



**ESRC Research Group on  
Wellbeing in Developing Countries**

**WeD Working Paper 17**

**MEASURING WEALTH ACROSS SEVEN THAI COMMUNITIES**

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## **WeD - Wellbeing in Developing Countries**

### **ESRC Research Group**

WeD is a multidisciplinary research group funded by the ESRC, dedicated to the study of poverty, inequality and the quality of life in poor countries. The research group is based at the University of Bath and draws on the knowledge and expertise from three different departments (Economics and International Development, Social and Policy Sciences and Psychology) as well as an extensive network of overseas contacts and specific partnerships with institutes in Bangladesh, Ethiopia, Peru and Thailand. The purpose of the research programme is to develop conceptual and methodological tools for investigating and understanding the social and cultural construction of well-being in specific countries.

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## SUMMARY

This paper discusses the methodology for creating an asset-based wealth index from household survey data. It critically reviews the main approaches used to create such indexes, showing that the aims of the study and types of data available are key factors in influencing the research design. It then outlines the methodology undertaken to create a wealth index to differentiate between households in the seven communities from the Wellbeing in Developing Countries (WeD) project in Thailand, and to validate it through further fieldwork in each community. The findings of the index suggest that households in the South of Thailand are generally richer than those in the North-East, and that wealth tends to be higher in urban areas compared to rural areas. Discussions to validate the index highlight the importance of combining qualitative fieldwork with quantitative analysis of household surveys to understand the local context of wealth, and appreciate the needs of households, and their different resources, livelihoods, relationships and life-cycles.

**Key Words:** Wealth, Asset index, Thailand, urban, rural, quantitative and qualitative research

**Key Reading:** Sahn, D. and Stifel, D. (2000) 'Poverty Comparisons Over Time and Across Countries in Africa' *World Development*, 28 (12), pp. 2123-2155.

Filmer, D. and Pritchett, L. (2001) Estimating Wealth Effects without Expenditure Data-or Tears: An Application to Educational Enrolments in States of India. *Demography*, 38(1), pp.115-132.

Jongudomkarn, D., Camfield, L. (2005) *Exploring the quality of life of people in North-Eastern and Southern Thailand*. WeD Working Paper 11.

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## INTRODUCTION

This paper outlines the methodology used to create a wealth index from household survey data from the ESRC funded Wellbeing in Developing Countries (WeD) project in Thailand and discusses the results. The aim was to create an index to differentiate between households both within and across seven different urban and rural communities in Thailand. The methodology includes quantitative and qualitative techniques, drawing on a detailed knowledge of seven Thai communities obtained from components of the WeD research framework. Further research was then carried out in each study community to validate the index, extending the range of insights into the nature of wealth in each location. This allowed conclusions to be made about the distribution of wealth within and between the seven communities in the WeD study, whilst identifying and exploring the dimensions of wealth that are unique to each location.

The WeD study aims to understand how people socially and culturally construct their wellbeing and what strategies they use to achieve this. The WeD framework consists of six distinct but interrelated research components, being applied in communities in Thailand, Peru, Bangladesh and Ethiopia<sup>1</sup>. In each study site, a detailed Community Profile has been carried out to record the historical and institutional context. Secondly, a Resources and Needs Questionnaire (RANQ), conceptually based on the Resource Profiles Approach (Saltmarshe, 2002; Ireland, McGregor and Saltmarshe, 2003) and Doyal and Gough's Theory of Human Need (1991), has been carried out to profile each household's characteristics and the activities that members engage in. Alongside this questionnaire, further analysis is being undertaken, including psychometric Quality of Life<sup>2</sup> (QoL) measures and income and expenditure diaries with core households<sup>3</sup>, as well as detailed and dynamic process research into some key themes that influence wellbeing in the context of the structures and regimes of contemporary Thailand.

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<sup>1</sup> For more information see WeD methods toolbox at [www.welldev.org.uk/research/methods-toobox/toolbox-intro.htm](http://www.welldev.org.uk/research/methods-toobox/toolbox-intro.htm)

<sup>2</sup> WeD-QoL is a psychometric measure being developed by the WeD project. For more information, see WeD methods toolbox and forthcoming WeD working paper by Camfield, McGregor and Yamamoto.

<sup>3</sup> There are 72 'core households' from the Thai RANQ sample that are being studied in more detail, 36 in the South and 36 in the North East. In the South there are 12 core households in three communities, 2 Rich, 2 Middle and 2 Poor for both Muslim and Buddhist households, and in the North-East, 9 core households in each of four communities, 3 Rich, 3 Middle wealth, and 3 Poor.

As part of this research, WeD collaborators in Thailand have undertaken the RANQ questionnaire, a 26 page household survey containing questions about happiness, and human, material, social and cultural resources, with 1183 households in 7 study sites. There are 3 sites in the South of Thailand, in and around the city of Hat Yai in Songkhla province; one urban, one peri-urban and the other rural. In the North-East there are four communities near the city of Khon Kaen; these sites are in urban Khon Kaen, a peri-urban community on the outskirts of Khon Kaen, a rural village in Roi-et province and a remote rural village in Mukhdahan province<sup>4</sup>.

The RANQ questionnaire covers 6 main areas; the household as an organisation, happiness with life 'as a whole' ('global' happiness), human resources, material resources, social resources and cultural resources<sup>5</sup>. It does not contain any quantitative questions about household incomes and expenditures<sup>6</sup>, rather households are asked to reflect on their relative wealth compared to other households in their community and to give some indication of the sufficiency of their incomes over the last month and how their income has changed compared to five years ago. Although it is possible to make some judgments based on people's subjective opinions on their own wealth relative to others in the community, these may be open to reporting biases. An alternative method of measuring wealth is to create a robust quantitative measure of household wealth based on the stock of assets available to households, which has the additional advantage of facilitating comparison between the seven study sites.

## **ASSET BASED WEALTH INDEXES**

There are many different ways of measuring household wealth. Perhaps the most conventional economic technique is to measure total consumption, since this offers a quantifiable and cardinal scale linked to utility. However, this is often expensive to collect and difficult to record accurately. Other ways of measuring wealth, such as participatory ranking exercises which

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<sup>4</sup> In the Southern study sites, the communities are made up of both Thai Buddhists and Muslims, however, in the North-East sites, the communities are entirely Buddhist, with some ethnic variations. For more information, see the WeD community profiles, which provide detailed descriptions of each community- see [www.wed-thailand.org](http://www.wed-thailand.org).

<sup>5</sup> For more information about RANQ see Velazco (2004); McGregor and Kebede (2003)

<sup>6</sup> These were felt to be too intrusive and time-consuming to attempt at an early stage of fieldwork. This information is subsequently being collected as part of the Income and Expenditure study with 'core households' with whom a relationship has been built up through monthly contact during a year of fieldwork.

were carried out for many of the WeD Community Profiles in Thailand, are useful for capturing local knowledge of the determinants of wealth in a community. However, the results cannot be used to compare households in one community with those in other locations, since it cannot provide an objective common scale measure.

An asset index can act as an estimate for wealth as it measures the stock of resources available to a household. This approach follows in the tradition of Sen's capability theory (Sen, 1985) and the sustainable livelihoods framework (DFID, 1999; Ellis, 2000) in connecting how what people have influences the strategies of what they do. Some suggest that such an index may even be more representative of long-term wealth than conventional income and expenditure methods (Sahn and Stifel, 2003), as it measures capabilities and the accumulation of resources, rather than contemporary flows of cash and in-kind services, and is easier to collect and is less subject to measurement error (Filmer and Pritchett, 2000). However, it is worth recognising that although many household surveys exist which researchers can use to build indices, the choice of variables to include is limited by the questions included in the survey. Very few researchers have attempted to validate the accuracy of their asset indices by investigating its appropriateness in and across local communities by conducting further qualitative research.

There are many possible ways of specifying an asset index<sup>7</sup>. Perhaps the most simple is to use arbitrary or subjective weights. In this case either equal weights, valuing all assets as contributing the same amount to wealth, are applied to all assets in the index. Alternatively, an estimate of their relative importance is made. The problems with this technique are that the first option is weak methodologically, since it provides no differentiation between assets, and the second approach is extremely complex and requires a high level of skill to make an accurate judgment.

