# DOES HAVING A NEWBORN CHILD AFFECT INCOME DIVERSIFICATION OPPORTUNITIES?

## Evidence from the Peruvian Young Lives Study

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An International Study of Childhood Poverty

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# Preface

This paper is one of a series of working papers published by the Young Lives project, an innovative longitudinal study of childhood poverty in Ethiopia, India (Andhra Pradesh state), Peru and Vietnam. Between 2002 and 2015, some 2,000 children in each country are being tracked and surveyed at 3-4 year intervals from when they are 1 until 14 years of age. Also, 1,000 older children in each country are being followed from when they are aged 8 years.

Young Lives is a joint research and policy initiative co-ordinated by an academic consortium (composed of the University of Oxford, University of Reading, the London School of Hygiene and Tropical Medicine, London South Bank University and the South African Medical Research Council) and Save the Children UK, incorporating both interdisciplinary and North-South collaboration.

Young Lives seeks to:

- Produce long-term data on children and poverty in the four research countries

- Draw on this data to develop a nuanced and comparative understanding of childhood poverty dynamics to inform national policy agendas

- Trace associations between key macro policy trends and child outcomes and use these findings as a basis to advocate for policy choices at macro and meso levels that facilitate the reduction of childhood poverty

- Actively engage with ongoing work on poverty alleviation and reduction, involving stakeholders who may use or be impacted by the research throughout the research design, data collection and analyses, and dissemination stages

- Foster public concern about, and encourage political motivation to act on, childhood poverty issues through its advocacy and media work at both national and international levels.

In its first phase, Young Lives has investigated three key story lines – the effects on child wellbeing of (i) access to and use of services, (ii) social capital, and (iii) household livelihoods. This working paper is one of a series which consider an aspect of each of these story lines in each country. As a working paper, it represents work in progress and the authors welcome comments from readers to contribute to further development of these ideas.

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For further information and to download all our publications, visit www.younglives.org.uk

# Acknowledgements

# Abstract

The ability of households to diversify their income sources is strongly related to their capacity to cope in times of pressure, such as during economic crises. This is particularly so among the poor, who often do not have adequate resources on which to draw when under such pressures. Households with a newborn child face two constraints that might affect their income diversification potential. First, the income-generating capability of one of the members (the mother) may be constrained, and second, they often face additional expenditure requirements due to the presence of the new child. Very little is known about whether income diversification strategies are constrained for this group of households, but if they are then there may be implications for child wellbeing at a critical time for that child's development and welfare. The Young Lives (YL) study in Peru provides an opportunity to investigate this issue.

This paper describes the income diversification patterns of households with a newborn child in Peru. Comparisons are made with what the literature shows for the overall population and with the income diversification patterns of households in the same communities but with no young child.

Our results show that there are clear differences between rural and urban households in terms of income diversification patterns and strategies, ie, the range and type of activities from which a household obtains its income. Furthermore, the type of diversification strategy is associated with household per capita income and a child wellbeing indicator – height-for-age z-score. We also found evidence that the presence of a young child appears to impact on diversification patterns and strategies, with less diversification in those households with a young child. Having a young child reduced the likelihood of the mother working, although this was only statistically significant in urban households. Further examination of the data shows that, in urban areas, access to childcare facilities outside the home is associated with improved income-generating opportunities for mothers in households with young children, enhancing their potential income diversification strategies. In rural areas, we find that improving access to daycare facilities to increase mothers' income-generating opportunities needs to be complemented with other interventions aimed at increasing the asset base, especially maternal education.

These findings give empirical support to policy or project interventions aimed at increasing income-generating opportunities for Peruvian women with a newborn child. One promising intervention is the Wawa Wasi programme, which has shown important positive impacts but remains underfunded. Our findings suggest that the programme merits closer examination, with a view to assessing the best way to increase its coverage.

# Contents

# 1. Introduction

Although income diversification has been extensively studied in rural areas and, albeit to a much lesser extent, in urban contexts, it is not known whether the patterns observed are also present in households with a newborn child. It may be argued that these households face two additional constraints: first, the income-generating capability of one of the members (the mother) can be, depending on specific circumstances, moderately or severely constrained; and, second, these households face additional expenditure demands due to the presence of the newborn child. Thus the pattern of income diversification may be different for this sub-sample, which could impact on child wellbeing at a critical time for that child's development and welfare.

The purpose of this paper is to describe the patterns of income diversification of Peruvian households with young children (aged between 6 and 18 months) interviewed during the first phase of the YL study. The paper aims to link income diversification strategies to the livelihood asset base and the external context of these households. In addition, it examines the relationship between these income diversification strategies and child wellbeing.

The paper is divided into six sections. In section 2 we briefly review the literature on income diversification in both rural and urban areas and show that income diversification can be thought of as both a risk-coping strategy and as a way of exploring new income-generating opportunities. The YL data are described in section 3. In section 4, we describe the income diversification patterns present in two household groups in the YL data set – households with a one-year-old child, and households with an eight-year-old child but with no child under the age of two. In addition, we move from diversification patterns to diversification strategies, showing that there are a small number of distinct diversification strategies in which the households may be engaged. Each of these strategies is related to specific combinations of asset endowments. Section 5 goes one step further and verifies which of the relationships found in section 4 are robust once we control for asset ownership. This section also examines the relationship between access to external daycare facilities and enhancement of the mother's role in the household's income diversification strategy. Finally, section 6 presents a summary of the major findings, suggests some hypotheses that may be evaluated with additional rounds of the YL survey, and indicates some policy implications of the results.

# 2. Determinants of income diversification in rural and urban areas

As Barrett et al (2000) state 'diversification patterns reflect individuals' voluntary exchange of assets and their allocation of assets across various activities so as to achieve an optimal balance between expected returns and risk exposure conditional on the constraints they face' (p. 2). Because of this, under risky conditions, the link between income diversification and total income is theoretically and empirically ambiguous.

Since income diversification depends on the asset base and restrictions faced by a household, it is no surprise that income diversification patterns may differ between rural and urban settings. In the former, natural resource availability (including agricultural and grazing land) will bias income diversification towards agricultural sources, while in the latter industrial and service sectors will be more predominant sources of income, either as waged employment sources or as non-waged sources.

### Income diversification in rural settings

The literature has well established that the relative importance of rural income sources changes with wealth. This is true not only for individuals but for regions and countries. Obviously this relationship will depend critically on other important factors such as the presence of cash or credit constraints as well as access to key public infrastructure. Most studies have shown that rural households in developing countries earn more from self-employment agricultural sources than any other income source. This is the case for most studies reported in Lanjouw (1996), Reardon et al (1998), Reardon, Cruz and Berdegué (1998) and Barrett et al (2000). Only in a few countries, where landless peasants are a sizeable population, is the importance of non-farm sources greater. However, the relative importance of the different waged employment sources does differ between countries – Reardon et al (1998) recognise that disaggregated information that allows the non-farm income share to be separated out into wage versus self-employment is relatively uncommon. They report that non-agricultural wage-employment sources are more important than sources of wage-employment related to agricultural activities, particularly in Africa but also, although less strongly so, in Asia and Latin America. This pattern is consistent with the fact that waged farm labour appears to be supplied by the poorer rural households. Even if this is true, there is also evidence that there may be a segmented rural labour market and there are some cases (related to highly skilled activities) for which the agricultural wage may be higher than the average non-agricultural wage.

The determinants of rural non-agricultural activities and wage-employment activities will certainly depend on the asset endowment of each household and the access they may have to key public goods and services. The quantity and quality of these assets may, for example, affect the responsiveness of each household to relative price changes. As several studies have shown,[1] the asset endowment can affect both the capacity to participate in a given activity and the differential return to that activity. In particular, some key assets such as those related to human capital may well be the key element to accessing better-paid skilled rural jobs.

Some households may be 'pushed' to diversify into self-employment agricultural activities or into waged employment (either in agricultural or non-agricultural activities). This strategy may be pursued

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1    See for example Reardon et al (2000) and Escobal (2001).

just to cope with external shocks to their self-employment agricultural income (such as drought or a steep decline in farmgate prices [the value of a product purchased directly from the producer]). In some cases, however, rural households may participate in these other activities because of their high return or as a strategy to obtain cash or credit resources. Thus, diversification of income sources may be related to both 'pull' and 'push' factors. It may be exacerbated by cash or credit constraints or by geographic characteristics, or it may well be part of a risk-coping strategy. In any case, these income source diversification strategies will tend to be different for the poorest as compared to the richest segments of rural households. Barrett et al (2000) show that, in general, the non-farm income share is much larger for rich than for poor rural African households; Reardon et al (2000) show that this is also the case for several Latin American countries (Argentina and Mexico). Lanjouw (1996) also confirms this pattern for Ecuador. For Asian countries, however, Reardon et al show that the evidence is somewhat mixed, with some areas of India and Pakistan where the share of non-farm income is smaller for the wealthiest households.

As has been shown for rural Peru (see Escobal, 2001), income diversification tends to be higher for both the poorest and the less poor of the income or expenditure spectrum. For the poorest, income diversification may be the optimal risk-coping response in the absence of other insurance mechanisms, and as such is related in general to poorly paid wage-earning activities (eg, low-paid farm work). In contrast, for the less poor diversification may be a strategy to develop new income-generating opportunities, thanks to the larger asset base they possess. In this case, diversification strategies tend to be related to either wage or non-wage non-agricultural activities (eg, blue-collar work in the commercial, construction or service sectors and handicraft production).

As Masset and White (2003) correctly point out, most of the analysis of income diversification has concentrated on rural dwellers. Although there are many similarities in terms of the principles underlying the livelihood approach in rural and urban areas (Meikle, Ramasut and Walker, 2001) there are contextual differences – social, economic, governance and environmental – that affect the specifics of both the nature of the poor's wealth and how they can make a living. For example, in urban settings, households relying heavily on informal work (non-wage income sources) may be more vulnerable than those with a regular, dependable source of income, whereas in rural areas these sources of income may compensate for the typical climatic and market risks that agricultural income may face.

### Income diversification in urban settings

The literature on urban income diversification is relatively scarce. Lanjouw, Quizon and Sparrow (2001) look at the peri-urban areas of Tanzania and show that non-farm income may be an important route out of poverty as this type of income rapidly increases. However, in other contexts, such as those reported by Drakakis-Smith, Bowyer-Bower and Tevera (1995) for Harare, Zimbabwe, the increasing importance of urban agriculture may be the main coping mechanism to confront shocks.

