

# (Un)sustainable Consumption in Australian Households: An Exploratory Study

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# INTRODUCTION

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## Chapter 4, Agenda 21 (UNCED, 1992)

- ▶ Unsustainable consumption and production patterns are the main cause of global environmental deterioration
- ▶ Increases in production efficiency and changes in consumption patterns are required
- ▶ Consumption choices made by households have environmental consequences



# INTRODUCTION

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## Definition of Sustainable Consumption:

“the use of goods and service that respond to the basic needs, bringing better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise, the needs of future generations”

- Norwegian Ministry of Environment 1995

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# CHANGING HOUSEHOLD STRUCTURE IN AUSTRALIA

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## Australian Social Trends (ABS, 2009)

- ▶ Higher proportion of adults are staying longer with their parents
- ▶ The number of single persons are expected to continue to increase

Using the family as a unit of analysis assumes that a nuclear family is the structure that pervades, which might not be the case.

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# MICROECONOMETRIC MODEL

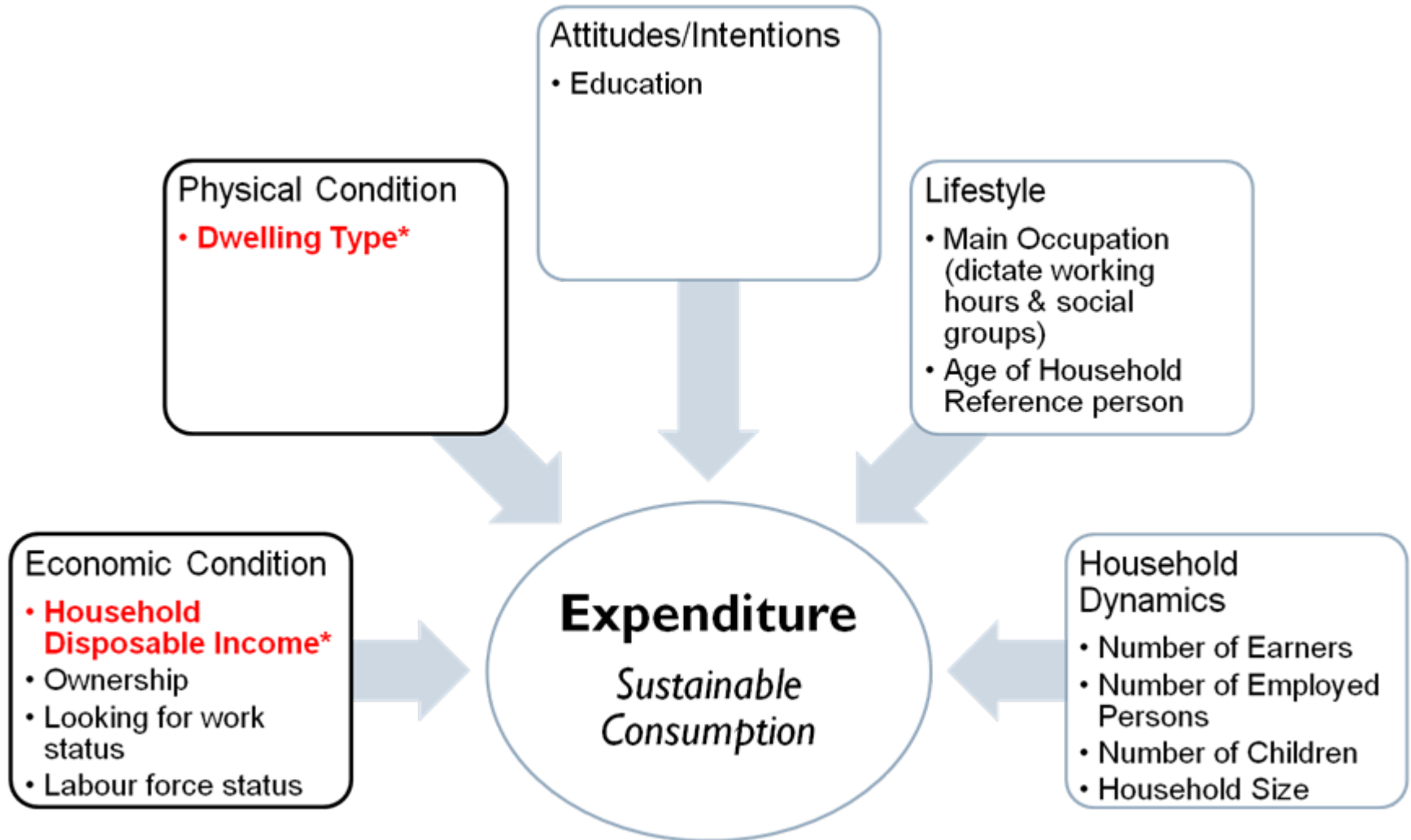
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- ▶ AIDS (Deaton and Mullebauer, 1980) requires the price of the derivatives to be equal to the quantity demanded and the total expenditures to be equal to the proportion of total expenditure
- ▶ Log-linear expenditure system (LES) assumes constant price and income elasticities of demand
- ▶ Separate models were estimated for share of household expenditure on water and energy in selected dwelling (electricity and natural gas).



