Gender, Time Use, and Labor Income in Guinea: Micro and Macro Analyses

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Introduction

Gender disparities in labor markets have important economic implications in sub-Saharan Africa. At least three different aspects of poverty and income generation can be related to the decisions made by various household members in terms of their allocation of time and their prospects for labor income. First, traditional consumption-based poverty is directly related to the earnings of household members as well as to household size. Increasing the earnings of women, either by closing the gender gap in earnings with men, or by facilitating the entry of women into the labor markets can thus be directly beneficial for household incomes and poverty reduction.

Second, relative power within households (including whether the household head or the spouse makes key decisions, either separately or jointly) also depends on the earnings of various household members and can have long-term effects on children. Typically, the less women are engaged in income-generating activities, the less influence they have on household decision making, and the less the household will invest in the human capital of children, which may reduce the likelihood that the children will be able to avoid poverty in the future as well as reduce prospects for income growth (Hoddinott and Haddad 1995).

Third, time poverty (working a larger number of hours than desirable) is also an important welfare measure, and it is the direct result of the decisions made within the household regarding the allocation of both domestic and productive work. For example, women tend to work much less in the labor market, but this is more than compensated by long hours of domestic work, so that they tend to be more time-poor (that is, a higher share of women than men work extra long hours; see Blackden and Wodon 2006).

In a microeconomic setting, standard regression analysis techniques can be used with household survey data to measure the likelihood of labor force participation, as well as the time spent on various household activities by different household members. The same techniques can be used to see how expected levels of earnings for women compare to those for men. Differences between men and women can then be analyzed using alternative

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decomposition methods, in order to assess the factors that drive differences in earnings and find out what remains unexplained[1]. Access to basic infrastructure services, such as electricity and water, is important here, because such access has a direct effect on the time allocation of household members, especially in Africa, as well as an impact on the productivity of labor. The first contribution of this paper is to summarize recent results from the analysis of household survey data in Guinea, with a focus on the differential in earnings between men and women who are already working, as well as the differences in time use by gender.

However, while standard microeconomic techniques can shed light on gender disparities, they do not typically provide insights into how broad structural shifts in the economy differently affect work opportunities for men and women. As noted by Nganou, Parra Osorio, and Wodon (2009), for any economic analysis that supposes the existence of general equilibrium feedback effects, a multisectoral approach is typically preferable to a partial, household-survey-based framework, because linkages among different parts of the economy are too complex to be considered in partial equilibrium models. In principle, applied general equilibrium analysis can be performed using econometric methods (Jorgenson 1984; 1998) on a system of simultaneous linear or nonlinear equations describing technology and consumption behavior of the various sectors and institutions considered. But such an approach requires a considerable amount of data, not readily available for many countries, even in industrial economies. Especially in African countries, the data required for the econometric approach to general equilibrium analysis are often missing, and the capacity to understand in-depth and apply such techniques among local researchers is often weak.

To circumvent these data and capacity requirement limitations, researchers have used static input-output and SAM-based general equilibrium models in much empirical work on developing economies, and especially in Africa. These models require only a single year of data (the base year). Input-output or SAM (social accounting matrix) databases are transformed into models to evaluate the impact of exogenous shocks on endogenous accounts (outputs, factor payments, and institutional incomes), yielding comparative static analysis with respect to base-year values. The use of input-output models can be traced back to seminal work by Leontief (1951; 1953), who gave impetus to the development of applied general equilibrium models. Since then, an extensive body of literature on both input-output tables and SAMs has been produced, some of which are reviewed in the next section. As discussed in the brief literature review provided here, the models have rather strong limitations. But they are still useful to conducting simple stylized simulations from an analysis of the structure of economies.

[1] While there is a consensus on the existence of gender disparities in African labor markets, assessing their nature and extent remains a challenge. Available databases provide incomplete and limited information on the relative situations of men and women, use very diverse methodologies and definitions of employment and earnings, and focus mostly on urban areas (see, for example, Appleton, Hoddinott, and Krishnan, 1999; Brilleau, Roubaud and Torelli, 2004). Drawing on a recent meta-analysis of studies on the gender pay gap, Weichselbaumer, Winter-Ebmer, and Zweimuller (2007) find that only about 3% of these studies stem from African data out of all the empirical literature on the topic since the 1960s.

In the second part of this paper, our objective is to use a recent SAM for Guinea to assess how demand shocks in various sectors of the economy are likely to differently affect the incomes of both women and men, with a focus on comparing domestic and export-oriented sectors. In so doing, we can analyze both direct and indirect effects of sectoral growth on labor income shares between men and women.

This paper is structured as follows. The next section reviews results from the analysis of recent household survey data from Guinea regarding earnings and time use differentials by gender. Next is a brief review of the literature on SAMs, a description of the structure of a standard SAM, and details on the 2005 Guinea SAM used for the analysis, including its disaggregation of labor income shares from different sectors by gender. Then presented are the results of simulations using the Guinea SAM of the potential impact of sectoral growth patterns on labor income shares, following similar work done on Senegal (Fofana, Parra Osorio, and Wodon 2009). A brief conclusion follows.

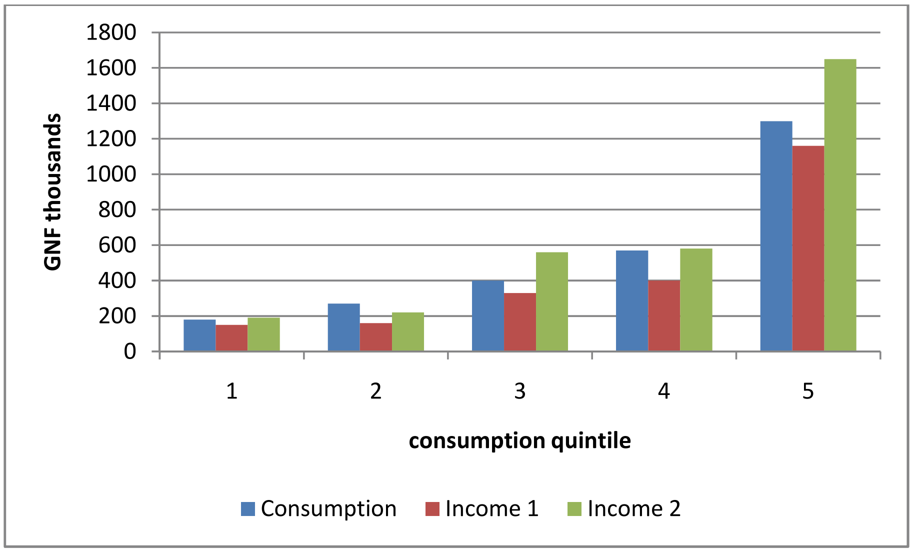
Gender, Labor Income, and Time Use from Household Survey Analysis

This section reviews existing information on labor income and time use patterns in Guinea, focusing on gender and building on a poverty assessment conducted by the World Bank (2005) and work by Bardasi and Wodon (2006a; 2006b). The analysis in both cases relies on the 2002/03 nationally representative EIBEP survey (Enquête Intégrée de Base pour l'Evaluation de la Pauvreté or Basic Integrated Poverty Evaluation Survey), which was also used to construct the 2005 Guinea SAM used here. We start with a discussion of results on labor income and continue with analysis of the relationship between gender and time use and the implications of this relationship for household income and consumption. Results suggest that the income, wage, and time use data in the survey are reliable; that women stand at a disadvantage, both in terms of labor income and time use patterns; and that higher participation by women in labor markets could increase labor income and reduce poverty.

Labor Income

There is a strong correlation between household consumption per capita and household income per capita in Guinea. Two alternative definitions of income are constructed from the data. A first definition (income 1) takes into account all sources of income identified in the survey. According to the data, most non-agricultural household enterprises would appear to operate at a loss, a finding that is unrealistic but may result from the fact that income from small firms and household enterprises is much harder to measure accurately, given the need to take into account both sales and costs. This is why a second definition (income 2) excludes income obtained from non-agricultural activities. The explanation for the construction of these income sources is provided in Annex 1. The key finding is that, irrespective of the approach used, there is a rather strong correlation between income and consumption with, as expected, consumption and income being noticeably higher in the top (fifth) quintile than in the rest of the distribution (see figure 1). However, in each quintile of consumption, average income is lower than average consumption; this is not unusual in the African context, given the difficulty of measuring income accurately. The differences between income and consumption are actually not large by sub-Saharan African standards, which in turn suggests that an income-based analysis is likely to be reliable in capturing key factors affecting the standards of living of households in Guinea.

Figure 1 Average Household Income and Consumption by Consumption Quintile in Guinea



Source: World Bank (2005)

The World Bank poverty assessment does not provide a detailed analysis of the various income sources by gender, but it does show that wages and earnings represent by far the largest source of household income and that there are large differences between men and women in earnings. The wage gaps between men and women are large, as shown when described in statistical terms (without regressions). In urban areas, women earn 41 percent less than men (25 percent in rural areas). In geographic terms, rural men earn 64 percent less than those in towns, whereas rural women earn 55 percent less than urban women. These gaps in gender and geographic terms remain in the econometric analyis presented in table 1 (this is done with standard log wage regressions but without Heckman selection in order to focus on individuals who are already in the labor market). In the regressions, after controling for other variables, the gender gap remains at 43 percent in urban areas and 35 percent in rural areas. Similarly, the geographic gaps in wages remain large, with rural men earning 34 percent less than urban men, and rural women earning 20 percent less than urban women. Furthermore, in relation to unmarried people, married persons apparently enjoy a wage bonus. Polygamous men earn 36 percent more than unmarried men in urban areas and 33 percent more in rural areas; married women earn 21 percent more than single women, but only in urban areas.

