

Abstract for EARLI Phenomenography and Variation Theory Special Interest Group, 'Implications of Phenomenography and Variation Theory in Practice', Conference, Kristianstad, May 22nd-24th, 2008

Paper proposal:

The application of variation theory in undergraduate teaching: addressing some difficulties in the context of students' understanding of saving

Peter Davies[†], Cecilia Lundholm^{◇†} and Jean Mangan[†]
[†] IEPR, Staffordshire University, UK,
[◇] Stockholm University

Abstract

This paper reports some findings from a small project that aims to address three difficulties that limit the application of variation theory in the teaching of some subjects. The first difficulty is reliance upon intensive methods to uncover different ways in which a phenomenon is understood. For example, phenomenographic research has suggested categorical differences in ways of understanding only a few phenomena in economics and, as far as we are aware, none at all in business studies. A second difficulty lies in the identification of a phenomenon. Current teaching frequently presents a way of understanding a phenomenon as the phenomenon itself. 'Today we are going to learn about product life cycles'. In these circumstances it is not always a straightforward matter to identify the phenomenon. A third difficulty lies in variation in the ways in which different social phenomena can be experienced.

The project examined students' understanding of 'withdrawals from the economy'. Data were collected through interviews and students' examination answers. The interviews focused on the effects of changes in saving, first at an individual and then at a collective level. Interview transcripts were analysed by the three researchers to identify differences in ways of understanding the phenomenon of saving and these categories were then compared with those arising from the examination transcripts. These data are used to provide a basis for the discussion of the three difficulties identified above.

1. Introduction

A critical feature of phenomenographic research has been the empirical finding that exploration of individuals' understanding of different phenomena consistently yields only a limited number of distinct conceptions (Marton, 1986, p.153). These conceptions may be placed in a hierarchy from the most simple to the most complex, with the most complex having the greatest explanatory power. Each conception may be described in terms of its structural aspects: the critical elements of the phenomenon which are highlighted by the conception. Variation theory asserts that conceptual change depends on highlighting critical elements of a phenomenon by creating variation in these whilst all other elements are held constant. This account of conceptions and conceptual change yields several possible implications for how teachers should practice their art: (i) they should aim to understand the qualitatively distinct conceptions that may be held about each of the phenomena that are referred to in their programme of teaching; (ii) they should use this understanding of qualitatively distinct conceptions to guide their interventions and their assessment; (iii) they should create conditions in the classroom such that students are made aware of simultaneous variation in critical elements of a phenomenon whilst all other elements are held constant.

This is a powerful and challenging prescription. Pang and Marton's (2003, 2005) provide evidence of the power of this framework in improving students' understanding of price. But the need to map conceptions of every phenomena is indeed challenging. It might be argued that this is a research programme that can be steadily accomplished by the academic community, providing teachers with a body of knowledge that they can use alongside the textbooks and resources that are their typical reference points at the moment. Existing research (e.g. Pong, 1997, Pang and Marton, 2003, 2005) on economics has so far examined conceptions of trade, elasticity, and diminishing returns. But most attention with regard to conceptions of economics has been devoted to price. This research has yielded many insights of value to the teacher of economics, but it has not established a definitive set of qualitative categories of conceptions of price.

In the first part of this paper we consider the possible sources of variation in categorizations of conceptions of price. The source of variation matters because it has important implications for the relationship between phenomenographic/variation theory research and the practice of teaching. In the second half of the paper we present some initial work from a small project on conceptions of saving held by students in Higher Education. The phenomenon of saving was chosen because previous work on economic conceptions has kept away from 'macroeconomics': how the whole economy functions. Learners' experience of phenomena like price and trade is more easily seen in terms of their everyday lives, whilst experience of how a whole economy works appears more distant since everyday lives only bring individuals into contact with snapshots of small parts of the overall economy. Within this project we have begun to examine two possible sources of variation in categorization: (i) the context in which evidence of different conceptions is gathered and (ii) the area of expertise and perceptions of the individual analysing the evidence. If the way in which evidence is collected and who conducts the analysis have little effect on the

resulting categorization then the scope for teachers to increase their understanding of conceptions is massively increased: they can do much of it for themselves using evidence that arises in the natural course of teaching and learning (e.g. from examination answers). However, if these possible sources of variation lead to radically different categorizations of conceptions then teachers will have to wait for the outcomes of more robust work. We ought also, in the light of the openness of phenomenographic research to researchers adopting different ontological positions (Svensson 1997) to warn the reader that our analysis is predicated on a critical realist approach to ontology.

2. Analysis of variation in conceptions

We start from the question ‘why might different researchers working broadly within the phenomenographic tradition categorise conceptions of a phenomenon in different ways?’ This question is made pertinent by the variation in ways that conceptions of phenomena have been categorised by phenomenographers. In the case of conceptions of price a number of different categorisations have been suggested (Figure 1). These categorisations have been shared through publications by researchers who may be described as being part of the phenomenographic research community. Therefore, they fulfil Marton’s (1986) general criterion (that research findings should be shared and discussed) for expecting researchers to find similar qualitative differences between ways of understanding any particular phenomenon.

