost method*) en hún verðleggur auðlindir sem ekki hafa markaðsverð. Þá er litið á verðmæti þjónustu sem vistkerfi býður upp á sem kostnaðinn við að koma á fót sams konar þjónustu með öðrum leiðum. Verðmæti vatnsbólsins felst þá í því að þurfa ekki að greiða fyrir að taka vatnið annars staðar frá. Í öðru lagi var framkvæmd sjóðstreymisgreining á vatnsveitu Orkuveitu Reykjavíkur en það er hefðbundin aðferð við verðmat fyrirtækja. Aðferðin metur framtíðartekjustreymi fyrirtækis núvirt með þeirri ávöxtunarkröfu sem gerð er til rekstrarins.

Lýsing á neysluvatnsauðlindinni

Heiðmerkursvæðið er um 30 ferkilómetrar að flatarmáli (Skógræktarfélag Reykjavíkur, 2010). Þar er meðal annars vatnsverndarsvæði fyrir Reykjavík og nágrenni sem er í heild um 300 ferkilómetrar. Stærstur hluti þess nær yfir svæðið sem liggar frá Bláfjöllum að byggð (Páll Stefánsson, 2004). Yfirlitskort af Heiðmörkinni má sjá á mynd eitt. Fjögur vatnstökusvæði, Gvendarbrunnar, Jaðarsvæði, Myllulækjarsvæði og Vatnsendakrikar eru öll inn á afmörkuðu svæði Heiðmerkur.

Grunnvatnið í Heiðmörk streymir undan Húsafellsbruna og úr Bláfjöllum. Tuttugu og ein borhola er á Heiðmerkursvæðinu. Allt vatn kemur úr lokuðum borholum til að koma í veg fyrir mengun (Orkuveita Reykjavíkur, 2010). Í Myllulæk er borað eftir vatni á um það bil 25 til 35 metra dýpi en af minna dýpi við Gvendarbrunna og á flestum stöðum á Jaðarsvæði sem eru þar af leiðandi viðkvæmari fyrir mengun. Vatnsendakrikar liggja ofar í Heiðmörkinni. Stofni byggðin vatnsverndarsvæðinu næst höfuðborginni í hættu er mögulegt að fára stærri hluta vatnstökunnar upp í Vatnsendakrika. Tvær adalaðar liggja frá vatnsbólunum til Reykjavíkur til að auka öryggi (Páll Stefánsson, 2004). Áætluð heildarvatnsvinnsla í Heiðmörk er að meðaltali um 1100 l/s og á að anna eftirspurn Reykjavíkurborgar, Kópavogsþær, Garðabærar, Álfanes, Seltjarnarnesþær og hluta Mosfellsþær (Myer, 2008).



Mynd 1. Yfirlitskort af Heiðmörk (Skógræktarfélag Reykjavíkur, 2010)

Erlendis er víða nauðsynlegt að hreinsa neysluvatn sem skilar sér í hærra vatnsverði. Enn sem komið er hafa Íslendingar að mestu sloppið við þennan kostnað. Ein ástæðan er sú að stærstur hluti vatnstökunnar er sóttur í grunnvatn sem síður þarf að hreinsa en yfirborðsvatn (Freysteinn Sigurðsson, Árni Hjartarson og Þórólfur H. Hafstað, 1998). Árið 1997 fékk Orkuveita Reykjavíkur fyrst vatnsveitna í heiminum svokallað GÁMES (Greining áhættuþáttu...) (HACCP (*Hazard Analysis ...*) kerfi viðurkennt en nafnið stendur fyrir Greining áhættuþáttu og mikilvægra eftirlitsstaða. Á hverju ári mælir Orkuveitan styrk allra efna í samræmi við reglugerð um neysluvatn nr. 536/2001. Síðan GÁMES kerfið var innleitt hafa sýnin nær alltaf mælst innan viðmiðunarmarka. Auk þess er vatnsveita Orkuveitunnar sú eina á Norðurlöndunum sem starfar í samræmi við ISO-9001 gæðastaðla (Orkuveita Reykjavíkur, 2010).

Staðkvæmdaraðferðin

Eftirfarandi skilyrði þurfa að vera uppfyllt til að réttmæta notkun staðkvæmdar-aðferðinnar:

1. Staðkvæmdin er jafn góð hvað gæði og magn varðar og þjónusta vistkerfisins sem hún leysir af hólmi.
2. Staðkvæmdin er ódýrasti valmöguleikinn sem getur komið í staðinn fyrir þjónustu vistkerfisins.
3. Notendur væru reiðubúnir að greiða þennan kostnað ef þjónustu vistkerfisins nytí ekki lengur við.