Table 1 Analysis of the Correlates or Determinants of Individual (Log) Wage Incomes in Guinea, 2002/03

						Urban		Rural	
	All	Men	Women	Urban	Rural	Men	Women	Men	Women
Age	0.030 ***	0.039 ***	0.037 ***	0.043 ***	0.016	0.058 ***	0.052 ***	0.012	0.010
Age squared	–0.000***	–0.000 ***	–0.000 ***	–0.000 ***	–0.000	–0.001 ***	–0.001 ***	–0.000	–0.000
Female *(base: male)*	–0.407***			–0.431 ***	–0.345***				
Handicapped *(base: not handicapped)*	–0.031	0.045	–0.180	–0.002	–0.249	0.030	–0.084	–0.074	–0.486
Marital status (base: single)									
Monogamous	0.200 ***	0.157 **	0.183 **	0.230 ***	0.047	0.153 *	0.208 **	0.073	0.050
Polygamous	0.279 ***	0.373 ***	0.135	0.317 ***	0.146	0.364 ***	0.188 *	0.331 **	0.012
Divorced	0.207 **	–0.111	0.216 *	0.184 *	0.162	–0.206	0.183	–0.047	0.188
Widower/widow	0.071	0.252	0.057	0.094	–0.048	0.227	0.145	0.079	–0.176
Education completed (base: no education)									
Primary	0.199 ***	0.211 ***	0.189 **	0.207 ***	0.188	0.242 ***	0.175 **	0.175	0.359
1st cycle secondary	0.320 ***	0.333 ***	0.288 **	0.295 ***	0.434 **	0.320 ***	0.248 **	0.379 *	2.147 *
2nd cycle secondary	0.338 **	0.354 **	0.268	0.316 *	0.266	0.383 **	0.087	0.102	1.522
Technical	0.634 ***	0.615 ***	0.656 ***	0.618 ***	0.439	0.583 ***	0.616 ***	0.521 *	0.707
University	0.761 ***	0.742 ***	0.994 ***	0.737 ***	0.996 ***	0.734 ***	0.927 ***	1.080 ***	
Industrial sector (base: manufacturing sector)									
Agriculture	–0.919***	–0.801 ***	–1.112 ***	–0.506 ***	–1.106***	–0.309 **	–0.815 ***	–1.136 ***	–0.986 ***
Mining	0.530 ***	0.727 ***	–0.039	0.684 ***	–0.387	0.851 ***	0.141	–0.618	–0.065
Energy	0.073	0.266	–1.742	0.106		0.335	–1.704		
Construction	0.087	0.174	–0.415	0.067	0.146	0.176	–0.430	0.167	
Trade	0.155 ***	0.301 ***	–0.014	0.136 **	0.265 *	0.312 ***	–0.088	0.347 *	0.331
Transport	0.163 *	0.266 ***	–0.011	0.187 **	0.614	0.306 ***	0.010	0.641	2.487
Finance, IT	–0.173	–0.089	–0.286	–0.136	–0.399	–0.050	–0.270	–0.378	
Public administration, education, health	–0.158 **	–0.067	–0.399 ***	–0.089	–0.030	0.011	–0.374 ***	–0.054	–0.160
Employment status (base: employee in formal private sector)									
Employee in the public sector	0.332 ***	0.338 ***	0.219	0.269 ***	1.070 ***	0.228 **	0.221	1.120 ***	1.955
Employee in the informal private sector	–0.346***	–0.361 ***	–0.423 **	–0.381 ***	0.212	–0.382 ***	–0.433 **	0.137	1.678
Self-employment	0.141 *	0.218 **	–0.082	0.224 ***	0.533	0.280 ***	–0.017	0.608	1.900
Type of contract (base: permanent)									
Seasonal	–0.227***	–0.309 ***	–0.165 ***	–0.182 **	–0.095	–0.466 ***	0.015	–0.128	–0.054
Daily work/piecework	–0.060	–0.048	–0.066	–0.136 ***	0.322 ***	–0.102	–0.169 **	0.190	0.472 ***
Rural *(base: urban)*	–0.275***	–0.344 ***	–0.198 ***						

Source: World Bank (2005) based on EIBEP 2002/03 (Basic Integrated Poverty Evaluation Survey)

Notes: The dependent variable is the logarithm of the hourly wage spatially adjusted (using poverty lines) for regional differences in purchasing power; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

The gains associated with education in table 1 are statistically significant and large, especially in urban areas, where up to the second cycle of secondary education the gains are greater for men than women (24 percent increase for primary education in relation to a total lack of education, 32 percent for the first cycle of secondary education, and 38 percent for the second cycle of secondary education). However, the gains from technical and university education are greater for women than men (62 percent increase for technical education and 93 percent for university education), but relatively few women have achieved these education levels.

With regard to the sector of activity, agricultural workers earn considerably less than workers in the manufacturing sector, while positive differentials exist for men employed in trade and transport (in urban areas). Moreover, a negative differential is estimated for women in urban areas working in public administration, health, and education, possibly because women in public services tend to be clustered in lower paying jobs. Employees in the informal sector earn 38 percent to 43 percent less than those in the formal sector in urban areas. Finally, the more or less permanent nature of employment also influences wages. Seasonal workers (for men in urban areas) earn much less than permanent workers (47 percent less), while rural women performing piecework appear to earn 47 percent more than permanent workers, a somewhat surprising result that may be related to the fact that most rural women with permanent work are involved in low-skill agricultural production that typically pay low wages.

Time Use

The previous section suggested that men and women who are working have very different wage expectations, even after controling for a wide range of individual characteristics. But, in addition, the likelihood of being engaged in labor market work and the number of hours worked differ substantially between men and women. Indeed, Bardasi and Wodon (2006a; 2006b) show that major differences exist in time use by gender.

Table 2 presents estimations of hours worked by individuals in income-generating and domestic activities. The survey did not collect information relating to the time used to deal with children and ill or handicapped persons. Thus, it is assumed that these activities are usually performed as "secondary activities," that is, in parallel with other "productive" activities recorded in the survey. The time used to help other households or perform community services is taken into account, however. Two definitions of "work time" are used. According to the first definition, work time includes the time devoted to domestic chores (collecting wood, fetching water) and income-generating activites (work on the labor market). According to definition 2, work time is total time worked as calculated using definition 1, plus the time used to help other households and perform community activities.

Table 2 shows that time worked in hours per week is higher on average in rural areas than in urban centers. The distribution of time worked in urban areas shows a large proportion of low values, as the considerable difference between the average and the median would suggest. Total individual median time worked in rural areas is 1.5 times higher than the corresponding value in urban areas. The gap between the total individual time worked in urban and rural areas, according to definition 2, is even greater than the gap as calculated according to definition 1. This is because individuals living in rural areas devote more time to helping other households and performing community activities than urban individuals, despite the fact that they already record a higher total time working.

Table 2: Work Time (hours/week) of Individuals Over Age 15 in Guinea, 2002–2003

	Average	Median	25th percentile	75th percentile
	Not including time spent helping other households and performing community activities			
All	44.6	47.0	19.0	64.0
Urban	36.2	31.0	5.0	61.0
Rural	48.7	49.0	32.0	65.0
Regional gap (%)	+34.5	+58.1	+540.0	+6.6
Men	38.8	44.0	8.0	57.0
Women	49.3	51.0	25.0	70.0
Gender gap (%)	+27.1	+15.9	+212.5	+22.8
	Including time spent helping other households and performing community activities			
All	46.1	48.0	20.0	66.0
Urban	36.7	32.0	5.0	62.0
Rural	50.6	51.0	34.0	68.0
Regional gap (%)	+37.9	+59.4	+580.0	+9.7
Men	40.5	46.0	9.0	60.0
Women	50.6	52.0	26.0	72.0
Gender gap (%)	+24.9	+13.0	+188.9	+20.0

Source: Bardasi and Wodon (2006a).

The data reveal considerable differences in time worked between men and women, the latter working longer hours (including domestic chores). Table 3 presents estimates of the use of time per activity, broken down for children and adults by gender and region. Using the second definition of work time (which also includes the time spent helping other households and performing community activities), the gap between men and women decreases somewhat because men spend more time performing community services; however, the qualitative results remain unchanged. Adult women spend much more time than men performing domestic chores (cooking, cleaning, washing, ironing, shopping), in particular in rural areas (18.3 hours/week compared to 2.6 hours/week for men). In urban areas, the differential, although lower, remains considerable at 15.5 hours/week for women and only 2.4 hours/week for men. Moreover, women must also provide the household with water and wood for cooking, especially in rural areas. Men, however, spend more time than women in the labor market, in particular in income-generating activities. Women record a high total work time in rural areas (54 hours/week), that is, 30 percent more than the time spent working by men, while in urban areas women work less, at about 39 hours/week, but still more than men. Gender differences also exist for the younger members of the population. In rural areas, children spend a substantial part of their time performing income-generating activities, almost exclusively in the agricultural sector (11 hours/week, boys and girls).

Table 3: Time (hours/week) Devoted to Different Work Activities by Sex, Age, and Region, 2002-2003

		Age 6-14			Age 15+		
		Men	Women	All	Men	Women	All
	Urban						
1	Cooking	0.1	1.2	0.6	0.2	6.8	3.4
2	Cleaning	0.4	1.4	0.9	0.5	2.3	1.4
3	Washing	8.0	1.3	1.0	0.8	2.4	1.6
4	Ironing	0.2	0.2	0.2	0.7	1.1	0.0
5	Market/shopping	0.2	0.5	0.4	0.2	3.0	1.6
6	**Domestic chores (total 1 to 5)**	**1.7**	**4.6**	**3.2**	**4.0**	**15.5**	**8.9**
7	Collecting wood	0.3	0.1	0.2	0.2	0.2	0.2
8	Fetching water	0.6	0.9	0.8	0.4	1.2	0.8
9	Helping other households	0.0	0.1	0.1	0.2	0.4	3.0
10	Performing community activities	0.1	0.1	1.0	0.3	0.2	0.3
11	Working for a wage	0.4	5.0	0.5	25.9	18.	22.3
12	Working on a family farm	1.0	0.9	0.9	4.0	3.2	4.0
13	**Work on the labor market (11+12)**	**1.3**	**1.4**	**4.0**	**30.7**	**21.9**	**26.3**
14	**Total time (definition 1)**	**3.9**	**7.1**	**5.5**	**33.6**	**8.0**	**36.2**
15	**Total time (definition 2)**	**4.0**	**7.2**	**5.6**	**34.1**	**39.4**	**36.7**
	Rural						
1	Cooking	0.2	2.7	1.4	0.3	9.2	5.0
2	Cleaning	0.4	1.7	1.0	0.4	2.8	1.8
3	Washing	0.9	8.0	1.3	0.7	3.1	2.1
4	Ironing	0.1	0.2	0.2	0.3	0.5	0.4
5	Market/shopping	0.3	0.8	0.6	0.0	2.8	2.0
6	**Domestic chores (total 1 to 5)**	**1.9**	**7.0**	**5.0**	**2.6**	**18.3**	**11.7**
7	Collecting wood	2.5	1.5	2.0	1.6	2.4	2.1
8	Fetching water	1.5	2.6	2.0	0.7	3.3	2.2
9	Helping other households	0.2	0.3	0.3	1.1	1.0	1.1
10	Performing community activities	0.2	0.1	0.2	1.2	6.0	0.9
11	Working for a wage	0.4	0.5	0.5	13.1	8.6	10.5
12	Working on a family farm	10.6	10.6	10.6	23.0	21.0	2.0
13	**Work on the labor market (11+12)**	**11.0**	**11.0**	**11.0**	**37.0**	**29.**	**32.7**
14	**Total time (definition 1)**	**16.9**	**22.4**	**19.6**	**41.8**	**53.7**	**48.7**
15	**Total time (definition 2)**	**17.3**	**22.9**	**20.0**	**44.2**	**55.2**	**50.6**

Source: Bardasi and Wodon (2006a).

Notes: Observations with a value of zero are included in the computation of averages**.** Total time (definition 1) is the sum of categories 6 (all domestic chores), 7 (collecting wood), 8 (fetching water), and 13 (work on the labor market). Total time (definition 2) is the sum of total time according to definition 1 plus categories 9 (helping other households) and 10 (performing community activities).

Some 18 percent of adults can be considered "time-poor" in that they devote abnormally long hours to various domestic and productive activities compared to the rest of the population. This assessment of time poverty is based on considering as time-poor those individuals who work above a threshold equivalent to 1.5 times the median for the individual time distribution. Table 4 provides data on the rate of time poverty. The rate of time poverty is higher for women (24.2 percent) than for men (9.5 percent) and higher in rural areas (18.8 percent) than in urban centres (15.1 percent). More women living in rural areas are time-poor (26.5 percent) than in urban areas (18.6 percent). Conversely, urban men are more likely to be time-poor than rural men (11.7 percent compared to 8.3 percent). If we adopt a time poverty threshold of twice the median for the individual time distribution, the rates of time poverty are naturally lower (the overall rate of time poverty falls to 4.8 percent), but proportional differences between men and women increase.