Figure 1 Alternative Categorisations of Conceptions of ‘Price’

Study	Sample	Object	Categories	Number
Dahlgren (1984)	university students of economics	Price of a Bun	‘the value of the object’, ‘related to the conditions of the market in which the object is situated’	2
Pong (1997)	16-18 year olds in secondary school	<i>Change</i> in price of a Flat	‘a function of its physical condition’, ‘related to its rarity’, ‘the result of market conditions’	3
Marton and Pong (2005)	16-18 year olds in secondary school	<i>Change</i> in price of flat, Price of doll, Price differences of coke/ baseball cards	‘the value of the object’, ‘related to the demand conditions of the market’, ‘related to the supply conditions of the market’, ‘related to the <i>opposing demand and supply conditions</i> of the market in which the object is situated’	4
Pang and Marton (2003)	Secondary school pupils	<i>Change</i> in price of Toy rocket	‘A change in the features of the good’, ‘Change in demand only’, ‘Change in supply only’, ‘Change in both demand and supply’, ‘Change in both demand and supply – taking	5

			account of relative magnitudes'	
--	--	--	---------------------------------	--

Nevertheless, there are several ways in which variation in categorisation may arise. First, it might be that the range of experience of the phenomenon varied between these groups of participants (Marton, 1986, p. 147). In the case of economic phenomena such as price, the context in which the phenomenon is experienced may be a particularly important source of variation. Marton and Booth (1997, p. 87) use the term 'external horizon' to refer to the way in which the individual encounters the phenomenon. They exemplify this with regard to a deer that may be pictured against a foreground or a background that are simultaneously experienced. In the case of price the 'external horizon' simultaneity has to be imagined since both the foreground (the occasion on which this price was set) and the background (the contexts that influenced the way this price was set) are removed both in time and space from the situation in which the individual encounters a particular price. Different ways of imaging the external horizon may therefore give rise to different ways of understanding the phenomenon in a manner reminiscent of Caravita & Halldén's (1994) account of how conceptions get their meaning from the belief systems in which they are embedded (see also Duit's summary of 'alternative frameowrks, (2008)) and Meyer and Land's (2005) notion of threshold concepts which has been applied to economics by Davies and Mangan (2007). However, it would be surprising if this was a sufficient explanation. The earliest study conducted by Dahlgren used a group of individuals who were older and had more experience of economics teaching than that enjoyed by participants in any of the subsequent studies. Yet, Dahlgren and colleagues only found two conceptions.

Second, different ways of categorising conceptions of a phenomenon might arise from the context in which evidence was collected. Marton (1994, p. 4427) suggests that evidence of conceptions may be gathered through "group interview, observations, drawings, written responses, and historical". Nevertheless, it is possible that variation in categorization could be attributable to the researchers' choice of example (the price of a bun, the price of a condominium, the price of face mask), through the medium of data collection (e.g. oral or written) or through the participant's perception of the social circumstances in which the data are collected and their intentions (Anderberg et al., 2008) in their expression (e.g. the language that is familiar to them and whether they are concerned about the impression of themselves that they are giving to the person collecting the data). On the basis of the reported method we might infer that medium and social circumstances did not vary across the studies reported above.

Third, variation in categorisation might arise from the understanding of the phenomenon held by the researchers. One way in which this might occur is through the way in which an example of a phenomenon is presented to participants. In the case of 'price' early research investigated conceptions of a 'price of a bun' or a 'price of a condominium'. Subsequent research has switched to conceptions of a 'change in the price of a face mask'. From an economic perspective this difference is very significant. One constant theme within phenomenographic research has been the distinction between a conception of price as determined by cost and a conception of price as determined by supply and demand. This distinction is much more pertinent in the case of a *change* in price. In the longer run, theory since the beginning of the twentieth century has suggested that price will settle to a cost plus a standard profit margin, since otherwise producers would switch so as to increase their profit margins.

The conception of the phenomenon held by the researchers might also be expected to influence the way in which data are interpreted. According to Säljö (1988, p. 41) “One of the prerequisites for analysing data is that the researcher is acquainted with the subject matter in question”. A phenomenographic researcher investigating conceptions of force some time around 1686 before the publication of *Philosophiæ Naturalis Principia Mathematica*, and including Isaac Newton amongst the interviewees might have had some difficulty in identifying Newton’s conception of force. That is, how would a researcher be able to recognise a distinct conception of a phenomenon when that conception is beyond their own conception of a phenomenon?

