Exploring The Role of Employment and Earnings in Poverty Reduction: The case Of Madagascar[1]

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ABSTRACT

This paper finds that in the period under observation (1999-2005), a fall in GDP per capita was accompanied by a substantial decrease in productivity per worker, the effects of which were only partly off-set by the increase in both (adult) employment and the increase of the working age population. The fall in output per worker is particularly associated with the primary sector, in which a substantial fall in productivity occurred simultaneously with a substantial increase of workers, among others due to the six month crisis starting in 2001 which is assumed to have resulted in a massive flight of workers from the secondary and tertiary sectors to the primary sector. Although changes in average output per worker in the three sectors cannot always be reconciled with the observed changes in earnings as derived from household survey data (particularly in the primary sector), the comparison of macro and micro data does provide a number of insights in the way the labor market functioned in the secondary and tertiary sectors.

Using household survey data, we not only find that poverty reduced mainly as a result of a fall in poverty within the primary sector, but are also able to understand the links between labor outcomes and changes in poverty in more subtle ways. For example, our findings suggest that the fall in the poverty rate is driven by households in the upper portion of the income distribution relying more on agriculture as a share of their incomes, and employing more family members in order to escape poverty. Although the poorest 40 percent of the population remain poor, the depth of their poverty has decreased as a result of higher earnings. Interestingly, these higher earnings appear to be coming from earnings in the tertiary sector as these households rely more on this sector as a source of household income. Although earnings in the tertiary sector have fallen overall, the poorest households with members who switch from low-paying agriculture to higher-paying non-farm employment will see a rise in household income even if they do not escape poverty entirely.

[1] Findings, interpretations, and conclusions expressed in this paper are entirely those of the authors, and they do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent. The participation of David Stifel in the preparation of this paper is part of a broader labor market program undertaken by the World Bank in Madagascar. The authors are grateful for valuable comments and contributions from Pierella Paci, Catalina Gutierrez, Pieter Serneels, and Marcin Sasin in Washington, DC, and Benu Bidani, Stefano Paternostro, Elena Celada, and Laza Razafiarison in Antananarivo.

1. INTRODUCTION

Aggregate growth typically contributes to poverty reduction (Kraay, 2006). Nonetheless, countries differ in the degree to which income growth translates into poverty reduction. Although differences in the responsiveness of poverty to income growth account for a small fraction of overall differences in poverty changes across countries, from the point of view of an individual country these differences may have significant implications for poverty reduction, especially in the short term (Ravallion, 2001).

Labor markets – in particular employment and earnings – may play a crucial role in poverty reduction, by affecting both growth and the effectiveness of growth in reducing poverty. This document is mainly concerned with exploring the latter: the role of employment and labor income in linking growth with poverty reduction. Although the poor derive most of their income from the one asset they possess in abundance – their largely unskilled labor – there is still insufficient understanding of the links between growth, employment and earnings, and poverty reduction.

As part of a broader research framework, comprising several country studies and a cross-country analysis, this paper attempts to contribute to improving the understanding of these links by studying them for the case of Madagascar. As the Malagasy population experienced the consequences of a crisis during part of the period under observation, this case study allows us to explore the linkages between growth, employment, earnings, and poverty in a situation when output per capita actually decreased. We start our analysis by a description of the Malagasy context in and prior to the period under observation (section 2), after which we explore to what extent changes in per capita GDP have been accompanied by changes in aggregate and sectoral productivity and employment, and dependency rates (section 3). We then address the relationship between changes in the aggregate indicators of productivity, and those in individual-level household earnings as derived from household surveys (section 4). Finally, section 5 uses household survey data to review linkages between changes in employment and earnings, and poverty reduction.

2. COUNTRY CONTEXT

POPULATION, INCOME, AND POVERTY

Madagascar's 17.9 million strong population continues to grow at a fast pace. From 2000-2005, the population grew with an average annual rate of approximately 2.9 percent, compared to 2.3 percent per year in sub-Sahara Africa as a whole. As a result of the steady pace of urbanization that has occurred since the 1960s, when more than 85 percent of the population lived in rural areas, over a quarter of the population now live in urban areas. Nevertheless, the urbanized share of the population in Madagascar is still well below the sub-Saharan average of 35 percent.

Madagascar's strong population growth rate, even in the African context, seems in part due to the population's relatively high longevity.[2] While the pace of population growth steadily increased in the last decades of the past century (from 2.5 percent per year in 1960 to 3.0 percent in 1999), there are some indications that Madagascar may be reaching the next stage of the demographic transition, in which a further decline in birth rates slows down population growth.[3] The associated decrease of the dependency

[2] With 55.6 years in 2004, average life expectancy at birth was over 20 percent higher than the sub-Saharan average.
[3] Since 1960, the birth rate in Madagascar has continuously fallen, from 48.9 births per 1,000 people in 1960 to 38.6 births per 1,000 people in 2004. In the same period, life expectancy rose from 40.1 years to 66.6 years.

Table 2.1: Population, income, and poverty in Madagascar, 1960-2005

	1960	1970	1980	1990	1999	2000	2001	2002	2003	2004	2005
Population											
Population growth (annual %)	2.5	2.6	2.8	2.9	3.0	2.9	2.9	2.8	2.8	2.7	2.7
Population ages 0-14 (% of total)	43.8	45.1	45.1	45.0	44.8	44.8	44.7	44.5	44.4	44.2	44.0
Population ages 15-64 (% of total)	53.4	52.0	51.9	52.0	52.1	52.2	52.3	52.4	52.5	52.7	52.9
Population ages 65 and above (% of total)	2.8	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Age dependency ratio (dependents to working-age population)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Urban population (% of total)	10.6	14.1	18.5	23.6	25.9	26.0	26.2	26.3	26.5	26.6	26.8
Income											
GDP per capita (constant 2000 US$)	389	405	342	271	235	239	247	209	224	229	233
GDP per capita (constant local currency)	46766	48697	41097	32599	28297	28787	29656	25177	26887	27541	28045
GDP per capita growth (annual %)		2.6	-2.0	0.2	1.6	1.7	3.0	-15.1	6.8	2.4	1.8
Poverty											
Poverty rate, at national poverty line (% population)											
- Total					71.3		69.7	73.0			68.7
- Rural					76.7		77.3				73.5
- Urban					52.1		44.2				52.0
Poverty rate, at $1 a day poverty line (% population)											
- Total					53.0		60.8				60.0
- Rural					58.7		68.7				65.0
- Urban					33.3		34.2				42.3

Sources: World Development Indicators. Poverty rates: World Bank estimates from Household Survey data. 2002 poverty rate concerns simulation.

ratio, which the US Census Bureau expects to fall from 83.6 percent in 2005, to 71.0 percent in 2025, would increase the scope for higher savings and investments, offering improved opportunities to accelerate economic growth and raise the living standards of the population.[4]

Living standards in Madagascar are generally bleak. In 2005, the average annual per capita income was $233[5]. Although this reflects an improvement compared to the past few years, it is still substantially lower than the average Malagasy income per capita in the 1990s, 1980s, and even further in the past. In 2005, 68.7 percent of the population lived below the national poverty line, with poverty in the countryside substantially higher than in rural areas (73.5 percent, and 52.0 percent, respectively). Although the poverty rate in 2005 rate was below the rate in 2001, it is not assumed that there has been a constant fall in poverty in these four years, as a crisis that started in the end of 2001 is believed to have raised the share of poor, particularly in urban areas. Although no poverty data for the period 2002-2004 exist, according to one estimate the overall poverty rate increased to 73 percent directly after the crisis (World Bank, 2003). The effect of the crisis, which mainly affected urban areas, still appears to be visible in the 2005 poverty rates areas, as urban poverty rates were still approximately 10 percent points higher than before the crisis, in 2001. The crisis is also assumed to have substantially deteriorated poverty rates in rural areas. By 2005, however, rural poverty rates were almost 4 percent-points lower than in 2001, a development that is partly attributed to public investments in rural areas, and partly to increases in global rice prices and the sharp depreciation of the local currency. Notwithstanding this post-crisis rural rebound, almost three quarters of rural inhabitants continue to live in poverty. (Table 2.1)[6]

MACRO ECONOMIC CONTEXT

Madagascar's economic past since independence in 1960 is characterized by periods of moderate to fairly high growth levels, interrupted by regular periods of brief but often severe crisis, which are believed to be caused by structural domestic imbalances and either triggered or aggravated by external shocks. Madagascar's more recent history is tainted by a six months political crisis, triggered by contested political elections, which started in December 2001 and which had a significant negative impact on social and economic conditions. Prior to the crisis, a period of economic growth averaging 4.6 percent per year between 1997 and 2001 had increased average nationwide living standards, although benefits were largely confined to the urban areas. The crisis, however, resulted in a drop in GDP of almost 13 percent in 2002, compared to the year before. In the same year, net inflows of foreign direct investment were reduced to less then 10 percent of their previous level, exports faltered, and infrastructure was destroyed. (Table 2.2)

After the crisis, the economy was relatively quick to rebound. With output growth rates of, respectively, 9.8 percent and 5.3 percent in the two years succeeding the crisis, total output had returned to its 2001 level by 2004. Per capita output, however, had not yet returned to its pre-crisis level by 2005. Despite high oil prices, and the financial crisis of the electric parastatal JIRIMA, growth still reached 4.6 percent in 2005, while investment levels were recovering toward pre-crisis levels. Growth in 2005 originated largely from improved performance in the agricultural sector, higher tourism receipts, and continued public investment programs, while stagnation in the growth of the textile sector was linked

[4] US Census Bureau – IDB Summary Demographic Data for Madagascar. The dependency rate is defined as the sum of the number of those under 15 years and over 65 years of age, as a share of those aged 15-64.
[5] WDI, in 2000 US$.
[6] Note that the $1 a day poverty line is lower than the national poverty line. Thus poverty rates measured using this line can be interpreted as measures of the depth of poverty. During the post crisis period, these rates moved in parallel fashion to the official poverty rates at the national, urban and rural levels. During the pre-crisis period, despite a fall in the percentage of rural inhabitants who were poor, those that remained poor were worse off as indicated by the 10 percentage point increase in rural $1 a day poverty.

with the phasing out of the Most Favored Nation Status Agreement. GDP growth in 2006 reached an estimated 4.7 percent, with agricultural output growth slowing down to 2.6 percent due to adverse climatic conditions. In the period from 2007-2011, growth is expected to average 5.6 percent per year, with the main sources of growth including tourism, mining, construction and, most importantly, improved growth prospects in agriculture. Exports are projected to grow at over 6 percent per year, originating from tourism, mining, and a more diverse range of agricultural products. Due to the expiration of the Multi-Fibre Agreement in 2005, however, Export Processing Zones, whose share in total output increased by almost 80 percent between 1999 and 2005, are not expected to be a substantial source of growth in the near future.