Table 4: Rate of Time Poverty of Individuals Over Age 15 in Guinea, 2002-2003

	Time poverty line 70.5 hours/week			Time poverty line 94 hours/week		
	Urban	Rural	All	Urban	Rural	All
Men	11.7	8.3	9.5	2.7	1.8	2.1
Women	18.6	26.5	24.2	4.7	7.9	7.0
All	15.1	18.8	17.6	3.7	5.3	4.8

Source: Bardasi and Wodon (2006a).

Notes: The time poverty line of 70.5 hours/week corresponds to 1.5 times the median number of hours for all adults aged 15+ (47 hours/week). The time poverty line of 94 hours/week corresponds to 2 times the median.

In order to understand the correlates or determinants of time poverty, Bardasi and Wodon (2006a) also estimate a probit model. The results confirm that women are more likely to be time-poor than men, after controlling for a range of individual characteristics, but other factors independent of sex also play a role in determining time poverty. For example, level of education is a powerful predictive variable for time poverty, both for men and women, and in particular in urban areas. An increase in the level of education is associated with a lower probability of time poverty. In rural areas, where an education above the primary level is rare, particularly among women, the fact of having completed primary education also greatly reduces the probability of being time-poor in comparison to individuals with no education (–4 percentage points for men and –14 percentage points for women).

Well-being per quintile of consumption is only slightly associated with time poverty when other factors are taken into account as controls. A statistically significant effect can be observed for men living in rural areas—those in the fourth and fifth quintiles of consumption per capita have a 6 percent higher probability of being time-poor than those in the first quintile. For men living in urban areas, a similar result is obtained, although only for those in the fifth quintile (4 percentage points increase compared to men in the first quintile). However, there is no significant effect for women (except for those living in rural areas and situated in the third quintile, who are 4 percentage points more likely to be time-poor than other women).

Household size and composition also may matter, but the relationships are not straightforward. The coefficients for number of children do not provide clear indications. Young children may need more time spent on them by adult members of the household, but time devoted exclusively to children was not explicitly collected in the survey. Moreover, slightly older children can help their parents, thereby enabling adults to save time. A positive coefficient is only estimated for men in rural areas, indicating for this group that each additional child increases the probability of being time-poor (one percentage point per additional child). A negative coefficient for the number of older children is estimated for men living in urban areas, meaning that, for this group, each additional child aged 6 to 14 reduces the probability of being time-poor at a decreasing rate. Time poverty for women, however, would not seem to be affected by the number of children in the household, whereas a greater number of adults in the household reduces the probability of being time-poor, indicating that the workload is more equally distributed between household members. This effect is more marked for women living in rural areas. The presence of handicapped persons in the household increases the probability of being time-poor for women living in rural areas (by approximately three percentage points), whereas it reduces the probability of being time-poor for men living in urban areas by about two percentage points, but the reasons for this are unclear.

Other factors, including geographic location, matter as well. Unlike women, men living in rural areas are *less* time-poor than men living in urban areas. Being handicapped substantially and significantly reduces the probability of being time-poor, given that these persons are often less able to work. Marital status is also associated with variations in the probability of being time-poor, but this effect is only significant (and substantial) for women. Married women (monogamous or polygamous) are more time-poor than single women (a difference of about 10–11 percentage points in urban areas and 13 percentage points in rural areas). A similar effect is estimated for divorced women. Christian or non-Muslim women living in rural areas are more time-poor (difference of 18–19 percentage points compared to Muslim women in rural areas). Geographical differences can also be observed.

Benefits for Poverty Reduction of Full Employment

In general, poorer households have more members who are time-poor. While the regressions indicate the existence of a weak correlation between time poverty and well-being as measured by consumption, the most vulnerable categories (women and individuals with a lower level of education) are still more time-poor. This result suggests that time poverty could be associated with poverty as measured by income or consumption. The main reason for this is that, in poor households, long hours are devoted to low productivity work, resulting in weak output (in terms of income or consumption). In addition, because of long hours worked, there is limited time left to increase labor income and thus household consumption.

Still, at the same time, many households, including poor households, do have members who are working well below the time poverty line. These household members have time available that could be used in productive activities to increase income and thereby reduce poverty. Bardasi and Wodon (2006b) performed simulations to measure the potential additional earnings of households that would be obtained from full employment of those who want to work (thus all workers would work up to the time poverty line). For workers not currently working, or for those working without pay, two techniques are used to assess potential earnings. The first is to impute a wage level based on log wage regressions. The second technique divides total household consumption by total number of hours worked in the household and uses this as the value of time for all individuals in the household. We use the first technique for our results, and use the second technique to check their robustness.

The simulations are performed with and without a redistribution of work time among household members from individuals who are time-poor to those who are not. The results, shown in table 5, suggest that richer individuals/households would gain the most from working additional hours, but the gains for the poor are important as well. The disparity in potential household income gains is particularly large when additional work time is valued using the household productivity measure instead of the expected wage rate of each adult. When work time is reallocated within the household, the average increase in per capita income, and thereby consumption, is lower (several productive members would work less if they were time-poor), with a larger reduction in the bottom quintile than the top quintile in comparison with simulations without redistribution of work in the households. Nevertheless, there is still a substantial potential to increase income among the poor and others alike.

Table 5: Effects of Work Time Increases by Individuals Over Age 15 on Household Income or Consumption in Guinea, 2002-2003

Quintile of consumption	Without redistribution		With redistribution	
	Time evaluated at individual hourly wage (1)	Time evaluated at level of household consumption (2)	Time evaluated at individual hourly wage (3)	Time evaluated at level of household consumption (4)
1	2,532	2,195	1,995	1,856
2	3,555	4,076	2,980	3,546
3	5,618	6,742	4,956	6,124
4	6,717	11,045	6,043	10,261
5	8,855	30,910	8,005	29,268

Source: Bardasi and Wodon (2006b).

Even if poor individuals tend to be more time-poor and less productive than richer individuals, an increase in work time would contribute to a substantial reduction in poverty. The simulations in table 6 suggest that the increase in weekly consumption per capita following an increase in the work time of individuals (below the time poverty line) is weaker in the lower part of the distribution. Nevertheless, this smaller increase in absolute terms still represents a substantial increase in percentage of consumption of poor households, in particular when the additional work time is evaluated using the hourly wage. Table 6 presents annual average per capita consumption simulated per quintile of consumption, together with the corresponding average increase. The increase in per capita consumption at the bottom of the distribution is large when the additional work time is evaluated at the hourly wage, while it is smaller when this time is evaluated according to household productivity. The estimated rates of poverty would fall from 49.1 percent to 29.2 percent and 26.2 percent, respectively; inequality, however, would increase because richer individuals would reap larger gains from additional work. This said, the largest portion of time still available among poor households to increase earnings comes from individuals who are now unable to find proper employment, rather than from the additional hours that could be worked by those already gainfully employed. Consequently, job creation policies would be needed to contribute to reducing poverty through higher time worked. Furthermore, although not discussed here, it is also necessary (and probably more beneficial) to implement actions that would increase labor productivity among the poor, in particular in rural areas. Higher productivity could have a larger impact on total earnings than would more working hours.

Table 6: Effect of Increase and Reallocation of Work Time on Monetary Poverty and Inequality in Guinea, 2002–2003

Quintile	Average routine consumption	Without redistribution/reallocation				With redistribution/reallocation			
		Time evaluated at wage rate		Time evaluated at household consumption productivity		Time evaluated at wage rate		Time evaluated at household consumption productivity	
		Simulated average consumption	Percentage increase	Simulated average consumption	Percentage increase	Simulated average consumption	Percentage increase	Simulated average consumption	Percentage increase
1	171,536	303,183	76.7	285,675	66.5	275,279	60.5	268,063	56.3
2	284,974	469,817	64.9	496,913	74.4	439,953	54.4	469,354	64.7
3	396,760	688,876	73.6	747,329	88.4	654,472	65.0	715,232	80.3
4	562,227	911,512	62.1	1,136,551	102.2	876,451	55.9	1,095,813	94.9
5	1,288,049	1,748,514	35.7	2,895,367	124.8	1,704,293	32.3	2,809,980	118.2
Rate of poverty	49.1	29.2		26.2		33.0		30.3	
Gini index	40.7	41.2		52.8		42.7		54.0	

Source: Bardasi and Wodon (2006b).

Macroeconomic Analysis of Sectoral Growth and Labor Income Shares

The previous section provided stylized facts based on household survey data about earnings and time use in Guinea. One obvious yet important conclusion is that, for both men and women, better job opportunities would help increase household income and reduce poverty. But where would jobs come from? In the household surveys used to conduct the work presented so far, the identification of individuals participating in the labor force in terms of their sector of activity is often limited to a few aggregate categories, which makes it difficult to identify more precisely on which sectors efforts could be made in order to facilitate a better insertion of women in the labor market. In addition, the type of analysis presented so far, while useful to assess the determinants of wages and time use, does not provide insights into the multiplier effects that policies aimed at boosting production and thereby employment in specific sectors could yield. In order to look both at a more detailed picture of the potential employment for women of specific sectors, and at the potential multiplier effects that sectoral policies may generate for the economy as a whole, an analysis based on general equilibrium models is more appropriate.

The simplest such general equilibrium model is the SAM, which is illustrated in the rest of this paper. Specifically, the next two sections provide a SAM-based macroeconomic analysis of the Guinean job market. A 2005 Social Accounting Matrix (SAM) for Guinea is used to assess how growth in various sectors of the economy might affect the labor incomes of women and men, both directly and indirectly, through multiplier effects. This section starts with a brief literature review on the use of SAMs in applied economic analysis, a presentation of the main characteristics of a SAM and of the SAM model, and a description of some of the features of the Guinea SAM. Then in the next section, simulation results are presented on the potential impact of sectoral growth patterns on labor income shares by gender.

Brief Literature Review of SAMs[2]

Early work on developing countries includes that by Adelman and Taylor (1990), who use a SAM of Mexico to explore the intersectoral impacts of alternative adjustment strategies, and Dorosh (1994), who develops a semi-input-output model based on a 1987 SAM to analyze how changes in economic policies and external shocks affected poor households in Lesotho. Taylor and Adelman (1996) develop the concept of village SAMs, which they apply to India, Indonesia, Kenya, Mexico, and Senegal. Thorbecke and Jung (1996) develop a decomposition method of the fixed multiplier matrix to analyze poverty alleviation. They study the impact of sectoral growth on poverty alleviation in Indonesia, concluding that agriculture and service sectoral growth could contribute more to overall poverty reduction than industrial growth.

[2] This discussion is adapted with minor changes from Nganou, Parra Osorio, and Wodon (2009); see also Nganou (2005).