# DIMENSIONS BEING TESTED

(\*) DENOTES INSTRUMENTS PREVIOUSLY USED BY POLICY MAKERS



# DATA - Household Expenditure Survey 2003-04 (ABS)

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- ▶ Focused only in New South Wales (1,745 Households)
- ▶ Unweighted data was used
- ▶ Age groups, education and main occupation were first transformed into continuous variables assuming a Normal (0,1) distribution using the method featured in Terza (1987)
- ▶ Assumed that these categorical variables can be ordered



# SHARE OF HOUSEHOLD EXPENDITURES ON WATER

Variables	Model 6 <sup>^</sup>		Model 5		Model 4		Model 3		Model 2		Model 1	
	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	<b>3.982</b>	<b>4.359*</b>	<b>2.845</b>	<b>6.138*</b>	<b>3.721</b>	<b>1.453</b>	<b>2.195</b>	<b>4.340*</b>	<b>2.380</b>	<b>1.361</b>	<b>1.996</b>	<b>6.817*</b>
Age group <sup>1</sup>	<b>0.134</b>	<b>3.689*</b>	<b>0.129</b>	<b>3.523*</b>	<b>0.128</b>	<b>3.485*</b>	<b>0.327</b>	<b>8.763*</b>				
Ln(household income)	<b>-0.389</b>	<b>-3.006*</b>	<b>-0.227</b>	<b>-3.256*</b>	<b>-0.478</b>	<b>-0.658</b>	<b>-0.198</b>	<b>-2.602*</b>	<b>-0.281</b>	<b>-0.542</b>	<b>-0.166</b>	<b>-3.94*</b>
Ln2(household income)					<b>0.018</b>	<b>0.348</b>			<b>0.009</b>	<b>0.223</b>		
Ln(household size)	<b>-0.045</b>	<b>-0.523</b>	<b>0.077</b>	<b>0.832</b>	<b>0.077</b>	<b>0.829</b>	<b>0.267</b>	<b>2.659*</b>				
No of children under 15	<b>0.023</b>	<b>0.592</b>	<b>0.017</b>	<b>0.430</b>	<b>0.017</b>	<b>0.428</b>	<b>-0.008</b>	<b>-0.190</b>				
Education degree <sup>1</sup>	<b>0.004</b>	<b>0.138</b>	<b>-0.003</b>	<b>-0.100</b>	<b>-0.003</b>	<b>-0.118</b>	<b>0.000</b>	<b>0.013</b>				
Looking for work status <sup>2</sup>	<b>0.014</b>	<b>0.123</b>	<b>-0.011</b>	<b>-0.389</b>	<b>-0.012</b>	<b>-0.416</b>	<b>-0.027</b>	<b>-0.845</b>				
Main occupation <sup>1</sup>	<b>-0.045</b>	<b>-1.426</b>	<b>-0.063</b>	<b>-2.23*</b>	<b>-0.065</b>	<b>-2.255*</b>	<b>-0.036</b>	<b>-1.155</b>				
Number of earners in the household			<b>-0.095</b>	<b>-2.088*</b>	<b>-0.096</b>	<b>-2.104*</b>	<b>-0.051</b>	<b>-1.016</b>				
Labour force status in main occupation <sup>2</sup>	<b>-0.026</b>	<b>-0.845</b>	<b>0.013</b>	<b>0.111</b>	<b>0.013</b>	<b>0.113</b>	<b>-0.047</b>	<b>-0.358</b>				
Dwelling structure <sup>2</sup>	<b>-0.015</b>	<b>-0.781</b>	<b>-0.012</b>	<b>-0.625</b>	<b>-0.012</b>	<b>-0.627</b>						
Ownership <sup>2</sup>	<b>-0.919</b>	<b>-</b>	<b>-0.927</b>	<b>-</b>	<b>-0.927</b>	<b>-</b>						
		<b>14.749*</b>		<b>14.925*</b>		<b>14.923*</b>						
N	<b>1113</b>		<b>1114</b>		<b>1114</b>		<b>1137</b>		<b>1114</b>		<b>1114</b>	
R	<b>0.500</b>		<b>0.507</b>		<b>0.507</b>		<b>0.284</b>		<b>0.094</b>		<b>0.094</b>	
F-value	<b>36.692</b>		<b>34.610</b>		<b>31.711</b>		<b>10.950</b>		<b>7.782</b>		<b>15.522</b>	
	<b>.250</b>		<b>0.257</b>		<b>0.257</b>		<b>0.080</b>		<b>0.009</b>		<b>0.009</b>	
Adjusted	<b>.243</b>		<b>0.249</b>		<b>0.249</b>		<b>0.073</b>		<b>0.008</b>		<b>0.008</b>	