Table 2.2: Macroeconomic indicators, 1997-2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Output										
GDP (bln. constant local currency)	409.1	425.2	445.1	466.2	494.3	431.6	473.9	498.8	521.8	546.5
GDP growth (annual %)	3.7	3.9	4.7	4.7	6.0	-12.7	9.8	5.3	4.6	4.7
Primary sector (share of total output, %)*	36.6	35.9	35.5	34.6	34.0	37.8	35.6	35.0	34.3	33.5
Secondary sector (share of total output, %)*	12.6	12.8	12.7	13.1	13.4	11.9	12.7	12.9	12.7	12.7
Tertiary sector (share of total output, %)*	50.8	51.3	51.8	52.3	52.6	50.3	51.7	52.2	53.0	53.8
Expenditures, inflation, lending, trade, and FDI										
Household consumption (% of GDP)	87.5	85.2	85.6	85.5	76.4	84.2	82.0	82.7	84.2	
Total consumption (% of GDP)	95.3	93.0	92.8	92.3	84.7	92.3	91.1	92.2	92.3	
Gross capital formation (% of GDP)	12.8	14.8	14.9	15.1	18.5	14.3	17.9	24.3	22.4	
Inflation (consumer prices, annual %)	4.5	6.2	9.9	12.0	6.9	15.9	-1.2	13.8	18.5	
Lending interest rate (%)	30.0	27.0	28.0	26.5	25.3	25.3	24.3	25.5	27.0	
Trade (% of GDP)	51.8	50.8	56.7	68.7	61.4	38.6	55.2	81.8	66.0	
Foreign direct investment (net inflows, % of GDP)	0.4	0.5	1.6	2.1	2.1	0.2	0.2	1.0		
Foreign direct investment (net inflows, current US$)	14.0	17.0	58.0	83.0	93.0	8.0	13.0	45.0		

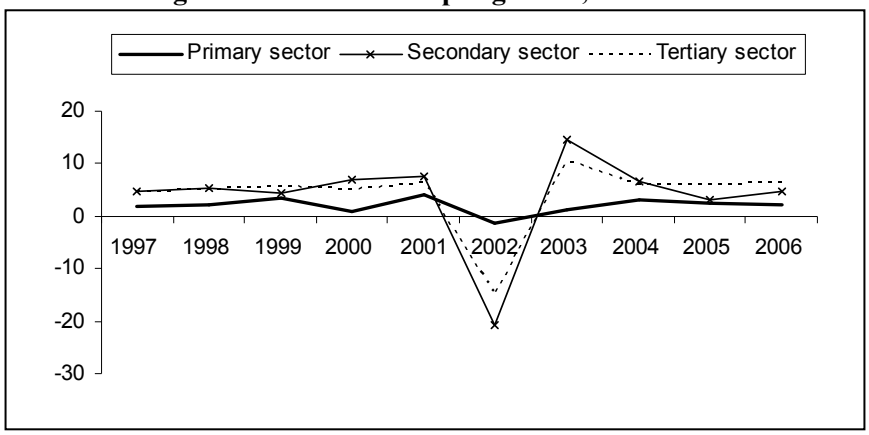
Source: Output data: Ministry of Finance and IMF Staff projections, World Bank calculations. Other data: WDI.
* Sectoral shares are expressed as share of total output from the three sectors.

In terms of sectoral output, the services sector is the most important sector in the Malagasy economy, accounting for more than half of total output. The primary sector produces around a third of output, while the remaining share, a mere 13 percent, is generated by the manufacturing sector. In terms of annual output growth, the manufacturing and services sectors have continuously outperformed the primary sector for more than a decade, with the exception of the crisis year 2002. Annual growth rates of the secondary and tertiary sectors averaged around 5 percent between 1996 and 2001, compared to only 2.5 percent for the primary sector. Consequently, the output shares of the secondary and tertiary sectors steadily increased, while the primary sector saw its relative importance, at least in terms of output, decline. Although the 2002 crisis temporarily interrupted this development (and the shares of the secondary and tertiary sectors fell back to pre-1995 levels in 2002), this trend seems to have picked up again in the past years. In 2006, the tertiary sector generated an estimated 53.8 percent of output, the primary sector provided 33.5 percent, while the secondary sector still produced only 12.7 percent. (See figure 2.1.)

The crisis had a particularly severe impact on the secondary and tertiary sectors. In 2002, output fell by 20.7 percent in the secondary, and by 15.0 percent in the tertiary sector. Both sectors also managed to rebound from the crisis relatively quickly, starting with 2003 growth rates of 14.5 percent in the secondary, and 10.6 percent in the tertiary sector. The primary sector, on the other hand, was only modestly affected by the crisis; primary sector output fell by only 1.3 percent in 2002. Although the post-crisis growth rates of the primary sector were also relatively modest, output had already returned to its

pre-crisis level in 2003. By 2006, four years after the crisis, the output level in all three sectors well surpassed the pre-crisis levels of 2001.

Figure 2.1: Sectoral output growth, 1997-2006



Source: Ministry of Finance and IMF Staff projections

THE LABOR MARKET

As is characteristic of many low income countries, labor force participation and employment rates are high in Madagascar. Those who were either working or actively looking for work accounted for 88.1 percent of the working age population[7] in 2005 (see Table 2.3). With over 97 percent of these individuals employed in some form or another, nearly 86 percent of the population held jobs. This was an increase of 4 percent from 2001, and 8 percent from 1999.

Employment is characterized predominantly by jobs that are either non-wage (85.1 percent) or agricultural (77.7 percent) or both (76.7 percent). Although non-wage employment rose by 3.4 percentage points between 2001 and 2005, the effect has been a return to 1999 levels. In the pre-crisis period, wage employment was growing at a rate faster than non-wage employment. Agricultural employment, however, rose persistently over the entire time period.

Naturally, the employment structure differs between urban and rural areas. Nearly 9 out of 10 working-age adults in rural areas are employed in primary activities, while services account for most of the remainder. In urban areas, on the other hand, services account for 46.9 percent of primary jobs, and industry 7.9 percent. Nonetheless, agriculture is also an important generator of urban employment (45.2 percent).

Wage employment in urban areas and among women increased in absolute terms (24.9 thousand and 34.6 thousand, respectively). Nonetheless, because non-wage employment grew at a much more rapid pace, their percentages of total employment fell (6.0 percentage points and 1.6 percentage points, respectively). Rural wage employment fell both absolutely (59.8 thousand) and relatively (2.8 percentage points), as did wage employment among men (69.6 thousand and 4.9 percentage points, respectively). Despite these trends, the number of rural individuals with wage jobs remains larger than that for urban

[7] Unless otherwise noted, the population under consideration is the working age population, which is defined as those between 15 and 64 years of age.

individuals (622 thousand compared to 616 thousand). Similarly, more men continue to be wage employed than women (750 thousand compared to 488 thousand).

Table 2.3: Basic labor market indicators for Madagascar, 1999-2005

Indicator	Level			Change (2005-2001)	
	2005	2001	1999	Absolute	Percent
Employment and unemployment					
Labor Force	88.1	83.5	80.2	4.6	6%
Employment-to-population ratio*	85.8	82.5	79.2	3.3	4%
Unemployment rate	2.6	1.2	1.3	1.4	113%
Child labor rate	18.8	24.3	26.4	-5.5	-23%
Women's Employment Rate	83.2	77.8	72.2	5.4	7%
Poverty rate among unemployed	42	44	61	-1.5	-3%
Wage and salaried workers					
Median monthly earnings**	71.5	88.1		-16.6	-19%
Earnings inequality (Gini)	0.45	0.49		0.0	-9%
Low earnings rate***	18.6	15.8		2.9	18%
Poverty rate	47	33	50	14.0	42%
Non Wage workers					
Median monthly earnings**	32.2	25.3		6.9	27%
Earnings inequality (Gini)	0.47	0.61		-0.1	-23%
Low earnings rate***	36.6	50.9		-14.3	-28%
Poverty rate	69	77	71	-8.3	-11%
All workers					
Median monthly earnings**	35.3	30.8		4.5	15%
Earnings inequality (Gini)	0.50	0.62		-0.1	-19%
Low earnings rate***	33.8	44.1		-10.3	-23%
Poverty rate	65	69	68	-4.0	-6%

* The individual is employed if he has a permenent job or he has worked at least 1 hour in the week prior to the survey

** Earnings levels for 2001 are expressed in thousands of MGA and divided by 0.6476 (= 197,720 / 305,300 = 2001 poverty line / 2005 poverty line) in order to make comparison between 2005 and 2001

*** Low earnings line: Official national poverty line 305,300 MGA per year for 2005

Most workers in Madagascar can be characterized as "working poor." Although unemployment more than doubled in post-crisis period (there was little change during the pre-crisis period), it remains low at 2.6 percent of the adult labor force. This measure, however, sends mixed information for low income countries such as Madagascar where unemployment can be viewed as a luxury afforded to those with the means to forgo income-earning employment while searching for "good" jobs.[8] As such, it is not surprising that the poverty rate among unemployed individuals is lower than for workers in general (41 percent and 65 percent, respectively).