Þar sem fullkomin staðkvæmd er sjaldan til er erfitt að uppfylla fyrsta skilyrðið og hefur aðferðin gjarnan verið gagnrýnd á þeiri forsendu. Uppfylli staðkvæmdin ekki sömu kröfur um magn og gæði eða sé ekki tekið tillit til allra jákvæðra áhrifa sem

vistkerfið kann að hafa er hættan sú að niðurstaðan verði vanmat á auðlindinni (Pearce og Moran, 1994). Eins getur verið um ofmat að ræða til dæmis þegar notendur hafa viðbótarhag af staðkvæmdinni sem ekki er tekið tillit til. Annað skilyrðið gerir kröfum að staðkvæmdin sé hagstæðasti kosturinn. Séu margir valmöguleikar í stöðunni þarf að kanna hver þeirra sé ódýrastur. Til að uppfylla þriðja skilyrðið er nauðsynlegt að sýna fram á að eftirspurn sé eftir þjónustunni sem staðkvæmdin veitir. Annars er hætta á að niðurstaðan ofmeti raunverulegt virði. Hægt er að fara þrjár leiðir til að ganga úr skugga um greiðsluvilja einstaklinga. Í fyrsta lagi er hægt að framkvæma spurningakönnun en þær eru kostnaðarsamar. Í öðru lagi má skoða niðurstöður úr öðrum rannsóknum á virði sem gerðar eru við sambærilegar aðstæður. Varasamt getur hins vegar verið að heimfæra virði á einum stað yfir á annan. Í þriðja lagi er hægt að athuga hvort pólitískur vilji sé til að greiða fyrir staðkvæmdina. Dæmi um þetta gæti verið ef aðgerðanna er þörf til að ná ákveðnum umhverfismarkmiðum eða til að viðhalda gæðum sem samfélagið gerir kröfum. Séu öll skilyrði uppfyllt á fyrsta skilyrðið að koma í veg fyrir vanmat og þriðja skilyrðið í veg fyrir ofmat (Sundberg, 2004).

Staðkvæmdaraðferðin hefur ýmsa kosti umfram aðrar verðmatsaðferðir. Hún er tiltölulega einföld í framkvæmd, byggir gjarnan á markaðsverðum og oftast er auðvelt að afla upplýsinga. Gallarnir eru hins vegar þeir að erfitt er að uppfylla áðurnefnd skilyrði og þá sérstaklega kröfuna um fullkomna staðkvæmd (Sundberg, 2004).

Verðmætamat á neysluvatnsauðlindinni

Vatnstaka fyrir Reykjavík og nágrenni er möguleg víða annars staðar en í Heiðmörk. Öflugir grunnvatnsstraumar liggja nálægt höfuðborgarsvæðinu. Selvogstraumur liggur frá vestanverðu Hengilsvæðinu og út í sjó og talið er að straumur í honum sé um 1200 l/s (Páll Stefánsson, 2004). Auk hans má nefna Elliðavatnsstraum sem er næstur höfuðborginni, Ölfusstraum og Þingvallavatnsstraum. Óvíssa ríkir um stærð og nýtingarhlutfall flestra straumanna. Einn staður er þó undanskilinn, en það er Engidalskvísl vestan Húsmúla á Hengilsvæðinu. Þar er áætlað að taka um 2000 l/s af köldu vatni fyrir hitaveitu í Hellisheiðavirkjun og hefur svæðið því verið kannað ítarlegar en önnur (VGK Verkfræðistofa, 2003).

Engidalskvísl varð því fyrir valinu sem staðkvæmd vatnsverndarsvæðisins í Heiðmörk. Auk fyrrgreindrar þekkingar má minnast á þrjár ástæður fyrir staðarvalinu. Í fyrsta lagi mætti leggja kaldavatnslögnina meðfram hitaveitulögn sem nú liggur frá Hellisheiðavirkjun til miðlunargeyma á Reynisvatnsheiðinni og þannig lágmarka umhverfistjón. Í öðru lagi er fyrirséð að framkvæmdir í Engidalskvísl valdi minna umhverfisraski en víða annars staðar þar sem nú þegar er búið að ákveða vatnstöku fyrir Hellisheiðavirkjun. Þriðja ástæðan var nálægð við höfuðborgarsvæðið en af þeim valkostum sem áður hefur verið minnst á er vegalengdin sem flytja þyrfti kalda vatnið styst frá Engidalskvísl að Miðmundardal. Af þessu leiðir að Engidalskvísl er sennilega ódýrasta lausnin af þeim sem skoðaðar voru þar sem hún lágmarkar umhverfistjón og lengd kaldavatnslagnarinnar. Því er annað skilyrðið, það að staðkvæmdin sé ódýrasti valmöguleikinn, uppfyllt.

Fyrsta skilyrðið gerir ráð fyrir að staðkvæmdin sé jafn góð hvað gæði og magn varðar og þjónusta vistkerfisins sem hún leysir af hólmi, en ástæða er til að athuga það sérstaklega. Fyrir jarðvarmavirkjun á Hellisheiði er áætluð þörf á köldu vatni um 2000 l/s en eins og áður hefur komið fram er heildarvatnsvinnsla fyrir höfuðborgarsvæðið um það bil 1100 l/s (Myer, 2008). Í kjölfar ákvörðunar um að byggja jarðvarmavirkjun á Hellisheiði var hafist handa við að kanna hvaða áhrif vatnstakan hefði á grunnvatns-hæð í nágrenni virkunarinnar og þá hvaða staðsetning væri heppilegust til vatnstökunnar. Sú athugun leiddi í ljós að best væri að taka vatnið við Engidalskvísl en þar rennur vatn í Þingvallavatnsstraumi. Í umhverfisskýrslu Orkuveitunnar fyrir árið 2008 kemur fram að vatnsmagn í Engidal sé yfirdrifið og því má leiða að því líkum að

nægilegt vatn sé á svæðinu fyrir vatnsveituna. Ekki hefur hins vegar verið kannað hvort svæðið geti staðið undir helmingi meiri vatnstöku.