Another approach, and one used by Morris *et al* (1999), is to determine the weights by the relative scarcity of assets. This relatively simple technique works on the assumption that the quantity of assets held is positively linked to their price, and so households holding more assets that are relatively scarce are given a greater wealth score. This technique clearly can only be used for 'normal goods', indicating that screening of the assets would have to be undertaken before the specification of the model. Another problem is

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<sup>7</sup> For a more extensive summary of proxy measures of welfare, covering not only asset indexes but also regression analysis see Falkingham and Namzie (2002).

that this methodology relies only on the quantity of assets; therefore it is difficult to logically include other qualitative determinants of wealth such as education levels.

A more sophisticated method is to use statistical techniques to determine the relative weights applied to different assets. This has the advantage of being statistically derived and theoretically consistent, as it is 'letting the data decide the weights' (Sahn and Stifel, 2000: 2124). Sahn and Stifel (2000) use factor analysis to decide the weights, whereas Filmer and Pritchett (1998) use Principal Component Analysis. Both techniques are based on the underlying assumption that it is possible to detect one or more underlying factors which are responsible for the covariation between variables. In this case, one single factor, wealth, or 'welfare' as they summarise it, is assumed to be behind the ownership of all the included assets. Many studies follow Filmer and Pritchett's technique, but Sahn and Stifel argue that their method is more theoretically accurate, since all the factors are not forced to explain all the variation between the assets. However, a correlation factor of 0.98 between the results of factor analysis and Principal Component Analysis techniques (Sahn and Stifel, 2001) suggests that there is little practical difference between methodologies.

As I have shown, there are several techniques that can be used to build an asset index- all involve attaching weightings to a set of chosen assets which are regarded as related to household wealth. Clearly, despite presenting itself as a more objective measure, this technique also involves some subjectivity on the part of the researcher who must decide which assets to include and how to specify the index. However, despite this drawback it has been successfully applied in many studies. Within the WeD team, three different approaches have been undertaken, including this one, which are outlined and related to these theoretical methods in the next section. A key issue that influences each of these methodologies is the purpose that the asset index will be used for, and the level of comparison. Where the asset index is to be used for comparison between different communities it may be necessary to adopt a different approach to that when the aim is to assess poverty and wealth within one site.

### **Asset based wealth indexes in WeD**

Within the WeD research teams there have been a number of different approaches to undertaking a wealth index and ranking. These have been carried out using data from Ethiopia and Thailand.

Monica Guillen, a research postgraduate student at the University of Bath, undertook a consumption index using data from the rural sites in Thailand. She did this by selecting assets from RANQ relating to consumption and categorising them into 6 groups, covering transport, household goods and jewellery, with different groups of assets for 'rich' and 'basic' bundles. The 6 groups representing bundles of goods were then ranked in an order of wealth, and households given a score from 1-6 according to the portfolio of assets that they owned. Households scored 1 if they only owned goods from the lowest group, 2 if they owned goods from the lowest and second to last groups, 3 if they owned goods from these groups and the next highest group, up to a maximum of 6 if they owned goods from all of these groups.

Guillen chose these groups by dividing the assets according to household's frequency of access and using local knowledge of the status attached to each asset, such as that obtained during the WeD QoL Phase 1 study, which asked people to describe things that were important to them. This division was done by running cross-tabs and checking for significant correlations using a Chi square test to ensure that the groups followed a logical sequence, with the higher groups always having more households not owning any of its assets than the group below. All the households included in the RANQ database were therefore divided between six categories according to which group of assets they held. This consumption index was then used in the analysis of determinants of happiness and domain satisfaction in rural Thailand, using probit analysis (see Guillen and Velazco, 2006). The analysis revealed a significant causal relationship between the index and happiness, satisfaction with food consumption, housing and total income.

The strengths of this technique of building an index are that it follows a theoretically logical approach, and has been shown to be statistically consistent. Ultimately the accuracy of the index relies upon being able to determine a hierarchy of goods. In the index this is done by relative scarcity and qualitative information about the meaning of different assets.

Using Ethiopian WeD data, Dr Marleen Dekker from Vrije Universiteit Amsterdam undertook a wealth index using factor analysis. She made a list of possible assets from RANQ and created site specific wealth indexes. She did this by separately selecting assets from RANQ for each of the WeD



research sites based on uniqueness scores from factor analysis<sup>8</sup> (0.95), and removed those that did not appear significant. This allowed statistical relationships to determine which assets were selected. The communities were then divided into quintiles according to their wealth ranking score. This approach uses the statistical technique of factor analysis to determine both what variables to include from RANQ, and the weightings assigned to them. It is therefore a statistically robust methodology, minimising human bias, but potentially also excluding informative cultural knowledge about the importance of assets in the communities. By differentiating between rural and urban households and conducting separate analysis for each of the sites, the index avoids issues of rural/urban bias, but cannot be used for comparison. This methodology only includes material resources related to assets and housing characteristics, and doesn't include other variables such as land area or education, which theory suggests may relate to wealth.

The wealth index was used by WeD researchers in Ethiopia to identify the ten richest and ten poorest households in each community. Further interviews about poverty dynamics were then undertaken with these households, with the aim of comparing these with the ten richest and poorest from a consumption poverty measure. Dr Dekker also devised a similar index to explore the relationship between asset-based wealth and food security as a measure of vulnerability<sup>9</sup>, using data from the 1994-5 Ethiopian Rural Household Survey (ERHS), which was carried out in the same villages. Dr Dekker concluded that households with a higher economic status experience fewer weeks of food insecurity than households with a lower economic status. In addition, she found variation in food security is explained more precisely by an asset based indicator of wealth than a wealth proxy defined as per capita consumption (Dekker, 2005).

## **CREATING A WEALTH INDEX**

The aim of this work is to create a wealth index to facilitate comparisons of the wealth of households across all the WeD study sites in Thailand, both within and between communities. To do this it is necessary to choose which method is most appropriate, and then decide which assets to use. The specification should be checked and the results shown to be intuitively

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<sup>8</sup> Uniqueness is measured by 1-Communality. In effect, this is the same as saying Communality less than 0.05.

<sup>9</sup> This is part of the research project "Social Security within and between households. A social network approach to intra-household resource allocation in Ethiopia" funded by The Amsterdam Institute for International Development.

correct based on the other WeD research findings. In this process, I follow the methodology of Sahn and Stifel's (2000) factor analysis paper, discussing the different stages of the process, and presenting the index it produces. The results of this index are then validated in the villages themselves using key informants, income data, and informal participatory ranking to provide insights into both the wealth index methodology and local perceptions of wealth across contemporary Thailand.

## **Methodological Issues**

There are some major issues with attempting to create a country-wide asset based wealth index across different sites and regions that need to be considered. While it is possible to create wealth indexes across similar countries<sup>10</sup>, it is potentially problematic to construct a single index across the four WeD study countries as the environments and types of livelihoods are so diverse. As Doyal and Gough's (1991) Theory of Human Need suggests, we can identify universal basic needs across these communities, but needs satisfiers are locally constructed, and so it may be difficult to get common indicators for these local measures. These issues apply within Thailand, where WeD is working in communities in two regions with very different geographical characteristics. Methodologically, there is a potential problem of including both urban and rural communities and different regions, as the portfolios of assets owned are likely to be influenced by the types of livelihoods that household members are engaged in and cultural factors. Measures of access to infrastructure are also likely to bias the index in favour of urban areas since modern methods are usually perceived as better; thus making it difficult to make a balanced comparison. For instance, the quality of natural water supplies such as mountain streams may exceed that of piped water in towns, but it may be more affected by seasonal fluctuations in rainfall.

In order to counteract potential bias, this asset index focuses predominantly on consumption goods and housing quality rather than assets directly associated with livelihoods. Inevitably, this may still lead to bias in favour of urban areas as these may have greater access to modern markets and infrastructure. Nevertheless, it provides a ranking that can be tested through participatory fieldwork in the villages themselves. Discussion with key informants helps to shed light on the nature of wealth and the factors that influence it in local contexts and across contemporary Thailand.

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<sup>10</sup> This is what Sahn and Stifel (2000) and Filmer and Pritchett (1999) do.