In some of these studies the asset base is shown to be a critical determinant of urban income diversification. Barrett, Bezuneh and Aboud (2001) show that households with poor asset endowments are less able to respond to emerging improved livelihood opportunities. However, in the setting they analyse (Kenya) food-for-work transfers reduced liquidity constraints allowing the poor to pursue more lucrative livelihood strategies. Zimmerman and Carter (2003) obtain similar results using a theoretical dynamical model calibrated with Burkina Faso data. They show that if subsistence risk is high, due to

an extremely low asset base, a household adopts the defensive portfolio strategy, which pushes it into a poverty trap. As the authors point out 'initial asset inequality reproduces and deepens itself over time'.

Bigsten and Kayizzi-Mugerwa (1992) also look at the ability of the urban poor to cope with risk through diversification. They report extensive diversification of incomes, in response to a number of shocks during the 1970s and 1980s, as a risk response strategy. The diversification strategy included a decrease in waged income compensated for by allowances of various types, increased income from the informal sector and even the appearance of farming activities in the urban sector.

Rakodi (1995) looks at the coping strategies of the urban poor in Gweru, Zimbabwe and shows that the common response to the impact of recession and structural adjustment was to diversify productive and reproductive activities. The scope for such diversification, however, varies between households, depending on education, skills and social networks. In similar research, Frayne (2004) shows that in Windhoek, Namibia urban households most vulnerable to hunger are those with limited social connections to rural areas. Finally, it is important to mention the work done by Mitlin (2003) in nine cities in Africa and South Asia. She observed the use of three strategies to enhance the asset base of the urban poor: strengthening grass-roots organisations, transforming relations with the state, and developing new alternatives to conventional urban development practices.

### Income diversification – research questions

In summary, although shocks and external constraints may differ, income diversification in rural and urban areas is clearly related to the asset base that each household possesses or has access to. Access to key public assets (such as health services) may affect health outcomes and labour productivity. Road infrastructure and access to electricity will also affect market access, while inadequate access to education may impose skills constraints that affect entrance to labour markets and may hinder productivity of non-earning income sources. Other assets may be critical to determine liquidity and/or credit constraints. Finally, social capital may be critical to lower the entry costs to some activities as well as, through short-term or more permanent migration, possibly providing a diversification source in itself through income transfers.

However, as already mentioned, it is not known whether the income diversification patterns described above are also present in households with a newborn child. In particular, examination of this question may offer important insights as to which types of policy or project intervention might help a household to shift towards a more profitable income-generating strategy at a time when income needs are often increased. The YL study offers the opportunity to examine diversification patterns in such a group of households. Furthermore, it has a contemporary comparison group from the same communities of households with an older child (eight years old) but no younger child.

# 3.  The Young Lives data

Young Lives is an international study of childhood poverty taking place in four countries – Peru, Ethiopia, Vietnam and India (Andhra Pradesh state). It aims to follow cohorts of children and their families over a fifteen-year period to study the causes and consequences of childhood poverty and to provide better research evidence for policy-making. Further details are available at www.younglives. org.uk. In each country in 2002, a sample of children aged between 6 and 18 months (henceforth the 'one-year-old sample') and a sample of 7.5 to 8.5-year-old children (henceforth the 'eight-year-old sample') were enrolled and surveyed in 20 sentinel sites. In Peru, 2,044 one-year-old children and 709 eight-year-old children were enrolled in the study from sentinel sites in urban and rural districts nationwide. Data were collected on the children, their families and their communities. For further information on the Peruvian component, including details of the data collected, see Escobal et al (2003a).

For this paper, the data are analysed separately for rural and urban areas due to the distinct types of occupation engaged in. Within each area of residence, we have divided the analysis into two parts. First we focus on variation in household diversification patterns and strategies, and define which characteristics are correlated with them. Then we assess whether the presence of a one-year-old child has an impact on a household's diversification, for example whether it is correlated with the fact that families are occupied in activities other than agriculture in rural areas, or how it is linked with the fact of being salaried or independent in urban areas. The second part of the analysis establishes (non-causal) relationships between the role of the mother of a one-year-old index child and the diversification strategies in her household. Here we analyse specific strategies of income diversification such as the mother's insertion into the labour market.

A unique feature of the YL Peruvian data set is that it contains not only the main economic activities that the members of each household have pursued to make a living, but also the income that the household has earned through these activities. On the methodological side, we take this into account and compare the diversification indices that can be constructed using activity data with diversification indices that are constructed using income data (as in Masset and White, 2003).[2]

In order to assess the impact of the presence of a one-year-old child, we have used those households in the eight-year-old sample that do not have children younger than two years as a control group.[3] For example, by comparing the sample of households with a one-year-old child with similar households from the eight-year-old sample in the same sentinel site, we can assess whether having a newborn child affects the mother's decision to work or not.

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2    This analysis will be useful to validate diversification indices of the other countries in the YL study.

3    Since both samples correspond to the same sentinel sites we consider this the best alternative to the optimal scenario where we would have surveyed mothers both before and after they had their children. In the future the YL panel will allow us to observe how diversification patterns change as the children grow up.

# 4. Income diversification patterns and strategies

To explore employment and income diversification patterns in the YL sample we have classified household income as follows:

- Labour income
  - ➤ Non-waged agricultural income
  - ➤ Waged agricultural income
  - ➤ Non-waged non-agricultural income
  - ➤ Waged non-agricultural income
- Private transfers (remittances)
- Property income and other fixed income.

We will explore employment and income diversification patterns looking at both total income and labour income. In the case of total income diversification, we look not only at decisions about employment in agricultural and non-agricultural sectors in either waged or non-waged activities, but also at the use of remittances as a way of diversifying income sources.[4]

The indicators of diversification patterns we will consider are the number of income sources per household and the Herfindahl diversification index. Our first indicator counts the number of activities[5] divided by the type of activity (waged and non-waged) in which the members of the household are involved.[6] This is a bounded number that can take a maximum theoretical value of 18 distinct economic activities, although in our sample it has a maximum value of 6. In order to obtain this indicator we use the information from the YL questionnaire which provides time allocation data for all types of economic activity at the individual level.

To see how diversification patterns are related to wealth, we have constructed an assets index that includes the major sources of wealth covered in the YL questionnaire. A detailed description of how this measure was constructed can be found in Appendix 1, as well as a comparison between this measure and the less comprehensive measure used in the YL preliminary report (See Escobal et al, 2003a). This measure includes key variables related to human capital, productive assets (agricultural and non-agricultural) and public goods and services. As Masset and White (2003), among others, have mentioned, the construction of this kind of index requires a large degree of arbitrariness. However, as is shown in Appendix 1, the measure does display desirable properties as mentioned in Filmer and Pritchett (1998): (a) internal consistency, ie, the index produces sharp differences in asset ownership across quintiles; (b) robustness, ie, the assets index produces a similar classification when a restricted

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4   This division aims to separate households' income between independent groups. Nonetheless, there is no way to prove that this assumption is correct.

5   Activities considered are: agriculture, hunting, forestry and fishing; mining and quarrying; manufacturing; electricity, gas and water; construction; wholesale and retail trade; transport, storage and communications; finance, insurance, real estate and business services; and community, social and personal services.

6   For example, in a household of five working-age members, if all members work on the household's own plot it is considered that the household has one income source. But if one of the members starts working as an employee in an industry, it is then considered that the household has two income sources.

subset of variables (not including agricultural assets) is used; and (c) the index shows a reasonably high correlation with key outcome variables such as income.

Tables 1 and 2 show the pattern of urban and rural diversification for this indicator according to asset quintiles, for both groups of households. In this case, Q1 represents the poorest 20 per cent of the sample, while Q5 represents the wealthiest 20 per cent.[7]

As can be observed in Table 1 and Figure 1, there is a clear pattern of a higher number of income sources as the asset base increases in urban areas, for both the one-year-old and eight-year-old samples.[8] It is important to note that this diversification index does not show a decrease in the number of sources for high levels of assets as we would have expected given that highly endowed households tend to benefit from specialisation. This non-linear pattern does appear when we use a more precise indicator that takes into account not only number of income sources but their relative importance in terms of income.

In the case of rural areas, the patterns for the one-year-old sample and the eight-year-old sample are very different. In the latter case, diversification has an inverse U-shape that first increases and then decreases as the asset base increases. This distinct pattern may be due to differences in other variables between the samples, alerting us to the need to control for other characteristics of the sample if we want to be able to draw conclusions about differences in diversification strategies in relation to the presence of a newborn child. For example, there appear to be systematic differences in the number of adult household members between the samples, which may explain this distinct pattern.

**Table 1: Mean number of income sources per household' (according to households' assets – urban areas)**

| Quintiles of households' assets | Income sources | |
|---|---|---|
| | 1 year | 8 years |
| Q1 | 1.86 | 1.96 |
| Q2 | 1.94 | 2.04 |
| Q3 | 2.00 | 2.03 |
| Q4 | 2.08 | 2.04 |
| Q5 | 2.25 | 2.29 |

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7    The eight-year-old sample has been re-weighted to assure that there is the same number of comparable children in both samples within each cluster. This is done to avoid having clusters with more eight-year-olds that have more weight in the total sample.

8    In order to plot the graphs we use the same procedure as in Masset and White (2003) estimating 'locally weighted regressions'. This method, which is a smoothing procedure, runs a regression at each of the data points using the nearest observations. By doing so, it can depict the relationship between two variables without assuming any functional form. For example, Figure 1 shows the number of income sources that correspond to certain levels of asset availability. For each target value of the assets index variable a 'locally weighted regression' is carried out in order to predict the number of income sources that correspond to that level of assets. The length of the horizontal axis depends on the range of the assets index variable within each sample.