This problem can be viewed in the terms developed by variation theory, namely by identifying critical elements of conceptions. Marton and Pong present a table in which they distinguish between conceptions of price by referring to the structural differences between them. We interpret this as synonymous with the identification of critical features. They suggest the following as structural (or critical) elements of the most sophisticated conception they identified: (characteristics of the object, people who buy, people who sell or places where they sell). This list of critical elements does not distinguish between an understanding of price in the context of a particular producer (or theory of the firm in the language of markets) and an understanding of price in the context of a market. One reason for suspecting that this distinction is important is that younger students are prone to explain prices in terms of ‘bulk buying’: the more that is bought and sold the lower will be the price. This is a ‘single producer’ perspective and may well reflect the way they have experienced price – not in the external horizon of a market but with the external horizon of a single provider. In this case their conception is not highlighting sellers in a market but a single producer. That is, a ‘critical element’ in a conception can also be viewed as a conception which is but one way of thinking about another phenomenon (such as ‘seller’).

This list of critical elements also omits any reference to time and this omission is repeated in Pang and Marton’s (2005) study. This may be simply because none of the participants in these studies had a conception of price that included a time element. But, in one way, this is somewhat surprising since, in the Pang and Marton study at least, there was a very explicit focus on successive changes in price over time. In the history of economic thought the development of price theory towards the end of the nineteenth century (Marshall, 1881) was notable for the way in which it emphasised the importance of time in changes of price. That is, a more formal argument was developed regarding the way in which the price in one market was driven over time towards a ‘cost plus normal profit’ level as suppliers moved resources between markets in response to prices available in different markets.

3. Method

Our discussion of studies of conceptions has identified two particular difficulties that can be experienced in the identification of the phenomenon of price: (i) the level or change in price; (ii) price in the context of a single provider or a market. It is important to be clear about the choices being made by the research and the reasons for these choices. The intention in our research was to support teaching in higher education that aims to improve students’ understanding of saving within the

development of their economic understanding as a whole. In this context we were interested in conceptions of the *effects* of changes in the total level of saving in a country. This appears to create a difficulty in regard to gathering evidence of the way that students experience of the phenomenon since students do not experience total saving in any direct way and the conception that economics encourages students to develop is not an aggregation of the effect that can be observed with respect to one person: it is essentially a systemic conception. Moreover, this target conception treats saving, taxation and imports as equivalent in their effects using the term ‘withdrawals’ to indicate this. This raises the question of whether the phenomenon is a ‘withdrawal’ or ‘saving’. At one level we could regard ‘withdrawals’ as a conception of the effects of a change in saving on the whole economy. As we shall see, though, there are different ways in which students understand ‘withdrawals’ and these differences are important to a developing understanding of economics.

Two sources of data are used. The first source of data was 25 students’ answers to end of year examination questions. The examination was completed in formal conditions and students were not given access to the questions in advance. This is standard practice for the first-year examinations in this subject area in UK universities. The analysis focused on students’ answers to one question in which they were asked to explain the term ‘withdrawals’. We might expect that this would provide rather limited opportunities for the range of conceptions to be revealed. In particular, the setting and the wording of the question signal to students that they are expected to provide an answer that has been previously been presented by the lecturer. That is, there are good grounds for believing that students’ answers may not correspond with their ‘lived experience’ of the phenomenon. However, since most lecturers will have access to these kinds of data and will not have time to conduct and analyse interviews it does provide a practicable source of data. Therefore it is pertinent to find out whether analysis of these data produce similar or different categories of conceptions than data derived from in-depth interviewing focused on students’ experience.

In-depth interviews with seven undergraduate students provided a second source of data. Although these students were on the same course as the students who had taken the examination in the previous year the majority of them were overseas students who had joined the course in the second year from other universities. The chosen focus for these interviews was savings. Savings are one form of ‘withdrawal’ and it was judged that students were likely to be more conscious of their experience of saving than the other withdrawals. Two leading questions were devised:

1. If you change the amount you save, what effect does it have on others?
2. If everyone in the country changes the amount they save so it was the same as your saving, what effect would this have?

In order to focus the interview on experience the first question focused on the individual and the second on the whole economy. In the final part of the interview students were given three statements about withdrawals and asked to choose which of these they felt was the best explanation. The three statements were written to correspond to three of the conceptions of withdrawals that were suggested by the analysis of the examination scripts.