## Specifying the index

To construct an asset index based on factor analysis, it is necessary to select from RANQ a series of variables that we would expect to be related to the common factor wealth. This can be done statistically, or following theoretical principals. In order to ensure that the variables in the index are theoretically consistent and are all related by wealth, I follow other studies and select the assets for inclusion manually, checking their statistical consistency. Sahn and Stifel (2000), using data from the Demographic and Health Surveys (DHS), chose the following household assets:

- Household characteristics (Water source, Toilet facilities and construction materials)
- Durables (Ownership of radio, television, refrigerator, bicycle and/or car)
- Education of Household Head

Filmer and Pritchett (1998), using Principal Components Analysis, use a similar survey, the National Family Health Surveys, and choose twenty-one asset variables, which they group into three types.

- Consumer durables (clock/watch, bicycle, radio, television, sewing machine, refrigerator, car)
- Characteristics of household dwelling (three about toilet facilities, three about the source of drinking water, two about rooms in the dwelling, two about the building materials used, and one each about the main source of lighting and cooking)
- Land Area (whether the household owned more than 6 hectares of land)

An index can only measure wealth based on the data available. However, as in RANQ, this data:

- Contains no information about the quality of assets. A battered black and white television would not be differentiated from a state-of-the-art plasma screen.
- Only records whether there are any in the household, but not how many. A household with 5 cars would score the same as a household with 1.

Some key considerations are necessary when deciding what assets to use. For example:

- Whether there will be a rural/urban bias. Area of land owned may be a better indicator of wealth in a rural setting than in an urban setting.
- Whether selected assets are correlated with wealth, or whether they are more influenced by other factors. Having a VCR may no longer indicate wealth, because alternatives such as VCD<sup>11</sup> or DVD are available.
- Whether assets are cross-correlated. Including mains electricity and having a fridge would not be appropriate, since the two are likely to be highly correlated. This point is not relevant when using principal components analysis, but if factor analysis is used, the correlation between variables should be minimised.
- How to deal with different household size. Sahn and Stifel (2000) use per capita information about assets. However, since the absolute number of assets owned by each household is not recorded in RANQ, it is not possible to make accurate *per capita* estimates. Filmer and Pritchett (2001) do not use *per capita* estimates, however, since they state that “Many of the assets, like the quality of materials, are at the household level and benefit all household members so our asset index is unadjusted for household size” (p14).

RANQ records a huge amount of data about different household assets. This means that there is a good stock of data to choose from, but has the disadvantage of complicating the decision of what assets to include.

In RANQ there is data on:

- Land and Natural Resource Use
- Livestock and small animals ownership
- Asset Ownership
- Housing, utilities and sanitation
- Education and human resources
- Social and Cultural resources

It is possible to include all assets and to remove those that are statistically inconsistent. Although this may seem more objective, it is necessary to combine this approach with available information about other factors influencing wealth in Thailand to produce a balanced index.

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<sup>11</sup> VCD is a video technology common in Thailand, which plays movies from ordinary CDs.

## Assessing wealth in Thailand

In order to include factors that are representative of wealth across all the study sites, the following sources of information gathered through the different research components informed by the WeD framework were used:

- Responses regarding wealth from the QoL phase 1<sup>12</sup> piloting carried out in the rural and peri-urban communities.
- Data from RANQ.
- Information about aspects of wealth included in the Community Profiles.
- Data from key informants and WeD field researchers who know the communities well.

The exploratory QoL research in Thailand highlights the importance of land in rural communities. It also highlights that people identified that the material goods which indicated wealth were “a TV set, fan, refrigerator and motorcycle. A pick-up truck was a most wanted automobile in every family in the peri-urban areas.” (QoL, 2004, p18). One person reported that rich people have “(a) car, money, gold and jewellery.”

There were differences in responses based on the sites in which the interviews were carried out. When asked the characteristics of a household that lives well, both focus groups of older women in rural villages in the North-East of Thailand stated ownership of cows and buffalos were important signs of living well. However, most groups stated the importance of land, a good house and transport, especially a car.

This clearly highlights the difficulties related with selecting a core list of assets and having common criteria for wealth across all the sites. Within the WeD theoretical framework, needs and resources are shown to be closely related. Assets or resources may have different significance to different households, depending on the types of needs that they help meet. The value of resources is therefore extremely context specific (White and Ellison, 2004); a pick-up truck may be more significant for a household living

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<sup>12</sup> See the QoL toolbox at [www.welldev.org.uk/research/methods-toobox/toolbox-intro.htm](http://www.welldev.org.uk/research/methods-toobox/toolbox-intro.htm) , and Jongudomkarn and Camfield (2005)

in a rural area for taking goods to market, than an urban household that lives within walking distance of the market.

Ultimately, we have to be clear about what we mean by 'wealth' and how the assets that we are including in the index contribute to this. As far as possible, the selection of assets to be included in the index was based around the following theoretical criteria:

1. Recognised as signs of wealth/good life by the community.
2. Offer an improved experience of life- offer new opportunities, quality of life, or be labour saving.
3. Not directly influenced by urban or rural livelihoods, or selective cultural factors (e.g. the ownership of a rice mill is a sign of status and wealth in the rural North-East of Thailand but is of less importance in the South or in urban areas).
4. Offer a balanced selection of assets which will not be directly cross-correlated, except by wealth.
5. Avoid context-specific ambiguity, such as social resources, which may or may not be beneficial or signify wealth (e.g. whether a member of the household has a position of responsibility).

Because of these broad criteria, the asset index will mainly focus on consumption in the following areas:

1. Transportation
2. Consumer durables
3. Other household assets
4. Housing quality and infrastructure
5. Vulnerability to shocks; estimated by food security
6. Education

Productive assets were excluded on the grounds that they create a clear urban-rural bias, since few urban households own mechanised or other productive assets. By excluding these, it inevitably understates the asset wealth of rural households, but it was the only possible way of working.

### *Transportation*

By including a variable associated with transport, we want a measure that will distinguish by wealth, not livelihoods or cultural factors. For this reason, a variable for 'motorised vehicle' was created, according to whether a household owned a car or pick-up truck, or equivalent. The two were

combined because households that own a car are unlikely to also own a pick-up truck. In total, 7% of households own a car, (mostly in the South: 17% of households in Ban Chai Khao and 8% of households in Ban Thung Nam own cars) and 10% own pick-up trucks. The decision over which to own is likely to be more determined by livelihoods than wealth.

However, because so few households own motorised vehicles, they only distinguish rich households. For this reason, a new variable was introduced, 'light motorised vehicles', which includes motorbikes and equivalents (such as motorbikes with sidecars and tuk-tuks<sup>13</sup>). In total, 77% of households own light motorised transport.

By having two variables for transport, we distinguish between different types of journey. This follows the responses of the QoL Phase 1 group research, which suggested that ownership of cars and motorbikes are attributes of households that live well in Thailand.

### *Consumer Durables*

When selecting consumer durables to include in the index, it doesn't seem appropriate to include assets as wealth indicators that are held by less than 5% of the population. Such assets could be more associated with individual tastes and age than with wealth. For this reason, microwave, satellite TV and rickshaw are not included.

The methodology of Sahn and Stifel (2000) suggest that television, radio and refrigerator should be included. This is consistent with data and knowledge of Thailand, although televisions are owned by 90% of households, and 97% in some communities. Video and DVD player ownership is low (7%) and likely to be highly correlated to television ownership; so these are not included.

49% of households own a radio. Refrigerators are owned by 69% of households overall, although this ranges from 89% in the peri-urban community in the South of Thailand, to 38% in the remote rural community in the North-East of Thailand.

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<sup>13</sup> These are not categorised in RANQ, but have been selected for inclusion from the 'Other, specify:' column to ensure that the analysis uses an accurate asset profile of each household.

Ownership of a computer is included because this is seen as a clear indication of wealth in Thailand. Similarly, ownership of a washing machine (owned by 28% overall) generally indicates wealth. Although washing machines are sometimes used as productive assets, such households are generally viewed as wealthy.