**Table 2: Mean number of income sources per household' (according to households' assets – rural areas)**

| Quintiles of households' assets | Income sources | |
| --- | --- | --- |
| | 1 year | 8 years |
| Q1 | 1.60 | 1.68 |
| Q2 | 1.71 | 1.68 |
| Q3 | 1.89 | 2.05 |
| Q4 | 1.84 | 2.02 |
| Q5 | 1.91 | 1.86 |

**Figure 1. Number of income sources by asset index (urban area)**
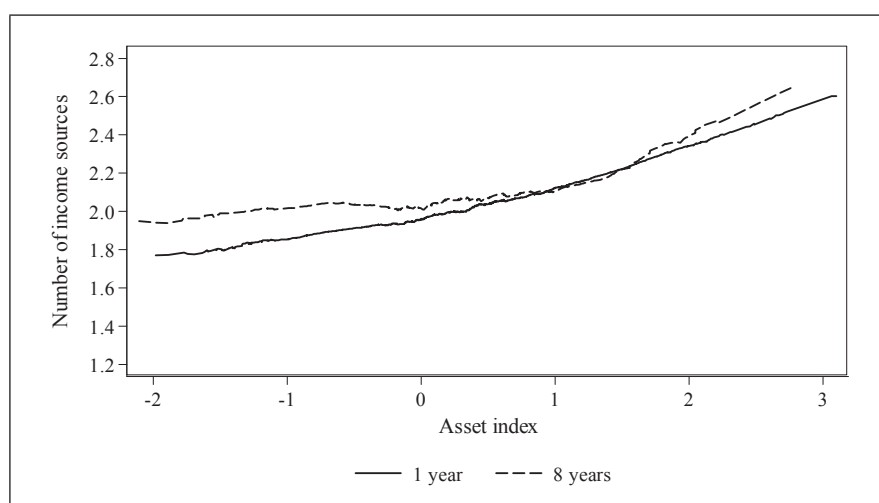


**Figure 2. Number of income sources by asset index (rural area)**
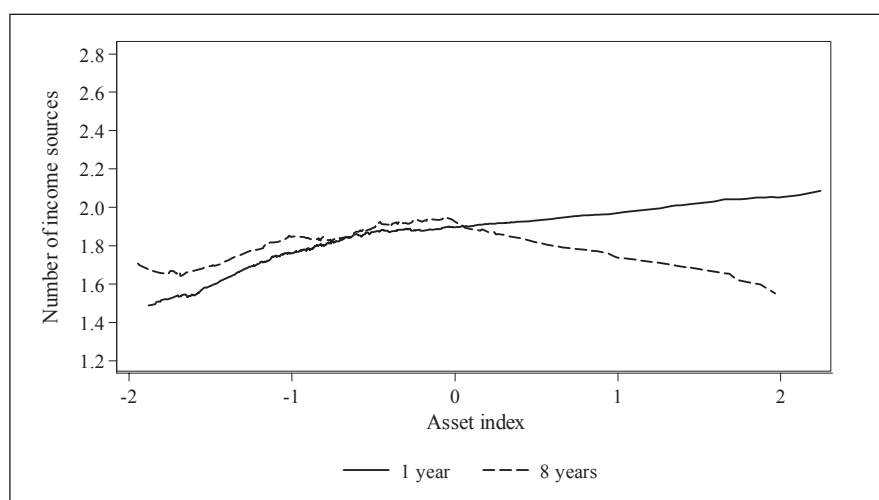
As Masset and White (2003) point out, it is important to take into account not only the number of economic activities adopted but also their relative importance, and this is the approach we adopt in this paper. Furthermore, we assess not only how much a household is diversifying but specifically what kind of diversification strategies it is pursuing and what asset portfolio may be conditioning these strategies. To study diversification patterns we will use both an indicator of the number of activities in which a particular household is engaged and the relative importance of each income source in terms of income.

This leads us to our second measure of diversification, the Herfindahl index (H index), which considers the relative importance of income sources. It is constructed as follows:

$$H = 1 - \sum_{i=1}^{N} S_i^2$$

Where $S_i$ is the portion of income coming from source $i$. The value of $H$ ranges from 0 if all income is concentrated in a single source to 1-1/N if the income is equally split between all income sources. To allow comparability between different ways of categorising income, we will be using a standardised H index, which ranges between 0 and 1, with 0 denoting full diversification and 1 denoting full concentration:

$$H^* = \frac{1 - \sum_i S_i^2}{1 - \frac{1}{N}}$$

Table 3 shows the median value of the H index for the two YL samples, for both total income and labour income in urban areas; there is a clear non-linear pattern as was expected. The U-shaped pattern reflects two distinct diversification profiles. While those with a small asset base may be pushed into diversification as a risk-coping strategy, those with a larger asset base can profit from diversification, entering into new labour market opportunities thanks to these assets. Some examples of this in the YL sample include households that can use key public services (such as electricity) to engage in non-salaried employment (small-scale industry, handicrafts, etc), as well as higher skilled (and therefore higher paid) jobs that can be undertaken thanks to higher-level skills gathered through education. It is interesting to note that for urban areas the eight-year-old sample shows, on average, a higher diversification index than the one-year-old sample. This can also be seen clearly in Figure 3, where the H index has been plotted against the wealth index.

**Table 3: Median of total and labour incomes diversification index (according to households' assets – urban areas)**

| Quintiles of households' assets | Total income | | Labour income | |
|---|---|---|---|---|
| | 1 year | 8 years | 1 year | 8 years |
| Q1 | 0.31 | 0.56 | 0.30 | 0.40 |
| Q2 | 0.19 | 0.33 | 0.13 | 0.27 |
| Q3 | 0.16 | 0.45 | 0.10 | 0.27 |
| Q4 | 0.20 | 0.44 | 0.11 | 0.09 |
| Q5 | 0.26 | 0.47 | 0.17 | 0.31 |

**Figure 3. Total income diversification by asset index (urban area)**
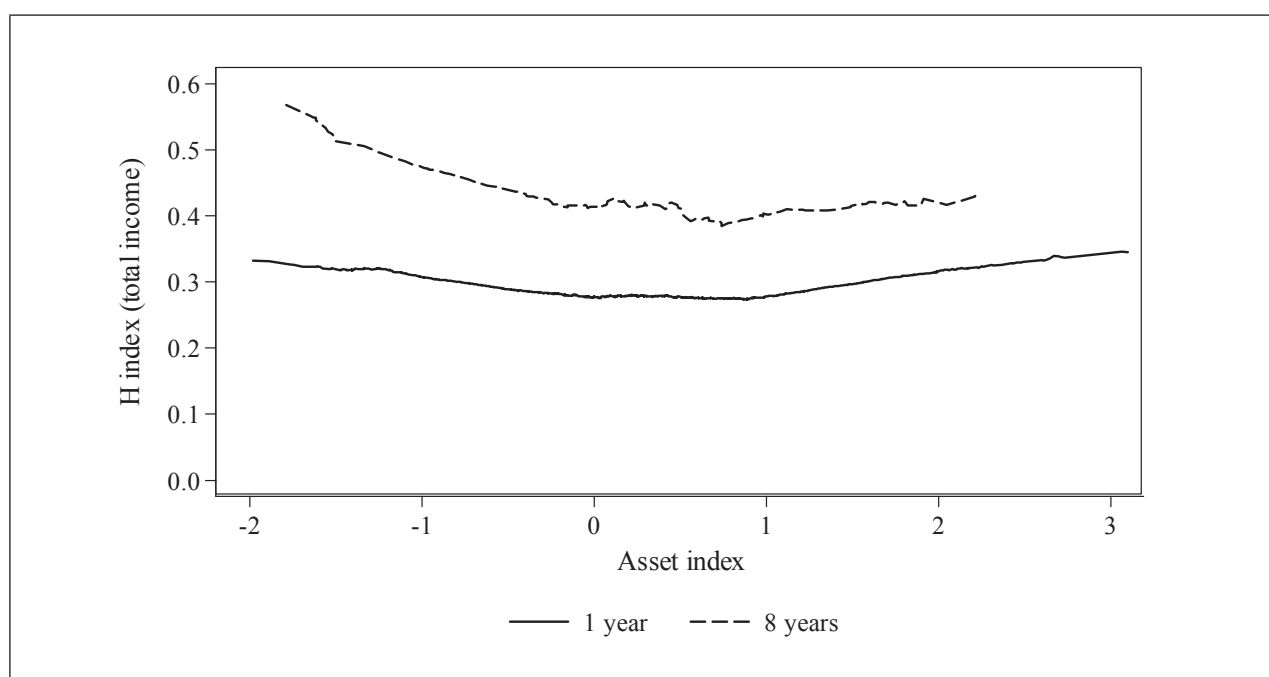


**Figure 4. Labour income diversification by asset index (urban area)**
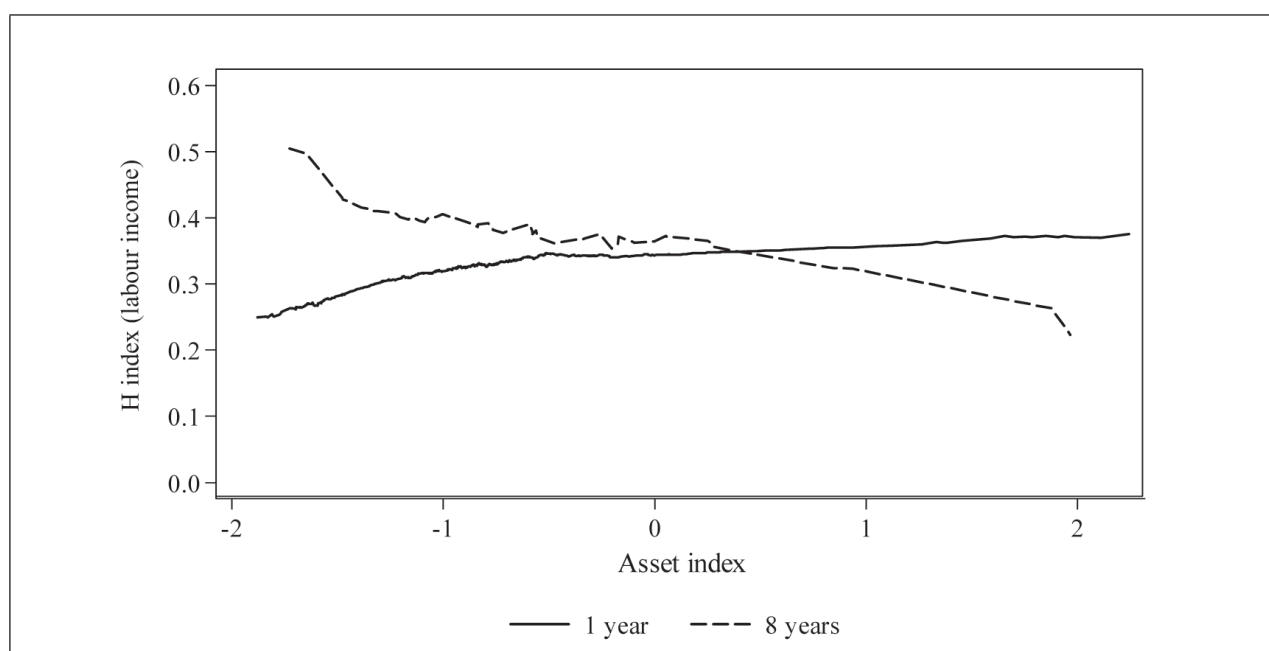
The fact that income diversification is greater when we measure it using total income, rather than labour income (Figure 4), may highlight the importance of remittances as part of the diversification strategy of urban households. This seems to be the case especially for the eight-year-old sample.

The H index shows a different pattern for rural areas (Table 4; Figures 5 and 6). In the case of the one-year-old sample, both the total income diversification measure and the labour income measure show a slight upward trend. However the eight-year-old sample shows a very distinct and somewhat odd pattern that, again, seems to be affected by a larger number of adults per household in this sample.

Nevertheless, it is clear that diversification patterns are very different between urban and rural areas. On average, rural households tend to have a similarly diversified portfolio of income to urban dwellers, however, there are important differences in the level of diversification – fewer poor people seem less able to diversify in rural than in urban areas, and fewer poor urban dwellers seem to take advantage of some specialisation capabilities due to the mix of assets they possess.