[8] Indeed, it is unclear if an increase in unemployment in such a situation is a signal of deteriorating or improving conditions.

Despite improvements since 2001, job quality – as measured by earnings[9] – remains low. Median monthly earnings for all adult workers were Ariary 35,600 (approx. US$ 17). Although these earnings increased by 15 percent, the gains were not evenly distributed. Contrary to what might be expected, earnings in the non-wage sector rose 27 percent, while those of wage and salaried workers fell 19 percent. This does not imply that those in the non-wage sector are necessarily better off than they were in 2001. Given that earnings of wage and salaried workers remain more than double those of non-wage workers (Ariary 71,500 vs. Ariary 32,300, respectively), those individuals whose earning status shifted from wage to non-wage during this time period were strictly worse off as their earnings fell on average.

Just as the trends in median monthly earnings diverged for wage and non-wage workers, changes in the percentages with low earnings differed (i.e. monthly earnings below the national poverty line). For non-wage workers, the percentage with low earnings fell by 29 percent to 36.3 percent. Although the low earnings rate among wage workers is low compared to non-wage workers, it rose by 18 percent to 18.6 percent.

3. RELATING CHANGES IN OUTPUT WITH CHANGES IN EMPLOYMENT AND PRODUCTIVITY

COMPARING SECTOR OUTPUT AND EMPLOYMENT SHARES, AND THEIR CHANGES OVER TIME

Although, in 2005, the primary sector generated only 34.3 percent of total output, it employed 80.1 percent of the working adult population. This discrepancy between output and employment shares becomes even more pronounced when looking at agriculture as one of the sub-sectors of the primary sector in addition to forestry, cattle farming, and fisheries. The agricultural sub-sector employs almost all of those working in the primary sector (97.0 percent), but only represents 16.1 percent of GDP. By contrast, the tertiary sector accounts for more than half of output (53.0 percent), while employing only 17.4 percent. Finally, the secondary sector generates 12.7 percent of total output, and employs a mere 2.5 percent of the working population. The differences in the shares of output and employment that each sector accounts for, leads to the assumption that there are substantial differences in labor productivity between the sectors, with particularly primary sector productivity falling far behind that in the other sectors. Observed differences in average output per worker between the sectors support this assumption

Table 3.1 below illustrates the differences in sectoral output and employment shares in the years 1999, 2001, and 2005. In the pre-crisis period under review (1999-2001) the secondary and, to a lesser extent, tertiary sectors gained ground in terms of output shares, at the expense of the output share of the primary sector. The secondary sector was in this period also clearly increasing the share of workers it absorbed, although its share in total employment was still only 6.8 percent in 2001. The success of the secondary sector was to a large extent driven by the textiles and leather industry, in combination with strong growth in the output share of the mining sector, and employment growth in the agro, food, and wood industries. The secondary sector was hard hit by the crisis, however, particularly in terms of employment. Between 2001 and 2005, the share secondary sector workers dropped by almost two thirds, to 2.5 percent. Despite a 14 percent increase in the working age population in this period, the number of persons working in the sector fell by more than half. The employment share of the tertiary sector decreased as well, albeit not as dramatically as in the secondary sector. As a result of the large influx of workers from industry and services into agriculture, the primary sector saw its share in total employment increase by more than 6 percentage points. In combination with the increase in the working age

[9] The analysis here is limited to the 2001-2005 period due to the lack of comparable earnings data in the 1999 EPM survey.

population, the total number of persons active in the primary sectors rose by almost 30 percent in this four year period. The substantial changes in sectoral employment shares, while changes in output shares remained fairly modest, hint to fairly substantial changes in relative productivity of the sectors – an assumption which is confirmed when reviewing relative changes in sectoral average output per worker between 2001 and 2005.

Table 3.1: Sectoral shares of output and employment (total, poorest quintile), 1999-2005

	Primary			Secondary			Tertiary		
	1999	2001	2005	1999	2001	2005	1999	2001	2005
Output	35.5	34.0	34.3	12.7	13.4	12.7	51.8	52.6	53.0
Employment:									
- Total	74.6	73.9	80.1	5.6	6.8	2.5	19.8	19.3	17.4
- Poorest quintile	83.1	95.1	92.0	3.5	1.7	0.7	13.4	3.2	7.3

Source: Ministry of Finance and IMF Staff projections, World Bank calculations from HHS data.
Poverty data based on national poverty line.

Table 3.1 also includes information on the sectoral distribution of the poorest quintile of workers.[10] The share of the poorest workers who are active in the primary sector is even larger than the share of overall workers in this sector. In 2005, only 8.0 percent of the poorest workers were active in either the secondary (0.7 percent) or the tertiary (7.3 percent) sector. Furthermore, the changes in the sectoral employment shares of the poorest workers that occurred between 1999 and 2001, and between 2001 and 2005, are quite different from those of the overall working population. When comparing 2001 to 1999, modest declines in the share of both output and total employment in the primary sector, were accompanied by a substantial increase of 12 percent-points of the share of poorest workers in this sector. The opposite occurred in the secondary sector, where output and employment shares rose (by 5 percent and 23 percent, respectively), while the share of the poorest workers fell by more than half. In the tertiary sector, the share of poorest workers employed in the tertiary sector fell by three quarters, despite only minor changes in sectoral output and employment shares.

The picture that emerges concerning employment of the poorest is thus that in the pre-crisis period from 1999 to 2001, the share of poorest workers who were active in the primary sector increased substantially (and fell substantially in the other sectors), even though the primary sector's share in overall employment decreased. From 2001 to 2005, the share of poorest workers active in the primary sector fell, despite the substantial increase in total employment in this sector, while the share in the tertiary sector more than doubled. A similar pattern occurs when changes in sectoral employment of all poor workers (instead of just the poorest quintile) are reviewed. When roughly equating the primary sector with rural regions, and the secondary and tertiary sectors with urban areas, these developments seem to correspond with observed changes in poverty rates: rural poverty increased between 1999 and 2001, and fell in 2005 (corresponding with first an increase, and then a fall in the share of the poorest working in the primary sector), while urban poverty rates first sharply declined, and subsequently increased again (matching an initial fall in the share of the poorest in the secondary and tertiary sectors, followed by an increase in these shares).

[10] A worker is considered to be poor if s/he resides in a household where household income per capita is below the national poverty line.

CHANGES IN GDP PER CAPITA: THE CONTRIBUTIONS OF PRODUCTIVITY, EMPLOYMENT, AND DEMOGRAPHIC CHANGE

The question arises how changes in output and employment relate to changes in GDP per capita. An indication of the extent to which changes in output per capita are associated with changes in output per worker, and/or changes in employment can provide useful guidance in policy discussions, particularly at a time when a changing demographic structure is expected to substantially increase the pool of available labor. To increase our understanding of the relative contributions of productivity, employment, and demographics to changes in GDP per capita, we decompose changes in output per capita into changes in productivity, employment, and demographics, as depicted in the below identity.

$$\frac{Y}{N} = \left(\sum_{i=1}^{S} \frac{Y_i}{E_i} \frac{E_i}{A} \right) * \frac{A}{N}$$

In this equation, Y is total output, Y_i is the value added of sector $i=1 \ldots S$, E_i is the number of (adult) workers in sector i, A is the working age population, and N is total population. Y/N, therefore, is equal to GDP per capita, and Y_i/E_i reflects productivity per worker in sector i. E_i/A_i equals the share of the working age population employed in sector i, and is interpreted as a measure of employment in sector i. A/N, finally, is the share of the population that is of working age. This variable is therefore inversely related to the dependency rate. In a similar way as output per capita can be described as a product of productivity, employment, and a measure of the population structure, *changes* in output per capita can be described as changes of these variables. The marginal contribution of each of these variables to observed changes in GDP per capita can subsequently be derived by using a Shapley decomposition (see Shorrocks, 1999).

The results of this decomposition for the economy as a whole, without distinguishing between the various sectors, are illustrated in figure 2.1. In the overall period between 1999 and 2005 (figure 3.1a), annual GDP per capita fell by approximately MGA 16,000, or 3.6 percent. The fall in output per capita was accompanied by a substantial decline in output per worker, and occurred despite the positive contributions to GDP per capita of both the increase in employment, and of the share of adults in the population. The interpretation of the results of the Shapley decomposition is that if there had not been an increase in both the share of adults in the population (A/N), and the share of working adults (E/A), then changes in output per capita would have been similar to the contribution of changes in productivity. In other words, had employment and dependency rates not changed, then the fall in GDP per capita would have been similar to the negative contribution of productivity changes, equaling almost MGA 60,000, or 13 percent, between 1999 and 2005. Similarly, if output per worker had remained constant in this period, then GDP per capita would have increased by more than MGA 41,000 (or 8.6 percent), and this increase would have been largely associated with a rise in the share of workers among adults (MGA 35,000), and to a lesser extent with the growth of the share of adults in the population (MGA 6,000).[11]

Figures 3.1b and 3.1c illustrate the results of similar decompositions for the pre-crisis period (1999-2001), and the period which includes the crisis (2001-2005). The contributions of changes in employment are positive and fairly similar in both periods. The steady decrease in the dependency rate, and thus the rise in the share of adults in the population, also ensures a modest positive contribution in both periods. The large differences in changes in output per capita between the two periods are therefore largely associated with substantial differences in the contributions of changes in productivity. While productivity was already falling in the pre-crisis period, the negative contribution of these changes was relatively small, and was thus easily offset by the positive contributions of employment and demographic

[11] Note that no causal relationship between any of the variables is identified through the decomposition.