In a study of South Africa, Khan (1999) explores the link between sectoral growth and poverty alleviation along the same lines as Thorbecke and Jung (1996). Other lines of research by the International Food Policy Research Institute include Arndt, Jenson, and Tarp (2000), who adopt the SAM multiplier approach to argue the relative importance of sectors of activity in Mozambique; and Bautista, Robinson, and El-Said (2001), who use SAM and computable general equilibrium (CGE) frameworks to analyze alternative industrial development paths for Indonesia. Although Bautista, Robinson, and El-Said (2001) recognize the limitations of the SAM multiplier analysis (which is linear and, in some cases, ignores supply constraints), they conduct simulations under the two frameworks and obtain the same result: agricultural demand-led industrialization yields higher increases in real GDP than two other industrial-led development paths (food processing-based and light manufacturing-based industry). Good reviews of the SAM model can be found in Defourny and Thorbecke (1984) and in Thorbecke (2000), who provides a comprehensive presentation of the SAM as both database and model, including the concept of structural path analysis.

Input-output, SAM, and CGE models all belong to the same family of economywide, or general equilibrium, models. There is, however, a key difference between input-output and SAM models and CGE models. Assume that we need to assess the impact of a demand quantity shock. A SAM will typically yield only the direct income effect from this shock in the economy, assuming no change in behavior among economic agents. But there could also be indirect (general equilibrium) effects of the exogenous shock through changes in prices. Taylor et al. (2002) argue that indirect effects may be ignored if all prices are given for a local economy by outside markets, that is, if the tradability of all goods and factors is assumed, or if a perfect elasticity of supply of all goods and services is assumed. But often this assumption is not valid. Input-output and SAM–based models are Keynesian demand-based systems based on the assumption of unconstrained resources (excess capacity in all sectors) and perfectly elastic supplies (for example, unemployment/underemployment of factors of production).

Thus, implicitly underlying many input-output and SAM multiplier models is the assumption that the economy is operating below its efficiency level. Exogenous changes in demand are also assumed not to influence local prices. The excess capacity assumption was relaxed in the literature in two steps. First, Lewis and Thorbecke (1992) allowed sectors with zero excess capacity in their analysis of economic linkages in the town of Kutus, Kenya. Later, Parikh and Thorbecke (1996) relaxed the assumption a bit further by including sectors with small excess capacity, while studying the impact of decentralization of industries on rural development. As to the price assumption, and the lack of behavioral response to shocks more generally, it cannot be dealt with easily, which is why some authors prefer to use CGE models.

Other assumptions in input-output and SAM models include the linearity of so-called technological coefficients, as well as linearity on the consumption side caused by assuming unitary income elastic demand (that is, the activities in SAM models assume Leontief production functions and there is no substitution between imports and domestic production in the commodity columns [Arndt, Jensen, and Tarp 2000; Thorbecke and Jung 1996]).

Another important limitation of the "traditional" SAM model is the assumption that the average expenditure propensities (technical coefficients) hold for exogenous demand shocks, implying income elasticities equal to one. A more realistic alternative, noted in Lewis and Thorbecke (1992), is to use marginal expenditure propensities.

Beyond the estimation of the impact of a shock, additional insights can be gained by looking at the main factors behind specific impacts. This can be done using a decomposition analysis of the multiplier model along the lines of Pyatt and Round (1979) and Thorbecke (2000). (The derivation of the decomposition is provided in Annex 2.) Essentially, three separate effects are distinguished under this approach: transfer effects, spillover effects, and feedback effects. Transfer (or within-account) effects capture the interindustry (input-output) interactions among production activities or any interdependencies emanating from the patterns of transfers of income between households. Spillover (or open-loop/cross) effects show the impacts transmitted to other categories of endogenous accounts (for example, factor payments and household accounts) when a set of accounts (say, activities) is affected by an exogenous shock, with no reverse effects. Feedback (also called between-account or closed-loop) effects capture the full impact of a shock caused by the full circular flow (Round 1985). They capture how a shock to a sector travels outward to other sectors or endogenous accounts and then back to the point of original shock. Closed-loop effects ensure that the circular flow is completed among endogenous accounts by capturing injections that enter through one subgroup but do not return after a tour through other subgroups (Pyatt and Round 1979).

Basic Structure of a SAM

In technical terms, SAMs are numerical arrays representing the circular flow of income in an economy between sectors or activities, as well as between sectors, the government, households, and the rest of the world[3]. Each cell in a SAM, denoted by SAM_{ij}, reflects payments from an account *j* to another account *i*. When using a SAM for simulations, some accounts have to be set as endogenous (which means that they can react to a shock in the economy), and the rest of the accounts are set as exogenous (no change in the account following a shock). It is customary to set the government, capital, and rest of the world accounts as exogenous, but this choice depends on the nature of the analysis. Mathematically, the structure of simulations can be presented using a simple representation of a SAM (table 7).

[3] This discussion follows closely Fofana, Parra, and Wodon (2009).

Table 7: Schematic Social Accounting Matrix

Income/Expenditure	Endogenous Accounts	Exogenous Accounts	Total
Endogenous Accounts	**T**	**X**	**Y**
Exogenous Accounts	**L**	**W**	$\mathbf{Y_x}$
Total	**Y**	$\mathbf{Y_x}$	

Source: Adapted from Defourney and Thorbecke (1984).

The core of the SAM analysis is the multiplier model. Assume there are *n* endogenous accounts. Let $\mathbf{A_{nxn}}$ denote the matrix of technical coefficients, that is, the matrix resulting from dividing every cell T_{ij} in $\mathbf{T_{nxn}}$ by the respective column sum Y_j. Let $\mathbf{Y_{nx1}}$, $\mathbf{N_{nx1}}$, and $\mathbf{X_{nx1}}$ denote column vectors with the sums of total expenditures for the endogenous accounts, the endogenous component of those expenditures, and the exogenous component, respectively. Then by construction, the following two equations hold: $Y = N + X$ and $N = AY$. Combining these equations yields

$$Y = AY + X \tag{1}$$

which can be rewritten as

$$Y = \left(I - A\right)^{-1} X = MX \tag{2}$$

where **I** is the *n* × *n* identity matrix. The matrix $M = \left(I - A\right)^{-1}$ is known as the accounting multiplier matrix, the Leontief inverse matrix, or simply the inverse matrix. Each cell m_{ij} of M quantifies the change in total income of account *i* as a result of a unitary increase in the exogenous component of account *j*. This change takes into account all the interactions in the economy that follow from an initial shock, so that SAMs are general equilibrium models.

When using SAMs for simulations of standard demand shocks (for example, an increase in the demand of tourism from the rest of the world), it is important to understand that a number of assumptions are implicit in the framework. The two main assumptions are that all prices remain fixed, as do all expenditure propensities, whether one considers productive activities or commodities purchased by households. Thus, a SAM is essentially a picture at one point in time of the economy and of the relations between different sectors, as well as between institutions or groups of agents. When using the SAM for simulations, we assume that the structural relations observed in the economy do not change, which is to say that there are no behavioral adjustments by agents following a shock. This is a strong assumption, which implies that the analysis obtained from a SAM is often tentative and indicative only and may lead to an overestimation of the impact of a shock.

Description of the Guinea SAM

The Guinea SAM was constructed by Fofana, Doumbouya, and Gassama (2007**).** It includes 21 activities and commodities, 18 categories of labor, 9 types of capital as a production factor, 1 account for enterprises, 8 types of households, 6 accounts for government, 2 accounts for investment, and 1 account for the rest of the world. The labor income accounts are disaggregated according to gender, area of residence (urban versus rural), education (skilled versus unskilled workers in urban areas), wage earners (permanent versus occasional), and independent workers. The accounts for capital and households are based on occupation. Table 8 provides basic data on the sectors included in the SAM. The table shows that Modern Commerce, Agriculture and Other Nontradable Services are by far the largest contributors to value-added, with shares of 17.3, 15.2, and 15.2 percent, respectively. These sectors are followed by Informal Transport and Communications, Aluminum, and Other Tradable Services, with shares between 6.5 and 9.0 percent.

Table 8: Sectoral Analysis for the Guinea SAM, 2005 (in GNF billions)

	Production (Q)		Value-added at factor costs		Imports (M)		Exports (X)		M/Q	X/XS
	Value	Share (%)	Value	Share (%)	Value	Share (%)	Value	Share (%)		
Agriculture	1052.7	12.8	887.5	15.2	100.4	9.5	33.7	2.2	9.5	3.2
Logging and Forestry	122.4	1.5	113.1	1.9	0.1	0.0	1.0	0.1	0.1	0.8
Fishery	155.9	1.9	127.0	2.2	15.5	0.9	67.6	4.4	3.3	43.4
Livestock	464.9	5.6	323.3	5.5	0	0	0.0	0.0	0	0.0
Aluminum	849.5	10.3	421.4	7.2	0	0	796.2	51.8	0	93.7
Modern Diamond Mining	13.2	0.2	6.5	0.1	0	0	11.5	0.7	0	87.2
Informal Diamond Mining	92.1	1.1	74.4	1.3	0	0	92.1	6.0	0	100.0
Modern Gold Mining	275.5	3.3	131.2	2.2	0	0	275.5	17.9	0	100.0
Informal Gold Mining	98.9	1.2	96.8	1.7	0	0	80.6	5.2	0	81.5
Other Minerals	155.2	1.9	150.3	2.6	0	0	0	0	0	0
Oil, Kerosene, and Gas			152.4	2.6	330.2	20.1	0	0	0	0
Modern Manufacturing	407.3	4.9	154.5	2.6	620.8	37.8	20.0	1.3	152.4	4.9
Informal Manufacturing	244.9	3.0	46.7	0.8	67.1	4.1	10.0	0.7	27.4	4.1
Electricity, Gas, and Water	87.8	1.1	265.2	4.5	0	00	0	0	0	0
Modern Construction	354.7	4.3	375.3	6.4	0	0	0	0	0	0
Informal Construction	438.0	5.3	257.9	4.4	0	0	0	0	0	0
Modern Commerce	416.5	5.1	1013.6	17.3	0	0	0	0	0	0
Informal Commerce	1099.4	13.3	226.5	3.9	0	0	0	0	0	0
Modern Transport and Communications	332.8	4.0	129.6	2.2	124.7	7.6	13.4	0.9	37.5	4.0
Informal Transport And Communications	184.0	2.2	508.4	8.7	0	0	0	0	0	0
Other Tradable Services	621.9	7.5	381.8	6.5	188.1	11.4	56.9	3.7	30.2	9.2
Other Nontradable Services	776.3	9.4	887.5	15.2	197.2	12.0	78.2	5.1	25.4	10.1
All	**8243.9**	**100.0**	**5843.4**	**100.0**	**1644.1**	**100.0**	**1536.8**	**100.0**	**19.9**	**18.6**

Source: Authors.

Notes: M\Q = Import share within sector production; X/XS = Export share of production; M = Imports.

In terms of international trade, Guinea imports mainly manufactured goods and oil. These two groups accounted for 62 percent of total imports in CIF (cost, insurance, and freight) value for 2005. The country imports 50 percent more manufactured goods than produced domestically, and almost 40 percent of the production of Transport and Communications. Aluminum represents 52 percent of total exports in FOB value, while Gold accounts for 23 percent. In terms of export propensity, more than 90 percent of the production of Aluminum, Gold, and Diamonds is exported.