Gæði kalda vatnsins fyrir Hellisheiðarvirkjun voru ekki rannsökuð sérstaklega enda er ekki ætlunin að nýta það vatn til neyslu. Því þyrfti að kanna hvort vatnið í Engidal uppfyllir þær kröfur sem gerðar eru til neysluvatns á Íslandi áður en ráðist væri í að flytja vatnsbólið. Hins vegar má benda á að almennt er grunnvatn hér á landi nýtt ómeðhöndlað til neyslu og því eru gæði vatnsins á þessum stað sennilega fullnægjandi (Gunnar Steinn Jónsson, 2003).

Þriðja skilyrðið gerir kröfu um að einstaklingar væru reiðubúnir að greiða kostnað af staðkvæmdinni ef þjónustu vistkerfisins nytí ekki lengur við. Samkvæmt Alþjóðasamningi um efnahagsleg, félagsleg og menningarleg réttindi sem Ísland hefur innleitt í lög stendur meðal annars: „Ríki þau sem aðilar eru að samningi þessum viðurkenna rétt sérhvers manns til þess að njóta líkamlegrar og andlegrar heilsu að hæsta marki sem unnt er.“ Í því felst rétturinn til heilbrigðisþjónustu en auk þess undirliggjandi þættir sem hafa áhrif á heilsu, eins og til dæmis aðgangur að hreinu neysluvatni og réttur til hreins umhverfis (*environmental health*) (Toebes, 2001). Ef ógn steðjaði að núverandi vatnsbóli svo hætta væri á ófullnægjandi gæðum eða ónógu magni er fyrirséð að brugðist yrði við því. Hins vegar er ekki hægt að fullyrða að vatnsbólið yrði fært í Engidal. Umfangsmikil undirbúningsvinna er nauðsynleg áður en ákvörðun á borð við flutning vatnsbóls er tekin. Bora þarf rannsóknarholur og fylgjast með áhrifum vatnstöku á grunnvatnshæðina, líkt og gert var fyrir Hellisheiðavirkjun. Slík athugun liggur ekki fyrir. Það er mat höfundar miðað við þær upplýsingar sem eru fyrir hendi að ef til þess kæmi að vatnsbólið í Heiðmörk uppfyllti ekki kröfur um magn og gæði yrði það flutt í Engidalskvísl.

Niðurstöður

Kostnaður við flutning vatnsbólsins frá Heiðmörk miðast við afköstin 1100 l/s og ætti það að anna eftirspurn Reykjavíkurborgar, Kópavogsþejar, Garðabæjar, Álfarness, Seltjarnarnessbæjar og hluta Mosfellsbæjar miðað við vatnsþörf undanfarin ár. Kostnaður við kaldavatnsveitu fyrir Hellisheiðavirkjun liggur fyrir en hann miðast við tvöfalt meira vatnsmagn. Heildarstofnkostnaður við slíka veitu með 2200 l/s afköst er 17.650.000€ á verðlagi í janúar 2008. Auk þess þarf að leggja kaldavatnsæð frá vatnstökustað og í miðlunargeyma. Reiknað er með að þurfi 700 mm kaldavatnsæð miðað við afköst en kostnaður við 900 mm kaldavatnsæð er 580€/m. Miðað er við að helmingur kostnaðarins sé í erlendri mynt (Hreinn Frímannsson, tölvupóstur, 20. ágúst 2009).

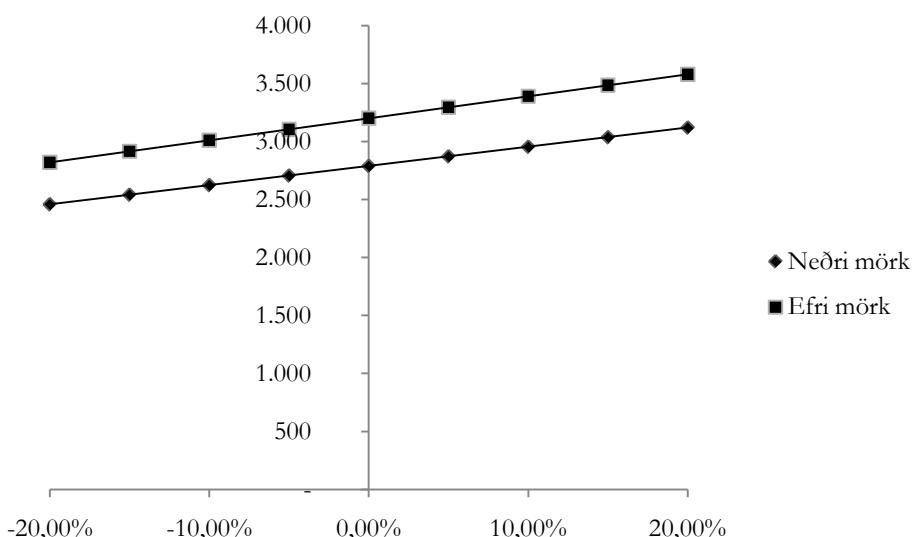
Gert er ráð fyrir að kostnaðurinn við vatnsveitu höfuðborgarsvæðisins gæti numið 50 til 60% af heildarstofnkostnaðinum við vatnsveitu fyrir jarðvarmavirkjunina en 70-75% af kostnaðinum við kaldavatnsæðar. Innifalið í kostnaðinum er fjárfesting í borholum, stjórnubúnaður, byggingar og 15% fyrir hönnun, eftirlit og framkvæmdastýringu. Leggja þarf kaldavatnsæð frá vatnstökustað við Húsmúla og að miðlunargeymum á Reynisvatnshæði. Áætlað er að sú vegalengd sé um 15 kilómetrar og miðast kostnaður við kaldavatnsæðar við það.