Figure 3.1 Aggregate contributions to changes in GDP per capita (1999-2001-2005, Ar. x1000)

Figure 3.1a: 1999-2005

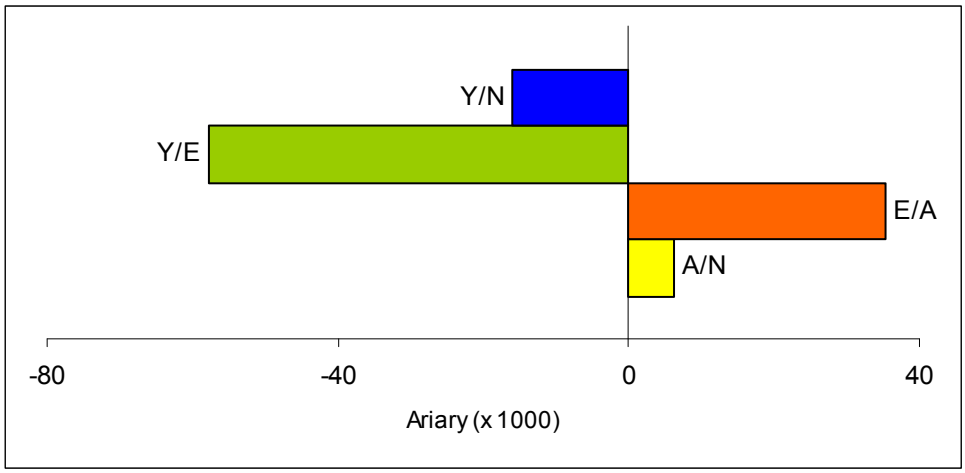


Figure 3.1b: 1999-2001

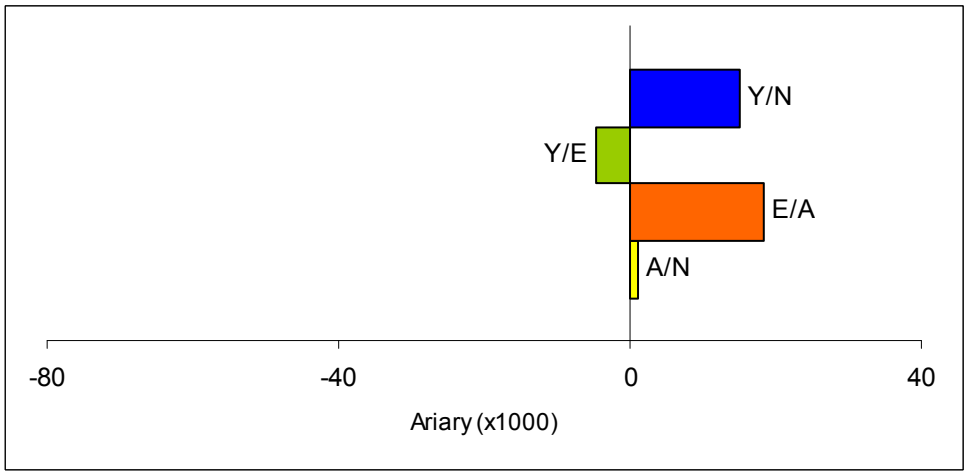
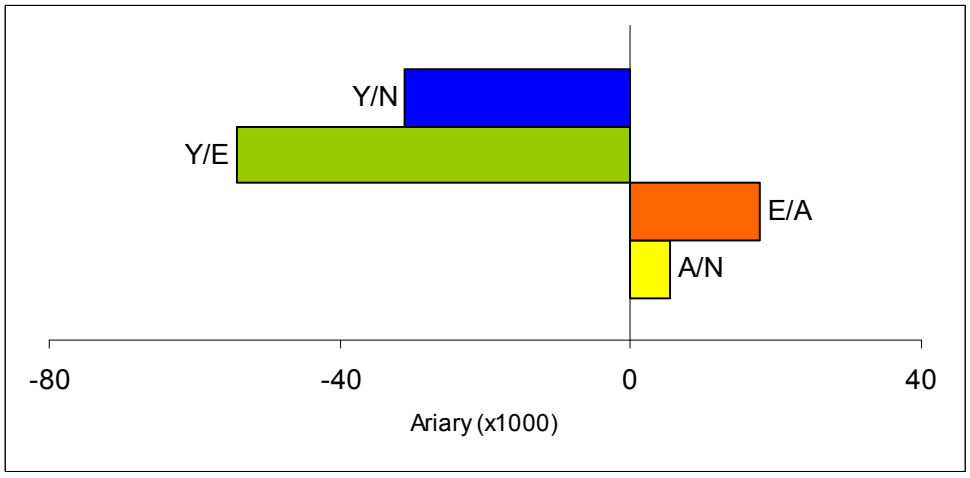


Figure 3.1c: 2001-2005



Source: Ministry of Finance and IMF estimates, HHS

changes. In the period from 2001-2005, however, the fall in productivity was so significant that it was not compensated by the positive impact of the other variables, and is therefore associated with the reduction of GDP per capita.

An analysis of sectoral contributions during the two sub-periods shows that during the pre-crisis period, both the secondary and tertiary sectors contributed positively to the observed growth in GDP per capita. Only in the case of the tertiary sector was this due to both an increase in employment and in output per worker. In the secondary sector, productivity fell in this period, but the negative contribution to GDP per capita growth was offset by the positive impact of employment growth in this sector. In the primary sector, a fall in productivity occurred simultaneously with an increase in employment. However, in this case, the impact of the fall in output per worker was not offset by that of the employment increase, resulting in an overall negative contribution of this sector. (Table 3.2, Figure 3.2.)

Table 3.2: Sectoral contributions to GDP per capita in two sub-periods (Ar. x1000)

	1999-2001	2001-2005
GDP per capita	15.0	-31.1
Primary Sector	-2.0	-11.2
Secondary sector	4.7	-7.8
Tertiary sector	11.1	-17.4
Demographics (A/N)	1.1	5.3

In the period form 2001-2005, none of the sectors contributed positively to GDP per capita growth. The underlying reasons for these negative contributions differed substantially per sector. In the primary sector, the substantial influx of workers resulted in a fairly considerable positive contribution of the employment variable, but most likely also contributed to the substantial fall in output per worker. The opposite occurred in the secondary sector, where a massive departure of workers can be assumed to have been closely linked to the almost equally substantial positive contribution of the increase in productivity. In the tertiary sector, both employment and productivity fell. Even though the contributions of both variables, and particularly productivity, were fairly modest, they were both negative and therefore enforced each other, rather than offsetting each other as occurred in the other sectors in this period. As a result, the overall negative contribution of the tertiary sector was more significant than those of the other sectors, even though these latter sectors experienced much more pronounced changes in both employment and productivity.

Figure 3.2 Sectoral contributions to changes in GDP per capita. 1999-2005

Figure 3.2a: Primary sector

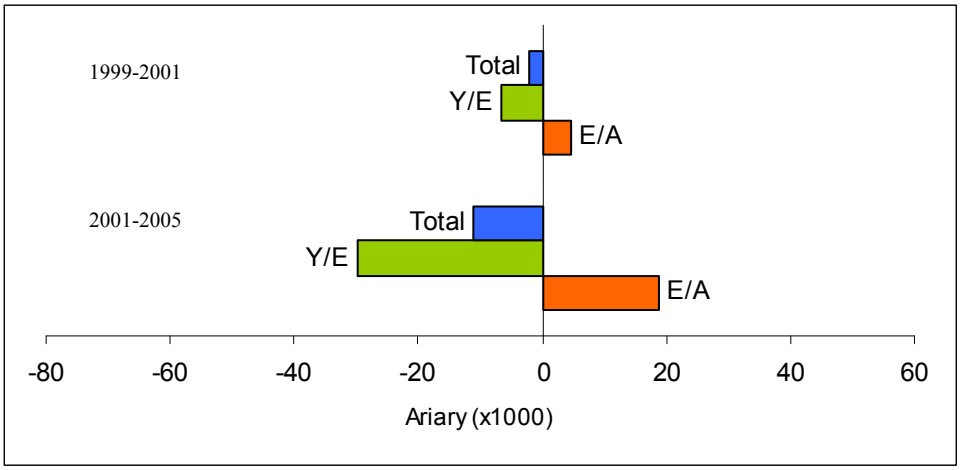


Figure 3.2b: Secondary sector

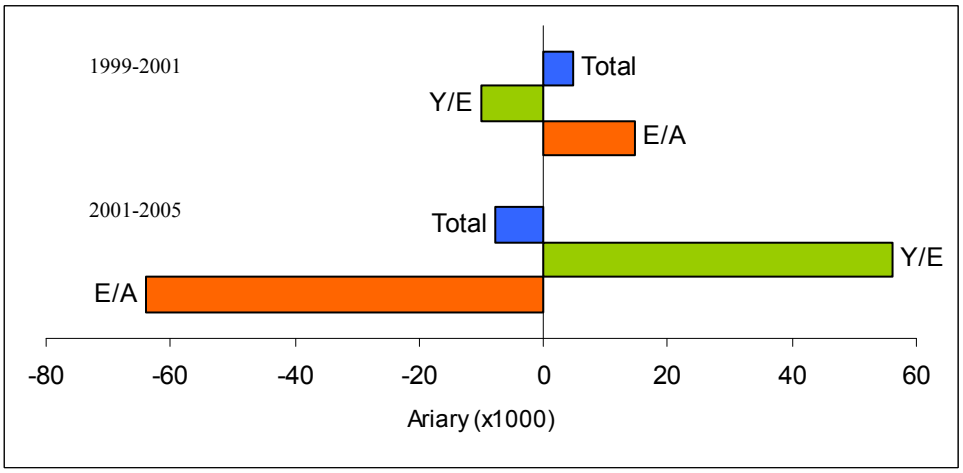
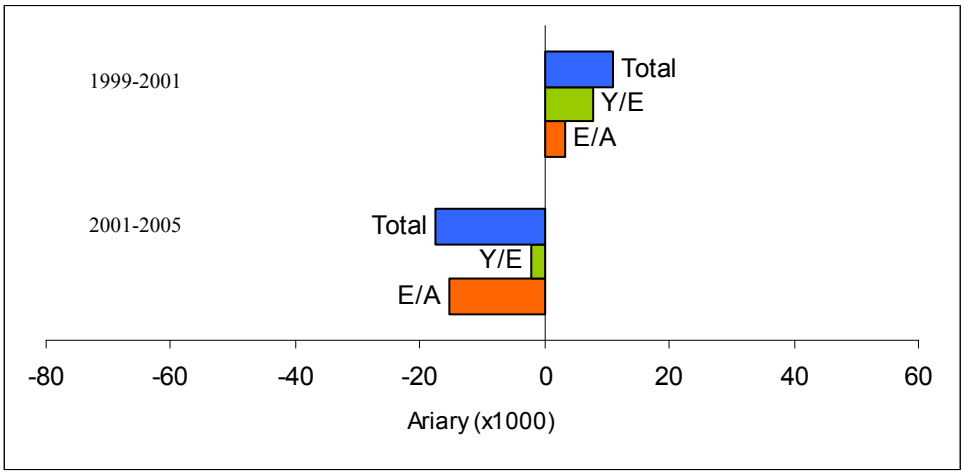