Gender Disaggregation for Labor Income in the Guinea SAM

In order to analyze the impact of exogenous shocks on labor income shares by gender, we need to have gender-disaggregated SAM accounts. Some descriptive statistics are displayed in table 9. Overall, Livestock is the most female-intensive labor activity, with 46.3 percent of total payments to labor going to female workers. Informal Manufacturing and Agriculture follow, with shares of labor income for women of 37.1 and 36.7 percent, respectively. Both Modern and Informal Commerce, and Modern Manufacturing have female labor shares exceeding one third. These female-labor-intensive sectors differ widely in labor intensity (share of labor in value-added). While labor income represents more than 80 percent of the value-added in Agriculture, it represents between 10 and 15 percent in the cases of Livestock and Commerce.

Table 9: Summary Data on Labor Income Shares in the Guinea SAM

	Female labor income share (percent)	Labor intensity (percent)
Livestock	46.3	10.3
Informal Manufacturing	37.1	51.5
Agriculture	36.7	81.4
Modern Manufacturing	34.1	55.8
Modern Commerce	32.3	16.6
Informal Commerce	31.6	15.6
Other Tradable Services	24.5	18.0
Other Non Tradable Services	14.1	92.0
Informal Gold Mining	13.8	1.8
Modern Gold Mining	13.6	2.3
Informal Diamond Mining	13.1	20.0
Aluminum	13.1	20.2
Modern Diamond Mining	13.1	48.7
Other Minerals	3.5	1.6
Logging And Forestry	1.6	13.8
Modern Transport and Communications	1.0	34.2
Informal Transport and Communications	0.6	26.0
Modern Construction	0.5	10.3
Electricity, Gas, and Water	0.5	36.2
Informal Construction	0.4	9.3
Fishery	0.4	7.0

Source: Authors.

In the analysis of labor income shares, the disaggregation of labor income in the SAM is interesting because it provides additional insights into gender issues, as well as into poverty issues, at least in urban areas, because households with less well-educated workers tend to be much poorer.

To conclude, when implementing SAM-based simulations, we are able to provide data on expected changes in labor income shares not only by gender, but also according to location (urban and rural areas) and education (skilled and unskilled workers). The next section turns to the empirical simulation results.

Sectoral Demand Shocks and Impact on Labor Income Shares by Gender

All the computations in this section were performed using SimSIP SAM, a powerful and easy to use Microsoft® Excel based application, with MATLAB® running in the background, which can be used to conduct policy analysis under a Social Accounting Matrix (SAM) framework. The tool was developed by Parra and Wodon (2010) and is distributed free of charge[4], together with the necessary MATLAB components. The accompanying user's manual describes the theory behind the computations. The application can be used to perform various types of analysis and decompositions, as well as to obtain detailed and graphical results for experiments.

In table 10, we start by showing the effect on labor income of an exogenous demand shock equal to 1 percent of aggregate exports, by gender as well as for different subgroups, for several sectors in Guinea. The first three sectors—Livestock, Agriculture, and Informal Manufacturing—have high female labor intensities and are mostly nontradable, while the other three sectors—Modern Construction, Aluminum, and Fishery—have low female labor intensities, and in the case of Aluminum and Fishery, have high export propensities (see tables 8 and 9). Because of the much higher value of payments to male workers, the impacts are larger for men than women. For example, an additional 1 percent of aggregate exports in Livestock generates an increase in male labor income of GNF 5,598.3 million after multiplier effects are taken into account, while the corresponding increase in female labor income is only GNF 2,901.7 million.

An exogenous demand shock in Agriculture has the highest impact on labor income among the six sectors. Even though men seem to benefit more from these demand shocks, the percentage changes show a different picture. Female labor income is growing faster than male labor income for Livestock, Agriculture, Informal Manufacturing, and Fishery, so the gender gap would be smaller as a consequence of a shock in these sectors. A demand shock on Modern Construction or Aluminum would widen the gender gap in terms of labor income shares. There are also differences by location, as well as according to the gender and worker education. Table 4 shows that the shocks in Livestock, Agriculture, and Fishery would benefit more rural workers than urban workers. The opposite is true for the other three

[4] The latest version can be obtained from www.simsip.org.

sectors. All sectors benefit more unskilled workers in urban areas than skilled urban workers; not only is the monetary value of the effect higher, but it is also higher in percentage terms, which corrects for size bias.

However, while the increase in labor income is higher for male workers than for female workers in all six sectors, the proportion of total labor income that goes to female workers increases after an exogenous shock in Livestock, Agriculture, Informal Manufacturing, and Fishery. This means that expressing the changes in labor income in percentage terms rather than values, paints a different picture.

The fact that the final effects of an exogenous demand shock in the six sectors studied here are much higher for male workers than for female workers can be explained by the higher initial values for male labor (more male workers earning more, on average, than female workers). The first three sectors in table 10 (the ones with highest female labor intensities) exhibit fairly similar importance for indirect effects for male and female workers (indirect effects are defined here as closed loop effects divided by total effects; see Annex 2 on multiplier decompositions for details). For the other three sectors, indirect effects are much more important for female workers (this is just a consequence of very low female labor intensities). Furthermore, indirect effects for rural workers are much higher than for urban workers for all sectors in table 11 but Agriculture.

Table 10 Effect on Labor of an Exogenous Demand Shock of 1 Percent of Aggregate Exports, 2005 (GNF 15,368 million—percent change in parentheses)

Destination/ Origin	Livestock	Agriculture	Informal Manufacturing	Modern Construction	Aluminum	Fishery
Male workers						
Urban skilled permanent wages	205.1 (0.07)	202.1 (0.07)	255.9 (0.09)	181.7 (0.06)	1035.3 (0.37)	214.7 (0.08)
Urban skilled occasional wages	20.1 (0.07)	22.0 (0.08)	24.3 (0.09)	80.4 (0.30)	16.2 (0.06)	23.1 (0.09)
Urban skilled independent	564.7 (0.34)	669.4 (0.40)	1402.6 (0.84)	539.7 (0.32)	269.6 (0.16)	638.1 (0.38)
Urban unskilled permanent wages	147.8 (0.15)	136.9 (0.14)	210.9 (0.21)	118.6 (0.12)	310.4 (0.31)	366.7 (0.36)
Urban unskilled occasional wages	49.4 (0.26)	59.9 (0.32)	57.6 (0.31)	74.0 (0.40)	89.0 (0.48)	90.3 (0.48)
Urban unskilled independent	816.3 (0.36)	1186.0 (0.52)	2341.0 (1.03)	776.3 (0.34)	360.0 (0.16)	899.7 (0.39)
Rural permanent wages	196.4 (0.19)	360.6 (0.35)	194.5 (0.19)	107.3 (0.10)	72.5 (0.07)	204.8 (0.20)
Rural occasional wages	187.1 (0.55)	538.4 (1.58)	133.1 (0.39)	118.1 (0.35)	47.0 (0.14)	142.5 (0.42)
Rural independent	3411.5 (0.78)	8709.2 (1.99)	2365.8 (0.54)	899.4 (0.21)	578.5 (0.13)	2393.3 (0.55)
Female workers						
Urban skilled permanent wages	16.7 (0.03)	18.1 (0.03)	31.8 (0.06)	11.6 (0.02)	181.2 (0.32)	21.1 (0.04)
Urban skilled occasional wages	2.3 (0.13)	3.0 (0.17)	6.7 (0.39)	1.1 (0.06)	1.2 (0.07)	2.7 (0.15)
Urban skilled independent	143.9 (0.31)	166.9 (0.36)	801.4 (1.72)	75.5 (0.16)	88.2 (0.19)	174.7 (0.38)
Urban unskilled permanent wages	11.7 (0.18)	13.4 (0.20)	20.1 (0.30)	6.6 (0.10)	11.7 (0.18)	18.1 (0.27)
Urban unskilled occasional wages	214.8 (3.03)	31.3 (0.44)	32.1 (0.45)	12.7 (0.18)	9.3 (0.13)	33.4 (0.47)
Urban unskilled independent	326.9 (0.34)	535.4 (0.56)	1404.3 (1.48)	148.3 (0.16)	148.3 (0.16)	375.3 (0.39)
Rural permanent wages	390.6 (1.74)	130.4 (0.58)	69.3 (0.31)	27.1 (0.12)	21.5 (0.10)	75.8 (0.34)
Rural occasional wages	67.4 (0.65)	204.4 (1.98)	46.2 (0.45)	18.2 (0.18)	23.2 (0.22)	46.9 (0.45)
Rural independent	1727.5 (0.71)	5342.3 (2.19)	1185.0 (0.48)	460.8 (0.19)	312.1 (0.13)	1201.2 (0.49)
Aggregation						
Male	5598.3 (0.40)	11884.5 (0.85)	6985.8 (0.50)	2892.6 (0.21)	2778.5 (0.20)	4973.1 (0.36)
Female	2901.7 (0.59)	6445.2 (1.31)	3596.9 (0.73)	761.9 (0.16)	796.7 (0.16)	1949.2 (0.40)
Urban	2519.6 (0.24)	3044.4 (0.29)	6588.7 (0.64)	2023.7 (0.20)	2520.3 (0.24)	2857.9 (0.28)
Rural	5980.5 (0.70)	15285.3 (1.79)	3994.0 (0.47)	1630.8 (0.19)	1054.8 (0.12)	4064.5 (0.48)
Urban skilled	727.6 (0.13)	857.4 (0.15)	2242.5 (0.39)	627.8 (0.11)	540.1 (0.09)	836.7 (0.14)
Urban unskilled	1566.8 (0.34)	1962.9 (0.43)	4065.9 (0.89)	1133.8 (0.25)	928.7 (0.20)	1783.4 (0.39)

Source: Authors using SimSIP SAM.