### *Other Household Assets*

Jewellery is likely to be an indicator of wealth, as suggested in the Thai QoL research; indicating the importance of including some measure of this in the index. However, since ownership of different types of jewellery is likely to show cross correlation, a single score will be included. This will be based on whether or not a household has any jewellery, which is the case in 71% of households.

Ownership of a telephone is also included in the asset index. This will be based on whether a household either has a landline or a mobile phone. Although traditionally a landline would have been viewed as a symbol of wealth, the wide coverage of mobile phone networks means that it is no longer necessary to have one.

Cameras are not included in the asset index, since it may be more related to personal taste rather than wealth. A sewing machine is not included, since it is often used as a productive asset and does not have a strong association with wealth in Thailand.

### *Household Characteristics: housing quality and infrastructure*

Both Filmer and Pritchett (1998) and Sahn and Stifel (2000) include household characteristics in their asset index. There is similar data available in RANQ, but unfortunately the information collected doesn't necessarily distinguish between the wealth of households.

RANQ includes information on the types of dwelling and the roof material but doesn't give information on the size of dwelling, such as number of rooms. The type of roof material isn't necessarily an indication of wealth, but is more associated with cultural or regional factors. A better indicator would be floor material (tiled, concrete, wooden or dirt), but this information isn't available. In order to get some kind of estimation of household size, those households who live in houses score 1, and those living in smaller accommodation (huts, parts of houses, flat) score 0. Additionally, a separate



kitchen is included as a greater wealth. Households with a separate kitchen score 1, otherwise 0.

Information about utilities and sanitation is included as a measure of housing quality. Similarly, the main source of fuel is included where a score of 1 given for clean fuels (electricity and bottled gas), and 0 for firewood and charcoal. Source of drinking water is also included where households that get water from piped water or bottled water score 1, and households getting their supply from a well or water storage jar score 0. Although supply of water may be affected by geographical location, and water from remote wells may be cleaner than urban mains supply, this distinction may not be as reliable.

Only a few households have a flush toilet, which is a clear indication of wealth and cultural status. Since most households have an improved pit latrine, those who don't are more likely to be poor. Therefore a score representing ownership of flush or improved pit latrine is used to indicate greater wealth.

#### *Vulnerability: Food security*

In order to capture another dimension of wealth, the ability to cope with shocks - a measure of vulnerability - was included in the index. This was determined by food security, based on whether households faced a food shortage in the last year. This variable was included as it is particularly able to differentiate between low and middle wealth households. It is an indicator that directly measures whether the basic needs of the household were met, and so can be used across different locations. In rural households, this is likely to be linked to land area and productivity, especially amongst those relying on the land for subsistence, whereas in urban areas it is likely to be linked closely to income and the ability to pay for enough food.

#### *Education*

Finally, as in Sahn and Stifel (2000), education of the household head is also included in the index, as a measure of the human resources of the household. This is given by the educational achievement of the household head. Different levels, such as completion of primary education, were considered. However, after comparing the statistical performance of different measures, the only measure that was included was whether the household head had completed secondary education.

The selection of these assets was based on a two stage iterative process. Firstly, a selection of possible assets was made, and then the appropriateness of each was tested by examining its uniqueness value (variables with a uniqueness above 0.95 were excluded) and factor scores (based on whether this appeared logically consistent). Because the inclusion of a factor not correlated to wealth would affect the levels of correlation and variability with every other asset, many amendments were made before the final index was specified.

Variables that were tested for appropriateness include ownership of the land of the dwelling, land area, having a separate kitchen and different combinations of productive and household assets, such as electric pot and stove. The final list of variables in the index detailed below was felt to offer a balanced combination of different areas:

*List of variables in the index:*

1. Light motorised transport (Motorcycle, tuk tuk etc)
2. Motor vehicle (Car or pick up truck)
3. Radio
4. TV
5. Fridge
6. Computer
7. Washing Machine
8. Jewellery (Household owns any jewellery)
9. Telephone (Mobile or Landline)
10. Dwelling (Dwelling is house)
11. Cooking (Cook with electricity, petrol products or gas)
12. Water (Source of drinking water is piped or bottled water)
13. Toilet (Toilet is flush or improved pit latrine)
14. Food shortage (Household experienced food shortage in the last year)
15. Education of Household Head (0=Uncompleted secondary, 1= Completed Secondary)

The index was produced following the approach of Sahn and Stifel (2000) using factor analysis ('principle axis factoring') in SPSS, with one factor extracted – assumed to be 'wealth'<sup>14</sup>. This approach has the advantage over

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<sup>14</sup> Filmer and Pritchett (2001, p6) state: "Our crucial assumption, and it is just that, an assumption, is that household long-run wealth is what causes the most common variation in asset variables"

principle components analysis, since it measures only the shared variance of the variables which is partitioned from its unique variance and shared variance. A varimax rotation was performed; the factor scores saved, and the results were saved as a new variable using the regression method<sup>15</sup>.

## RESULTS

The results of the index are outlined in detail in the Appendix, showing the correlation matrix (Figure A1), uniqueness/communality scores (Figure A2) and the factor scores (Figure A3). The results of the factor analysis were compared with principal components analysis ('principal components'), which found a Spearman's coefficient score of 0.994, suggesting that there is no significant difference between the methods<sup>16</sup>. In addition, the 'maximum likelihood' method of factor analysis was also compared, which had a Spearman's rank coefficient of 1.000<sup>17</sup>.

### *Factor Scores*

The factor scores (Figure 1) show the relative weights given to each variable in the index. These suggest that the most important assets relating to wealth in Thailand are ownership of a fridge, washing machine and telephone. The household characteristics, which have the highest weightings, are whether the household lives in a house, and their source of fuel for cooking. The assets with the lowest weightings are T.V., radio, transport (both light motorised and motor vehicle) and toilet type. Education also has a low score, which indicates that it is not strongly related to wealth. There is no discernable distinction between the magnitudes of weightings attached to household assets compared with housing characteristics, as there is a range of values for each.

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<sup>15</sup> An orthogonal rotation method ('varimax') was used to explore the consistency of the variables and simplify the data structure. An orthogonal rotation is appropriate since there is not a high correlation between variables, although all are predicted to be independently associated with wealth. The results were also normalised according to the Kaiser normalisation as this is a standard procedure in SPSS. Since this normalisation does not affect the ordinal ranking of the index, only the relative distance between variables, it does not adversely affect the results.

<sup>16</sup> This is the same finding of Sahn and Stifel (2000, p5)

<sup>17</sup> Fabrigar, Wegener, MacCallum and Strahan (1999) argue that if data is relatively normally distributed, then maximum likelihood is the best method of extraction to use because it facilitates a wide range of goodness of fit indexes and statistical tests. As this correlation shows, it offers the same results in this case as the Principle Axis Factoring approach.

These results appear consistent with knowledge of wealth in Thailand. It is slightly surprising that transport assets have a low weighting, and that the weights given to the highest assets are more than three times greater than the lowest ones, but the results are statistically derived and nevertheless logically consistent.

**Figure 1      Factor Score Coefficient Matrix**

**Factor Score Coefficient Matrix**

	Factor
	1
Motorised Vehicle	.060
Light Motorised Vehicle	.072
Radio	.070
TV	.069
Fridge	.239
Computer	.074
Washing Machine	.198
Jewellery	.100
Telephone	.221
Dwelling	.007
Cooking	.200
Water	.084
Toilet	.058
Food Shortage	-.111
Education of Household Head	.055

Extraction Method: Principal Axis Factoring.  
 Rotation Method: Varimax with Kaiser Normalization.  
 Factor Scores Method: Regression.

*Robustness*

The robustness of the index was tested by investigating how the distribution of wealth was affected by removing variables from the sample, following Filmer and Pritchett (2001). This shows whether any of the households considered ‘poor’ (in the lowest 40%) by the index would appear differently in a more limited index.

First, the index was tested removing the variables concerning education and food shortages, leaving only assets and housing. Next the housing characteristics variables were removed, leaving only assets. Thirdly, only household assets were included, removing the two transport variables. In the fourth case, the two highest weighted household assets were removed (fridge and telephone) leaving only the remaining assets. Finally, all the variables were included except fridge and telephone to test their influence on the index as a whole.