Útreikninga á kostnaðarliðum má sjá í töflu eitt. Kostnaður var umreknaður yfir í íslenskar krónur. Miðað var við gengi evru þann 31. janúar síðastliðinn sem var 178,24 kr/evra. Kostnaður í íslenskum krónum var auk þess núvirtur til ársins 2010. Miðað við framangreindar forsendur er kostnaður við vatnsból í Engidal með um 1100 l/s afköst 2,8 til 3,2 milljarðar. Eftir flutning vatnsbólsins í Engidal er ekki gert ráð fyrir að kostnaður við rekstur þess sé markvert meiri en hann er í Heiðmörk.

Tafla 1. Kostnaður vatnsveitu með 1100 l/s affköst. Heimild: Tölur áætlaðar hlutfallslega út frá kostnaðartölum fyrir kaldavatnsveitu með 2200 l/s afköst sem fengnar voru með aðstoð Hreins Frímannssonar hjá Orkuveitu Reykjavíkur.

	Neðri mörk	Efri mörk
Heildarstofnkostnaður:		
50% erlendur	786.484.000	943.780.800
50% innlendur	539.014.619	646.817.543
700 mm kaldavatnsæð :		
50% erlendur	542.740.800	581.508.000
50% innlendur	371.965.896	398.534.888
Samtals:	2.240.205.315	2.570.641.231
m. vsk.	2.789.055.617	3.200.448.555

Næmnigreiningu á gengi evru gefur að líta á mynd tvö. Gert er ráð fyrir að gengi hennar á móti íslensku krónunni geti fallið eða styrkst um 20%. Þessar gengisbreytingar hafa tóluverð áhrif á niðurstöðurnar en vikmörkin eru rúmar 300 milljónir. Hafa ber í huga að helmingur kostnaðarins er í íslenskum krónum.



Mynd 2. Næmnigreining á ávöxtunarkröfu miðað við að gengið styrkist eða veikist um 20% (í millj. kr.)

Sjóðstremmisgreining á vatnsveitu Orkuveitu Reykjavíkur

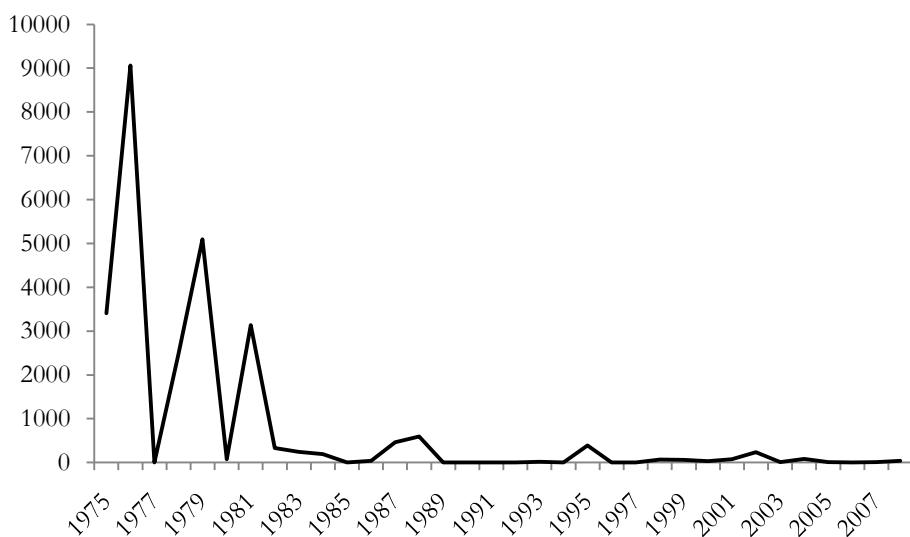
Við verðmat fyrirtækja er gjarnan notuð nývirt sjóðstremmisgreining (*discounted cash flow*). Aðferdin snýr að því að meta framtíðartekjustreymi fyrirtækis nývirt með þeirri ávöxtunarkröfu sem gerð er til rekstrarins. Til dæmis má miða við vegið meðaltal fjármagnskostnaðar (*weighted average cost of capital*) en það er meðalkostnaður fyrirtækis við að afla sér fjármagns. Þessa aðferð má nota til að meta vatnsveitu Orkuveitu Reykjavíkur og þannig má finna annan mælikvarða á verðmæti neysluvatnsauðlindarinnar í Heiðmörk. Gefi niðurstöður úr sjóðstremmisgreiningunni svipaða upphæð eða hærri en þá sem fékkst með staðkvæmdaraðferðinni bendir það til þess að

greiðsluvilji sé til staðar til að greiða fyrir staðkvæmdina. Þá er jafnframt þriðja skilyrði staðkvæmdaraðferðarinnað uppfullt.