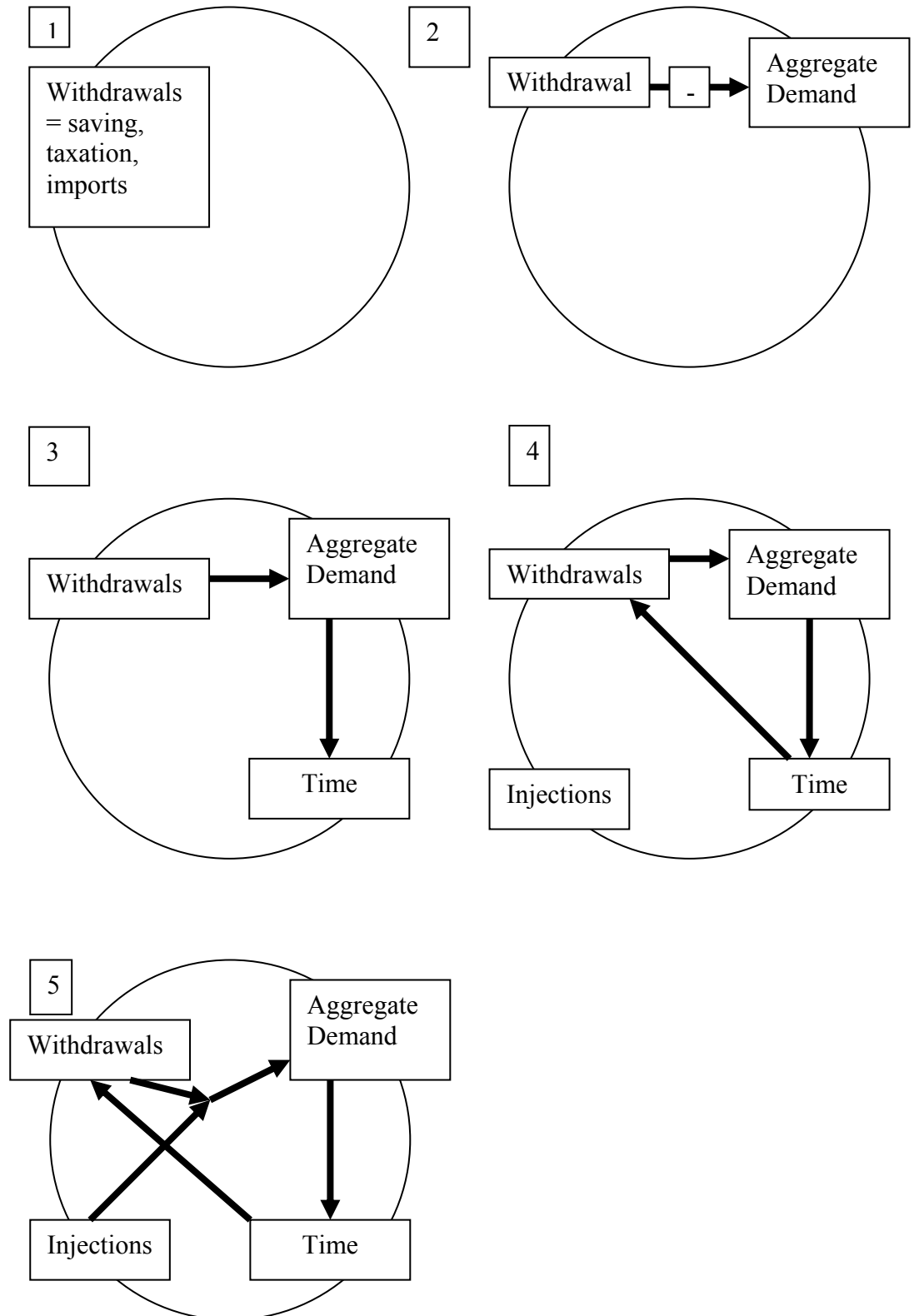
The analysis of the data was undertaken separately by three researchers. Two were economists and one was a non-economist who had recently begun researching students' economic conceptions, particularly in the context of environmental issues. Discussions between the researchers took place to compare their categorisations and the reasoning being used to establish these differences in conception. In the results we present the agreed categorisation of the two economists and then categorisation by the non-economist. The two distinct sources of data are compared within each of these sub-sections. The economists used a representational device ('Learning Outcome Circles') from Davies and Dunnill (2008) to express the structural differences they perceived between the conceptions. This device aims to show the elements of the phenomenon that are made critical to each conception. The non-economist did not initially use this device and approached the structural differences in a more generic way. However, Learning Outcome Circles were used in the discussion between the three researchers about the similarities and differences between the outcomes of their analysis.

4. Results

4.1 Analysis of Examination Scripts by Economists

The economists identified five different conceptions that are represented in diagrammatic form in Figure 1. The boxes set against each circle are used to denote elements made critical within the structure of each conception and the arrows are used to indicate expressions of causation. Conception One restricts its scope to defining withdrawals and says nothing about the effect of a change in withdrawals on the economy. Conception Two refers to understanding the effect of an increase in saving as leading to a fall in the total demand in the economy. Conception Three recognises that an initial change in total demand will have knock-on effects, whilst conception four identifies that knock-on effects will be mediated by withdrawals. That is, in conception Three there is no recognition that knock-on effects will be less than the original effect whilst in Conception Four the reference to withdrawals within the knock-on process explicitly recognises this. This distinction was regarded by the economists as very significant. Conception Five is an improvement on Conception Four in that it recognises that the effect of a change in withdrawals on total demand depends on what is happening at the same time to the level of injections (government spending, investment and exports) into the economy.