Table 11: Percentage of Total Multiplier Effect Resulting from Indirect Effects in Guinea, 2005

	Livestock	Agriculture	Informal manufacturing	Modern construction	Aluminum	Fishery
Male workers						
Urban skilled permanent wages	67.9	78.8	54.8	66.7	3.9	78.6
Urban skilled occasional wages	64.0	68.6	51.6	22.3	22.2	66.7
Urban skilled independent	59.8	67.0	27.7	54.3	40.2	63.6
Urban unskilled permanent wages	62.8	77.7	44.4	66.4	8.5	33.2
Urban unskilled occasional wages	78.8	74.3	66.1	52.3	12.2	54.5
Urban unskilled independent	63.4	57.9	24.2	52.5	42.5	63.6
Rural permanent wages	79.8	48.7	66.1	80.9	48.4	75.2
Rural occasional wages	94.4	37.1	90.8	74.2	71.7	96.8
Rural independent	83.1	36.1	79.9	94.7	89.7	87.9
Female workers						
Urban skilled permanent wages	56.7	79.3	37.7	80.7	2.2	61.7
Urban skilled occasional wages	74.2	76.3	30.1	93.8	47.9	76.3
Urban skilled independent	72.0	83.7	17.0	92.1	40.2	75.3
Urban unskilled permanent wages	51.5	74.9	38.2	88.4	23.7	49.9
Urban unskilled occasional wages	15.4	92.0	81.5	97.6	84.3	96.1
Urban unskilled independent	69.4	62.0	20.2	94.5	51.2	70.7
Rural permanent wages	21.2	59.0	85.3	99.4	82.4	94.5
Rural occasional wages	94.4	35.3	90.6	99.5	50.4	99.0
Rural independent	95.3	35.0	90.8	99.8	96.3	99.2
Aggregation						
Male	79.3	41.5	46.4	48.7	33.5	76.9
Female	78.1	39.1	44.2	90.6	57.3	94.7
Urban	73.3	67.9	24.3	34.9	18.6	69.6
Rural	81.2	35.3	80.8	85.5	87.0	90.5
Urban skilled	76.7	75.7	26.0	32.6	12.1	76.8
Urban unskilled	71.3	63.6	23.3	36.7	29.8	65.2

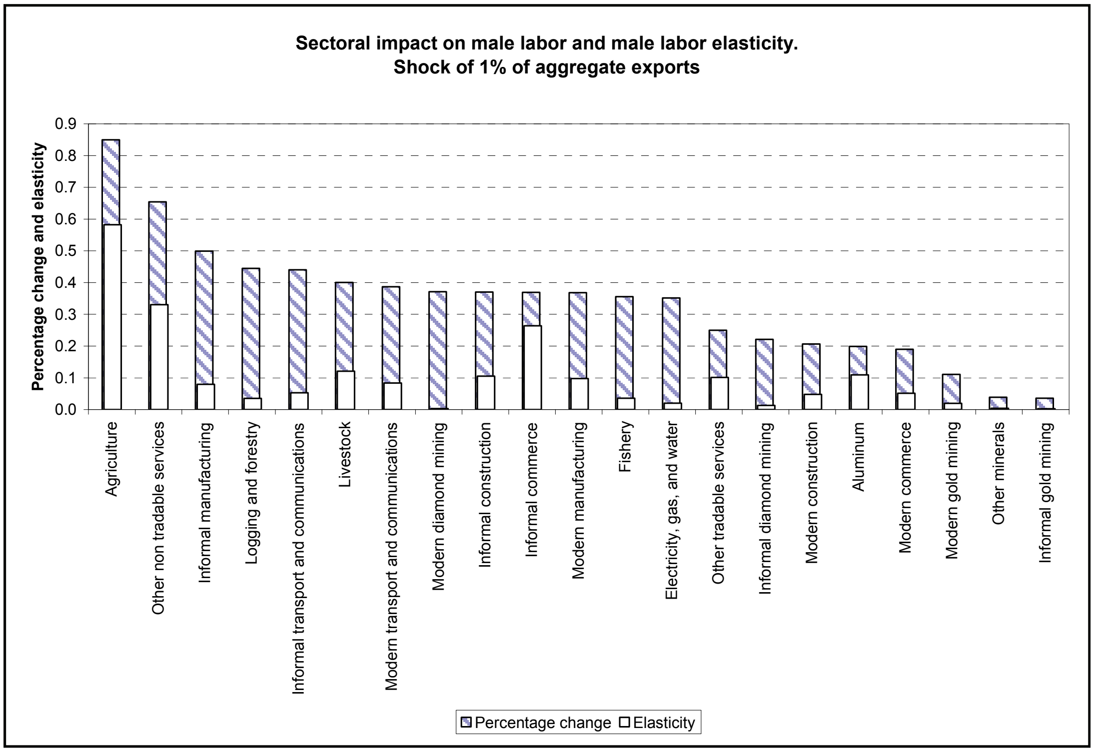
Source: Authors using SimSIP SAM.

In order to compare the percentage increases in labor income by gender in the six sectors in tables 10 and 11 with other sectors, we simulate an increase in demand for each of the sectors in the SAM equal to 1 percent of aggregate exports (GNF 15,368 million) and estimate the resulting increase in labor income in percentage terms. The size of the shock is arbitrary and was chosen as a percentage of aggregate exports to give an idea of importance relative to a macroeconomic aggregate. Figures 2 and 3 show the percentage increase in labor income for male and female workers, respectively, that results from the same increase in demand in each sector, as well as the elasticity of labor income to demand shocks for the various sectors.

Agriculture is the sector that generates the highest growth in male labor income (figure 2) with an increase in total male income of 0.85 percent, followed by Other

Nontradable Services and Modern Manufacturing. Gold Mining and Other Minerals generate, on average, the lowest percentage growth in male labor income (partially explained by their very low labor intensity). The effect on labor income is related in part to the labor intensity of different activities, as well as the gender shares of labor income in the various sectors, but the multiplier effects of the various sectors also play a role. In terms of elasticities, Agriculture, Other Nontradable Services, and Informal Commerce exhibit the highest elasticity in labor income, at values of 0.58, 0.33, and 0.26, respectively.

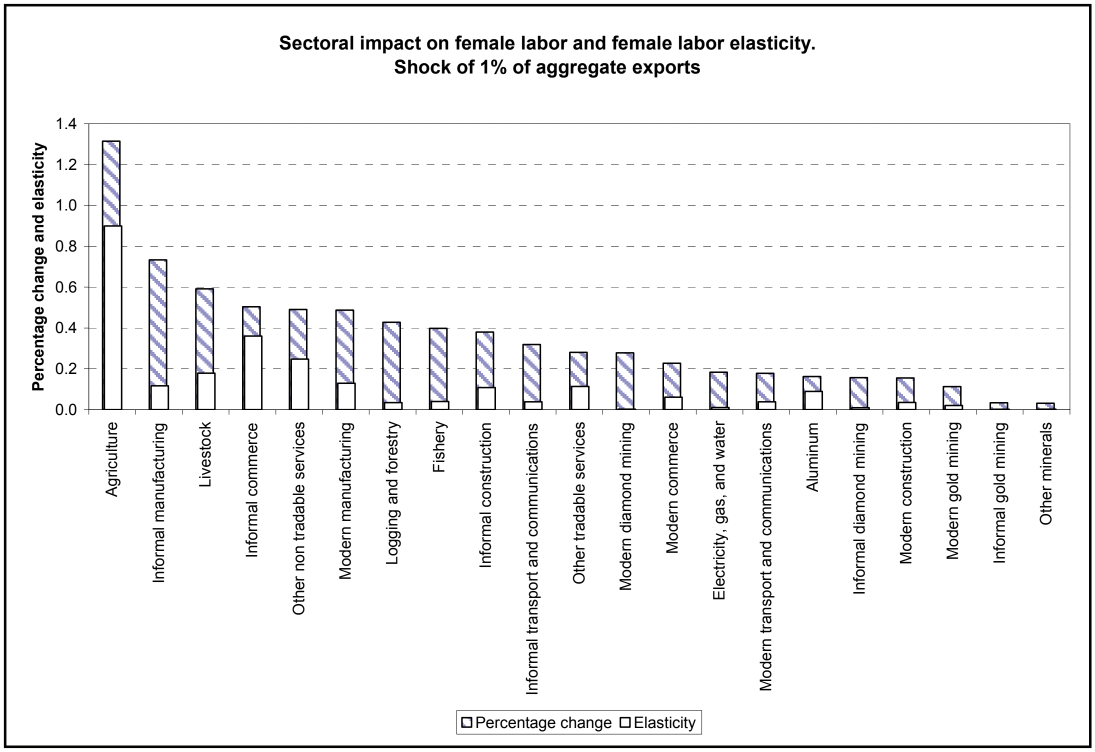
Figure 2



Source: Authors using SimSIP SAM.

The same procedure is used to examine the impact of shocks on female labor income, with the results shown in Figure 3. Agriculture, Informal Manufacturing, and Livestock are the sectors with the highest growth in female labor income, with increases of 1.31, 0.73, and 0.59 percent, respectively, when all sectors receive the same demand shock of 1 percent of aggregate exports. As was the case for male labor income, Agriculture has, by far, the highest elasticity in female labor income at 0.90.

Figure 3



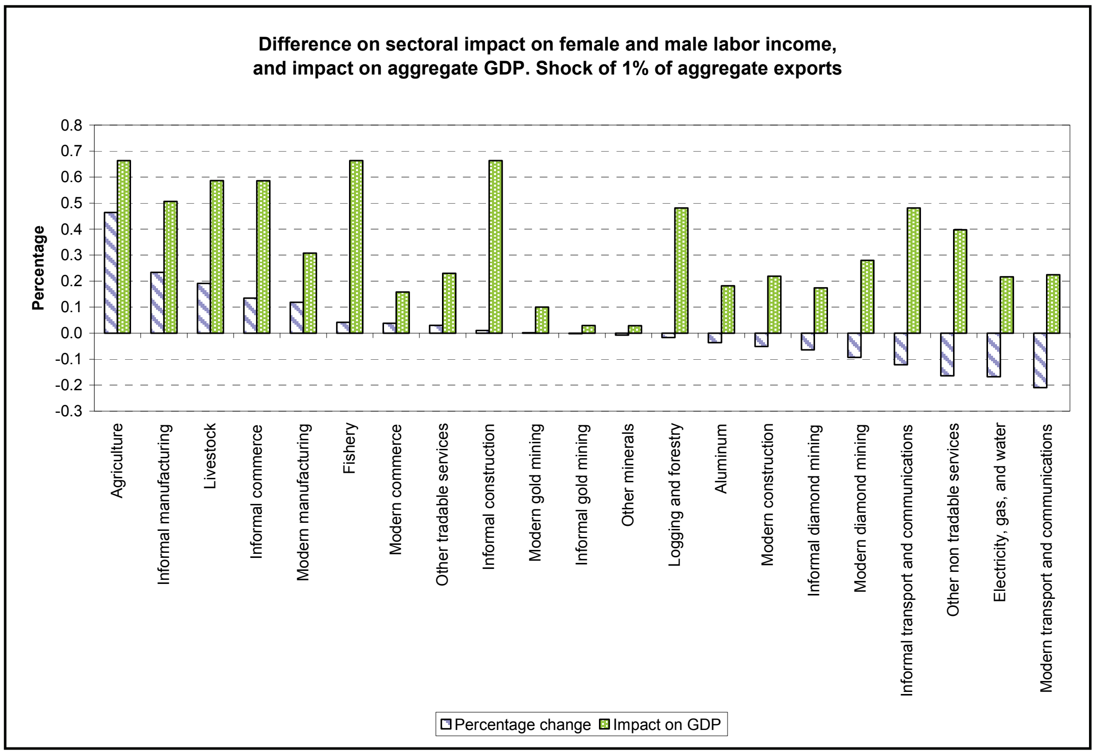
Source: Authors using SimSIP SAM.

In Figure 4, using the same demand shock for each sector of 1 percent of aggregate exports, we compute the differences in the percentage increases in labor income for male and female workers, as well as the impact on aggregate GDP that the shock might have when applied to each sector, one sector at a time. Agriculture, Informal Manufacturing, and Livestock not only benefit both male and female workers more than other sectors do, but also benefit female workers much more than male workers. Again, remember that many different factors contribute to these rankings, as well as the overall impact on labor income. One factor is the labor intensity of the various sectors. Another factor is the initial labor income shares by gender for each sector. The third factor is the multiplier effects at work, which depend in large part on the backward and forward linkages of the various sectors with the rest of the economy.