**Table 4: Median of total and labour incomes diversification index (according to households' assets – rural areas)**

| Quintiles of households' assets | Total income | | Labour income | |
|---|---|---|---|---|
| | 1 year | 8 years | 1 year | 8 years |
| Q1 | 0.25 | 0.49 | 0.24 | 0.15 |
| Q2 | 0.34 | 0.46 | 0.32 | 0.26 |
| Q3 | 0.35 | 0.49 | 0.35 | 0.26 |
| Q4 | 0.34 | 0.23 | 0.38 | 0.52 |
| Q5 | 0.36 | 0.56 | 0.35 | 0.31 |

**Figure 5. Total income diversification by asset index (rural area)**
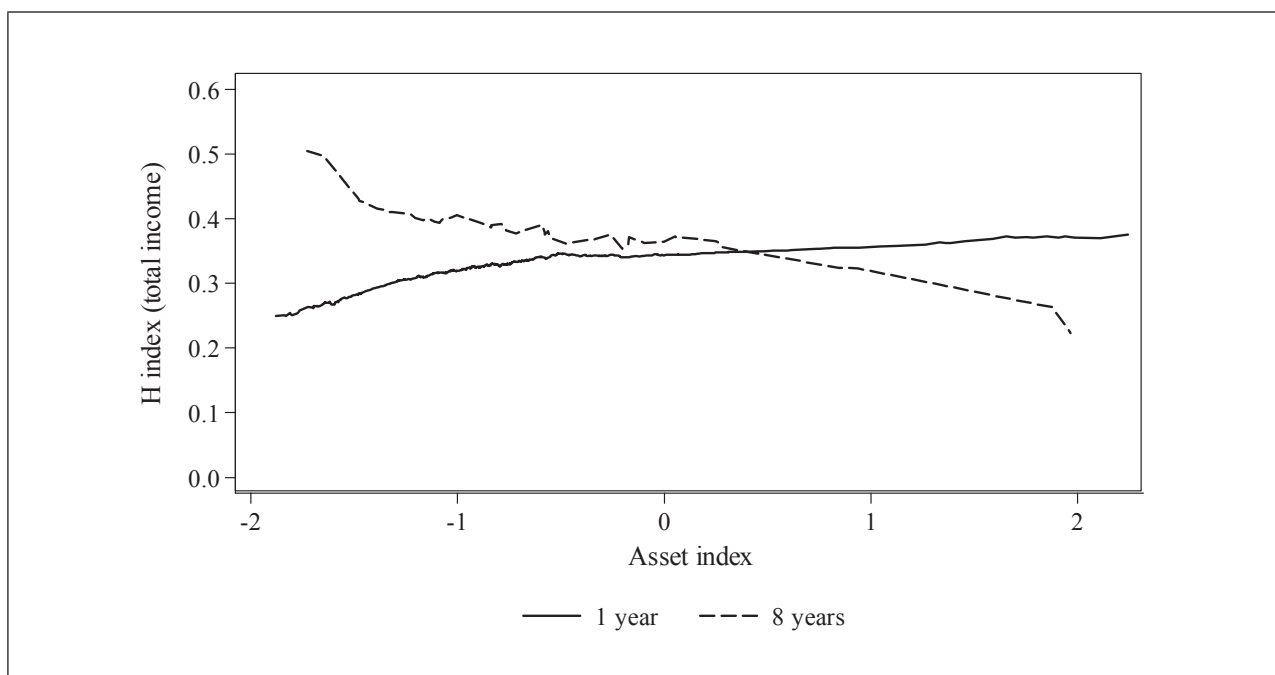
**Figure 6. Labour income diversification by asset index (rural area)**
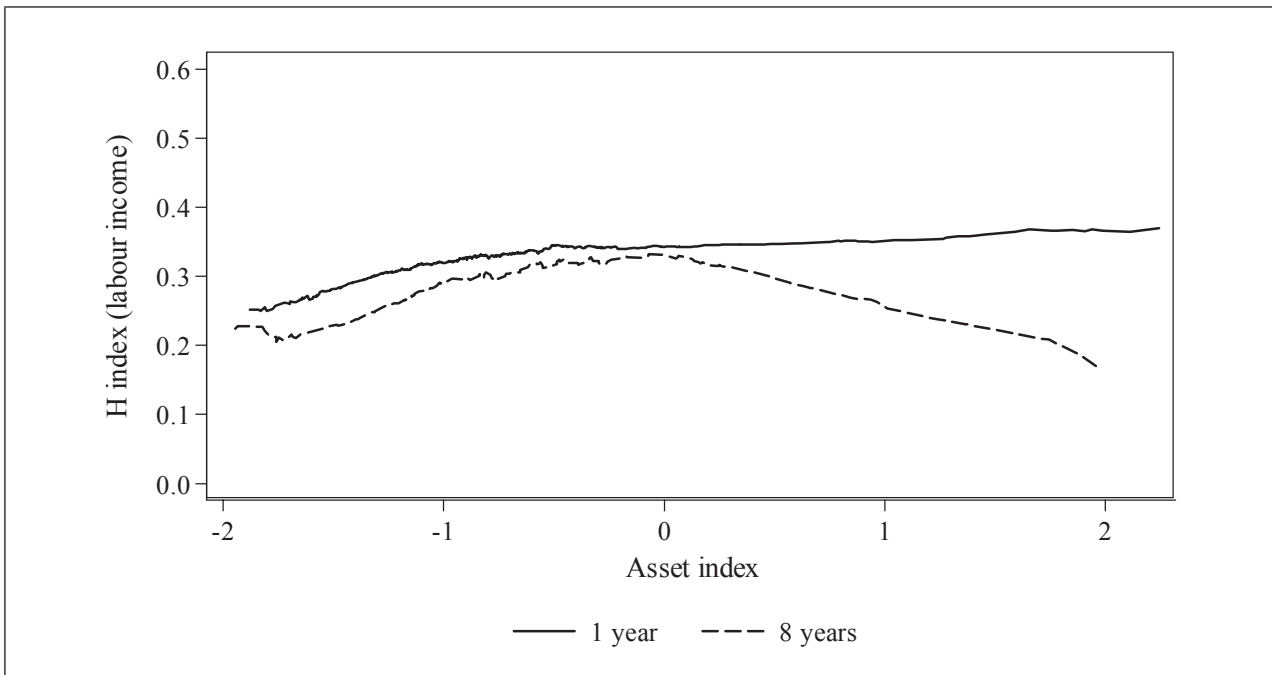


This diversification pattern is looked at further in Tables 5 and 6 where we present the distribution of income between sources in urban and rural areas covered by the YL project. We can see that the percentage of income coming from agricultural waged income declines as the assets index rises. This is consistent with the evidence presented by Escobal (2001), where waged labour in agriculture is in general a low productivity, low-paid job that tends to be used as a diversification strategy for those who own small plots and need to go off-farm to obtain additional income. For them, most of the higher paid, non-agricultural income sources are not an option given their low level of education.

It is interesting to note that agriculture is also an income option for those living in urban areas. Obviously this is related to the way the sample was split between the urban and rural domain.[9] However, it is also due to the fact that a considerable number of households in peri-urban areas diversify incomes, mixing agricultural and non-agricultural sources.

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9    Here we use the Peruvian statistical agency (INEI) definition of urban towns, which must have at least 400 dwellings. District capitals, even if they have a lower number of dwellings, are always considered urban centres, because they include all the usual public facilities. However, even if we change the urban definition to one based solely on the number of dwellings in the community, the results remain similar.

**Table 5: Total income composition according to households' assets – urban areas**

| | 1 year | | | | | | 8 years | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q5 | Total | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| Wage agricultural income | 19.4 | 4.8 | 3.2 | 1.4 | 0.8 | 3.5 | 16.1 | 5.4 | 5.1 | 1.1 | 1.3 | 4.5 |
| Wage non-agricultural income | 33.6 | 44.9 | 59.8 | 48.6 | 51.2 | 50.1 | 22.0 | 38.9 | 34.8 | 42.2 | 37.9 | 36.4 |
| Non-wage agricultural income | 26.8 | 15.2 | 5.2 | 5.1 | 6.4 | 8.6 | 36.9 | 20.2 | 14.0 | 5.6 | 9.1 | 14.6 |
| Non-wage non-agricultural income | 17.9 | 32.3 | 30.1 | 42.3 | 38.0 | 34.9 | 21.7 | 33.7 | 40.7 | 44.8 | 44.4 | 39.1 |
| Private transfers | 1.7 | 2.3 | 1.6 | 1.7 | 2.2 | 1.9 | 2.4 | 1.5 | 2.9 | 4.9 | 5.2 | 3.8 |
| Others | 0.6 | 0.6 | 0.1 | 0.9 | 1.4 | 0.9 | 0.9 | 0.3 | 2.5 | 1.4 | 2.1 | 1.5 |

Source: YLS, 2002

**Table 6: Total income composition according to households' assets – rural areas**

| | 1 year | | | | | | 8 years | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q5 | Total | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| Wage agricultural income | 20.4 | 18.0 | 17.4 | 17.7 | 9.2 | 15.3 | 17.1 | 20.4 | 7.4 | 10.3 | 3.6 | 9.7 |
| Wage non-agricultural income | 5.0 | 8.4 | 16.6 | 14.5 | 22.2 | 15.1 | 14.1 | 13.3 | 20.5 | 26.9 | 38.1 | 26.7 |
| Non-wage agricultural income | 63.9 | 60.0 | 55.1 | 51.5 | 39.5 | 51.4 | 58.6 | 50.9 | 58.8 | 47.1 | 24.1 | 41.6 |
| Non-wage non-agricultural income | 9.3 | 12.0 | 8.7 | 13.3 | 26.2 | 15.8 | 8.3 | 13.7 | 9.5 | 15.2 | 31.7 | 19.8 |
| Private transfers | 0.6 | 1.3 | 0.8 | 1.4 | 2.1 | 1.4 | 1.0 | 1.4 | 1.2 | 0.6 | 2.2 | 1.5 |
| Others | 0.7 | 0.3 | 1.4 | 1.5 | 0.8 | 1.0 | 0.9 | 0.2 | 2.6 | 0.0 | 0.4 | 0.6 |

Source: YLS, 2002

Income diversification patterns in urban and rural areas are clearly distinct. In addition, there seem to be differences between those households where a one-year-old lives and those in the eight-year-old sample without children under the age of two. Of course some of these differences between the one-year-old sample and the eight-year-old sample may be due to differences in asset endowments, but, as we will show later, there are indeed some differences that are robust once we control for key covariates such as household age composition and asset endowment (including education, household assets, access to public services, and agricultural assets).