Figure 1 Alternative conceptions of the effects of withdrawals (such as saving) on the economy suggested by an analysis of the examination scripts as interpreted by an economist



Only three of the students did not reproduce a diagram of the circular flow of income as part of their answer. The form of the diagram they used was identical to the one that had been used in the lecture. It appears that the majority of the students interpreted the demands of the situation as requiring them to demonstrate their understanding through correct reproduction of the diagram.

4.2 Analysis of Interviews on savings by economists

Only one of the students interviewed (Student A) expressed a conception of the effect of a change in saving that fell into one of the categories in Figure 1). His conception corresponded to Conception Three. When asked about the effect of a change in their personal saving on others most students (B-G) referred first of all to possible effects on banks. They believed that an increase in their saving was to the benefit of a bank. In one case (Student E) there was a belief that it would directly improve the well-being of staff in the bank. Students B-F offered the same account of the effect of a change in their saving and a change in the saving of everyone.

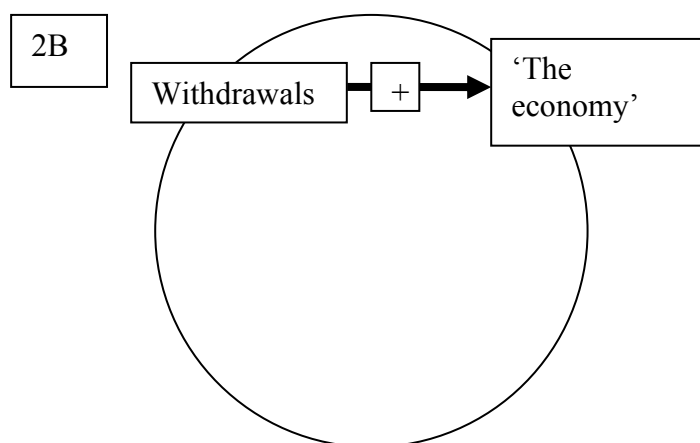
I think the bank will definitely benefit from it because I am giving them more money and at the same time other people who are at the same bank they get to use the money and that is how it contributes and when the bank is doing well I think it contributes to the economy of the country as well. (Student B).

However, although Student G had given an explanation of the effect of an increase in her personal saving operating through banks to improve the economy she gave a different explanation of the effects of a change in everyone's saving.

Because people are saving money and the supermarkets and shopping mall they can't sell things because people have no money, they need to save their money to the bank, so yes, how can I say that word? The economy of the whole country maybe will decrease yes? (Student G)

Some students (Students B, C and E) associated the well-being of banks with the well-being of the economy as a whole. This conception is portrayed in Figure 2 below.

Figure 2 Conception of saving improving the economy through banks



This conception contrasts with conceptions suggested by the analysis of scripts in two ways. First, it portrays the effects of saving on the economy operating through banks rather than through consumption. The element of the time distinction created by the distinction between investment and consumption is missing. Also the notion of ‘the economy’ is less sharply defined than in the ‘aggregate demand’ found in conception 2 in Figure 1. One of the interesting things about the responses of students who expressed this conception is the way in which they struggled with the idea of holding other things constant. That is, in posing the question ‘how would an increase in your saving affect others’ the interviewer stressed that this was an increase in saving out of the same level of income. However, these students strongly associated more saving with higher income and in their responses they switched without apparently noticing it to describing a situation where incomes are rising as well:

It’s (more saving) good for the economy because if people are earning more money and saving more money they are able to afford some goods that they are not usually able to buy. So it will be important if they save money, they know exactly what they have in their bank account and then can say yes I have the money so I can afford something that I never seemed to afford before. (Student D)

For Student F, thinking about saving started with variation in income. If he wanted to save more this must mean that he wanted to earn more:

If I want to earn more money in my savings I can find some job, part time job, maybe more part time jobs and I can have some other such as a cleaner and do some job and the employer can pay money to me. (Student F)

In the final part of each interview students were given three statements (Figure 3) and asked which of these three offered the best explanation of ‘withdrawals’ in the economy. The first explanation corresponds to Conception One in Figure 1. The second statement corresponds to Conception Five in Figure 1. This conception was observed in only one of the examination scripts. The third statement corresponds to Conception Two in Figure 1. This provided an opportunity to compare the conceptions about the effects of savings expressed earlier in the interview with students’ choice of best explanation of withdrawals. Conception 2B (Figure 2) was not available in the written options and two of the statements (2 and 3) contradicted Conception 2B.

Figure 3 Alternative explanations of withdrawals in the economy

When someone talks about ‘withdrawals’ when explaining what is happening in the economy what do they mean?

- 1 ‘ This is when income is withdrawn from the economy it can be by either savings or taxation etc. For example the government may want to withdraw money from the economy so they may put up taxes, this leaves consumers with less disposable incomes.’
- 2 ‘If on the circular flow of income withdrawals outweigh injections then the economy shrinks and aggregate demand falls. If we then look at the multiplier effect we can see if this downward spiral continues as demand for GDP products would decrease, causing job losses and unemployment to rise.’
- 3 ‘Withdrawals include savings, taxation and exports. Taxes can be on income or expenditure. If any of these three withdrawals are high the economy will suffer. For example if too many people save and don’t spend any money there will be a recession and prices will rise.’