But clearly, even if indirect effects matter, in terms of the differentiated impacts by gender, the original labor income shares in each sector (direct effect) apparently play an important role, since the sectors that have the most pro-female labor impacts tend to be those with the highest proportion of labor income going to women (primary sector activities and Informal Manufacturing and Commerce). Another important finding is the direct relationship between how much more a sector benefits female than male workers, and the impact it has on aggregate GDP. The average impact on GDP of a shock of 1 percent of aggregate exports among the sectors that benefit female workers more than male workers is 0.44, compared to 0.26 among the sectors that benefit male workers more than female workers. On top of that, five of the six sectors with the highest impact on GDP favor female workers more than male workers. This result suggests, in a stylized way, that promoting growth may be compatible with closing the gap between female and male labor income, but obviously this statement is based on a very limited analysis.

Let us be clear about what the results mean. Even if agricultural growth is conducive to overall growth, this obviously does not mean that one job created in agriculture generates the same value-added elsewhere. As seen in the discussion of household survey based results, the lowest paying jobs are in agriculture. What is simulated is an identical value-added demand shock in various sectors**,** and achieving a given increase in value-added in Agriculture requires the creation of many more jobs than in other sectors. Beyond the simple simulations provided here, a strategy for growth in Guinea should clearly also focus on creating jobs in the higher productivity sectors.

Figure 4



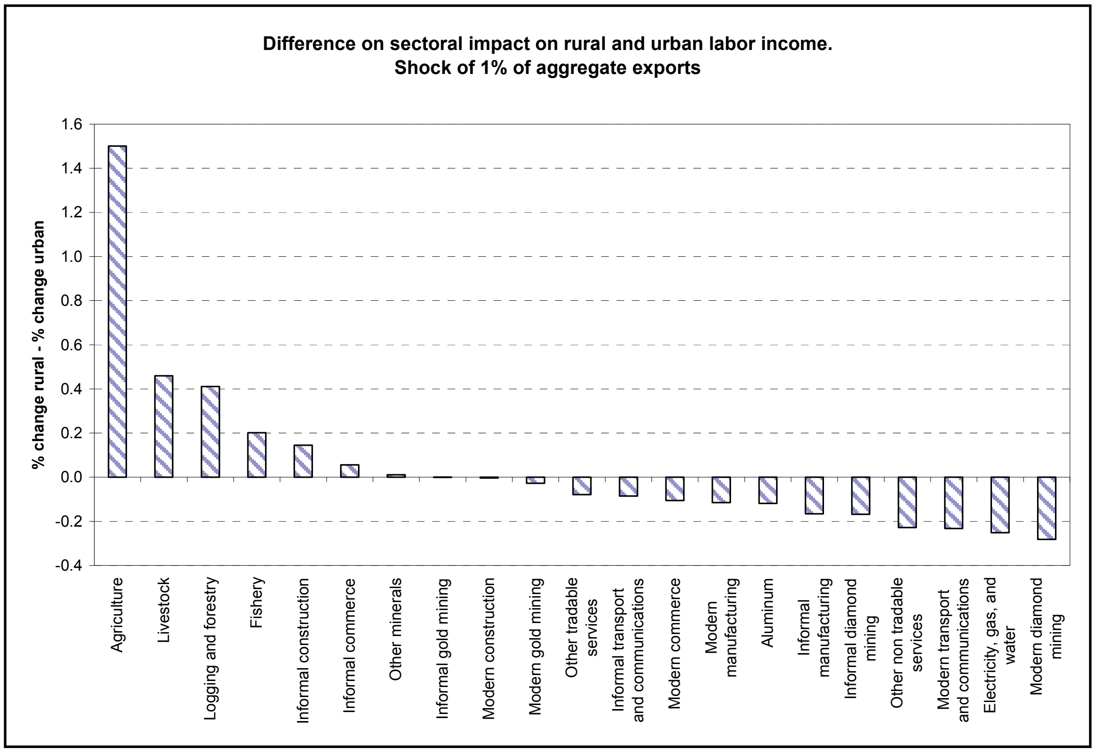
Source: Authors using SimSIP SAM.

In figure 5, we repeat the exercise presented in figure 3, but now comparing the percentage increases in labor income for rural and urban workers. Agriculture, Livestock, and Logging and Forestry benefit rural workers more, as expected.

Finally in figure 6, we compare the percentage increases in labor income for unskilled and skilled workers in urban areas resulting from the same aggregate shock (1 percent of total exports) applied to all sectors, one sector at a time. The fact that every single sector in the Guinean economy benefits unskilled labor more than skilled labor in urban areas is striking.

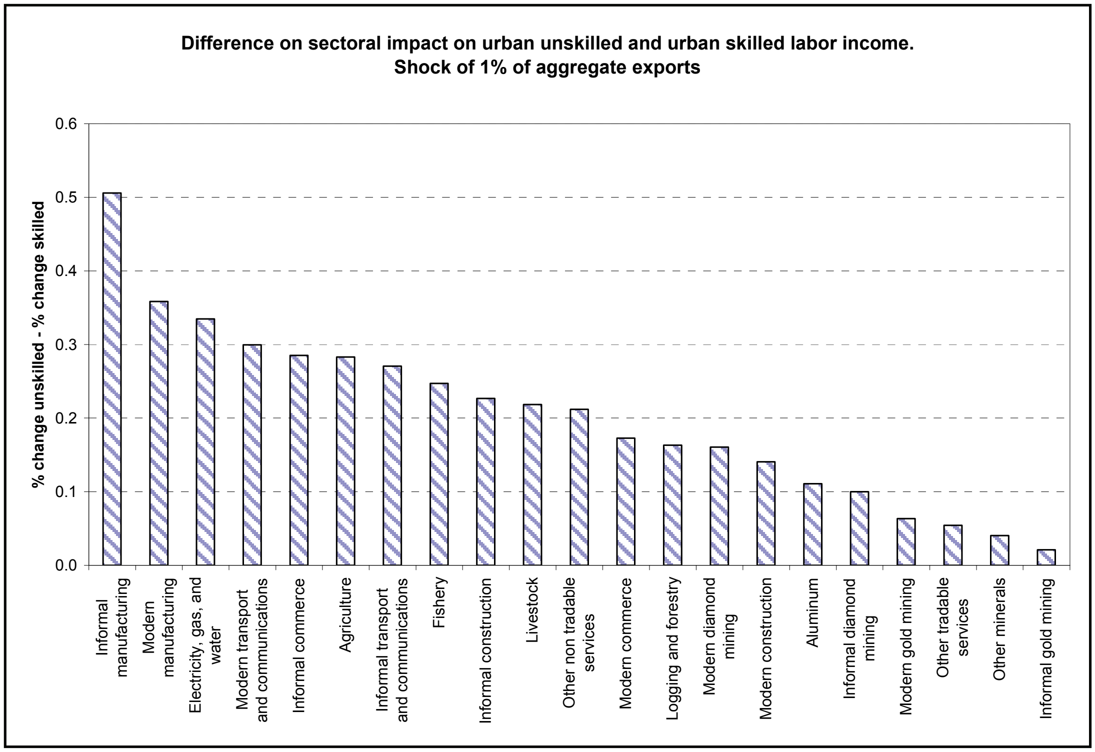
Informal and modern manufacturing are the sectors where the gap between the change in unskilled and skilled urban labor is highest. Mining and services sectors have relatively small differences between the changes in labor income for the different skill levels.

Figure 5



Source: Authors using SimSIP SAM.

Figure 6



Source: Authors using SimSIP SAM.

Conclusion

Increasing labor income for women and reducing gender disparities in labor income can have beneficial impacts on growth and poverty reduction. In addition to higher household income having a direct effect on poverty, research shows that a higher labor income share for women tends to shift household consumption choices toward more investments in human capital, among others for children**.**

This paper started by reviewing some of the evidence on gender differentials in earnings and time use patterns in Guinea using household survey data. It also provided a simulation of the potential impact on poverty of an increase in the hours worked by individuals within households. But increasing hours worked presupposes that jobs are available. Using a recent SAM for Guinea, we then turned to simple simulations of the potential impact on labor income shares by gender of growth in various sectors.

The results obtained from the microeconomic analysis of the Guinea survey are intuitive enough, and they are in line with what has been observed in other papers. These results suggest that even after controlling for a wide range of explanatory variables, the differential in wages between men and women is very large, at about 40 percent. Women tend to work lower hours than men, but earn much less, because they are often confined to low productivity jobs as well as domestic work. Unlocking the productive potential of female employment could help in improving living conditions in Guinea.

The second part of the paper was devoted to assessing whether some sectors of the economy would be especially well suited for improving the place of women in Guinea's labor markets. The empirical results were obtained with a recent Guinea SAM. We found that an expansion in agriculture especially would lead to a higher income share for women over time. This is not surprising, given the fact that many women work in agriculture. From the point of view of the implementation of Guinea's poverty reduction strategy, which places an emphasis on gender issues, the message is that investments in Agriculture, as well as other sectors such as Manufacturing, Livestock, Commerce, and Hunting, probably would help not only in reducing poverty, but also in reducing gender disparities in earnings in labor markets. Another result was that closing the gap between female and male labor incomes may also help growth in the specific sense that the sectors that comparatively favor female labor income are, on average, also the sectors that have a higher overall impact on economic growth through their multiplier effects. This is an interesting result that warrants further more detailed analysis.

One should however be careful in interpreting or using the results for policy, because of the simplicity of the analysis, and especially in the case of the SAM model, because of the strong implicit assumptions in the model. For example, the fact that agricultural growth is conducive to overall growth and a higher labor income share clearly does not mean that creating one job in agriculture has the same impact on value-added than creating one job in another sector. What was simulated is an identical value-added demand shock in different sectors. An original increase in demand of 1 percent of total value-added in agriculture implies the creation of many more jobs than an equivalent injection of 1 percent of value-added in other sectors.

The findings from this study do not imply that an actual growth strategy for Guinea should rely on sectors that favor workers with no education or sectors that favor women simply because the SAM analysis suggests that these sectors yield higher multiplier effects on overall GDP for a given shock. Such a policy would be dangerous. In the medium to long run, promoting unskilled, labor-intensive sectors, or those that traditionally employ women, would be problematic. For medium-term growth, it may be better to generate higher quality jobs, rather than lower paid jobs in lower productivity sectors, even if it is also necessary, of course, to provide conditions that enable individuals, especially the poor, to make a living. Because the Guinea SAM does not have data on employment by sector, we have not carried out here any analysis of the potential trade-offs between job creation, as opposed to value-added creation, and these trade-offs would need to be assessed for specific policies, none of which have been discussed here.

Even from a gender point of view, there may be trade-offs between creating many low-paid jobs versus creating better jobs for women. Better jobs for women may help not only to reduce the gender gap in pay, but also to provide incentives in order to encourage girls to pursue their education further because their prospects may then improve. Again, none of these dynamic considerations, which matter for policy, is discussed here.