Figure 3.2c: Tertiary sector



Source: Ministry of Finance and IMF estimates. HHS

4. RELATING AGGREGATE AND SECTORAL PRODUCTIVITY WITH INDIVIDUAL EARNINGS

The first step in tracing the effects of aggregate indicators of economic performance to poverty through labor is to address the relationship between these indicators and individual labor earnings. Thus in this section we ask the following question: "How do the changes in aggregate and sectoral productivity and employment translate into individual earnings as evidenced by the household survey data?"[12] The relationship between these two indicators is of relevance because earnings are a close individual-level analog to productivity as measured in the national accounts data. Although earnings are directly related to individual productivity in the presence of competitive markets, the presence of market failures that plausibly characterize the economy[13] suggest that this is not the case in Madagascar. A comparison of productivity indicators derived from aggregate data, and individual-level earnings data from the HHS could, in principle, shed some light on the existence and nature of market failures. As we will see below, the comparison can also provide insights in the nature and extent of compatibility issues between the micro and macro data, rather than of market functioning – which also helps us to gain a better-informed picture of productivity, employment and earnings.

Whereas the analysis in the previous section focused on changes in aggregate and average variables, household survey data permit us to also take distributional issues into account. This will allow us to explore the linkages between employment, earnings, and poverty (in section 5). In this section, 'looking beyond the averages'[14] will help us to reconcile some of the messages on productivity changes from the previous section, with data on individual-level labor earnings as derived from household surveys.

Table 4.1 presents mean and median monthly labor earnings for all workers and for workers in each of the economic sectors. Consistent with the 11 percent fall in aggregate productivity, average monthly earnings fell by 20 percent between 2001 and 2005. However, at first glance, the changes in sectoral earnings do not appear to be entirely consistent with the changes in sectoral productivity measured using the national accounts data. For example, productivity in the primary sector fell during this period while earnings rose. Further, the very substantial increase in productivity in the secondary sector is not reflected in higher earnings in this sector (mean earnings fall by 30.3 percent).

Before exploring the linkages between changes in sectoral productivity and sectoral earnings, we note the difference in mean and median earnings in table 4.1. In 2005, median monthly earnings (Ar 35,300 per month, approximately US$ 17.65), were even lower than mean monthly earnings (Ar 55,500, or around US$ 27.75). The earnings distribution is thus skewed, with median earnings representing the earnings of the 'middle' worker, while mean earnings reflect those of workers at around the 70th percentile of the 2005 earnings distribution. As in the previous section productivity was defined as the output of the average worker, changes in that variable may thus be best compared with changes in mean earnings. Median earnings, on the other hand, help explain distributional and poverty related matters. For instance, as noted in Table 2.3, earnings inequality fell as measured by the Gini coefficient. This describes the distribution of earnings becoming less dispersed, which in this case is consistent with those at the

[12] The analysis here is limited to the 2001-2005 period due to the lack of comparable earnings data for 1999.

[13] Such market failures are likely due to high transaction costs (Stifel and Minten, 2000), an inefficient financial sector, and non-separable household decision making (Singh, Squire and Strauss, 1986). Further, in family enterprises, labor earnings may be shared among household members rather than distributed according the marginal product of labor (Lewis, 1953).

[14] Ravallion (2001) notes that, "The poor typically do share in the benefits of rising aggregate affluence, and they typically do suffer from economic contraction. However, there is a sizable variance around the 'typical' outcomes for the poor. One source of variance is that 'economic growth,' as measured in the national accounts, is not always reflected in average household living standards as measured in surveys, at least in the short run."

lower and middle portions of the distribution experiencing increases in earnings (e.g. rising median earnings), while the earnings of those at the upper end of the distribution fall (e.g. falling mean earnings).

Table 4.1: Monthly Labor Earnings by Sector

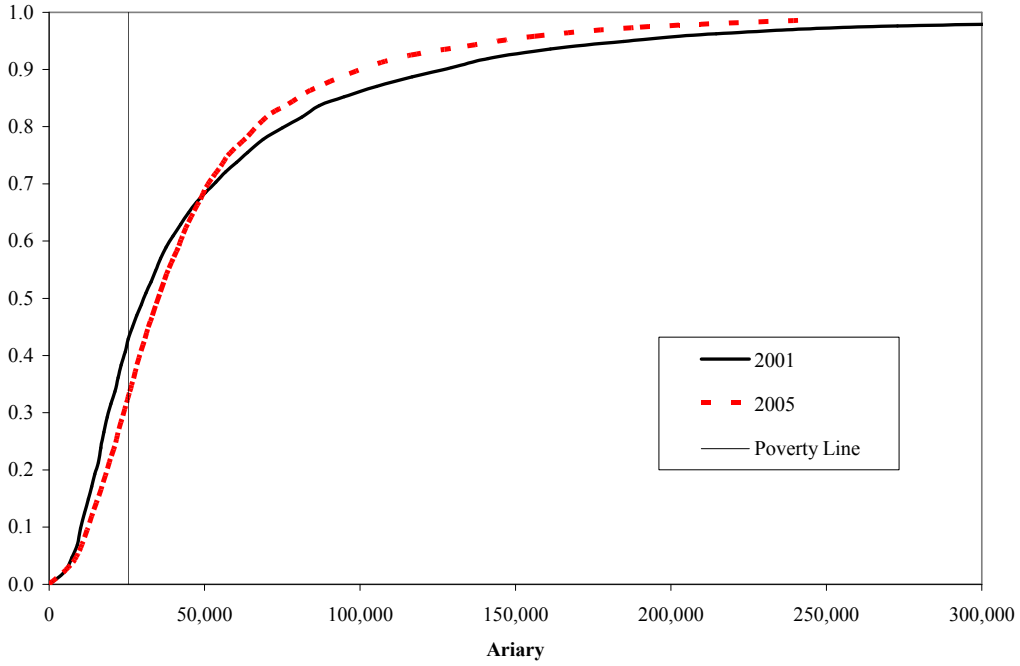
Thousands of	Mean			Median		
2005 Ariary	2001	2005	% Diff	2001	2005	% Diff
Primary	33.8	39.7	17.6	24.2	31.6	30.3
Secondary	148.1	103.2	-30.3	83.6	80.0	-4.4
Tertiary	177.6	118.4	-33.3	92.6	72.3	-22.0
Total	***69.4***	***55.5***	***-20.0***	***30.8***	***35.3***	***14.6***

Source: Authors calculations from EPM data

The compression of the distribution of earnings in Figure 4.1 illustrates this decrease in labor earnings inequality. Monthly earnings for all workers rose for those up to approximately the 67th percentile (the 2005 distribution is to the right of the 2001 distribution up to this point), while they fell for the 33 percent of the workers with the highest earnings.[15] In the individual sectors, both mean and median earnings either rise (primary sector) or fall (secondary and tertiary sectors). Note that both mean and median primary sector earnings fall below overall mean earnings, and secondary and tertiary sector earnings are greater. Thus, what appears to drive the compression of the earnings distribution is the combination of a fall in earnings among the higher-paid workers in the secondary and tertiary sector, combined with a rise in earnings of those lower-paid workers in the primary sector. Further, the magnitudes of changes in the sectoral earnings (greater fall for mean secondary and tertiary earnings, larger increase for median primary earnings) are consistent with an overall decrease in inequality in the earnings distribution.

[15] This does not imply that all individuals with higher earnings were necessarily worse off in 2005 than in 2001, nor that those with low earnings were better off. Since these distributions treat individuals anonymously, there is possibly (likely) some switching in the order of individuals. Further, these distributions are estimated using two cross-sectional datasets, the latter of which represents a larger number of workers due to population growth. Note that the poverty line in the figure illustrates the low earnings rates reported in Table 1.3.

Figure 4.1: Distributions of Monthly Earnings in Madagascar



Source: Authors calculations from the EPM data.

Primary sector

Turning to the linkages between sectoral productivity and earnings, how can the increase in primary sector earnings (17.6%) be reconciled with the fall in aggregate labor productivity of approximately equal extent in this sector? We assume that a number of compatibility issues are at play, which exacerbate both the fall in productivity (output) in the aggregate data, and the rise in mean (and median) individual-level earnings.