*From income diversification patterns to income diversification strategies*
Until now we have been looking at diversification patterns summarised by a one-dimensional indicator (number of income sources or the H index). However, a single diversification level may be consistent with very different diversification strategies. For example, a household with a portfolio of low diversification may be engaged in very different income-generating activities. For example, if one household splits its income between two sources, say 90 per cent from non-waged agricultural labour and 10 per cent from non-waged non-agricultural labour (eg, handicraft production), it will have the same H index as another household having a similar split but in this case between waged non-agricultural labour (eg, schoolteaching) and remittances. Obviously the skills and social networks needed to have the first income mix are quite different from those required to obtain the second

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income mix. This being the case, it is important not only to know how diversified a certain portfolio is but the specific income source it comprises.

Tables 7 to 10 list the major labour income diversification strategies that are seen in the YL samples. Diversification strategies are defined here as different mixes of employment sources that the household has in order to obtain its labour income. To include a certain household as engaged in a certain income-generating activity we have used an arbitrary cut-off point of obtaining at least 5 per cent of total labour income through that activity. This has been done to avoid including a household as engaged in an activity that is truly marginal in terms of generating income.[10]

Table 7 shows that the rural sample has three major strategies. The first is being solely a farmer on one's own land (non-waged agricultural income), which comprises about a third of the households in the one-year-old and the eight-year-old samples. Second in importance, covering about a quarter of each sample, is the strategy defined by those who do not have enough land and need to complement their income on nearby farms as a waged income earner. Next we have those who complement their own farm income with other non-waged non-agricultural activities (such as handicrafts, processing of agricultural products, etc). These three distinct income-generating strategies account for 78 per cent of the entire one-year-old sample and 64 per cent of the eight-year-old sample. It is important to highlight that for the eight-year-old sample there is an additional income-generating strategy not linked to agricultural income that appears as an important alternative strategy. In the next section we will look further into this issue and examine whether this pattern may be related to the fact that in the eight-year-old sample the mother or caretaker can engage in alternative income-generating activities because she is no longer dedicating the bulk of her time to caring for the young child.

**Table 7: Households' labour income diversification strategies – rural areas**

|  | 1 year | | 8 years | |
|---|---|---|---|---|
| **Strategies** | **Freq** | **%** | **Freq** | **%** |
| **Non-waged agricultural** | 240 | 37.3 | 189 | 31.4 |
| **Waged agricultural (including mixed with non-waged agricultural)** | 153 | 23.8 | 129 | 21.4 |
| **Non-waged agricultural and non-waged non-agricultural** | 110 | 17.1 | 72 | 12.0 |
| **Non-waged agricultural and waged non-agricultural** | 50 | 7.8 | 51 | 8.5 |
| **Non-agricultural** | 46 | 7.1 | 127 | 21.1 |
| **Waged and non-waged agricultural and non-agricultural and others** | 45 | 7.0 | 34 | 5.6 |

If we look at Table 8 we can see the differences in asset endowments and outcomes that are related to these distinct strategies. We have included the overall assets index and an index that captures just the main agricultural-related assets (land, cattle and agricultural tools). Two outcome indicators are also shown – the per capita income (in US dollars) and the child outcome indicator of height-for-age z-score.[11] Here it is quite striking to note that those who engage in non-farming activities in rural areas are the ones with higher income per capita and higher height-for-age z-score. These results are similar in both the one-year-old and the eight-year-old samples. In contrast, those who are just farmers or are

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10    To evaluate the robustness of our results we changed this cut-off point to 10 per cent. The results obtained were similar.

11    A detailed analysis of this indicator for the Peru YL sample can be found in Escobal et al (2003a).

pushed to diversify away from their own land, presumably because their asset base is too low, are the ones that show lower income per capita and lower height-for-age z-score.

**Table 8: Median of households' characteristics according to labour income diversification strategies – rural areas**

| Strategies | 1 year | | | | 8 years | | | |
|---|---|---|---|---|---|---|---|---|
| | asset indicators | | outcome indicators | | asset indicators | | outcome indicators | |
| | Assets index | Farming assets index | Per capita income (US$) | HAZ | Assets index | Farming assets index | Per capita income (US$) | HAZ |
| Non-waged agricultural | -0.91 | 0.61 | 168 | -1.8 | -1.03 | 0.86 | 168 | -2.3 |
| Waged agricultural (including mixed with non-waged agricultural) | -0.88 | 0.28 | 252 | -2.0 | -0.82 | 0.42 | 186 | -2.0 |
| Non-waged agricultural and non-waged non-agricultural | -0.92 | 0.10 | 218 | -1.6 | -0.63 | 0.94 | 280 | -1.5 |
| Non-waged agricultural and waged non-agricultural | -0.78 | 0.51 | 279 | -1.7 | -0.60 | 1.87 | 276 | -2.0 |
| Non-agricultural | -0.19 | -0.32 | 586 | -1.1 | 0.27 | -0.44 | 479 | -1.6 |
| Waged and non-waged agricultural and non-agricultural and others | -0.79 | 0.18 | 370 | -1.8 | -1.07 | -0.39 | 296 | -1.5 |

In urban areas we also have distinct income-generating strategies. As Table 9 shows, non-agricultural waged employment is the most frequent strategy, accounting for a quarter of the one-year-old sample. However, also quite common are those who just engage in independent (non-waged) employment activities or engage in a mix of these two strategies, each of them covering about 20 per cent of each sample. The major difference between the two samples is a lower proportion in the eight-year-old sample engaged solely in non-agricultural waged activities and a higher proportion in those strategies that include agricultural activities (either solely or mixed with other activities). A hypothesis that might be interesting to pursue is whether this change may be due to the increased mobility of the mother once the child she has been looking after gets older. We will pursue this further in the next section.

**Table 9: Households' labour income diversification strategies – urban areas**

| Strategies | 1 year | | 8 years | |
|---|---|---|---|---|
| | Freq | % | Freq | % |
| Waged non-agricultural | 342 | 24.7 | 181 | 15.4 |
| Waged and non-waged non-agricultural | 275 | 19.9 | 257 | 21.9 |
| Non-waged non-agricultural | 270 | 19.5 | 257 | 21.9 |
| Agricultural | 236 | 17.1 | 232 | 19.8 |
| Waged or non-waged non-agricultural and agricultural | 203 | 14.7 | 230 | 19.7 |
| Waged and non-waged non-agricultural and agricultural | 57 | 4.1 | 28 | 2.4 |

Table 10 shows the differences in asset endowments and outcomes that are related to these different urban strategies. Here we see that those urban dwellers who engage solely in farming show the lowest assets index and the lowest outcome indicators. At the other end of the asset spectrum, those who have been able to diversify into waged and non-waged non-agricultural income sources have the largest assets index and at the same time show higher income per capita and higher height-for-age z-score. Thus it seems that there is indeed a positive correlation between asset ownership, diversification strategies and household and child wellbeing. These are of course basic correlations – their robustness needs to be checked after controlling for differences in key variables such as household composition and external restrictions.

**Table 10: Median of households' characteristics according to labour income diversification strategies – urban areas**

| Strategies | 1 year | | | | 8 years | | | |
| | asset indicators | | outcome indicators | | asset indicators | | outcome indicators | |
| | Assets index | Farming assets index | Per capita income (US$) | HAZ | Assets index | Farming assets index | Per capita income (US$) | HAZ |
|---|---|---|---|---|---|---|---|---|
| Waged non-agricultural | 0.62 | -0.60 | 625 | -0.8 | 0.38 | -0.55 | 534 | -1.11 |
| Waged and non-waged non-agricultural | 0.81 | -0.55 | 661 | -0.8 | 0.62 | -0.52 | 684 | -1.04 |
| Non-waged non-agricultural | 0.53 | -0.60 | 531 | -0.9 | 0.58 | -0.52 | 535 | -1.15 |
| Agricultural | -0.61 | -0.44 | 210 | -1.5 | -0.55 | -0.30 | 220 | -1.92 |
| Waged or non-waged non-agricultural and agricultural | -0.16 | -0.21 | 299 | -1.2 | -0.28 | 0.00 | 352 | -1.41 |
| Waged and non-waged non-agricultural and agricultural | 0.54 | -0.37 | 584 | -1.0 | 0.41 | -0.09 | 464 | -1.86 |

# 5. Income diversification and welfare outcomes: Does having a newborn child make a difference?

In the diversification patterns and strategies shown above some differences emerge between the two samples that might be related to the fact that the mother has more time to engage in income-generating activities once the child gets older. Alternatively she might be using a childcare facility to free up time for the same purpose. To investigate this further we now present analyses that examine whether there is a 'one-year-old effect'. That is, if after controlling for assets, household composition and key external labour market restrictions (in this case market size proxied by town/community size), does having a one-year-old child in the household affect income diversification pattern and strategies?

In this section, we first build on the analyses in section 4 in order to quantify the impact of a one-year-old child on households' diversification *patterns* (Tables 11 and 12). Next, in Tables 13 and 14, we assess the 'one-year-old effect' on diversification *strategies*, as defined in section 4. Then we focus on the mother's labour status as an important factor that may explain changes in a household's diversification patterns and strategies, and look at the impact of having a one-year-old child on the probability that the mother works (Table 15). Finally, in Tables 16 and 17, we look within households with a one-year-old child to see whether the use of external childcare facilities affects the probability that the mother works.

Table 11 presents three different estimations of the determinants of income diversification in urban areas of the YL sample. The first column looks at the number of income sources while the other two focus on the total income H index.[12] In all the estimations we have accounted for the clustered nature of the data and in that way we have controlled for potential heterogeneity from factors that have not been measured but that might be highly correlated within a community.

**Table 11: Determinants of diversification in urban areas (regression coefficients and standard errors)**

|  | Number of income sources | | |
| --- | --- | --- | --- |
|  | Poisson regression | Standard regression | Tobit-censored |
| Potential household labour force | 0.101 (0.009)*** | 0.026 (0.004)*** | 0.036 (0.005)*** |
| Assets index | 0.010 (0.025) | -0.001 (0.014) | -0.003 (0.016) |
| Assets index square | 0.001 (0.011) | 0.009 (0.007) | 0.013 (0.009) |
| Farming assets index | 0.044 (0.028) | 0.018 (0.011) | 0.023 (0.013)* |
| Town size (logs) | 0.005 (0.010) | -0.020 (0.006)*** | -0.025 (0.007)*** |
| Has one-year-old child | -0.046 (0.020)** | -0.150 (0.021)*** | -0.199 (0.022) |

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12 The number of income sources is a count variable and it has therefore been estimated through a Poisson regression. The determinants of the H index have been estimated using both a standard regression and a tobit-censored regression to account for the fact that a number of households show zero diversification.

| | Number of income sources | | |
| --- | --- | --- | --- |
| | **Poisson regression** | **Standard regression** | **Tobit-censored** |
| Constant | **0.380 (0.098)*** | **0.519 (0.058)*** | **0.526 (0.069)*** |
| Insigma | | | **-1.169 (0.033)*** |
| Sigma | | | **0.311 (0.010)** |
| **observation** | **1,842** | **1,538** | **1,538** |
| **Left censored observations** | | | **387** |
| **R-squared** | | **0.115** | |
| **Wald chi2(6)** | **170.2** | | **269.7** |
| **Prob > chi2** | **0.00** | | **0.00** |
| **Log pseudo-likelihood** | **-3,748.7** | | **-724.1** |

Robust standard errors in parentheses (clusters at the town level)
* significant at 10%; ** significant at 5%; *** significant at 1%

The table shows that in urban areas the U-shaped diversification profile related to the assets index, as was seen in Figures 3 and 4, does not prevail once we control for other covariates. Furthermore, the results show clearly that households having a one-year-old child have lower capabilities to diversify incomes than households who do not have to care for a young child (as indicated by the factor 'has one-year-old child' in the table).