Two students (B and C) who, earlier in the interview, expressed Conception2B (Figure 2) opted for Statement One (Figure 3) which was the only statement consistent with the thinking they had expressed earlier. One student (D) who had earlier expressed Conception 2B opted for Statement Three. However this choice may have been prompted by the interviewer’s response (which defined withdrawals in terms of foregone consumption) to their enquiry about the meaning of the term ‘withdrawals’.

I think I will choose the third one because as we speak about, if I understand what withdrawal means, if yes it can be on income and expenditure yes if people, if there are some problems in the economy people are going to spend less money in the environment because they are afraid of the recession and that would have a very big impact on the economy for people, diminish. (Student D)

We cannot know from the exchange in the interview how this student sees the relationship between savings and withdrawals. Three students (A, E and G) opted for Statement Three but their explanations for their choice were different.

Student A If you look at the scenario where we are spending less and as a result the economic activity slows down, the spiral would multiply the effect of that is going to be negative as well, so it’s going to point at a downwards trend.

In his explanation for choosing Statement Two Student A uses words taken from the extract (‘spiral’ and ‘multiply’) that he had not used earlier in the interview. But he had expressed the same idea earlier in the interview, using the word ‘chain’:

Student A So the chain goes on and on, the less we spend I think it will have a negative affect on people who depend on our spending.

The language used by this student in explaining his choice of Statement Three suggests the same conception (Three) that he had expressed earlier in the interview even though the statement he had chosen was more complex than this. Student E was explicit in explaining this choice on the basis of what they regarded as signals in the language:

Because compared to other two explanations I think this one has more professional words to explain the withdrawals... The GDP and some other words, in fact some words I can't understand, but I think that it's more professional than the others. (Student E).

Student G also opted for Statement Two but her explanation of her choice was restricted to Conception Two in Figure 1.

Because people are saving money and the supermarkets and shopping mall they can't sell things because people have no money, they need to save their money to the bank, so yes, how can I say that word? The economy of the whole country maybe will decrease yes? (Student G)

4.3 Analysis of Examination Scripts by a non-economist

The non-economist used several strands to identify differences between conceptions: (i) whether withdrawals were correctly identified as savings, taxation and imports, (ii) whether the reasoning was composed of just one link or more than one sequential link; (iii) whether the explanation does nor does not include suggested links that are denied by the textbook model and (iv) whether the explanation includes pair-wise connections. This researcher used the term 'pair-wise connections' to refer to examples where the student referred to withdrawals and injections as connected whether in the text or in a diagram. The distinction between single and multiple links was regarded as pivotal since it was used an indicator of 'systems thinking' that was understood to be central to the way of thinking about phenomena that was being encouraged by economics teaching. Using these strands the conceptions were organised into three categories as presented in Figure 4. Each of the students was placed in of these categories. Although more categories were considered the researcher settled on these three since it reduced the number of categories to the minimum that accounted for all the students.

Figure 4 Suggested conceptions as identified by the non-economist

	Category of Conception		
	I	II	III
Withdrawals were correctly identified as savings, taxation and imports,	Yes	Yes	No
Sequential links	Consistently	Sometimes	No-only one link
Incorrect links	No	Some	Some
Pair-wise connections	All students	Some students	Few Students
Number of students	7	9	9

Example of part of an answer falling into Category I (Figure 4) was

When interest rates rise, the cost for borrowing money raises and people are discouraged to invest and hence are encouraged to save their money as it's the most profitable thing to do at present. When they start to save more consumption falls, therefore the demand for goods and services may fall. (Exam Answer H)

An example of part of an answer falling into Category II was

The money of the economy could decrease if the consumer is spending more on imported goods such as perfumes etc. The flow of withdrawals helps influence circulation of money, with savings going to banks, government getting taxes = more expenditure. (Exam Answer J)

An example of part of an answer falling category III was

Withdrawals is the money spent to keep the economy going and put into firms and business so it can move through the cycle. (Exam Answer K)

The researcher who conducted this analysis explained it to colleagues in terms of identifying the systems thinking that was suggested in textbook definitions of the 'Circular Flow of Income' (CFI). The focus was mainly on 'sequential links' made in the explanation of the concept. Sequential links means that events are addressed, where one event leads to another and yet another. This could indicate that students see economics and changes within not as isolated but always related to other phenomena, possibly indicating a notion of a system, and economy as a 'whole'.