Forsendur

Í sjóðstreymlíkaninu er tekið mið af tekjum og gjöldum vatnsveitu Orkuveitu Reykjavíkur í sjö ár frá árinu 2008. Stærstur hluti tekna vatnsveitunnar er vatnsgjald sem íbúar Reykjavíkurborgar greiða óháð notkun. Auk þess greiða fyrirtæki aukavatnsgjald eftir notkun og sveitarfélög Mosfellsbær og Seltjarnarnes kaupa vatn í heildsölu af Orkuveitunni. Vatnsveitan greiðir ekki tekjuskatt þar sem starfsemi vatnsveitna fellur hvorki undir ákvæði laga um tekjuskatt nr. 90/2003 né laga um skattskyldu orkufyrirtækja nr. 50/2005.

Fjárfestingar vatnsveitu eru mestar í upphafi þegar hún er stofnuð en eftir það er kostnaður hlutfallslega lítt eins og sjá má á mynd þrjú. Til fjárfestinga telst meðal annars virkjun borhola, lagning aðalæða, stofnæða og flutningsæða, bygging spennistöðva og lokahúsa. Þær fjárfestingar sem teknar eru með í sjóðstreyminu snúa eingöngu að viðhaldi á mannvirkjum og búnaði. Gjöld eru stöðugri kostnaðarliður, en þau haldast tiltölulega óbreytt milli ára. Í þeim felst almennt viðhald svo sem laun, rafmagn, tæki, áhöld og svo framvegis. Stærsti kostnaðarliðurinn í dag er hins vegar dreifingarkostnaðurinn, það er að segja kostnaðurinn við dreifingu kalda vatnsins til heimila og fyrirtækja. Hann er tiltölulega stöðugur kostnaðarliður.



Mynd 3. Fjárfestingar vegna vatnsveitu í Heiðmörk frá árinu 1975 (í millj. kr.) Hagdeild Orkuveitu Reykjavíkur 2009

Sjóðstreymið er nývirk út frá gefnum fjármagnskostnaði vatnsveitunnar. Miðað er við 20% eiginfárlutfall og 80% lánsfárlutfall. Auk þess er gerð 5,55% ávöxtunar-krafa á eigið fé og reiknað með 3,48% lánsvöxtum. Miðað við þessar forsendur fæst 4% veginn fjármagnskostnaður en sú tala er raunávöxtunarkrafa vatnsveitunnar. Í líkaninu er gert ráð fyrir að fjöldi íbúa höfuðborgarsvæðisins aukist um 1% á ári til ársins 2020 en 0,9% eftir það. Sú tala byggir á mannfjöldaspá svæðisskipulags höfuðborgarsvæðisins. Ennfremur er gert ráð fyrir að tekjur og gjöld vaxi í hlutfalli við þessa spá. Sjóðstreymisgreiningin nær 15 ár fram í tímann.

Niðurstöður

Hreint núvirði (*net present value*, NPV) vatnsveitunnar er reiknað út frá sjóðstreymislíkaninu. Með því er átt við mismun á innflæði fjármagns og útflæði sem er nývirt að gefinni ávöxtunarkröfu. Hreint núvirði er sett fram með eftirfarandi jöfnu:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n}$$

$$= \sum_{t=0}^n \frac{CF_t}{(1+r)^t}$$

CF_t = vænt fjárstreymi á tíma t

t = tími

r = fjármagnskostnaður

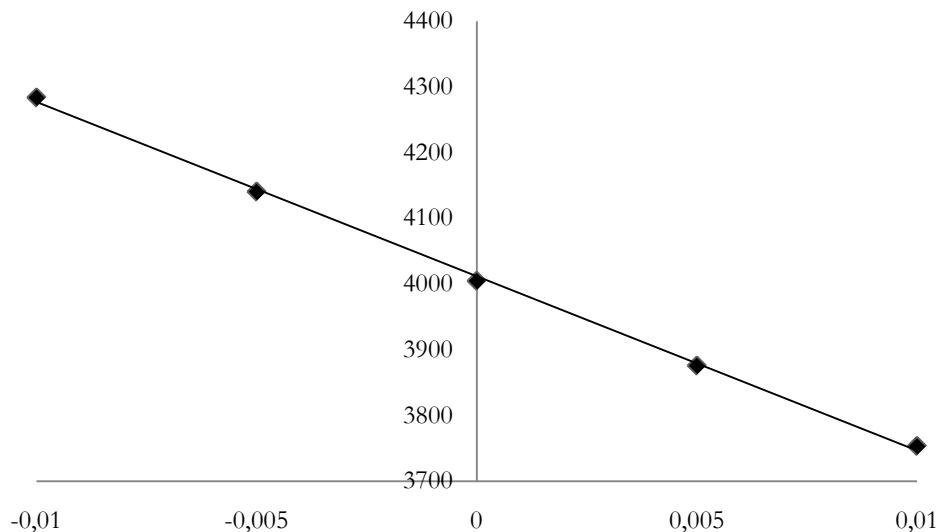
Heimild: Brigham og Daves, 2004.