Table 12 looks at the determinants of income diversification in rural areas of the YL sample. The results show that when properly specified (ie, using a tobit equation) the 'one-year-old effect' in the rural sample becomes apparent. Furthermore, once we control for other factors, the pattern of income diversification is rather flat across the asset spectrum.

**Table 12: Determinants of diversification in rural areas (regression coefficients and standard errors)**

| | Number of income sources | | |
| --- | --- | --- | --- |
| | **Poisson regression** | **Standard regression** | **Tobit-censored** |
| Potential household labour force | **0.040 (0.022)*** | **0.014 (0.009)** | **0.016 (0.010)** |
| Assets index | **0.011 (0.024)** | **0.001 (0.014)** | **-0.023 (0.017)** |
| Assets index square | **-0.044 (0.018)**** | **-0.018 (0.015)** | **-0.016 (0.016)** |
| Farming assets index | **-0.008 (0.020)** | **-0.015 (0.014)** | **0.026 (0.015)*** |
| Town size (logs) | **0.036 (0.016)**** | **0.023 (0.013)*** | **-0.093 (0.043)**** |
| Has one-year-old child | **-0.026 (0.033)** | **-0.063 (0.041)** | **0.256 (0.089)*** |
| Constant | **0.389 (0.132)*** | **0.276 (0.076)*** | **-1.239 (0.035)*** |

| | Number of income sources | | |
| --- | --- | --- | --- |
| | **Poisson regression** | **Standard regression** | **Tobit-censored** |
| Insigma | | | 1.239 (0.035) |
| Sigma | | | 0.290 (0.010) |
| **observations** | **814** | **692** | **692** |
| **Left censored observations** | | | **134** |
| **R-squared** | | **0.027** | |
| **Wald chi2(6)** | **28.07** | **0.027** | **12.31** |
| **Prob > chi2** | **0.000** | | **0.055** |
| **Log pseudo-likelihood** | **-1,713.9** | | **-272.2** |

Robust standard errors in parentheses (clusters at the town level)
* significant at 10%; ** significant at 5%; *** significant at 1%

It is important to note that these determinants are not clear when we limit ourselves to the number of distinct income sources. This result warns us of the risks of solely using count data without accounting for the relative importance of each employment source when trying to detect income diversification patterns.

Again, these estimations show whether a household diversifies its income sources or not but they do not take account of the specific strategies these household may be pursuing. To look at whether or not having a one-year-old matters for choosing specific income diversification strategies, we have estimated a multinomial logit, which looks at the relative probabilities (odds) of choosing specific strategies compared to a 'base' strategy. For urban households the base strategy was non-waged non-agricultural employment as the sole source of income. For rural households, the base strategy was chosen to be non-waged agricultural employment as the sole source of income (ie, farming one's own land).

Table 13 shows the determinants of diversification strategies for urban areas. These numbers can be interpreted as the increase or decrease in the probability of engaging in a particular strategy due to a 1 per cent increase in value of a variable depicted in the first column of the table. For example, doubling the assets index (ie, a 100 per cent increase) increases by 5.9 per cent the probability of engaging in a strategy based solely on non-waged non-agricultural employment (eg, small-scale manufacturing) and, at the same time reduces by 11.7 per cent the probability of engaging only in agricultural-related activities. The results of this modelling exercise are consistent with the results in Table 9 and show that the presence of a one-year-old child results in a different income diversification strategy even after controlling for main covariates such as assets index, size of market and number of adults. The presence of a child decreases the probability of engaging in agricultural activities (in combination with other sources) in favour of non-agricultural salaried activities.

**Table 13: Determinants of households' labour income diversification strategies – urban areas 1/ (regression coefficients)**

| | Waged non-agricultural | Waged and non-waged non-agricultural | Non-waged non-agricultural | Agricultural | Waged or non-waged non-agricultural and agricultural | Waged and non-waged non-agricultural and agricultural |
|---|---|---|---|---|---|---|
| **Number of members of working age** | -0.019* | 0.037*** | -0.023* | 0.007 | -0.007 | 0.005 |
| **Assets index** | 0.090*** | 0.068*** | 0.059*** | -0.117*** | -0.113*** | 0.012 |
| **Farming assets index** | -0.139*** | 0.032* | -0.046* | 0.073*** | 0.129*** | 0.015** |
| **Log town size** | 0.011 | 0.049*** | 0.052*** | -0.050*** | -0.050*** | -0.014*** |
| **Has one-year-old child** | 0.098*** | -0.037+ | -0.009 | -0.015 | -0.053+ | 0.015 |

* significant at 10%; ** significant at 5%; *** significant at 1%
1/ Base = non-waged non-agricultural
+ For the fourth and fifth strategies, the 'one-year-old child' dummy is almost significant at the 10 per cent level
Controlled by cluster effects at the community level

In rural areas, the results of this modelling exercise are consistent with the results in Table 7 and also show that the presence of a one-year-old child makes a difference in the income diversification strategy even after controlling for covariates (Table 14). In this case the presence of a child decreases the probability of engaging in non-farming activities. This result suggests that a mother may have a greater chance to engage in off-farm income-generating activities if there is a way of replacing her, at least partially, in looking after the one-year-old child.[13]

**Table 14: Determinants of households' labour income diversification strategies – rural areas 1/ (regression coefficients)**

| | Non-waged agricultural | Waged agricultural (including mixed with non-waged agricultural) | Non-waged agricultural and non-waged non-agricultural | Non-waged agricultural and waged non-agricultural | Non-agricultural | Waged and non-waged agricultural and non-agricultural and others |
|---|---|---|---|---|---|---|
| **Number of members of working age** | 0.014 | -0.028** | -0.006 | 0.012 | -0.008 | 0.017** |
| **Assets index** | -0.255*** | -0.010 | 0.041 | 0.024 | 0.142*** | 0.058* |
| **Farming assets index** | 0.126*** | -0.016 | -0.020 | 0.033** | -0.068*** | -0.055*** |
| **Log community size** | -0.057* | 0.096 | -0.024 | -0.023 | 0.003 | 0.005 |
| **Paved or engineered road** | -0.006 | 0.125 | -0.080* | -0.024 | 0.019 | -0.034 |
| **Has one-year-old child** | 0.057 | 0.019 | 0.025 | -0.016 | -0.078** | -0.007 |

* significant at 10%; ** significant at 5%; *** significant at 1%
1/ Base = independent farming
Controlled by cluster effects at the community level

13 The reduction in the probability of the non-waged agricultural income strategy, although not statistically significant, is the strategy that comes closest to being significant (20 per cent). In addition, the odds ratio estimated for the one-year-old dummy variable using this strategy as the base category returns parameters that are statistically significant.

### Effects on mother's employment

The above results show that the presence of a one-year-old child has an effect on household diversification patterns and strategies. However, we do not know through which channels this relationship operates. One of the most intuitive channels is the labour status of the child's mother. Table 15 looks at the determinants of whether a mother works, in both urban and rural settings. Analysis is restricted to biological mothers and is based on the pooled sample of one-year-olds and eight-year-olds. Here we can see that, once we control for family characteristics, asset endowments and community context, having a one-year-old child reduces by 24.2 per cent the probability of a biological mother engaging in income-earning activities in urban areas. However, this pattern is not seen in rural settings where there is no significant effect. This finding is consistent with it being more likely that a mother takes her baby along with her when performing labour chores in rural settings (eg, agricultural chores) than in urban settings, especially when she is engaged in waged labour.

**Table 15: Determinants of mother's work – urban and rural areas (regression coefficients)**

|  | Urban | Rural |
|---|---|---|
| Household members aged 0-5 | 0.018 | -0.016 |
| Household members aged 6-14 | 0.035** | 0.018 |
| Household members aged 15-64 | -0.052*** | -0.057*** |
| Household members aged 65 and over | 0.054 | -0.006 |
| Mother's years of education | 0.004 | -0.010** |
| Farming assets index | 0.089*** | 0.072*** |
| Town/community size (logs) | -0.002 | 0.039** |
| Community has paved or engineered road |  | -0.130** |
| Has one-year old child | -0.242*** | -0.018 |

* significant at 10%; ** significant at 5%; *** significant at 1%

### Does access to childcare facilities make a difference?

Therefore, we now know that having a one-year-old child may affect a household's income diversification strategies and may hinder, at least for urban areas, the ability of the biological mother to engage in income-generating activities. However, if the mother can obtain outside help in taking care of the child it may change her employment decision and affect the overall income diversification strategy of the household. Tables 16 and 17 investigate this issue by estimating the probability that the biological mother may be working, in both urban and rural settings, conditional on whether she receives external help in caring for the one-year-old. Obviously this analysis is restricted to the one-year-old sample.[14] Column 1 in Tables 16 and 17 shows the determinants of the probability of a mother engaging in any income-generating activity *conditional* on being able to use external childcare facilities.[15] Column 2 shows the determinants of using external facilities for childcare. This includes

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14  The estimation technique used is called Heckman probit, and is basically a two-stage procedure first estimating the probability of using external help to care for the young child and then using this estimation to correct the estimators of the second stage (that is, the probability of working) which may have a sample-selection bias. A detailed explanation of this technique can be found in StataCorp (2001) vol. 2, H-P, pp. 29-31.

15  In this type of model a critical element needed for proper estimation is identifying a variable that may affect the first stage (using external daycare facilities) and will not directly affect the second stage (probability of working). In this case an obvious candidate is the existence or not of daycare services, which can be obtained from the Young Lives community questionnaire, which can be viewed at www.younglives.org.uk.

public (such as Wawa Wasi or PRONOEI[16]) and private childcare facilities, as well as services provided by neighbours or any person outside the household. This last group is included since it reflects a potential demand for public or private daycare facilities that may not be available at the time.