<sup>^</sup> Estimated using 2SLS due to endogeneity

\* t-values that are significant at p-value=0.05

<sup>1</sup> Transformed into a continuous variable using Terza's method

<sup>2</sup> Discrete variables were not transformed



# SHARE OF HOUSEHOLD EXPENDITURES ON WATER

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Significantly affected by:

- ▶ Household income - as income increases, the share spent on water decreases
- ▶ Age of household reference person – share increased with age. Older people spend more time at home and gardening
- ▶ Ownership – Renters have a lower percentage share. They are less likely to have gardens and landlord pays up to a legislated amount.



# SHARE OF HOUSEHOLD EXPENDITURES ON ENERGY (ELECTRICITY AND GAS)

Variables	Model 5		Model 4		Model 3		Model 2		Model 1	
	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
<b>Intercept</b>	<b>0.957</b>	<b>0.241</b>	<b>0.821</b>	<b>0.207</b>	<b>10.086</b>	<b>1.863</b>	<b>-0.702</b>	<b>-0.179</b>	<b>9.541</b>	<b>14.535*</b>
<b>Age group<sup>1</sup></b>	<b>0.281</b>	<b>3.476*</b>	<b>0.372</b>	<b>5.049*</b>	<b>0.364</b>	<b>4.958*</b>				
<b>Ln(household income)</b>	<b>1.435</b>	<b>1.209</b>	<b>1.393</b>	<b>1.173</b>	<b>-1.492</b>	<b>-0.969</b>	<b>2.108</b>	<b>1.820</b>	<b>-0.956</b>	<b>-10.13*</b>
<b>Ln2(household income)</b>	<b>-0.159</b>	<b>-1.777</b>	<b>-0.159</b>	<b>-1.774</b>	<b>0.055</b>	<b>0.504</b>	<b>-0.227</b>	<b>-2.655*</b>		
<b>Ln(household size)</b>	<b>-0.036</b>	<b>-0.165</b>	<b>0.220</b>	<b>1.042</b>	<b>0.611</b>	<b>3.106*</b>				
<b>Number of children under 15</b>	<b>0.233</b>	<b>2.476*</b>	<b>0.210</b>	<b>2.238*</b>	<b>0.066</b>	<b>0.792</b>				
<b>Education degree<sup>1</sup></b>	<b>-0.317</b>	<b>-4.556*</b>	<b>-0.325</b>	<b>-4.690</b>	<b>-0.181</b>	<b>-2.902*</b>				
<b>Looking for work status<sup>2</sup></b>	<b>0.025</b>	<b>0.318</b>	<b>0.009</b>	<b>0.116</b>	<b>0.056</b>	<b>0.895</b>				
<b>Main occupation<sup>1</sup></b>					<b>-0.113</b>	<b>-1.844</b>				
<b>Number of earners in the household</b>					<b>-0.194</b>	<b>-1.977*</b>				
<b>Labour force status in main occupation<sup>2</sup></b>	<b>0.048</b>	<b>0.686</b>	<b>0.027</b>	<b>0.384</b>	<b>0.128</b>	<b>0.500</b>				
<b>Occupation in main job</b>	<b>-0.017</b>	<b>-0.575</b>	<b>-0.006</b>	<b>-0.203</b>						
<b>Number of employed persons in the household</b>	<b>-0.113</b>	<b>-1.031</b>	<b>-0.150</b>	<b>-1.362</b>						
<b>Dwelling structure<sup>2</sup></b>	<b>-0.146</b>	<b>-3.393*</b>								
<b>Ownership<sup>2</sup></b>	<b>-0.094</b>	<b>-0.632</b>								
<b>N</b>	<b>1691</b>		<b>1725</b>		<b>1137</b>		<b>1744</b>		<b>1744</b>	
<b>R</b>	<b>0.352</b>		<b>0.339</b>		<b>0.311</b>		<b>0.244</b>		<b>0.236</b>	
<b>F-value</b>	<b>19.748</b>		<b>22.201</b>		<b>12.074</b>		<b>55.070</b>		<b>102.735</b>	
	<b>0.124</b>		<b>0.115</b>		<b>0.097</b>		<b>0.059</b>		<b>0.056</b>	
<b>Adjusted</b>	<b>0.117</b>		<b>0.110</b>		<b>0.089</b>		<b>0.058</b>		<b>0.055</b>	

\* t-values that are significant at p-value=0.05

<sup>1</sup> Transformed into a continuous variable using Terza's method

<sup>2</sup> Discrete variables were not transformed



# SHARE OF HOUSEHOLD EXPENDITURES ON ENERGY (ELECTRICITY AND GAS)

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Significantly affected by:

- ▶ Age of household reference person – Older people tend to stay at home. Younger people are less likely to take steps to limiting their consumption.
- ▶ Number of children under 15 years old – younger consumers are less likely to care about how much electricity they consume.
- ▶ Educational attainment – non holders of post school qualifications are less likely to be concerned about the environment.



# SHARE OF HOUSEHOLD EXPENDITURES ON ENERGY (ELECTRICITY AND GAS)

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Significantly affected by:

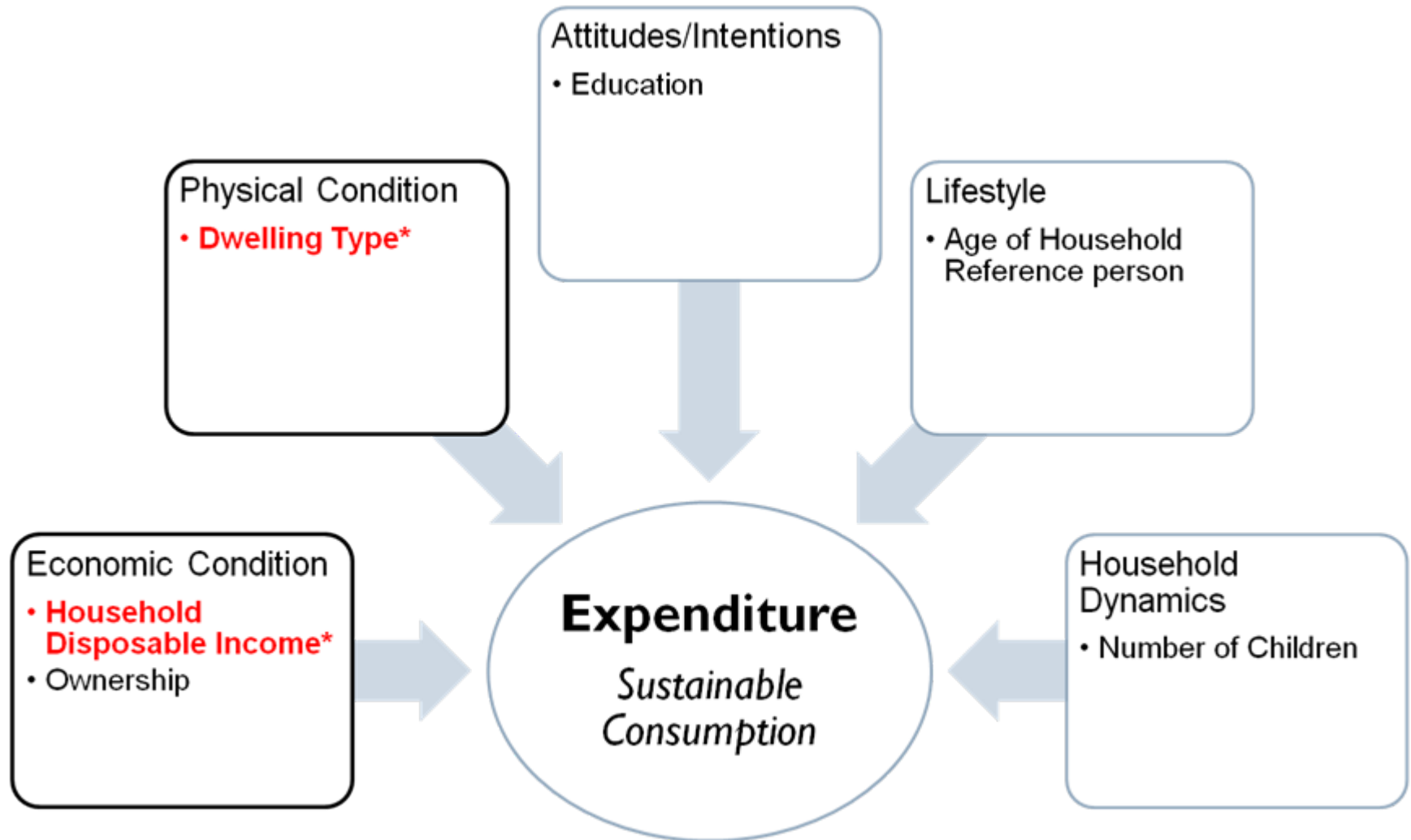
- ▶ Dwelling Structure – flat dwellers tend to spend more time outside their home causing their energy consumption to be transferred elsewhere.



# SIGNIFICANT VARIABLES FROM BOTH MODELS

(\*) DENOTES INSTRUMENTS PREVIOUSLY USED BY POLICY MAKERS

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# LIMITATIONS OF THE STUDY

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- ▶ Applicability to other states in Australia was not explored in the study
- ▶ Although categorical variables were translated to continuous variables, the model by Ferrer-i-Carbonell could not be fully translated.
- ▶ Only one variable was used to explain some dimensions
- ▶ In some dimensions, only one variable was significant