Miðað við gefnar forsendur og 4% ávöxtunarkröfu er hreint núvirði (*net present value*) vatnsveitunnar rúmlega fjór milljarðar sem er nokkuð hærri tala en fékkst með staðkvæmdaraðferðinni. Þar sem virðið er hærra en með staðkvæmdaraðferðinni bendir það til að þriðja skilyrði staðkvæmdaraðferðarinnar sé uppfyllt þannig að ætla má að greiðsluvilji fyrir staðkvæmdinni sé til staðar. Í töflu tvö gefur að líta brot úr sjóðstreymisgreiningu fyrir Orkuveitu Reykjavíkur miðað við áðurnefndar forsendur. Næmnipróf á mynd fjögur gefur til kynna að niðurstaðan sé viðkvæm fyrir breytingum á ávöxtunarkröfu.

Tafla 2. Sjóðstreymisgreining (í þús. kr.)

	2002	2003	2004	2005	2006	2007	2008	2009s	2024s
Mannfjöldaspá								1%	0,90%
Tekjur	1.737	1.802	1.852	1.869	1.837	1.990	1.739	1.757	2.031
Gjöld	197	150	216	167	178	165	135	137	158
Fjárfestingar	42	9	85	10	3	10	35	35	41
Dreifing	1.026	976	1.117	1.051	1.140	1.140	1.263	1.276	1.475
Sjóðstreymi	472	667	434	641	516	675	306	309	357

NPV, nettó núvirði verkefnisins 4.004.736.299,45 kr.



Mynd 4. Næmnigreining á ávöxtunarkröfu (í millj. kr.)

Umræða

Niðurstöður staðkvæmdaraðferðinnar gefa til kynna að verðmæti vatnsauðlindarinnar sé á bilinu 2,8-3,2 milljarðar króna, en það er kostnaðurinn við að koma á fót sams konar vatnsveitu í Engidalskvísl á Hengilssvæðinu. Samkvæmt sjóðstreymisgreiningunni er virði vatnsveitunnar rúmlega 4 milljarðar miðað við 4% ávöxtunarkröfu. Aðferðirnar gefa svipaða niðurstöðu sem rennir stoðum undir að þær séu nálægt réttu virði.

Staðkvæmdaraðferðin

Eftir því sem höfundur kemst næst hefur staðkvæmdaraðferðinni ekki verið beitt á þennan hátt áður. Algengt er að aðferðin sé notuð til að verðmeta þjónustu vistkerfa sem kostnaðinn við að leysa vistkerfi af hendi með mannlegrum hlutunum. Til dæmis eru verðmæti sem kóralrif skapa, með því að verja strandlengjuna, metin með því að finna kostnaðinn við að útbúa manngerða vörn sem þjónar sama hlutverki. Markmið þessarar rannsóknar er hins vegar að leggja mat á þjónustu vistkerfis með því að meta kostnaðinn við að koma á fót sams konar þjónustu annars staðar. Þrátt fyrir að fordæmi fyrir þessari útfærslu séu ekki fyrir hendi er það mat höfundar að hún falli vel undir aðferðafræði staðkvæmdaraðferðarinnar.

Þegar niðurstöðurnar eru túlkadar ber að hafa í huga að fleiri staðir kunna að koma til greina sem mögulegir vatnstökustaðir en hér hafa verið nefndir. Ekki er víst að kostnaður við flutning vatnsbólsins sé sami annars staðar þar sem aðstæður á hverjum stað eru breytilegar og þar af leiðandi virkjunarkostnaður. Vegalengd frá vatnstökustað að dreifikerfi kalda vatnsins getur auk þess verið mismunandi. Hins vegar gefa þessar niðurstöður vísbindingu um stærðargráðu kostnaðar við flutning vatnsbólsins.

Sjóðstreymisgreining

Áður en ákvörðun er tekin um viðamikla framkvæmd á borð við til dæmis virkjun er ekki óalgengt að verkefnið fari í gegnum arðsemis- og áhættumat. Ein aðferð til að meta slíkt er að finna núvirt fjárvstreymi verkefnisins líkt og gert var í þessari rannsókn. Ef það er jákvætt er litið svo á að framkvæmdin sé arðbær. Tilgangur þessarar rannsóknar er hins vegar ekki að meta ávinning af að ráðast í ákveðið verkefni heldur að

verðmeta fyrirtæki sem búið að koma á fót. Nú þegar er búið að stofna til staðstum hluta kostnaðarins við framkvæmdina. Tekju- og útgjaldaliðir síðastliðinna ára liggja fyrir og út frá þeim má áætla væntanlegt framtíðarfjárvisteymi. Þetta felur í sér minni óvissu og því er líklegra að sjóðstreymisgreiningin sé sannspá.

Veikleiki greiningarinnar er sú forsenda að tekju- og útgjaldaliðir vaxi í réttu hlutfalli við mannfjöldaspá. Sé spáin skoðuð má sjá að gert er ráð fyrir lítilli breytingu á þessum liðum milli ára. Hins vegar hafa tekjur og útgjöld hafa vaxið með tiltölulega jöfnum hraða þau ár sem skoðuð hafa verið sem rennir stoðum undir að þessi forsenda eigi rétt á sér. Það er því mat höfundar að niðurstaða sjóðstreymisgreiningarinnar gefi góða hugmynd um verðmæti vatnsveitu Orkuveitu Reykjavíkur miðað við forsendur.

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Family Consumption and Time Use

How is intra-household consumption and time use impacted by income decrease, following an economic recession?