Tables 16 and 17 show that the size of the town/community is related to the probability of using external daycare services in both urban and rural settings. Similarly the greater the number of household members aged between 6 and 64 years in urban areas, and between 15 and 64 years in rural areas, the less likely there will be a need for using external daycare services. It is interesting to note that in rural areas the existence of Wawa Wasi (a public-funded daycare service programme that has increased its coverage during recent years) affects the probability of using external childcare services.

The analysis procedure indicated a need to control for use of external childcare facilities in urban areas but not in the rural setting (ie, correcting selection bias, see footnote 14). After controlling for this, we found that in urban areas the probability of working is significantly related to mother's education and household size, and that it shows no relationship with the farming asset base (Table 16). This result is quite important since the results in Table 15, with no conditioning for the use of childcare facilities, showed that the probability of working was not significantly related to mother's education but *was* associated with the farming asset base. This difference in results may suggest that it is mother's education and access to childcare facilities that improve the income-generating opportunities of the biological mother in households that have young children.

In rural areas, the analysis procedure indicated no need to correct for selection bias. We can therefore use the results in Table 15 where no correction for selection bias was considered. As shown in Table 15, in rural areas asset endowments (mother's education and farming assets index) play a major role, being related to the probability of the mother engaging in income-generating activities.

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16   Programa No Escolarizado de Educacion Inicial (PRONOEI) is a free-to-use early education programme provided by the Peruvian government.

**Table 16: Determinants of mother's working decision – urban areas (regression coefficients)**

|  | (1)<br>Mother works | (2)<br>Someone external to the household takes care of child |
|---|---|---|
| Child's age (days) | 0.001<br>(0.000)*** | 0.001<br>(0.000)*** |
| Mother's years of education | 0.073<br>(0.011)*** | 0.069<br>(0.011)*** |
| Farming assets index | 0.028<br>(0.081) | -0.069<br>(0.049) |
| Household members aged 0-5 | 0.059<br>(0.075) | -0.075<br>(0.068) |
| Household members aged 6-14 | -0.012<br>(0.063) | -0.138<br>(0.040)*** |
| Household members aged 15-64 | -0.114<br>(0.026)*** | -0.100<br>(0.027)*** |
| Household members aged 65 or over | -0.198<br>(0.134) | -0.240<br>(0.145)* |
| Town size (logs) | 0.017<br>(0.028) | -0.053<br>(0.027)* |
| Community has a Wawa Wasi |  | 0.208<br>(0.159) |
| Constant | -2.036<br>(0.329)*** | -0.875<br>(0.272)*** |
| Observations | 1.366 | 1.366 |
| Selectivity term | 0.902 |  |
| Probability selectivity term is equal to zero | 0.000 |  |

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 17: Determinants of mother's working decision – rural areas (regression coefficients)

|  | (1)<br>Mother Works | (2)<br>Someone external to the household takes care of child |
|---|---|---|
| Child's age (days) | 0.000<br>(0.001) | 0.000<br>(0.0001) |
| Mother's years of education | 0.022<br>(0.047) | 0.043<br>(0.024)* |
| Farming assets index | 0.351<br>(0.207)* | -0.055<br>(0.059) |
| Household members aged 0-5 | 0.362<br>(0.286) | -0.035<br>(0.102) |
| Household members aged 6-14 | -0.016<br>(0.077) | -0.044<br>(0.066) |
| Household members aged 15-64 | -0.048<br>(0.201) | -0.211<br>(0.072)*** |
| Household members aged 64 or over | 5.766<br>(1.883)*** | -0.826<br>(0.453)* |
| Town size (logs) | 0.153<br>(0.364) | -0.223<br>(0.104)* |
| Community has a Wawa Wasi |  | 0.776<br>(0.247)*** |
| Constant | -0.703<br>(2.436) | -1.611<br>(0.800)** |
| Observations | 423 | 423 |
| Selectivity term | -0.014 |  |
| Probability selectivity term is equal to zero | 0.977 |  |

Robust standard in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

# 6.   Discussion and conclusions

This paper has described income diversification patterns and strategies in households with young children and those without a young child, using the Peruvian YL data. The paper shows that the link between income diversification and total income, or any other welfare indicator, is theoretically and empirically ambiguous and needs to be analysed in the context of the asset mix and the external constraints of each household.

Total income was divided into labour income, private transfers and property income. Labour income was further divided into four distinct sources related to the combination of self-employment/waged employment activities, as well as agricultural/non-agricultural activities. The results for income diversification in urban settings show a U-shaped relationship in which the poorest are pushed to diversify to make up for the lack of assets they possess or have access to; and the less poor do the same as their higher asset endowment allows them to explore new income-generating opportunities. However, this relationship did not hold once we controlled for other variables. In rural settings, we found that for households with a young child income diversification increases with the level of assets. Again, this result was not robust once other factors were controlled.

We have also shown that urban dwellers who engage solely in farming have the lowest assets index and the lowest outcome indicators. At the other end of the asset spectrum, those who have been able to diversify into waged and non-waged non-agricultural income sources have the highest assets index and at the same time show higher income per capita and higher height-for-age z-score. For rural dwellers we noted that those who engage in non-farming activities have higher income per capita and higher height-for-age z-score. These results are practically the same for both the one-year-old and the eight-year-old samples. At the other extreme, those who are solely farmers or are pushed to diversify away from their own land, presumably because their asset base is too low, show lower income per capita and lower child health outcomes. Thus it seems that there is a positive correlation between asset ownership, diversification strategies and household and child wellbeing.

Comparing some of the diversification patterns and strategies between households with and without a one-year-old child, we find some behavioural differences that can be related to the fact that the mother has more time to engage in income-generating activities once the child gets older, or alternatively if the mother manages to use an external childcare facility so she can free up time for the same purpose. This result is robust once we control for assets, household composition and key external labour market restrictions. In rural settings the household may have a greater chance to engage in off-farm income-generating activities if there is a way of replacing the mother, at least partially, in looking after the one-year-old. In urban areas the presence of a child decreases the probability of engaging in agricultural activities (in combination with other sources) in favour of non-agricultural waged activities.

We have found that having a one-year-old may affect income diversification strategies and may hinder the ability of the biological mother to engage in income-generating activities. However, if the mother obtains outside help in taking care of the child it may well change her employment decision and affect the overall income diversification strategy of the household. Our results show that access to childcare services may improve the income-generating opportunities of the biological mother in households with young children. In urban areas, improving mother's education and access to childcare services might be the best strategies for improving income-generating opportunities. In rural settings we found that the asset base itself is an important factor hindering income diversification. Although availability of childcare facilities (Wawa Wasi) affects the decision to use external childcare services, availability

of private and public assets may largely explain most of the households' diversification strategies independently of the availability of childcare services.

According to official statistics,[17] in Peru there are currently almost 4,700 Wawa Wasis, with capacity to care for over 40,000 children aged four or under. Although this number has increased in recent years – starting from less than 12,000 in 1999 – it appears to be insufficient, especially when seen alongside the target population of nearly 2 million children under the age of four living in poverty. In Peru, mothers have few childcare options when they wish or need to work; even in urban areas few organisations have such facilities for their employees' children. Most childcare appears to be based on social networks of either family or friends, leaving a group of women with an unmet demand for childcare. The Wawa Wasi programme is an option that has been positively accepted by mothers in diverse settings. Nonetheless, its coverage appears insufficient. Our results show that there may be a link between this kind of childcare programme and enhancing the income diversification strategies of the poor. It is important to mention that our results suggest that although in urban settings such a programme may on its own yield a positive outcome in terms of enhancing income opportunities, in rural settings the need to combine it with enhancing mother's education is critical. This is especially true in areas such as the southern sierra where women's illiteracy continues to be high.

A complementary objective of this paper was to identify future research questions that can be addressed once longitudinal data are available in the YL study, to examine changes over time. Once the second survey round of the YL study has been completed it will be possible to improve our hypotheses regarding income diversification. First, it will be possible to examine whether having childcare services in a community – where mothers can leave their children in order to work – changes the mother's decision to work or not.[18] Related to this, we will be able to analyse if there is a relationship between the availability of care centres and the type of occupation a mother has. For example, we could investigate whether the availability of care centres for four-year-old children contributes to changes in the income source (such as starting work as a salaried non-agricultural worker instead of an agricultural one) of a mother who lives in a community without a care centre for one-year-olds.

It would also be interesting to analyse the job allocation dynamics of the mother and other household members once the child gets older. For example, once the child is grown up the mother might go back into the labour market, taking the place of other household members, because she is more educated. It would also be interesting to examine if such reallocation were affected by the availability of childcare centres.

In addition, the longitudinal data will allow us to examine whether a wage gap exists between mothers who were not working when their child was one-year-old and those who were. This could help us to establish which mothers face restrictions to re-enter the labour market once they have abandoned it to take care of their children and this could inform policies targeting mothers who wish to go back to work.

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17    Detailed statistics can be found on the official Wawa Wasi website: www.mimdes.gob.pe/wawawasi/ (in Spanish).

18    Daycare services for one-year-olds in Peru are in short supply, but care services for four-year-olds – the age surveyed children will have attained by the second round – provided by PRONOEIs and other nursery schools, are much more widespread.

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# Appendix 1: Construction and validation of the assets index

In order to construct the assets index, we used a similar method to the one proposed by Filmer and Pritchett (1998), based on principal components analysis. Using this method, we aimed to discover the principal components explaining most of the common variance of households' assets. The assets we considered for the analysis are listed in Table A1. Two rotated factors were found to explain 36.7 per cent of the total variance; each one assigned a different weight to each asset and was interpreted as an index. The first one accounted for 21.3 per cent of the total variance and tends to group those assets classified as 'non-farming', while the second accounted for 13.4 per cent of the variance and is more correlated to those assets related to farming activities. Weights for each of these indices can be seen in Table A2.