First, primary sector output may have been underestimated in the 2005 national accounts data. One reason to assume this is that estimating aggregate output of the primary sector is an inexact science that is based largely on projections which tend to smooth annual fluctuations. Given the positive correlation between individual earnings and household consumption, and between household consumption levels and remoteness (Stifel and Minten, 2000), the national accounts may have particularly missed increases in primary sector output of the poorest (most remote) households in 2005. Figure 4.2a, reflecting the distributions of monthly earnings of the primary sector and their changes over time, illustrates that earnings increases were more substantial among the lowest earners than among the best earners. Assuming that the former are mostly located in the more remote areas, this may be an indication that output increases in those areas – which are not assumed to have been fully captured in the national accounts data – were also more substantial than those in less remote areas. This, in turn, could possibly be attributed to the public investments in rural infrastructure that have been made since 2001 which, among others, may have improved market access in remote areas. Another possible reason for the underestimation of 2005 primary sector output, is that changes in prices tend to be incorporated in national accounts data with some delay. Actual increases in rice prices may have therefore not yet been reflected in the national accounts, leading to an underestimation of primary sector output.

Second, it is possible that agricultural earnings were overestimated in the 2005 household survey data. Because of difficulties in estimating the value of agricultural production, agricultural non-wage earnings are estimated in the household survey data as a residual between household consumption on the one hand and non-agricultural non-wage earnings, wage earnings, non-labor earnings and net transfers on the other. A strong assumption of zero savings is made when we use this as an estimate of agricultural non-wage earnings. As such, one might argue that these earnings are overestimated in 2005 because the political crisis in 2002 and the ensuing economic disruptions forced households to dis-save in order to maintain their consumption levels for survival. As such, it is possible that the dis-saving that appears in the household consumption aggregate is incorrectly attributed to agricultural earnings. That the survey was conducted over three years after the crisis, however, reduces the strength of this concern.

Third, changes in earnings as derived from household surveys reflect distributional issues which do not occur in the national accounts output data, in which changes in output across sub-sectors are averaged. In the case of Madagascar, it is possible that the sluggish growth in primary sector output as measured in the national accounts data is a result of the 42 percent fall in high-value vanilla production partly offsetting the 28 percent increase in rice production during this period (FAOStat, 2007). Since a small portion of agricultural workers are involved in vanilla production (fewer than 2.5 percent) and a large portion produce rice (over 85 percent), the distribution of agricultural earnings in the household survey data is determined largely by the outcomes for rice producers, not by vanilla producers. Further, because rice workers account for the majority of agricultural workers the household survey is more likely to be representative of them, rather than vanilla workers.[16] As such, the increases in both mean and median labor earnings – and the entire distribution – measured in the household survey likely represent increases in the production of rice (and other crops for which there were increases in production during this period; e.g. maize, cassava and fruit). Whereas the changes in primary sector output per worker in the national accounts averages changes in output across all of the sub-sectors.

Secondary sector

In the secondary sector, mean wages fell by almost one third between 2001and 2005, while average output per worker more than doubled, and the number of persons working in the sector decreased by more than half. We look for a rationale for this opposite direction of the changes in productivity and earnings by exploring the available micro data on secondary sector workers and their earnings.

In 2005, wage workers made up a substantially larger share of all secondary sector workers than in 2001 (77 percent in 2005, 59 percent in 2001), implying that workers that left the sector were most likely to have been self-employed and household enterprise workers. The increase in productivity as observed in the aggregate data may thus not only be explained by workers leaving the sector while output remained fairly constant, but perhaps also because of the increased share of waged workers, which could be more productive than self-employed and household enterprise workers. Although the share of self-employed in secondary sector employment dropped from 14 percent to 5 percent, median earnings in this sector for the self-employed were almost 70 percent higher in 2005 than they were in 2001. This leads to the hypothesis that the most productive self-employed remained in the sector, while others moved to, most likely, the primary sector.

Although these observations provide some further insight in the reasons for the sharp increase in productivity, it does not explain the fall in earnings. While mean secondary sector earnings fell by more than 30 percent, median earnings fell by less than 5 percent, reflecting that mostly those at the top of the secondary sector income distribution saw their earnings fall. As can also be seen in figure 4.2b, changes in median earnings for the lowest earning quintiles in the secondary sector where ambiguous, and much less pronounced. Considering the importance of the share of waged workers in this sector, and taking into

[16] There were only 200 households out of a sample of 11,781 that reported producing vanilla.

Figure 4.2: Distributions of Monthly Earnings by Sector

Figure 4.2a: Primary Sector

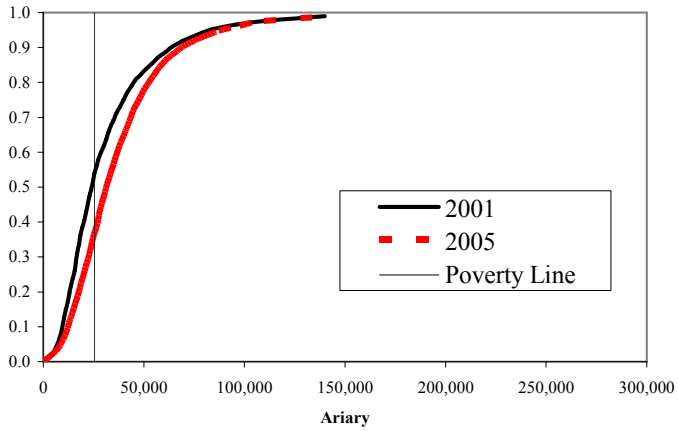


Figure 4.2b: Secondary Sector

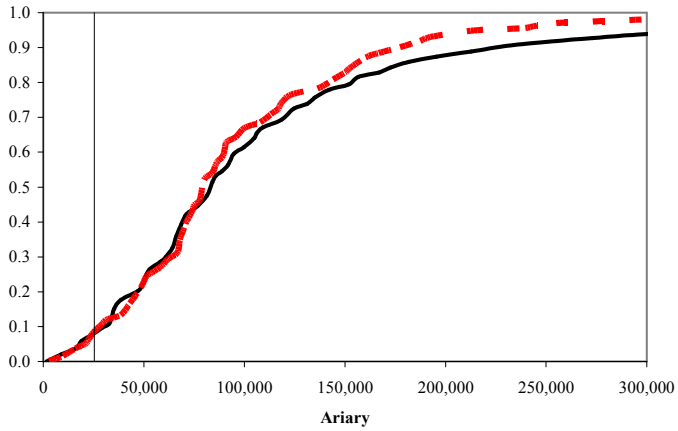
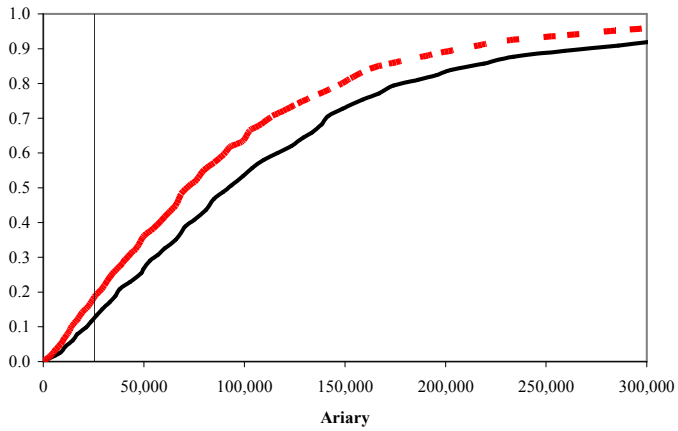


Figure 4.2c: Tertiary Sector



account that median earnings of waged workers fell by only 8 percent, it seems likely that also in the waged sector, the highest paid workers experienced a relatively substantial loss of earnings. One explanation may be that the only enterprises that managed to weather the crisis were those that were either paying lower wages in the first place, or reduced them during the period under observation.

Tertiary sector

The tertiary sector saw a sharp reduction in mean earnings, even though average output per worker hardly changed. Unlike in the secondary sector, there were no significant differences in earnings changes between the different earnings quintiles (hence, changes in mean and median earnings changes are fairly similar), nor were there substantial shifts in the shares of waged, self-employed and household enterprise workers. We are this faced by a sector which shed workers, where the remaining workers remained as productive as they were, but where individual earnings fell substantially.

We explain the decrease in earnings at constant productivity in the context of the relative level of tertiary sector earnings compared to those in the other sectors. In 2001, each identified category of workers in the tertiary sector (waged, self-employed, household enterprise worker) earned more than workers in the similar category in the other sectors. Median earnings for secondary sector waged and self-employed workers, were 13 percent (waged workers) to 60 percent higher than for same-category workers in the secondary sector. As sectoral employment reduced, workers are assumed to have accepted a decrease in earnings at least for as long as no equally profitable opportunities existed outside the sector. This assumption is supported by the convergence of the earnings of waged workers in the secondary and tertiary sectors – in 2005 the difference in median earnings of waged workers between the sector and tertiary sector had been reduced to less than 5 percent.

5. LINKING EMPLOYMENT AND EARNINGS WITH POVERTY

We now take the next step and use the household survey data to examine the links between employment and labor earnings on the one hand and poverty on the other. It is worth noting that in doing so, we switch gears in an important way in that the unit of analysis is no longer an individual worker (or a representative worker). Rather, because poverty is measured at the household level, households in which workers reside are now the unit of analysis. Further, because many labor allocation decisions in low income countries like Madagascar are made at the household level as part of the households' livelihood strategies (Behrman, 1999; Singh, Squire and Strauss, 1986), any effort to establish a link between labor market outcomes and poverty must view those outcomes in the context of the household.

The analysis here is done in two ways in an effort to complement the macro-level analyses from Section 2. First, we analyze the structure of household earnings and employment by economic sector (primary, secondary, and tertiary) and assess their effects on changes in poverty. Second, similar to the Shapley decompositions in Section 2, we examine the components that make up household labor income such as hourly earnings, hours worked and employment levels. We then simulate the effects that the observed average changes in each of these components may have on poverty.

SECTORAL EMPLOYMENT, EARNINGS AND POVERTY

We begin by examining the sectoral sources of household earnings. Table 5.1 shows the percentages of household earnings that can be attributed to employment in the primary, secondary and tertiary sectors, as well as to non-labor income and to transfers. These figures represent averages over the entire nation, as well as for each of the expenditure quintiles.