Sif Sigfúsdóttir
Helga Kristjánsdóttir

In the current economic turmoil where old enterprises and established banks have been hit hard, Iceland has been particularly affected. The quick economic shock from boom to bust has made this little country one of the hardest hit by the gloom.

It is important to consider the economic effects not only on macro economic entities, but also in a micro perspective on micro entities like the family. Has the economic change caused a change in the way things are organized within the family? Has it affected the time and money parents devote to their children, and if so, how? Can this be captured by an effective measurement procedure? Has anyone measured it simultaneously before?

This research project involves a study of the economics of the family. In particular, it studies the distribution of income, consumption and time use within Icelandic families. This can provide a basis for international comparisons and potentially guide the design of policies intended to increase welfare of children and families. Conducting a survey using the structure of a unique Danish household study that measured consumption and time-use simultaneously, brings the opportunity for a valuable comparison of Icelandic households to other Nordic households.

A consumption and time-use survey for Iceland allows analysis of the following: To which degree do couples pool their income and does it matter for their consumption and activity pattern? Is pooling affected by background or education? Is income pooling affected by reduced salaries or unemployment? How is consumption and time-use within the household? How is income pooling affected by an economic recession? To which degree does consumption of both partners change with wage changes of either spouse?

The proposed research is unique since these factors have not been estimated before in Iceland for the same family simultaneously. Plus, since the model of this research is another Nordic study, the results of both can be compared to find if there are any analogous factors within the two countries. Last but not least, the survey results can be used to help design public policies aimed at improving the welfare of families with children.

Statistics Iceland (2010) has conducted household expenditure surveys, measuring prices and consumption for a number of years. However, consumption and time use have not been estimated simultaneously before in Iceland, and neither has the distribution of consumer goods within the household been the subject of data-collection.

Figure 1. Families, 1000s and per cent, by family type, reporting country, marital status and time (Nordic council of ministers, 2010)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Families with children aged 0-17														
Denmark														
Total	644	645	644	645	648	653	658	663	667	670	673	675	756	762
Married couples in per cent	64	64	64	64	64	64	63	63	63	62	62	62	62	62
Cohabiting couples in per cent	18	18	18	18	18	18	18	18	18	17	17	17	17	16
Single people in per cent	19	19	18	18	18	18	19	19	20	20	20	21	21	22
Total in per cent	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Finland														
Total	640	635	630	625	620	613	605	599	595	593	592	589	588	585
Married couples in per cent	70	69	68	67	66	65	64	64	63	63	62	62	62	62
Cohabiting couples in per cent	12	13	14	14	15	16	16	17	17	17	18	18	18	18
Single people in per cent	18	18	18	19	19	19	20	20	20	20	20	20	20	20
Total in per cent	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Åland														
Total	..	..	..	..	..	..	3	3	..	..	..	..	..	..
Married couples in per cent	..	..	..	..	..	..	55	54	..	..	..	..	..	..
Cohabiting couples in per cent	..	..	..	..	..	..	26	27	..	..	..	..	..	..
Single people in per cent	..	..	..	..	..	..	19	19	..	..	..	..	..	..
Total in per cent	..	..	..	..	..	..	100	100	..	..	..	..	..	..
Iceland														
Total	39	39	39	40	41	43	44	44	44	45	45	45	46	..
Married couples in per cent	57	56	55	55	55	55	54	54	54	53	53	53	53	..
Cohabiting couples in per cent	23	23	22	22	21	20	20	20	20	20	20	20	20	..
Single people in per cent	20	21	22	23	24	25	26	26	27	27	27	27	27	..
Total in per cent	100	100	100	100	100	100	100	100	100	100	100	100	100	..
Norway														
Total	565	570	570	573	..	..	581	581	581	..	604	604	609	613
Married couples in per cent	66	64	64	63	..	..	60	60	60	..	57	57	56	56
Cohabiting couples in per cent	13	14	14	15	..	..	20	20	20	..	22	22	22	23
Single people in per cent	22	22	22	22	..	..	20	20	20	..	21	21	21	21
Total in per cent	100	100	100	100	..	..	100	100	100	..	100	100	100	100
Sweden														
Total	1 016	1 143	1 137	1 141	1 140	1 142	1 142	1 036	1 070	1 093	1 088	1 111	1 108	1 097
Married couples in per cent	67	81	81	80	80	79	79	76	76	77	79	76	78	77
Cohabiting couples in per cent	15	..	..	..	..	..	..	..	..	..	..	..	..	..
Single people in per cent	18	19	19	20	20	21	20	24	24	23	21	24	22	23
Total in per cent	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Footnote:

Reporting country Denmark.

From 2007: Number of families with children in the age of 0-24 years old.

In recent years, extensive household consumption surveys have improved data availability on household behavior, helping researchers to focus more on individual household member's actions. Researchers have also sought to explain the strategic interaction between couples. Intra-household allocation, the processes by which resources, tasks, and leisure are allocated between the two individuals and the outcomes of these processes, is a relatively new field of study. This has made it possible for researchers (Browning, Chiappori, & Lechene, 2006) to focus more on interaction between individual household members in a collective model setting, rather than using inter-household analysis in a unitary model setting, assuming identical preferences of household members.

The configuration of this paper is in the following manner: First we will take a look at the literature in the field, then data, and continue with model setup and finally end with summary and conclusions.