Table A1: Components of the asset index

| Assets Index | Univariate statistics | | Components Score coefficients | | Impact of assets over the index | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Assets Index | Farming assets index | Assets index With | Without | Farming assets index With | Without |
| Highest education level achieved by an adult householder member | 9.99 | 3.67 | 0.142 | 0.006 | 0.04* | - | 0.0016* | - |
| Has electricity | 0.65 | 0.48 | 0.139 | 0.000 | 0.10 | -0.19 | 0.00 | 0.00 |
| Has piped water | 0.77 | 0.42 | 0.103 | 0.033 | 0.06 | -0.19 | 0.02 | -0.06 |
| Has toilet or septic tank | 0.44 | 0.50 | 0.142 | -0.014 | 0.16 | -0.13 | -0.02 | 0.01 |
| Uses gas or electricity for cooking | 0.34 | 0.47 | 0.132 | -0.026 | 0.18 | -0.09 | -0.04 | 0.02 |
| Has working telephone | 0.08 | 0.27 | 0.115 | 0.034 | 0.39 | -0.03 | 0.11 | -0.01 |
| Has working radio | 0.74 | 0.44 | 0.099 | 0.098 | 0.06 | -0.17 | 0.06 | -0.17 |
| Has working fridge | 0.17 | 0.37 | 0.129 | 0.022 | 0.29 | -0.06 | 0.05 | -0.01 |
| Has working bicycle | 0.26 | 0.44 | 0.078 | 0.035 | 0.13 | -0.05 | 0.06 | -0.02 |
| Has working TV | 0.58 | 0.49 | 0.145 | 0.023 | 0.12 | -0.17 | 0.02 | -0.03 |
| Has working motor vehicle | 0.04 | 0.20 | 0.079 | 0.038 | 0.38 | -0.02 | 0.18 | -0.01 |
| Has working sewing machine | 0.14 | 0.34 | 0.086 | 0.082 | 0.22 | -0.03 | 0.21 | -0.03 |
| Number of members per room | 2.91 | 1.73 | -0.080 | -0.047 | - | - | - | - |
| Has cement/tile/laminated material floor | 0.37 | 0.48 | 0.146 | -0.008 | 0.19 | -0.11 | -0.01 | 0.01 |
| Has brick/concrete/ cement walls | 0.32 | 0.47 | 0.135 | -0.013 | 0.20 | -0.09 | -0.02 | 0.01 |
| **Farming assets** | | | | | | | | |
| Has plough | 0.24 | 0.43 | 0.004 | 0.203 | 0.01 | 0.00 | 0.36 | -0.11 |
| Has wheelbarrow | 0.18 | 0.38 | 0.064 | 0.219 | 0.14 | -0.03 | 0.47 | -0.10 |
| Has tacks | 0.19 | 0.40 | 0.019 | 0.216 | 0.04 | -0.01 | 0.44 | -0.11 |
| Has crop-spraying machine | 0.13 | 0.34 | 0.059 | 0.209 | 0.15 | -0.02 | 0.54 | -0.08 |
| Has irrigation hoses | 0.08 | 0.27 | 0.078 | 0.199 | 0.26 | -0.02 | 0.67 | -0.06 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Has farming fence, animal huts, warehouse or silo | 0.09 | 0.28 | 0.058 | 0.187 | 0.19 | -0.02 | 0.61 | -0.06 |
| Hectares of own land | 1.12 | 3.98 | 0.014 | 0.107 | - | - | - | - |
| Livestock indicator | 1,134.2 | 2,748.8 | 0.017 | 0.174 | - | - | - | - |

*Impact of each additional year of education over the index
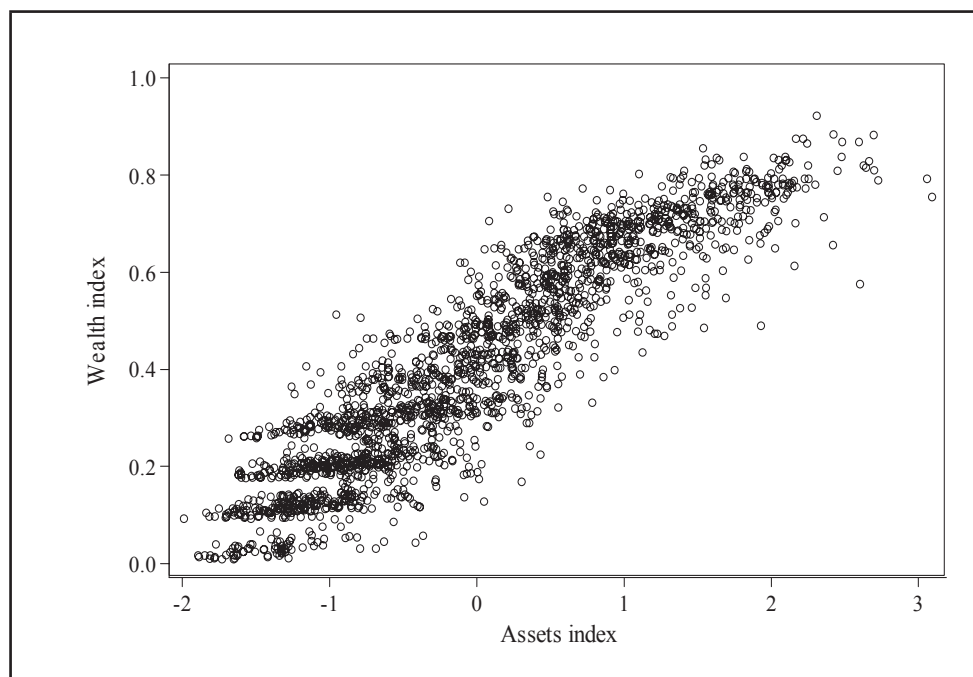Source: YLS, 2002

The distribution of each index can be observed in Graph A1. The assets index is slightly bimodal, mainly because of the differences between urban and rural areas, while the farming assets index is skewed to the left.

**Graph A1: Assets index and farming assets index distribution**
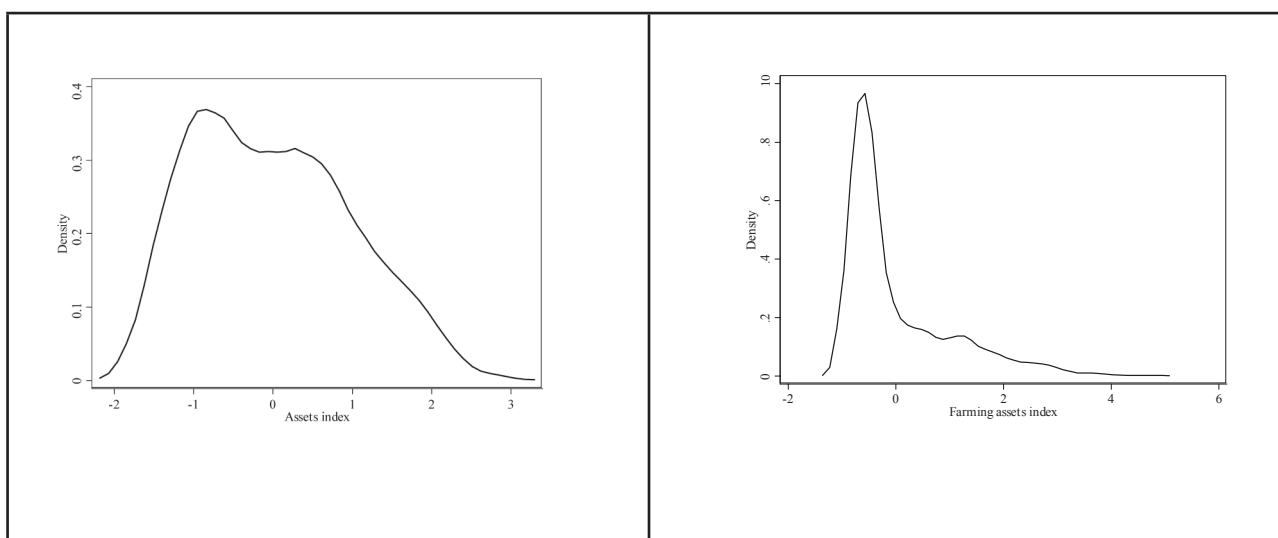


We compared the assets index with the wealth index used in the YL preliminary reports (See Escobal et al, 2003a). The YL wealth index does not consider education as an asset and excludes farming assets. In addition, the YL wealth index groups assets in three categories (housing quality, consumer durables and services) and gives each asset the same weight within each category, and then each category a same weight within the index. We did find a strong correlation between the two indices, as can be seen in Graph A2.

**Graph A2: Wealth index versus assets index in one-year-olds survey**



Source: YLS, 2002

However, when we looked for correlations between each asset and total household income in rural areas, we found that the assets index is slightly more correlated with income than with wealth index, as can be seen in Tables A2 and A3. In contrast, almost no difference is found in urban areas as Tables A4 and A5 show.

**Table A2: Correlation between total household income and assets index by quintiles – rural areas**

| Assets Index | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Q1** | **Q2** | **Q3** | **Q4** | **Q5** | **Total** |
| | **Q1** | 31.8 | 23.3 | 20.3 | 13.2 | 11.7 | 20.1 |
| | **Q2** | 28.7 | 20.2 | 24.2 | 16.3 | 10.9 | 20.1 |
| **Per capita income** | **Q3** | 19.4 | 22.5 | 21.1 | 24.8 | 11.7 | 19.9 |
| | **Q4** | 10.9 | 18.6 | 17.2 | 26.4 | 27.3 | 20.1 |
| | **Q5** | 9.3 | 15.5 | 17.2 | 19.4 | 38.3 | 19.9 |
| | **Total** | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table A3: Correlation between total household income and wealth index by quintiles – rural areas**

| | | Wealth Index | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| | Q1 | 25.4 | 20.0 | 23.4 | 18.9 | 12.7 | 20.1 |
| | Q2 | 28.5 | 20.8 | 20.3 | 15.9 | 14.3 | 20.0 |
| Per capita income | Q3 | 20.0 | 20.8 | 24.2 | 16.7 | 18.3 | 20.0 |
| | Q4 | 13.8 | 21.5 | 17.2 | 27.3 | 19.8 | 20.0 |
| | Q5 | 12.3 | 16.9 | 14.8 | 21.2 | 34.9 | 20.0 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table A4: Correlation between household total income and assets index by quintiles  – urban areas**

| | | Assets index | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| | Q1 | 47.5 | 28.5 | 11.6 | 9.8 | 2.9 | 20.1 |
| | Q2 | 26.3 | 29.9 | 22.5 | 14.1 | 7.6 | 20.1 |
| Per capita income | Q3 | 14.7 | 20.4 | 26.2 | 21.4 | 16.5 | 19.8 |
| | Q4 | 7.6 | 12.4 | 21.8 | 30.8 | 27.7 | 20.1 |
| | Q5 | 4.0 | 8.8 | 17.8 | 23.9 | 45.3 | 20.0 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Table A5: Correlation between household total income and wealth index by quintiles  – urban areas**

| | | Wealth index | | | | | |
|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q5 | Total |
| | Q1 | 47.2 | 28.1 | 11.4 | 9.1 | 3.6 | 20.0 |
| | Q2 | 27.0 | 28.8 | 23.2 | 13.8 | 7.2 | 20.0 |
| Per capita income | Q3 | 14.2 | 20.9 | 27.6 | 23.3 | 14.4 | 20.0 |
| | Q4 | 7.1 | 12.2 | 19.9 | 31.3 | 30.0 | 20.0 |
| | Q5 | 4.6 | 10.1 | 18.0 | 22.5 | 44.8 | 19.9 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

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