The primary sector accounts for the lion's share of household earnings in Madagascar. The average household acquires 70.7 percent of its total earnings from primary activities. Further, since

agriculture makes up the bulk of these activities, 68.0 percent of total earnings come from this subsector. The second largest source is from tertiary sector activities (21.4 percent). The secondary sector accounts for 3.5 percent of household earnings.

Consistent with the employment shifts into agriculture described in Section 1, primary activities have become a more important source of household earnings while secondary sector earnings have fallen. In 2005, earnings from the primary sector accounted for 6.0 percentage points more of total household earnings on average than in 2001 (64.8). At the same time, secondary sector employment contributed 4.4 percentage points less to total household earnings. On average, there was little change in the share of earnings attributed to the tertiary sector.

Tab 5.1: Structure of Household Earnings

Percent of household income from…

	Primary	Secondary	Tertiary	Non-Labor Earnings	Transfers	*Total*
2005	***70.7***	***3.5***	***21.4***	***0.7***	***3.7***	***100***
Poorest	81.0	1.9	12.6	0.5	4.0	*100*
Q2	77.1	2.1	17.8	0.5	2.5	*100*
Q3	76.2	3.0	16.9	1.0	2.9	*100*
Q4	68.8	3.6	23.0	1.0	3.7	*100*
Richest	50.6	6.8	36.6	0.4	5.5	*100*
2001	***64.8***	***7.9***	***21.9***	***1.0***	***4.5***	*100*
Poorest	87.2	3.0	5.4	0.2	4.3	*100*
Q2	82.4	4.3	8.4	1.1	3.7	*100*
Q3	73.3	5.0	16.0	1.9	3.8	*100*
Q4	56.7	10.7	27.0	1.2	4.3	*100*
Richest	23.7	16.5	52.9	0.4	6.5	*100*
Difference (% points)	***6.0***	***-4.4***	***-0.5***	***-0.3***	***-0.8***	
Poorest	-6.2	-1.1	7.2	0.3	-0.3	
Q2	-5.3	-2.2	9.4	-0.7	-1.2	
Q3	2.9	-2.0	0.9	-0.8	-1.0	
Q4	12.1	-7.1	-4.1	-0.3	-0.7	
Richest	26.9	-9.7	-16.2	0.0	-1.0	

These average changes mask important differences in distributional levels and changes in the composition of household labor income. For example, poor households are more dependent on primary sector activities as a source of earnings than are non-poor households. 81.0 percent of earnings for households in the poorest quintile derive from primary activities, while 'only' 50.6 percent for those in the richest quintile come from this sector. Those in the richest quintile also earned considerably more from secondary (6.8 percent) and tertiary activities (36.6 percent) than the poor (1.9 percent and 12.6 percent, respectively).

As observed in the changes in individual earnings in Table 3.2, the structure of household earnings changed in different ways for poor and non-poor household between 2001 and 2005. Although median earnings rose for primary sector workers in the poorest quintiles, this sector has become a less

important source of earnings for poor households (falling by 6.2 and 5.3 percentage points for the two poorest quintiles, respectively). At the same time, tertiary activities have become more important, rising by 7.2 and 9.4 percentage points for the two poorest quintiles, respectively. Conversely, richer households have become substantially more dependent on primary activities as earnings from both the secondary and tertiary sectors fell. For example, the share of earnings derived from the primary sector for the richest quintile rose by 26.9 percentage points to represent over half of household earnings. These developments may be explained by changes in the geographic composition of households in the various income quintiles. As rural poverty fell and urban poverty increased between 2001 and 2005, the poorest quintiles in 2005 likely contained more urban households than in 2005, which would be less dependent on primary sector income. Similarly, there are assumed to be more rural households in the better-off quintiles in 2005 than there were in 2001.

This confirms the decrease in both employment and earnings in this sector, earnings from the secondary sector fell as a share of total income for all quintiles, though households in the two richest quintiles were hit the hardest.

In an effort to make the link between household sectoral earnings and poverty, we decompose changes in poverty between 2001 and 2005 into those components that can be attributed to changes in poverty within the sectors, and to movement among the sectors (as in Ravallion and Huppi, 1991). We illustrate this decomposition, proposed by Ravallion and Huppi (1991), for three sectors (primary, secondary, tertiary). By applying an additively separable poverty measure[17], P, to two distributions of household consumption over time (years 1 and 2), difference in national poverty for this time period can be broken down into three general components:

$$P^2 - P^1 = \sum_{s=1}^{3} (P_s^2 - P_s^1) n_s^1 + \sum_{s=1}^{3} (n_s^2 - n_s^1) P_s^1$$

Intrasectoral effects: Change in poverty arising from within sector poverty changes

Intersectoral effects: Change in poverty arising from employment/earning shifts

$$+ \sum_{s=1}^{3} (P_s^2 - P_s^1)(n_s^2 - n_s^1)$$

Interaction between sectoral changes and population shifts

where P_s^t is the poverty measured in sector s at time t, and n_s^t is the population share of sector s at time t. The first component, the intrasectoral effects, shows how changes in poverty in each of the sectors contributes to the aggregate change in poverty. The second component is the contribution of changes in the distribution of the population across the sectors sectors. Ravallion and Huppi (1991) note that the final component can be interpreted as a measure of the correlation between population shifts and changes in poverty within the sectors.

To relate the changes in earnings and employment in the primary, secondary and tertiary sectors to poverty, we apply this decomposition to changes in these sectors. Because the analysis is done at the household level, households must be assigned to a sector. But because households have multiple sources of income (see Table 5.1), this is not straightforward. Two approaches are adopted here. First, households are assigned to a sector if more than half of the workers in the household were employed in

[17] The Foster, Greer and Thorbecke (1984) measures, P_α, are a class of such additively separable poverty measures. In this analysis, we use the headcount ratio (P_0) and the depth of poverty (P_1)

that sector. Second, households are assigned to a sector if more than half of the total household labor income derives from that sector. In both cases, there are households for which employment/income is distributed across all three sectors in such a way that they are not associated mainly with any of the three sectors. These households, along with those with no labor income, are categorized as other. The results appear in Table 5.2.

Aside from the intra-sectoral effects attributed to the secondary sector, the two classification methods produce similar results. Further, the directions of the various effects are similar for both the incidence (headcount ratio) and depth of poverty measures, though the relative magnitude of the contributions is always higher for the incidence.

The decrease in poverty between 2001 and 2005 appears to be due largely to fall in poverty within the primary sector. In the absence of employment shifts between the sectors, national poverty would have fallen by approximately 6.5 percentage points due only to the decrease in poverty among households in the primary sector.

The employment shift out of the secondary and tertiary sectors into the primary sector following the 2002 crisis is reflected in the rising shares of the population living in primary sector households. For example, the percentage of the population living in households with more than half of the household workers employed in the primary sector rose from 67.4 to 75.5 percent. Similarly, the share living in households in which more than half of earnings came from this sector rose from 66.5 to 73.4 percent. As more households become more dependent on primary sector employment/earnings, the sector accounts for a greater percentage of the poor. This is seen by the positive and large inter-sectoral effect. With poverty rates highest in the primary sector, it is not surprising that national poverty would rise substantially as more workers are employed in this sector and when we hold these sectoral poverty rates constant.

The opposite is observed for the tertiary sector where poverty within the sector has risen (positive intra-sectoral effect). But because employment in this sector has fallen (15.6 percent live in households with more that half of the workers in the tertiary sector in 2005 compared to 17.5 percent in 2001), and in particular a portion of the poor have left, this sector contributed marginally to a fall in national poverty as seen by the small positive inter-sectoral effect.

It is worth noting that although this decomposition is informative, it suffers from a weakness in that we cannot fully differentiate the sources of changes in income. For example, the decreased reliance on primary sector income for the poorest households does not lead to a shift in the household category since well over 50 percent of household income comes from the primary for these households. As such, the fall in the depth of poverty among households in this category that may actually be due to increases in tertiary sector income are attributed to improvements in the primary sector. With this in mind, we turn to other sources of household labor income.

Table 5.2: Decomposition of Changes in Poverty in Madagascar into Intra- and Inter-Sectoral Effects

				Intra-Sectoral Effects				Inter-Sectoral Effects				
	2001	2005	Diff	50% + Primary	50% + Secondary	50% + Tertiary	Other	50% + Primary	50% + Secondary	50% + Tertiary	Other	Residual Effect
Sectors defined by shares of HH workers												
Levels												
Incidence (P_0)	69.7	68.7	-1.0	-6.8	-0.4	3.1	0.1	7.0	-1.5	-0.5	-1.0	-0.9
Depth (P_1)	34.9	26.8	-8.1	-10.5	-0.3	1.2	0.1	3.7	-0.6	-0.2	-0.3	-1.2
Share of Total Change												
Incidence (P_0)			100.0	693.4	41.7	-314.0	-6.8	-711.7	156.9	52.3	100.6	87.5
Depth (P_1)			100.0	129.1	3.3	-14.3	-0.7	-45.7	7.3	2.0	4.2	14.8
Share of Total Population												
2001			100.0	67.4	5.9	17.5	9.3					
2005			100.0	75.5	1.6	15.6	7.4					
Sectors defined by shares of HH income												
Levels												
Incidence (P_0)	69.7	68.7	-1.0	-6.5	0.8	3.3	-0.2	5.9	-1.6	-0.3	-1.3	-1.1
Depth (P_1)	34.9	26.8	-8.1	-9.9	0.0	1.2	-0.1	3.1	-0.6	-0.1	-0.6	-1.0
Share of Total Change												
Incidence (P_0)			100.0	664.3	-77.2	-340.8	16.9	-598.2	160.0	28.9	132.2	114.0
Depth (P_1)			100.0	122.3	-0.3	-14.4	1.5	-38.0	7.9	1.3	7.1	12.7
Share of Total Population												
2001			100.0	66.5	7.5	21.8	4.2					
2005			100.0	73.4	3.5	21.0	2.1					