4.4 Analysis of Interviews on savings by a non-economist

Two different conceptions were identified in the main part of the interview: (i) a negative effect on spending in the economy and (ii) a positive effect on the economy because more saving is good for banks. Students who expressed conception (i) also selected the most complex text (number 2, figure3). Conception (ii) was then subdivided according to whether students chose the most complex text or one of the other texts. As indicated by the explanation for choosing text 2 given in row 2A (figure5), students who are capable of identifying text 2 as the best explanation may be doing so through interpreting signs in the language rather than identifying ideas that are they are capable of reaching out to with the aid of some scaffolding.

Figure 5 Conceptions of the effects of a change in saving identified in interviews by a non-economist

	Conception and example
1	<p>Understanding of the effects of a change in savings in terms of relating it to change of the economy as whole,</p> <p><i>“I think this would decrease the consume of the country, am I right in using that word? Because people are saving money and the supermarkets and shopping mall they can’t sell things because people have no money, they need to save their money to the bank, so yes, how can I say that word? The economy of the whole country maybe will decrease yes? I think this is the affect to the country and then for the people of the country’s economy decreases because people’s salary’s or something like that will decrease too, so saving money for the whole country is not a good thing I think.”</i></p> <p><i>Choice of text (2): “If you look at the scenario where we are spending less and as a result the economic activity slows down, the spiral would multiply the effect of that is going to be negative as well, so it’s going to point at a downwards trend. It is showing the negative side where money has been withdrawn, the economy shrinks, aggregate demand falls, I think this would happen, yes.”</i></p>
2A	<p>Described how the economy as whole would benefit through savings in the bank.</p> <p><i>“You’re putting money in the bank I think the staff in the bank can get more benefits. Because of all the money and so they can operate better and they can, I don’t know all of the whole programme that they need but I think that they can get more money from that and they can promote the economy, certainly also I have gained some interest.”</i></p> <p><i>Choice of text (2): “more professional words”.</i></p>
2B	<p>Described the benefits of savings in terms of how they would gain interest, and how the banks would profit.</p> <p><i>“I will send my money to the bank to increase my capital when I don’t use this money, and I would like to in order to invest in a house or something like that, so I think it will have an impact on the society because people could profit off my expenses.”</i></p> <p><i>Choice of text (1) or (3)</i></p>

4.5 Comparison of the analyses

First we compare the categorisation between the economists and the non-economist. Both sets of analysis focus upon the structure of conceptions: the elements that are included as critical to each conception and the way in which elements are related. However, the non-economist describes these in more generic terms referring to ‘systems thinking’, ‘sequential links’ and ‘pair-wise connections’. In some respects this is just a difference in language. But there is more to it. In Figure 1 the economists

identify three different conceptions which each include sequential links. For example, the difference between Conceptions Three and Four was regarded as very important since in Conception Three the 'knock-on' effects have no resolution whilst in Conception Four the system will head towards a new equilibrium and tendency towards equilibrium is a central aspect of economists' ways of understanding phenomena. It is in many ways a 'forward looking' distinction since it prefigures a more general way of thinking that students will be expected to use in making sense of a whole range of phenomena. This distinction is not made in the non-economists categorisation even though it is a feature of systems dynamics modelling. The difference between the two approaches to categorising conceptions is more noticeable with the more complex conceptions than with the more simple conceptions.

However, there is a similarity between the analyses of the economists and non-economist in so far as both analyses find strong differences between the categorisation from examination answers and categorisation from interviews. In particular, one conception (that an increase in savings benefits the economy through the banks) was not seen at all in examination answers but featured strongly in the interviews.

There are alternative possible explanations for this that will be pursued in the remainder of the project. It is possible that this difference arose simply because overseas students who joined the course after the examination had a conception of saving that was different from any of the conceptions held by students who took the examination. It is also possible that the form of the examination encouraged students to express a conception that they would not have expressed if interviewed the same day using the questions that were posed in the interview. The way in which every student in the examination used a diagram (which they were not prompted to use by the examination rubric) of the circular flow of income may well have acted as a prompt to think about the effects of withdrawals in a particular way.

5. Discussion

For teachers in higher and secondary education to make widespread use of phenomenography/variation theory in their routine practice they must have easy access to categorisations of conceptions in which they can place their confidence. For economics teachers the most widely researched phenomenon is price. But even here we find a range of categorisations that have been suggested over the past 20 years. Moreover, we have suggested some reasons why teachers of economics might be wary about the categories that have been suggested, believing that some elements that they regard as critical to the way of understanding they are trying to develop are not identified in current research (e.g. time, the distinction between the individual seller and the sellers in a market). It is perfectly possible that no individual included in previous research had a conception of price that included such elements. However, it might also be that the way in which the research was constructed and the data analysed made it difficult to observe such conceptions. We have noted the susceptibility of research findings to the construction of the research scenario: whether participants are asked to explain price or change of price, whether they are presented with a scenario that encourages them to think of a single provider or a market with a number of providers, the way in which time is signalled. That is, just as variation theory indicates the importance of simultaneously varying each of the elements critical to a target conception, research that is designed to uncover

conceptions of a phenomenon needs to take account of the way in which the example given to participants is likely to draw their attention to some but not other critical elements of a phenomenon. As we have also seen in the case of conceptions of saving, categorisation of conceptions may also be susceptible to the familiarity of the researcher with the way of thinking in a particular discipline. In this respect their awareness of the 'external horizon' may be particularly significant in the way that they distinguish between more complex conceptions.