The index appears to be very robust (Figure 2). Only by stripping the index down to basic consumer assets, excluding a fridge and washing machine do any of the households that appear poor in the full index appear to be rich, and generally, over 80% of households appear in the same category when the index consists of only assets.

### **Distribution of results**

The results of the index allow us to compare the distribution of wealth between the different sites in Thailand. The asset index was divided into quintiles and the distribution of these was compared between villages. Although there are different numbers of households in each community, they were sampled randomly in each community to allow comparison of the relative distribution of wealth between the sites by the proportion of households in each category. Figure 3 below illustrates that sites 1, 2 and 3 are in the South of Thailand, and 4, 5, 6 and 7 are in the North-East of Thailand.

Households in the same quintile of wealth from the index can be said to experience a similar objective level of wealth, regardless of their location or site. Comparing the proportion in each quintile shows the relative distribution of wealth across all the 7 communities. Quintile 1 is the poorest 20% of all RANQ households, and Quintile 5 is the richest 20%. According to the index, we can see that the more wealthy communities are those that live in the South and in the more urban communities.

Figure 4 shows the distribution of households in each wealth quintile for each community. The different sizes of the bars reflect the different numbers of RANQ households in each community.

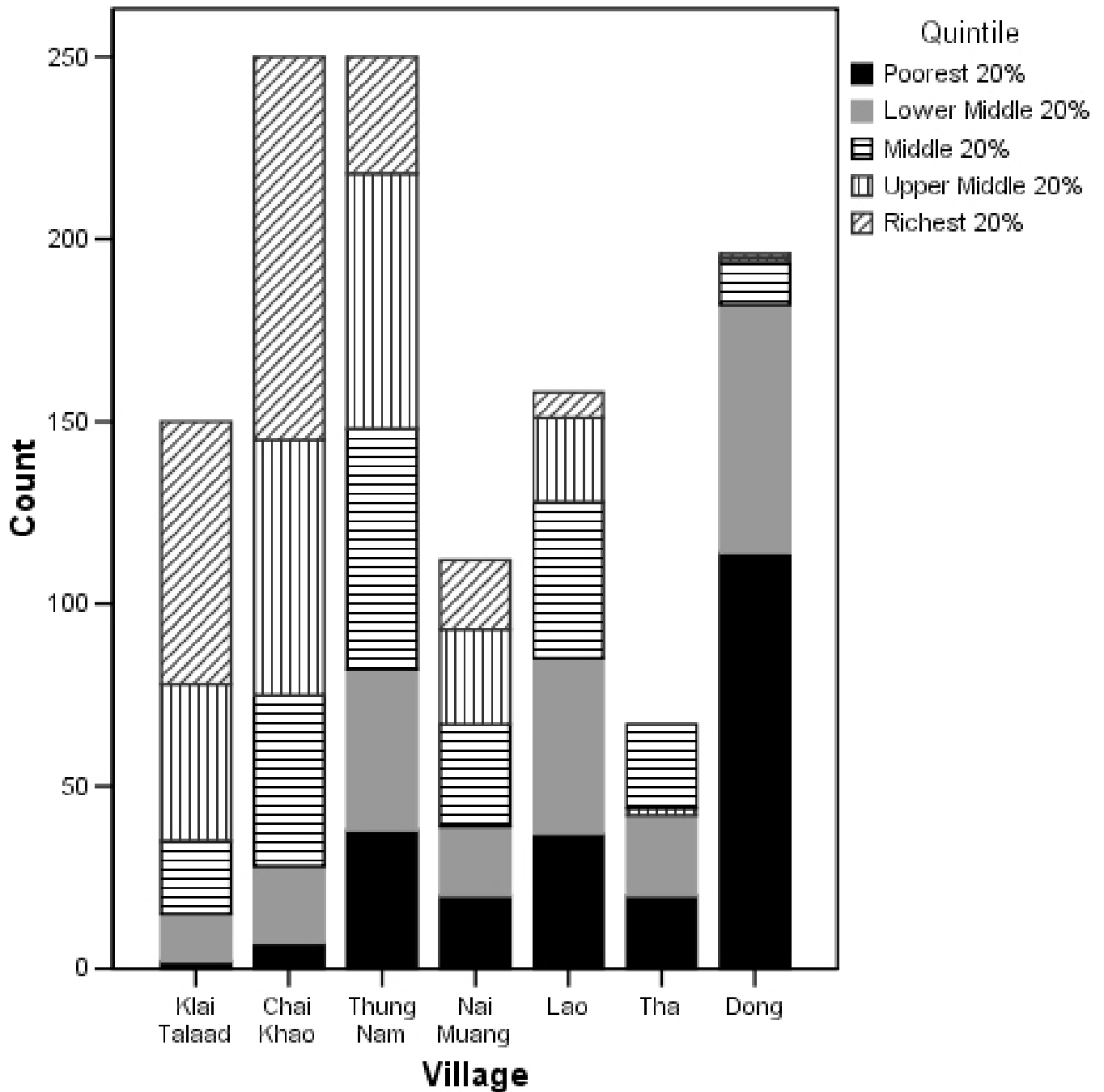
**Figure 2 Robustness test of results**

<b>Robustness Test</b>	<b>1. Assets and housing only</b>	<b>2. Assets only</b>	<b>3. Assets only, no transport</b>	<b>4. Assets only, no fridge or telephone</b>	<b>5. All index, no fridge or telephone</b>
Bottom 40%	94.5%	87.1%	84.8%	66.6%	86.9%
Lower Middle 20%	5.5%	12.9%	14.8%	31.9%	11.6%
Upper Middle 20%	0%	0%	0.4%	0.8%	1.5%
Top 20%	0%	0%	0%	0.6%	0%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Figure 3 Names, Regions and Characteristics of the RANQ study sites.**

	<b>Name of Community</b>	<b>Region</b>	<b>Characteristics</b>
1	Klai Talaad	South	Urban
2	Ban Chai Khao	South	Peri-urban
3	Ban Thung Nam	South	Rural
4	Nai Muang	North-East	Urban
5	Ban Lao	North-East	Peri-urban
6	Ban Tha	North-East	Rural
7	Ban Dong	North-East	Remote rural

**Figure 4** Distribution of the Quintiles of the asset index by number of households



In Figure 5, the number in each quintile of the total asset index is shown as a proportion of the number of households in the WeD sample for that community to illustrate the distribution of wealth across the study sites.

In the South, the urban community has the greatest proportion of households in the highest category, with nearly 50% of households in the top 20% of the wealth index, compared to just over 40% of the peri-urban