There are also limits to the SAM simulations themselves. Since our goal was mostly to illustrate the type of simple analysis that can be conducted with a SAM, we chose to simulate demand shocks of an arbitrary size that, for comparison purposes, were set identically in value-added terms for all sectors of the economy. For small sectors, the magnitude of the shocks may simply not be realistic. Since the SAM model is linear, one could of course reduce the size of the shock in the simulations, and the relative findings would remain. But the point is that, before recommending any policy, a detailed analysis of the potential for value-added and job creation in various sectors would need to be conducted. Thus, when it was stated that promoting growth in Guinea may be compatible with closing the gap between female and male labor income shares, this statement may be true as a stylized fact from the SAM analysis, but it should not be taken as a policy fact.

The above comments are not meant to imply that the analysis in this paper is useless—we do not believe it is, and we would not have carried it out if such was our belief. SAM-based analysis, as well as microeconomic analysis, provides valuable insights into the workings of the economy and the place of women in the labor market. These insights are precious especially in poor countries where data and more sophisticated models are often not available for detailed analysis, or not well understood locally due to limited capacity to carry analytical work based, for example, on more complex computable general equilibrium models. But, in conclusion, we do want to emphasize that there is a difference between trying to better understand the basic structure of an economy through the type of simulations implemented here and claiming that the results should orient actual policy making.

The simplicity of the SAM model is both its main weakness and its strength. This simplicity is a weakness because it comes from serious limitations of the model, including the fact that no behavioral responses are taken into account, and that the model cannot be used to simulate at the same time price and quantity shocks (when a price shock is simulated, quantities are held constant, and when a quantity shock is simulated using a SAM, prices are held constant). A SAM also has limitations in examining sectoral labor movements in response to demand and other exogenous shocks. Simplicity is also a strength because the SAM-based model is relatively easy to understand and use, and its results can be easily replicated. More complex models, such as CGE models, can take into account behavioral responses, but their results depend on many assumptions made by the user that are not always easy to assess for the external reader. Of course the SAM model also makes some strong assumptions, but they are fewer and usually easier to understand. Thus, while SAM-based analysis can help to better understand the structure of an economy, it does not mean that the results from simulations should be taken literally in order to inform policy.

While we have focused on some of the limits of the SAM model in the conclusions of this paper, similar caution is of course also warranted in the use of microeconomic survey-based empirical results such as the ones presented in the first part of this paper. But these tend to be well understood as the community of practitioners for such work is much larger than the community of practitioners for SAM and other general equilibrium models.

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Annex 1 Construction of Total Income in the EBEIP Household Survey

To obtain total annual household income, modules for employment, agricultural and non-agricultural activities, transfers, and other activities in the EIBEP (Enquête Intégrée de Base pour l'Evaluation de la Pauvreté or Basic Integrated Poverty Evaluation Survey) were used. Auto-consumption was derived from the consumption module. Aggregate annual income is defined as the sum of the incomes of household members obtained from main and secondary jobs (including benefits), income obtained from the sale of agricultural products (net of costs), profits from sales of agricultural equipment and tools, other incomes from agricultural and breeding activities, profits from non-agricultural activities, auto-consumption, payments received, transfers, and other incomes. Some of those costs and incomes are based on data collected over a short period (the last 15 days or the last period of payment). When this is the case, the amounts are adjusted to correspond to an annual activity. Incomes are collected separately for each household member and aggregated at the household level in order to obtain the total annual household income. Table A.1. shows how the main components of aggregate income have been derived. The second definition of household income used in this paper is given in the last line of the table.

Table A.1. Definition of Aggregate Household Income

Detailed components		Aggregated income components (equal to the sum of detailed components by row)
+ Cash wages from the main job + Allowances and bonuses + Payments in kind (food, animals, etc.) + Value of housing assigned by the company + Reimbursement of transport costs	=	+ Income from main job
+ Cash wages from the second job + Payments in kind (food, animals, etc.) + Other payments in kind (housing, transport, goods and services)	=	+ Income from secondary job
+ Profits from the sale of agricultural products – Costs from activities linked to agriculture and breeding	=	+ Profits from the sale of agricultural production
		+ Incomes from the sales of agricultural tools
		+ Other income from agriculture and breeding
+ Turnover from non-agricultural firms – Costs from non-agricultural firms – Value of depreciation	=	+ Profits from non-agricultural activities
		+ Auto-consumption
		+ Payments received
		+ Transfers and other income
		= Total Annual Household Income
Total Annual Household Income – Profits from non-agricultural activities = 'Income 2'		

Annex 2 Block Decomposition of the SAM Multiplier Matrix

Cell m_{ji} of the multiplier matrix M quantifies the change in total income of account *i* as a result of a unitary increase in the exogenous component of sector *j*. In order to decompose the matrix M[5], for any nxn nonsingular matrix, we can rewrite equation (2) as:

$$Y = \left(A - \tilde{A}\right)Y + \tilde{A}Y + X \tag{3}$$

$$Y = A^{*}Y + \left(I - \tilde{A}\right)^{-1} X \tag{4}$$

where

$$A^{*} = \left(I - \tilde{A}\right)^{-1}\left(A - \tilde{A}\right) \tag{5}$$

Multiplying through by A^{*} yields:

$$A^{*}Y = A^{*2}Y + A^{*}\left(I - \tilde{A}\right)^{-1} X \tag{6}$$

From equation (2) we have an expression for $A^{*}Y$. Replacing it on the left-hand side yields:

$$Y = A^{*2}Y + \left(I + A^{*}\right)\left(I - \tilde{A}\right)^{-1} X \tag{7}$$

Multiplying equation (2) through by A^{*2} and replacing the expression for $A^{*2}Y$ from equation (6) yields:

$$Y = \left(I - A^{*3}\right)^{-1}\left(I + A^{*} + A^{*2}\right)\left(I - \tilde{A}\right)^{-1} X \tag{8}$$

Notice that we just decomposed multiplicatively the multiplier matrix M from equation (2) into three different matrices. Define:

$$M_1 = \left(I - \tilde{A}\right)^{-1},\ M_2 = \left(I + A^{*} + A^{*2}\right),\ \text{and}\ M_3 = \left(I - A^{*3}\right)^{-1} \tag{9}$$

Then $M = M_3 M_2 M_1$. It is also possible to present the decomposition in an additive way:

$$M = I + \underbrace{\left(M_1 - I\right)}_{TR} + \underbrace{\left(M_2 - I\right)M_1}_{OL} + \underbrace{\left(M_3 - I\right)M_2 M_1}_{CL} \tag{10}$$

where the first term (the identity matrix) is the initial unitary injection, matrix M_1 captures the net effect of a group of accounts on itself through direct transfers, matrix M_2 captures all net effects between partitions, and matrix M_3 captures the net effect of circular income multipliers among endogenous accounts. The terms in the additive decomposition (labeled *TR*

[5] For more details about computation, see Pyatt and Round (1979).

for transfer effects, *OL* for open-loop effects, and *CL* for closed-loop effects), have broadly the same interpretation as the corresponding multiplicative effects (the matrices M_i).

The nxn matrix $\tilde{A}$ (partition of A) was chosen as follows, considering that the first row (and column) corresponds to the activities/commodities group, the second to the production factors, and the third to enterprises/households:

$$\tilde{A} = \begin{pmatrix} A_{11} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & A_{33} \end{pmatrix}$$

Using the definition of A^* from equation (5) yields

$$A^* = \left(I - \tilde{A}\right)^{-1}\left(A - \tilde{A}\right) = \begin{pmatrix} \left(I - A_{11}\right)^{-1} & 0 & 0 \\ 0 & I & 0 \\ 0 & 0 & \left(I - A_{33}\right)^{-1} \end{pmatrix} \begin{pmatrix} 0 & 0 & A_{13} \\ A_{21} & 0 & 0 \\ 0 & A_{32} & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 & A_{13}^* \\ A_{21}^* & 0 & 0 \\ 0 & A_{32}^* & 0 \end{pmatrix}, \quad \begin{cases} A_{13}^* = \left(I - A_{11}\right)^{-1} A_{13} \\ A_{21}^* = A_{21} \\ A_{32}^* = \left(I - A_{33}\right)^{-1} A_{32} \end{cases} \tag{11}$$

Using the expression for A^* and the definitions in equation (9) yields

$$M_1 = \begin{pmatrix} \left(I - A_{11}\right)^{-1} & 0 & 0 \\ 0 & I & 0 \\ 0 & 0 & \left(I - A_{33}\right)^{-1} \end{pmatrix} \tag{12}$$

$$M_2 = \begin{pmatrix} I & A_{13}^* A_{32}^* & A_{13}^* \\ A_{21}^* & I & A_{21}^* A_{13}^* \\ A_{32}^* A_{21}^* & A_{32}^* & I \end{pmatrix} \tag{13}$$

$$M_3 = \begin{pmatrix} \left(I - A_{13}^* A_{32}^* A_{21}^*\right)^{-1} & 0 & 0 \\ 0 & \left(I - A_{21}^* A_{13}^* A_{32}^*\right)^{-1} & 0 \\ 0 & 0 & \left(I - A_{32}^* A_{21}^* A_{13}^*\right) \end{pmatrix} \tag{14}$$

We can provide expressions for the matrices *TR*, *OL*, and *CL* defined in equation (10):

$$TR = \begin{pmatrix} (I - A_{11})^{-1} - I & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & (I - A_{33})^{-1} - I \end{pmatrix} \tag{15}$$

$$OL = \begin{pmatrix} 0 & A_{13}^{*} A_{32}^{*} & A_{13}^{*} (I - A_{33})^{-1} \\ A_{21}^{*} (I - A_{11})^{-1} & 0 & A_{21}^{*} A_{13}^{*} (I - A_{33})^{-1} \\ A_{32}^{*} A_{21}^{*} (I - A_{11})^{-1} & A_{32}^{*} & 0 \end{pmatrix} \tag{16}$$

$$CL = \begin{pmatrix} C_{132} (I - A_{11})^{-1} & C_{132} A_{13}^{*} A_{32}^{*} & C_{132} A_{13}^{*} (I - A_{33})^{-1} \\ C_{213} A_{21}^{*} (I - A_{11})^{-1} & C_{213} & C_{213} A_{21}^{*} A_{13}^{*} (I - A_{33})^{-1} \\ C_{321} A_{32}^{*} A_{21}^{*} (I - A_{11})^{-1} & C_{321} A_{32}^{*} & C_{321} (I - A_{33})^{-1} \end{pmatrix} \tag{17}$$

where $C_{132} = \left(I - A_{13}^{*} A_{32}^{*} A_{21}^{*}\right)^{-1} - I$, $C_{213} = \left(I - A_{21}^{*} A_{13}^{*} A_{32}^{*}\right)^{-1} - I$ and $C_{321} = \left(I - A_{32}^{*} A_{21}^{*} A_{13}^{*}\right)^{-1} - I$

We now interpret and describe some features of the matrices *TR*, *OL*, and *CL* defined in equation (10). *TR*, which quantifies the net effect (net with respect to the initial unitary effect of a shock to an account on itself) of groups of accounts into themselves (intra), is a block diagonal matrix with a zero block in the second block on the diagonal, a consequence of the absence of transfers among production factors. *OL*, which captures the net direct effect (net with respect to the matrix M_1) between (inter) accounts, has zeros along the diagonal. *CL*, the matrix that captures the net closed-loop effects (net with respect to the product $M_2 M_1$), has no special structure.