Nonetheless, we found less variation in (expert and non-expert) researchers' categorisation of evidence from interview transcripts than from examination scripts. There are at least two possible explanations for this. One could be that the framing provided by formal examinations means that these are of little use in identifying different qualities of conception. From the viewpoint of the application of phenomenography/variation theory in practice this would be disappointing for a couple of reasons. First, it would mean that a source of data that is relatively inexpensive and therefore more practicable for teachers to access is in fact doing them no good. Second, it would mean that the differences between students' thinking that are suggested in typical examinations and which form the basis for distinguishing between the achievements of different students do not correlate at all well with the way that students really think about economic phenomena. The implication of this is that economists would need to completely start again with their thinking about students' achievements and this level of challenge is not going to make it easy to get them to use phenomenography/variation theory in their regular practice. However, a second possible explanation is that we have problems with the relationship between our samples of interviewees and examination answers. It could be that since the students who were willing to be interviewed were largely overseas entrants to the second year of the course they may have come with less developed conceptions about savings and withdrawals. There is plenty of work still to be done to evaluate these and other possible explanations. The data we have presented here are very limited in scope and it may be that some more illumination can be provided as the project continues.

References

- Anderberg, E., Svensson, L., Alvegard, C. and Johansson, T. (2008) The epistemological role of language in learning: A phenomenographic intentional expressive approach, *Educational Research Review*, 3, 1, 14-29.
- Caravita, S. and Halldén, O. (1994). Re-framing the problem of conceptual change. *Learning and Instruction*. 4(1), 89-111.
- Dahlgren, L. (1984) Outcomes of Learning, in Marton, F., Hounsell D., and Entwistle N. ed. *The Experience of Learning*, Scottish Academic Press, Belfast.
- Davies, P. and Dunnill, R. (2008) Learning Study as a model of collaborative practice in initial teacher education, *Journal of Education for Teaching*, 34, 1, pp. 3-16.
- Davies, P. And Mangan, J. (2007) Threshold concepts and the integration of understanding in economics, *Studies in Higher Education*, 32, 6, pp. 711-726.

Duit, R. (2008). *Bibliography: Students and teachers conceptions and science education*. Available online: <http://www.ipn.uni-kiel.de/aktuell/stcse/stcse.html> (accessed May 2008).

Marshall, A. (1890) *Principles of Economics* (London, MacMillan).

Marton, F. (1981) Phenomenography – Describing Conceptions of the world around us, *Instructional Science*, 10, 2, 177-200.

Marton, F. (1986). Phenomenography- A research approach to investigating different understandings of reality. *Journal of Thought*, 21(3), 28-49. Reprinted 1988 in R. R. Sherman & W. B. Webb (Eds.), *Qualitative research in education: Focus and methods* (pp. 141-161). London: Falmer Press.

Marton, F. (1988). Describing and improving learning. In R. R. Schmeck (Ed.), *Learning strategies and learning styles* (pp. 53-82). New York: Plenum Press.

Marton, F. (1994). Phenomenography. In T. Hus6n & T. N. Postlethwaite (Eds.), *The international encyclopedia of education* (2nd ed., Vol. 8, pp. 4424-4429). Oxford, U.K.: Pergamon.

Marton, F. and Booth, S. (1997). *Learning and Awareness*. Mahwah, NJ: Erlbaum.

Marton, F. and Pong, W.Y. (2005). On the unit of description in phenomenography. *Higher Education Research and Development*, 24, 4, 335-348.

Meyer, J. H. F. and Land, R. (2005). Threshold concepts and troublesome knowledge (2) Epistemological considerations and a conceptual framework for teaching and learning, *Higher Education*, 49, pp. 373-388.

Meyer, J.H.F. and Shanahan, M. P. (2002) On variation in conceptions of ‘price’ in economics, *Higher Education*, 43, 2, pp. 203-225.

Pang, M. and Marton, F. (2005) Learning Theory as a Teaching Resource: Enhancing Students’ Understanding of Economic Concepts, *Instructional Science*, 33, 159-191.

Pong, W. (1997) Students’ Ideas of Price and Trade, *Economic Awareness*, 9, 2, 6-9.

Richardson, J.T.E. (1999). The Concepts and Methods of Phenomenographic Research. *Review of Educational Research*, 69, 1, 53-82.

Säljö, R. (1988). Learning in educational settings: Methods of inquiry. In P. Ramsden (Ed.), *Improving learning: New perspectives* (pp. 32-48). London: Kogan Page.

Svensson, L. (1997). Theoretical Foundations of Phenomenography. *Higher Education Research and Development*, 12 (1), 159-71.