Note: Reference year is 2001

SOURCES OF LABOR INCOME AND THE LINK WITH POVERTY

In our second approach linking labor income to poverty, we start by decompose the changes in household labor income into components such as household average hourly earnings, hours worked and employment. We then use this decomposition as a basis for simulating changes in poverty. The decomposition of labor income is based on a methodology from Kakwani, Neri and Son (2006) which describes the average labor income profile of households. The starting point is to note that the average weekly labor income of household *j* can be written as:

$$\frac{I_j}{N_j} = \frac{I_j}{H_j}\frac{H_j}{E_j}\frac{E_j}{L_j}\frac{L_j}{N_j}$$

where I_j is total weekly labor income of the household, N_j is the number of household members, H_j is the total number of hours worked per week by household members, E_j is the number of household members who are employed, and L_j is the number of household members participating in the labor force. Using this terminology, we can define $i_j = I_j / N_j$ as average weekly household labor income (averaged over all household members). In the same way $w_j = I_j / H_j$ is the average earnings per hour worked, $h_j = H_j / E_j$ is the average hours worked per week by those employed, E_j / L_j is the household employment rate, and $l_j = L_j / N_j$ is the household participation rate. For simplicity, the above equation can be written as:

$$i_j = w_j\, h_j\, (1- u_j)\, l_j$$

where $(1- u_j)$ corresponds to the household employment rate which is rewritten as one minus the household unemployment rate (u_j). To analyze the source of changes, we take logs and average each of these components. The temporal differences in these averages provides us with the following:

$$\Delta\frac{1}{N}\sum_{j=1}^{N}\ln i_j = \Delta\frac{1}{N}\sum_{j=1}^{N}\ln w_j + \Delta\frac{1}{N}\sum_{j=1}^{N}\ln h_j + \Delta\frac{1}{N}\sum_{j=1}^{N}\ln(1-u_j) + \Delta\frac{1}{N}\sum_{j=1}^{N}\ln l_j\,.$$

Dividing this equation through by the left-hand side, we can see what portion of the average change in average household labor income is due to changes in household hourly earnings, hours worked, unemployment, and participation. These results appear in the bottom panel of Table 4.3.

There was a 15 percent increase in average household per capita weekly labor income between 2001 and 2005, from Ar 3,995 to Ar 4,599. This followed primarily from a 20 percent increase in average hourly earnings among household members. Indeed 138 percent of the increase total household earnings is explained by this increase in hourly earnings, offsetting both the fall in average hours worked (from 43.8 hours to 41.4 hours) as well as the rise in household unemployment (from 1.1 percent to 2.4 percent). Note that although there was an overall increase in the household participation rate, it appears that not all could find jobs.

Average household earnings rose in each of the poorest three quintiles (by 53.0 percent, 37.6 percent, and 18.1 percent, respectively). Meanwhile, they fell by 2.5 percent and 20 percent in the two richest quintiles, respectively. Interestingly, it was changes in hourly earnings that explain both the increase in total earning among the poorer households and the fall in total earnings among the richer households. Note that the rate of growth of hourly earnings falls from 76 percent for the poorest quintile to 26.9 percent for the middle quintile. It then turns negative for the fourth (-5.6 percent) and richest (-25.6 percent) quintiles. As such, changes in hourly earnings accounts for between 133.3 percent and 149.3 percent of the changes in total household per capita labor income.

Table 4.3: Household labor income profile

	Expenditure Quintile						Non	
Geometric mean across households	Poorest	Q2	Q3	Q4	Richest	Poor	Poor	Total
2005								
Average hourly earnings	152.5	224.3	258.1	312.6	506.2	216.0	432.6	267.2
Average hours worked per week by the employed	37.6	40.6	42.3	42.8	44.1	40.4	43.8	41.4
Household unemployment rate	1.5	1.4	1.9	2.3	4.7	1.6	4.1	2.4
Household participation rate*	36.7	38.6	41.9	45.0	48.5	39.6	47.5	41.9
Total household per capita weekly labor income	*2,090*	*3,551*	*4,578*	*6,039*	*10,345*	*3,465*	*8,727*	*4,599*
2001								
Average hourly earnings	86.6	146.6	203.3	331.2	680.0	152.2	546.3	222.3
Average hours worked per week by the employed	41.2	43.4	43.8	45.5	45.5	43.1	45.6	43.8
Household unemployment rate	0.3	0.8	0.7	1.2	2.7	0.7	2.2	1.1
Household participation rate*	38.1	40.4	43.3	41.5	42.8	40.9	41.9	41.2
Total household per capita weekly labor income	*1,366*	*2,581*	*3,876*	*6,196*	*12,924*	*2,681*	*10,297*	*3,995*
Percent Change								
Average hourly earnings	76.0	53.0	26.9	-5.6	-25.6	41.9	-20.8	20.2
Average hours worked per week by the employed	-8.9	-6.5	-3.4	-5.8	-3.1	-6.3	-3.9	-5.5
Household unemployment rate	484.5	63.1	177.3	90.3	71.5	122.6	89.2	105.7
Household participation rate*	-3.6	-4.4	-3.1	8.5	13.3	-3.0	13.6	1.8
Total household per capita weekly labor income	*53.0*	*37.6*	*18.1*	*-2.5*	*-20.0*	*29.3*	*-15.2*	*15.1*
Sources of Change in Labor Income (percent)								
Average hourly earnings	133.7	138.4	149.3	124.9	133.3	142.8	140.6	138.3
Average hours worked per week by the employed	-21.9	-21.9	-21.6	128.4	14.1	-26.7	24.1	-42.8
Household unemployment rate	-3.0	-1.8	-7.8	23.8	9.1	-3.6	11.9	-9.3
Household participation rate*	-8.8	-14.8	-19.9	-177.1	-56.5	-12.5	-76.6	13.8
*Total household per capita weekly labor income***	+	+	+	-	-	+	-	+

* Share of adult household member who are working or looking for work

** A "+" indicates that average labor income rose, while a "-" indicates that it fell between 2001 and 2005.

For households in all five expenditure quintiles, the average number of hours worked per week fell as the household unemployment rates rose. This contributed further to falling earnings among households in the two richest quintiles which were only offset by the increase in labor force participation among members of these households. Among the three poorest quintiles, the increases in unemployment and decreases in number of hours worked were compounded by decrease in average household participation rates, though their effect was only to dampen the positive effect of increased hourly earnings.

To better understand the effects of the components of household labor income on poverty, we simulate the effect of changes in mean household hourly earnings, hours worked and employment. To isolate the effect of changes in hourly earnings on changes in poverty, for example, we scale the average hourly earnings for each household in the 2001 data, so that in each expenditure quintile, the mean is equivalent to that observed in the 2005 data. We add the difference in total labor earnings that derive from this change in hourly earnings to household expenditures and calculate the new poverty levels. The difference in the simulated poverty and the original poverty levels is then attributed to changes in hourly earnings. This is also done for average household hours worked and percent of household members employed. The results of this simulation appear in Table 5.4.

Table 5.4: Simulated Changes in Poverty Due to Household Average Hourly Earnings, Hours Worked, and Employment

	2001	2005	Diff	Hourly Earnings	Hours Worked	Percent Employed	Other
Levels							
Incidence (P_0)	69.7	68.7	-1.0	1.0	1.5	-1.9	-1.7
Depth (P_1)	34.9	26.8	-8.1	-6.9	1.3	0.4	-3.0
Share							
Incidence (P_0)			100	-102.2	-156.7	189.8	169.1
Depth (P_1)			100	85.1	-16.3	-5.3	36.6

Note: Reference year is 2001

The effects of earnings and employment in the simulation depend on the type of poverty measure used, and are consistent with the previous analysis and the emphasis made here on distribution.

Consider the change in the incidence of poverty. Since a large percent of the population falls below the poverty line (68.7 percent in 2005), factors that affect the headcount ratio will necessarily affect those relatively better off households (i.e. those around the 70th percentile). As noted in Table 5.3, average hourly earnings fell for those households in the two richest quintiles. Thus the simulated changes in hourly earnings alone resulted in a decrease in labor earnings among these households and an increase in poverty of 1.0 percentage points.

The rise hourly earnings for those at the lower end of the distribution has little effect on the incidence of poverty as this measure of poverty is insensitive to changes in earnings among the poor. But it does affect the depth of poverty as this measure represents the average consumption shortfall in the population (i.e. the average of the poverty gaps). The 6.9 percentage point decrease in the depth of

poverty follows from the substantial increases in hourly earnings for households in the lowest three quintiles. The resulting increases in labor earnings for these households more than offsets the increase in the percent that are poor due to the fall in earnings among the better off households.

The opposite is observed for employment. The fall in employment among poorer household contributes to an increase in the depth of poverty, while a rise in employment (increase in household participation means an increase in household employment) among households in the top to quintiles translates into an decrease in the percent of households that are poor.

The combination of the sectoral decomposition of poverty and the simulated changes in poverty based on the components of household labor income, help us to formulate a larger picture of how changes in employment and earnings affect individuals in different types of households and how these changes manifest themselves in changes in poverty. For example, the fall in the poverty rate (headcount ratio) appears to be driven by households in the upper portion of the income distribution who rely more on agriculture as a share of their incomes and who escape poverty through more household members working.

Although the poorest 40 percent of the population remain poor, the depth of their poverty has fallen as a result of higher earnings. Interestingly, these higher earnings appear to be coming from earnings in the tertiary sector as they rely more on this sector as a source of household income. Although earnings in the tertiary sector have fallen overall, households with members who switch from low-paying agriculture to higher-paying non-farm employment will see a rise in household income even if they do not escape poverty entirely.

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