# LIMITATIONS OF THE STUDY

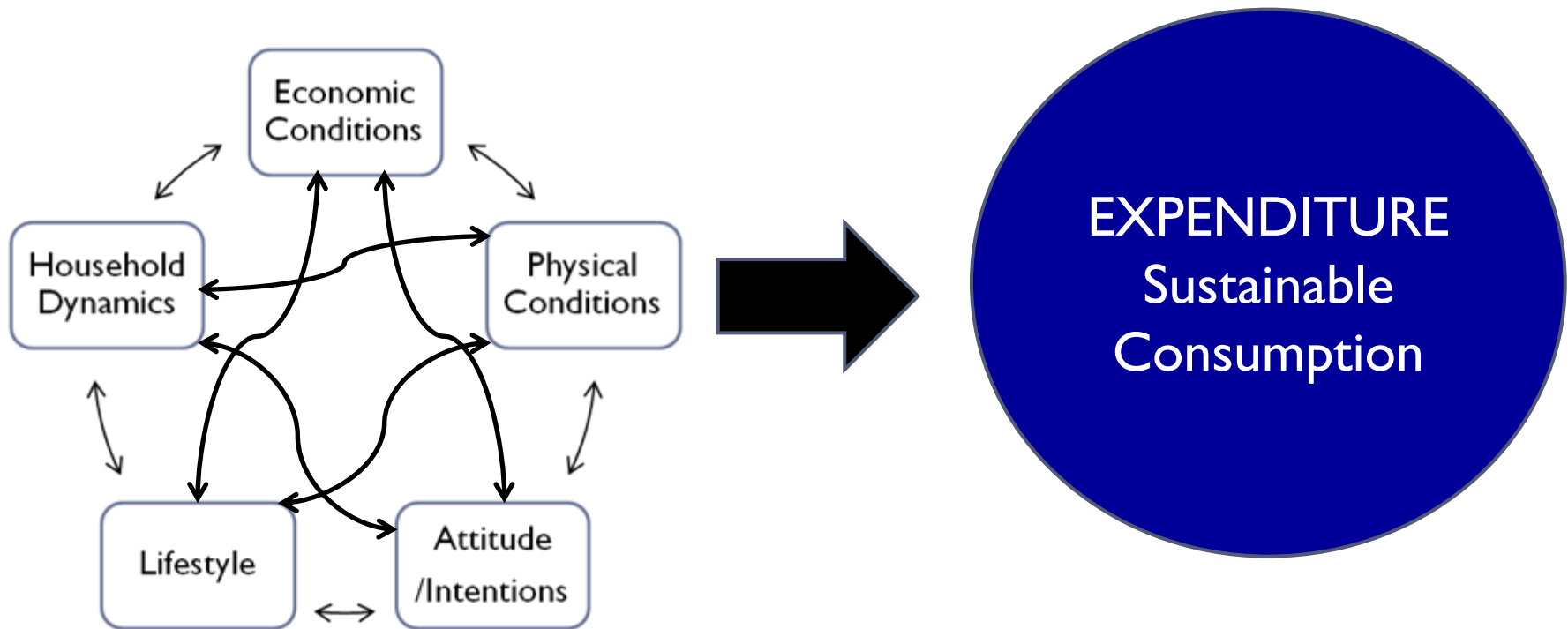
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- ▶ Although different dimensions have been included, the regression model is static. It does not address the possible interactions between dimensions.
- ▶ It does not take into account the possible role of credit to cover expenditure.



# POSSIBLE ALTERNATIVE MODEL

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The resulting interactions between dimensions determines expenditure, rather than each one affecting expenditure.

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# IMPLICATIONS FOR POLICY MAKERS

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- ▶ Certain demographic characteristics of households need to be taken into consideration when designing policies
- ▶ Policies need to influence demographic groups when aiming to change consumption patterns to affect more than one dimension
- ▶ Possible policies include commutative instruments like education and advertising



# FUTURE STUDIES

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- ▶ Explore other variables that would better describe Attitudes/Intentions, Lifestyle and Household Dynamics
- ▶ Explore the use of other statistical models apart from Ordinary Least Squares. Structural Equation Modelling and Neural Networks have been used in other papers.
- ▶ Explore the possible use of time-series analysis or variables that reflect consumption over time. Habits formed in the past can affect current consumption.



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