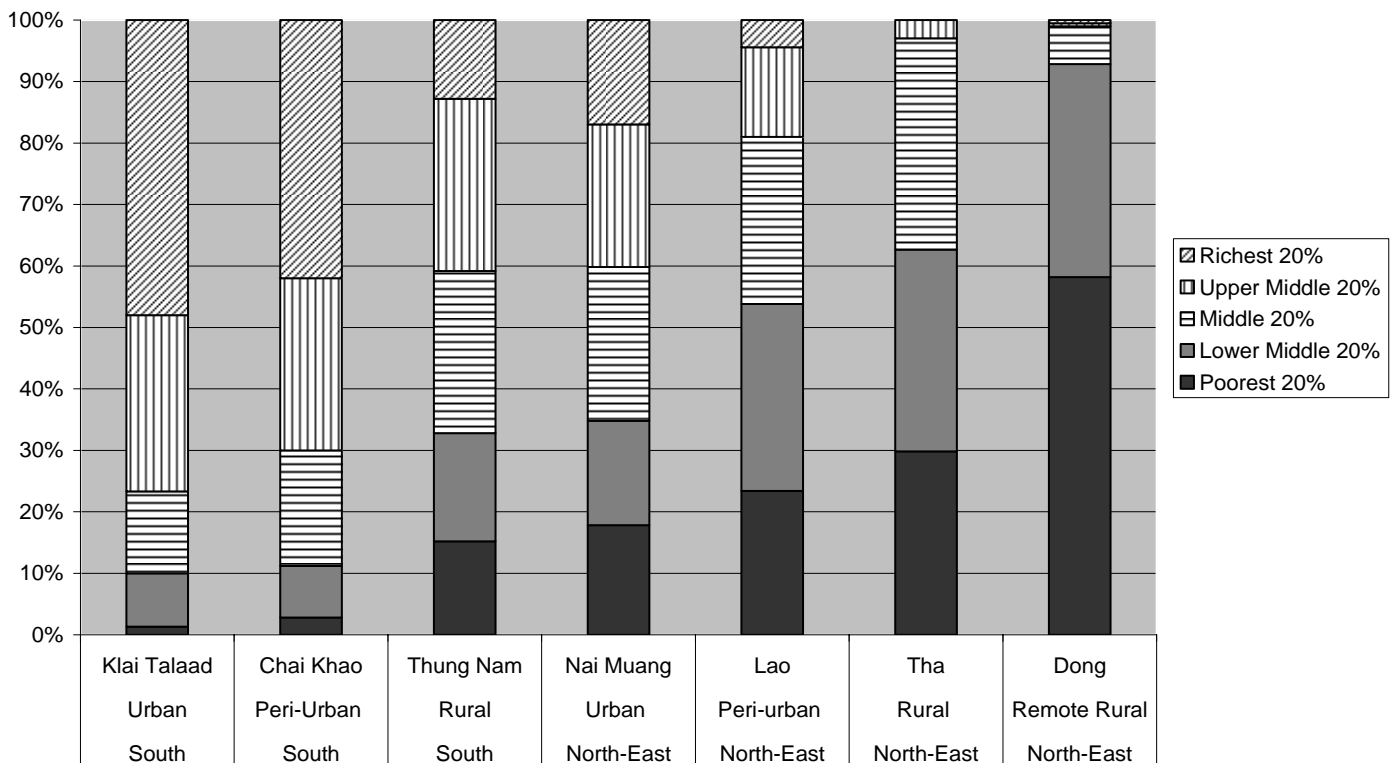
community, and just over 10% of the rural community. Equally, the urban community has the lowest proportion in the bottom category of wealth (1.3%), whereas 2.8% of the peri-urban community and 15.2% of the rural community are in this quintile.

In the communities in the North-East, far fewer households are in the top 20% of scores in the wealth index. In Nai Muang, the urban community, 16.9% of households are in this top category, compared with 4.4% of the peri-urban community and practically no households in the rural sites. However, nearly 60% of households in the remote rural site are in the bottom 20% of the wealth index scores, compared with 30% of households in the rural community, and just over 20% of households in the peri-urban community. In the urban community, just fewer than 20% of households are in this bottom quintile of the index.

**Figure 5 Distribution of the Quintiles of the asset index as a proportion of households**

### Distribution of wealth index scores by community

Proportion of households in each quintile by asset score for all communities



The box plots in Figure 6 below show the distribution the actual wealth index scores in each community, revealing the mean and inter-quartile range, and outliers. The different communities show both different mean levels of



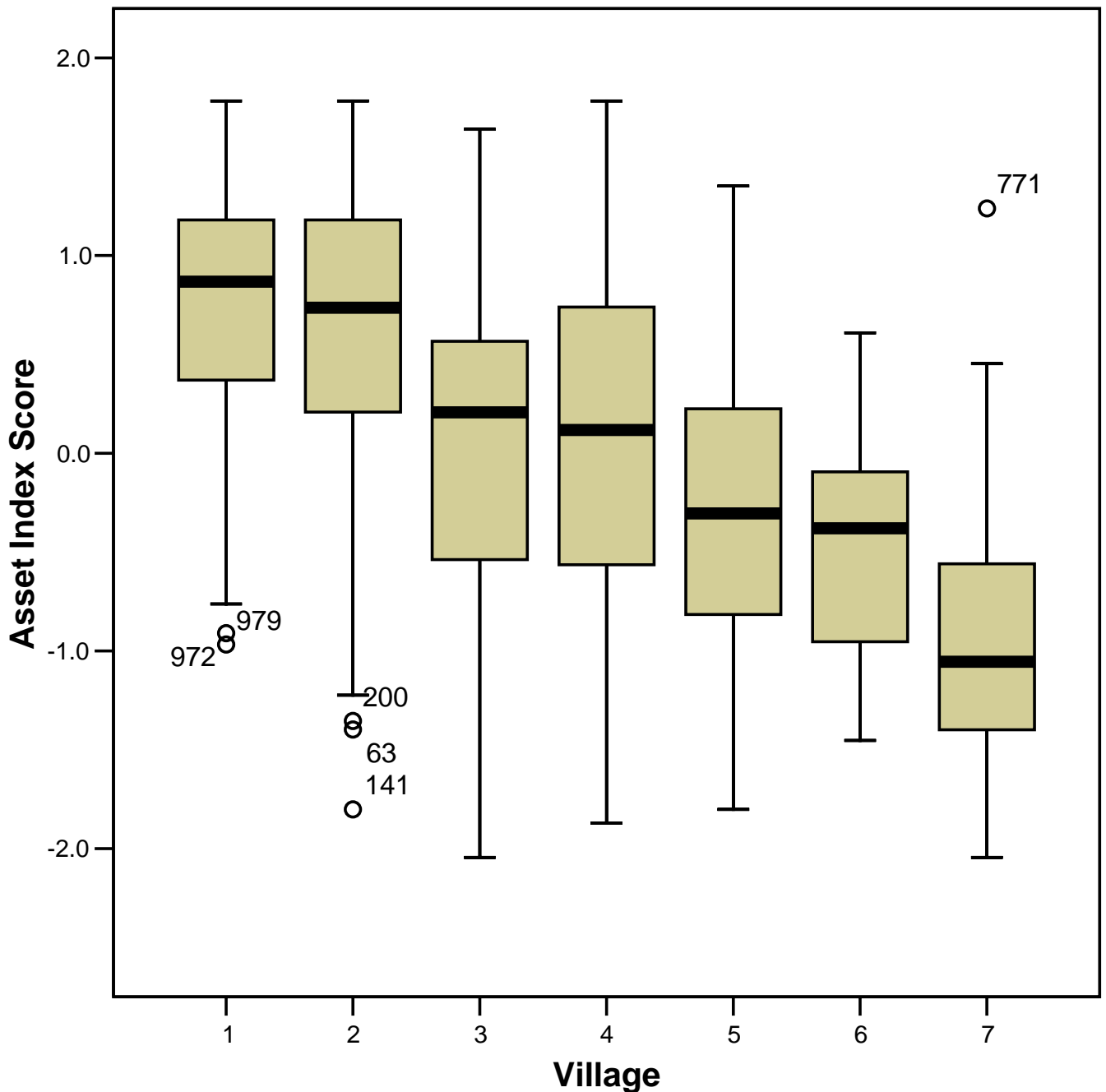
wealth, with all of the Southern communities having a higher mean wealth ranking than those in the North-East, but also different ranges of wealth. In both regions, the mean wealth score is greater in the urban areas than the rural areas, and the mean gets lower as the communities get more remote.

In the South, the urban community of Klai Talaad has the highest mean score of any of the communities, but also has a much narrower range of scores. In the peri-urban community of Ban Chai Khao, the mean and upper inter-quartile range are similar to Klai Talaad, but there are a much wider range of values at the lower end of the scale, including a number of outliers with very low wealth scores, indicating the presence of poor households. In Ban Thung Nam, the mean wealth score is lower. Although there are a number of households with high wealth scores, there is a greater range of poor households, and the lowest of these are below the levels of households in the North-East.

In the North-East, the urban area, Nai Muang, has the highest wealth score, but also the largest range of values. The highest scores in the community are as high as the highest of those in the urban community in the South, but the lowest scores are as low as the lowest in rural communities. The peri-urban community, Ban Lao has a lower mean score than the urban area, and a similar mean score to the rural community of Ban Tha. However, although the distribution of the wealth score for the lowest households is similar between them, there is a greater range of higher scores in the peri-urban community, although the highest of these is not as high as the highest of those in the urban area. The range of scores in the rural communities in the North-East is the smallest of any community. The remote rural site, Ban Dong, has the lowest mean wealth score, and a small range of values, except for two outlying households whose scores are much higher than the others. This community used to be a major centre for the Communist Party of Thailand, which may provide an explanation for these lower levels of inequality.