Literature

Recent developments have made better data available which provide an opportunity to come up with more thorough data analysis on the family, allowing for further development of the theory.

Becker (1974) provides an important framework for the study of intra-household allocation. His pioneering economic approach to the family – maximizing behavior and equilibrium – forms our basic framework for understanding the behavior of households.

Thomas (1990) and Schultz (1990) offer empirical analysis of the degree to which couples pool their incomes. Both Thomas and Schultz use non-labor income in their research, since non-labor income can be treated as an exogenous variable. Thomas (1990) uses Brazilian data and finds that if the mother controls a larger part of family resources, non-labor income in this case, then children within the family are subject to lower rates of mortality and morbidity. Schultz (1990) uses data from Thailand and shows that men and women's non-labor incomes have different effects on female labor supply.

The results by Thomas (1990) and Schultz (1990) are somewhat similar in that they both reject the neoclassical model that models the behavior of a family by letting it maximize a joint family utility function subject to a family resource constraint. In practical terms this implies that it matters which household member is the recipient of non-labor income and how non-labor income is delivered.

Moreover, Bourguignon, Browning, Chiappori and Lechene (1994) modeled intra-household allocation.

A research by Browning and Gørtz (2006) analyzes how time and money are spent within the household. Browning and Gørtz use survey data from Denmark measuring simultaneously intra-household time and expenditure allocation. In their research Browning and Gørtz seek to determine the effects of power bargaining, productivity and preferences on balance between leisure and consumption.

Bonke, Deding, Lausten, and Stratton (2009) analyzed how household members specialize in housework within the household in the United States and Denmark.

This current research is also based on a paper by Bonke and Browning (2009a) who analyze the allocation of expenditures within the household, applying Danish expenditure survey for their analysis. To the conventional measures applied by the Danish Household Expenditure Survey DHES, they add a survey accounting for whether expenditures are contributed to either of the parents, children or someone outside the household. They incorporate household management, family background and autonomy in their examinations, as well as clothing expenditure relation to other goods distribution. They conclude that it is advantageous to gather information within the household on "who gets what" and sociological questions to provide important additional information. Also a paper by Bonke and Browning (2009b) on pooling of income and the sharing of consumption within households will be considered. Bonke and Browning (2009b) find consumption sharing to depend on the income recipient within non-pooling households.

Method and Data

The objective here is to analyze family consumption and time use simultaneously and, provide an international comparison by constructing an Icelandic database, provide testing of empirical hypotheses and theories, and compare it to a recent identical research in the field.

Method

The methodology applied in this research will correspond to the Danish Time Use and Consumption Survey DTUC-2008/9, by using a random sample of people aged 18-74 years. The sample selected for Iceland will consist of 1200 households, and we expect a response rate greater than 67%. The number of callbacks will be 4-5 times before giving in. At least two reminders will be sent to respondents via email during the data collection period. A letter will be sent out to respondents, asking them to choose between a 15-20 min telephone interview and filling in an Internet questionnaire, participants will receive an access code if choosing the internet option. Also, as in the Danish survey, we will ask survey participants to complete two forms for daily time use – one for a weekday and one for a weekend day – together with an account sheet. Moreover, the 18-74 aged sample group respondents having a spouse or cohabiting partner and - or children aged 12-17, will also be asked to fill in information on how they spend their time. The parents having children in the age range 7-11 year old will be asked to assist their children in completing a form accounting for information on time use. The information can be filled in over the internet if parents choose to do so, parents will be provided by access codes for that option, and they can also opt to do so through an interview over telephone. Both the internet and telephone components of the survey will be conducted by Capacent-Gallup in Iceland.

Data

The database established is based on Bonke (2007) and is intended to provide information on the following:

- Time use of children, from families with different parental backgrounds, in leisure, socializing, and in connection with school etc, and the potential connection between income and time use of parents and children.
- How the upbringing of children can potentially be affect their progress in the school system, and afterwards in life.
- Do highly educated parents tend to devote more time with their children than less educated parents, and do they differ in how they allocate their money to their children?
- The time fully employed family parents spend with their children - compared with families where one or both parents are unemployed – and also compared with single parent families.
- Does father participation in the daily housework significantly affect how well children do?
- What effects has the recession had on time spent at work, and the use of money?
- How does increased working time of mothers affect leisure and money spending, incorporating time and consumption devoted to children?

Data will be based on additions to an intensive Danish questionnaire, providing valuable answers to affects on the society following the severe economic recession of the Icelandic economy. This particular analysis will use survey data obtained for Icelandic families, giving an important opportunity of determine uniqueness of Iceland and its analogy to other countries, such as Denmark.

The research applies a tested and well-defined approach to Icelandic micro economic household data. Within Iceland the study is novel and unique in that it

covers consumption and income issues simultaneously, for the same family, and for both adults and children, and will thus provide valuable information to policy makers.

Summary

This project aims at making somewhat greater attempt than before to capture use of time and money within the household, with the hope of being able to model it in a richer way. The recent economic crisis may provide an interesting opportunity to capture priorities of the household heads with respect to consumption and time use. The objective is to identify and potentially apply additional measures to previous research in the field.

The paper makes use of several investigations in the field and relies considerably on recently developed empirical investigations applied in Denmark.

The research has potential implications for policy making in the future, aimed at improving the well-being of children and families.

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