These results suggest that average wealth is higher in the study sites in the South of Thailand than the North-East, and that urban sites tend to have greater wealth than rural areas. In the North-East, the urban and peri-urban communities seem to have a much greater range of wealth scores than the rural communities.

**Figure 6** Range of asset index scores by community



### **Validating the index in the communities**

In order to explore the appropriateness of the index, further fieldwork was undertaken in each community to explore how reliable the index is as a proxy for wealth, and to offer additional insights into different dimensions of wealth in each community. This was done through observation, discussions with key informants and ranking exercises. The results of these investigations provide insights into the reliability and limitations of the asset index method, the nature of wealth in Thailand, and how it differs within and between the WeD study communities.

Interviews were held with key informants in each of the seven communities over two weeks. In each community three or four semi-structured interviews were undertaken, capturing rich and poor households, men and women, and where applicable, Buddhists and Muslims. The informants were asked about what factors characterise wealth in their community, how significant the factors in the index were for judging between the wealth of households, and asked to rank the wealth of selected households. In the North-East villages, participatory wealth ranking exercises with key informants had also been carried out previously, so it was possible to compare the appropriateness of the wealth scores with this subjective assessment. In order to find out more about the local context and aspirations of villagers, further questions were asked about their perceptions of other areas in Thailand, and the differences between living in the city and the countryside.

### *Factors affecting wealth in the community*

The responses regarding how to differentiate the wealth of households in the community differed slightly between the interviews conducted in the South of Thailand and the North-East. In the South, although some people mentioned size of land, particularly ownership of a rubber plantation, and productive assets, there were a greater proportion of responses that regarded how people lived- such as having time for leisure, or nice clothes. However, in the North-East of Thailand, nearly all the key informants said that size of land and business activities were the key indicators of wealth. This is especially true in the rural areas, where there are few alternative livelihoods to agriculture. In the urban area in the North-East, having a secure income and land rights are very important for determining wealth, since the community is built on land owned by the railways authority.

In general, it can be said that most of the responses regarding wealth in the North-East were about having enough to live, whereas in the South, the differentiation was more about the quality of how people live. This is probably because the South is generally richer, with higher returns from a larger range of livelihoods available, which reinforces the distribution of wealth in the index. It was interesting that although remittances play a very important role in the livelihoods of households in the North-East, very few people mentioned this as a source of wealth in itself, mentioning instead those things which offered long-term income security. In contrast, responses from the South where incomes are more secure, tended to be more closely linked to current disposable income, and households which were currently investing heavily in areas such as education were not seen as rich.

## *Appropriateness of the index*

In travelling around all seven different WeD study communities in Thailand, I found that the contrasts between the sites were remarkable, particularly between the South and the North-East, making direct comparison difficult. However, the distribution of the asset index scores between and within the communities seemed appropriate. For instance, in Ban Dong there is a small range of scores, which may be explained by its remoteness and the fact that it was formerly a stronghold of the Thai Communist Party. In the urban slum community, Nai Muang in the North-East, the asset index indicated that households were not homogenous. The asset index could not take into account the fact that the lack of land rights was a major source of insecurity in the village, but was able to show that although all households lived in these conditions, their wealth and capability to cope were not the same.

In all of the rural communities, the housing quality of the poorest was comparable with households living in basic shelters made from available materials, which reflects the similar scores of the lowest households in the wealth index across all of the rural sites. However, there were differences in the characteristics of the houses amongst the richer households which seemed to be more linked to cultural factors than wealth. The dwellings of the richest households in the South of Thailand tended to be built on one level, with solid walls, glass windows, and tiled floors. However, rich rural households in the North-East of Thailand tended to have much larger dwellings on two floors. In assessing the appropriateness of the index, it definitely seems important to include housing quality to measure wealth. The type of dwelling gives some indication of this, but other characteristics of the dwelling, particularly the quality of materials used would help to differentiate wealth more clearly.

When asking about the appropriateness of consumer goods for differentiating wealth, many key informants mentioned that it was very easy for poor people to obtain many different consumer durables through hire-purchase schemes. Typically, these involve making an initial down payment and monthly instalments. In the urban and peri-urban areas, this made many goods available to people who could not otherwise afford them. In the remote rural areas, where incomes and access to markets for consumer durables were not so good, it was far less common for poor people to buy these goods.

In all communities, it was typically felt that cars, washing machines and computers were definite indicators of wealth, but that a radio was not a good indicator as they were easily available to everyone. However, there were different responses to the importance of a motorbike, TV, fridge and telephone in indicating wealth, usually with urban informants stating that everyone has these goods and rural informants saying that only middle or rich households can afford them. When asked further, however, most key informants also said that although it was possible for poor people to buy many goods, most chose not to as they felt it was better to use their limited resources elsewhere.

In most of the communities, discussions with key informants revealed that the quality of goods is a key difference between households in different wealth categories. It is not difficult for poor households with good contacts to get hold of second-hand assets. In the slum community in the North-East, Nai Muang, an elderly woman living in terrible conditions still had a mobile phone, which her daughter had given her. However, to visit a poor household with a very old, very small TV and to compare this with a modern widescreen TV in a rich household seems inappropriate. Particularly in the South, it appeared that for some items such as cars, wealth was determined by the number of them that the household had. One poor household even owned four motorbikes.

Food shortages are far more common amongst households in the North-East of Thailand, and are particularly linked to a lack of land for farming and low incomes. It is seen by all key informants as a good indicator of poor households, and illustrates the greater wealth of households in the South, which generally have enough to eat. The type of fuel used by households was typically felt to be a good indicator of wealth, as many poor households own gas stoves, but choose to cook with firewood instead to save money. However, some rich households said that they preferred the taste of food cooked with firewood.

The type of drinking water used is a very difficult indicator of wealth across households as it is heavily influenced by the location of the community and the quality of water available. Most households in the North-East of Thailand use rainwater, whereas most households in the South get their water from wells. In urban areas, people also get piped water. Discussions with key informants suggest that there are potential problems with all of these sources of water, in terms of reliability throughout the dry season and

quality. As a result, the richer or more health conscious households choose to use bottled water.

Although most households agreed about the importance of education, it was felt that household heads who were old had overwhelmingly received very little education, typically only primary education. Rather, more people stated that wealth was more related to inheritance or working hard. However, it was still felt that those with more money would have greater access to education, whereas some poor households in the remote North-East may not even be able to afford travel costs.

Key informants were asked about their preferences and perceptions of life in rural areas and in the city. Nearly all respondents stated that they preferred life in the rural area because cities, particularly Bangkok, are polluted and expensive. In contrast, people in the countryside are perceived to be friendlier and it is possible to survive while spending very little money by collecting natural resources, whereas everything in the city has to be bought.

#### *Limitations of the index*

Key informants were asked to classify the wealth of different households in the community, and the results were compared with the asset index score. The results of these interviews suggested that the index works generally well, capturing the majority of cases in the same category of wealth as those identified by the respondents. However, in all of the communities there were also many households that were misrepresented by the index. These cases show the multi-dimensional nature of wealth and poverty, and highlight the difficulty of measurement through an index.

Although the RANQ sample has households ranging from one person to fourteen people in size, there is no adjustment for this in the index. Discussions with community members indicate that the size and composition of households makes a large difference to wealth, particularly the ratio of dependent household members to those earning regular income. However, because of the lack of information about the quantities of individual assets owned, there was no way of measuring this in the index.

In discussions with key informants, the importance of debt was raised frequently, and in many communities it was reported that the poor had a lot of debt, while the rich often had savings and acted as money lenders.

However, since debt is so prevalent in Thailand amongst all groups, a crucial issue is the terms of the debt and the ability to repay it; otherwise households are exposing themselves to increased risk and insecurity.

The wealth index measures many different assets, and provides a more long-term view of wealth. Since there is very little social security provision in Thailand, a continued stream of income or large savings are necessary. In some cases, respondents described how the circumstances of households had changed, and though they may once have been considered rich and still had a lot of assets, they no longer had a secure income and were not so wealthy.

In other cases, the life-cycle of the household made a big difference to wealth. In Ban Dong, the remote rural site in the North-East of Thailand, one respondent described how she had always considered another household as poor, but since their children had now grown up and were working in Bangkok and sending back money, they now had more than enough to live on. In the same way, younger households may have had less time to accumulate assets than older ones, thus making comparison between them difficult.

### **Interpreting the results**

The results of the wealth index suggest that the WeD communities in the South are wealthier than those in the North-East, and that urban communities tend to be richer than rural ones. These results appear as we would expect from knowledge of Thailand; from observation, government statistics and other literature. However, it is important not to ignore the context of the villages and the complex processes and livelihoods that create and reproduce wealth in each community.

The wealth index is mainly based on consumption goods and infrastructure due to the problems of comparison across regions, which means that it does not take into account the importance of productive assets to household wealth. In the North-East of Thailand, for instance, owning a rice mill is a key sign of wealth, which is not captured in the index. Similarly, the index may be biased towards urban areas as it does not take into account the different costs of fulfilling needs of households in rural areas. Nearly all key informants observed how the cost of living is much cheaper in rural areas, as wild food can be collected and there is a greater sense of community

interaction and assistance, which reduces the need to purchase goods individually.

The discussions with key informants allowed an insight into the things that were particularly important for households in each community. However, it also revealed that the subjective opinions of key informants are not always based on a complete knowledge of these households. In particular, key informants often had very simple ways of assessing wealth, which were based largely on historical perceptions of status. However, there were often contradictions between the asset index score and the opinions of key informants. In some cases, the opinion of key informants were clearly affected by their own 'face-saving' behaviour, as they refused to believe that they were rich and that their neighbours were poor, even though to an outsider the contrast was clear. In this way, the index has the advantage of being objective in that it does not rely on individual judgements.

However, the wealth index cannot be said to be truly representative of the quality of life that people enjoy, or to take into account the many environmental factors that influence the needs of a household. Although rural areas generally have a lower wealth score than the urban areas, people also need to spend far less to survive, and for some people the decision to buy fewer assets reflects this lower need.

## **CONCLUSIONS**

An asset index method is a statistical method for ranking households according to their wealth. In this paper I have outlined the methodology for creating an asset index based on informed selection, supported by factor analysis. I have also explored its accuracy and limitations through fieldwork in each of the seven WeD study communities, and outlined the results.

An asset index is simpler to undertake than collecting income and expenditure data, which can be time-consuming and is difficult to record accurately (Sahn and Stifel, 2003, outline the different dimensions of this problem). However, unlike measuring consumption, there is no clear interpretation of the index or the weightings; they reflect a statistical relationship, but have no inherent meaning in themselves. The index provides a way of differentiating between households, but it can never fully approximate the wealth of households which is complex and multi-dimensional, comprising many intangible factors which differ according to context.



To construct an asset index, it is necessary to have access to appropriate household survey data. An asset index is constrained by the survey material that it is based on. In this case, RANQ contains no information about the quality and number of assets, and lacks extensive information about housing quality. Other household surveys, such as the DHS, also have limitations and ask about an even smaller range of assets. For many regions there is no survey information available, and in these cases other techniques such as participatory wealth ranking exercises may provide an assessment of wealth more easily and with greater accuracy than a wealth index.

Thailand is undergoing rapid change and the contrast between the urban and rural areas and between different regions is very stark. The wealth index shows that the WeD study communities in the South have greater average wealth than those in the North-East. This reflects the differences in rural livelihoods, with villagers in the Southern communities engaged in rubber cutting, compared with rice farming in the North-East, which has lower returns. What is also interesting is the range of distribution of wealth in each community- in the South there was a far greater range of wealth than the North-East in the rural areas, although for urban areas the community in the North-East had a greater range of wealth scores than the South. The discussions with key informants in the communities and the findings of the asset index also highlight the multidimensionality of wealth and poverty, and how difficult these are to measure in a linear way.

The major finding of this research is differences in levels of wealth between locations and regions. More specifically there appear to be higher scores in urban areas than in rural areas, and the South compared with the North-East. The wealth scores give valuable insights into the differences between communities and give a way of comparing diverse communities. Ultimately, these differences also mean that the index cannot capture all the different factors influencing wealth in the community. As a result, local factor analysis is necessary to explore the relevant needs satisfiers for each community with context-specific assets and characteristics. However, there are indications that the wealth index does not take into account all factors that influence quality of life. Therefore, narrative accounts of life in each community allow a broader and more nuanced perspective. To extend the work, it is possible to investigate the significance of wealth by exploring its relationship with other factors, such as health or happiness, using regression analysis. Further analysis can also be done to explore the processes that lead to the production and reproduction of inequality in each

community, and how this affects wellbeing, to get more insights into the nature and significance of wealth in contemporary Thailand.

# APPENDIX

## Figure A1 Correlation Matrix

Correlation Matrix

	Motorised Vehicle	Light Motorised Vehicle	Radio	TV	Fridge	Computer	Washing Machine	Jewellery	Telephone	Dwelling	Cooking	Water	Toilet	Food Shortage	Education of Household Head
Correlation Motorised Vehicle	1.000	.126	.105	.107	.188	.174	.223	.183	.187	.035	.042	-.016	.037	-.096	.049
Light Motorised Vehicle	.126	1.000	.149	.178	.256	.077	.145	.171	.225	.029	.157	.005	.142	-.078	.079
Radio	.105	.149	1.000	.111	.186	.101	.215	.168	.194	.020	.099	.153	.052	-.044	.084
TV	.107	.178	.111	1.000	.272	.083	.136	.134	.221	-.010	.085	.071	.155	-.108	.032
Fridge	.188	.256	.186	.272	1.000	.147	.345	.281	.425	.086	.383	.204	.233	-.314	.134
Computer	.174	.077	.101	.083	.147	1.000	.261	.137	.195	.038	.165	.116	.049	-.096	.154
Washing Machine	.223	.145	.215	.136	.345	.261	1.000	.215	.408	.030	.393	.263	.160	-.239	.135
Jewellery	.183	.171	.168	.134	.281	.137	.215	1.000	.263	-.014	.254	.049	.085	-.183	.103
Telephone	.187	.225	.194	.221	.425	.195	.408	.263	1.000	-.010	.338	.249	.193	-.248	.137
Dwelling	.035	.029	.020	-.010	.086	.038	.030	-.014	-.010	1.000	-.004	-.024	.034	-.047	-.037
Cooking	.042	.157	.099	.085	.383	.165	.393	.254	.338	-.004	1.000	.377	.104	-.433	.196
Water	-.016	.005	.153	.071	.204	.116	.263	.049	.249	-.024	.377	1.000	.077	-.240	.161
Toilet	.037	.142	.052	.155	.233	.049	.160	.085	.193	.034	.104	.077	1.000	-.140	.034
Food Shortage	-.096	-.078	-.044	-.108	-.314	-.096	-.239	-.183	-.248	-.047	-.433	-.240	-.140	1.000	-.055
Education of Household Head	.049	.079	.084	.032	.134	.154	.135	.103	.137	-.037	.196	.161	.034	-.055	1.000

The correlation matrix shows a positive correlation between nearly all variables, with the exception of food shortages, which we would expect. There are some negative relationships between water and motor vehicle ownership, and also dwelling and jewellery ownership.

**Figure A2      Communalities Scores**

**Communalities**

	Initial	Extraction
Motorised Vehicle	.115	.072
Light Motorised Vehicle	.122	.101
Radio	.100	.086
TV	.111	.091
Fridge	.347	.425
Computer	.108	.097
Washing Machine	.311	.365
Jewellery	.161	.167
Telephone	.318	.404
Dwelling	.020	.002
Cooking	.388	.367
Water	.207	.148
Toilet	.086	.074
Food Shortage	.235	.206
Education of Household Head	.073	.059

Extraction Method: Principal Axis Factoring.

**Figure A3      Factor Matrix**

**Factor Matrix<sup>a</sup>**

	Factor
	1
Motorised Vehicle	.268
Light Motorised Vehicle	.318
Radio	.294
TV	.302
Fridge	.652
Computer	.312
Washing Machine	.604
Jewellery	.408
Telephone	.635
Dwelling	.040
Cooking	.605
Water	.384
Toilet	.272
Food Shortage	-.454
Education of Household Head	.243

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 5 iterations required.

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