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Impact of Rising Rice Prices and Policy Responses in Mali:

Simulations with a Dynamic CGE Model

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Abstract

The increase in the international price of rice is likely to have substantial negative impacts on the poor in countries such as Mali which are net importers of rice. This paper relies on a dynamic CGE model to estimate the likely impact of the recent increase in rice prices on poverty with and without policy responses. Two sets of policy responses are considered: import tax cuts on rice and measures to increase productivity of domestic rice production. The results suggest that an increase in productivity would have a much larger positive impact than a reduction in taxes.

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Impact of Rising Rice Prices and Policy Responses in Mali: Simulations with a Dynamic CGE Model[1]

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1. Introduction

Many countries from the West Africa Economic and Monetary Union (WAEMU) have been hit hard by the recent increase in food prices. While the countries have to some extent been protected from the full impact of the increase in international cereals prices due to the appreciation of the Franc CFA which is pegged to the Euro, they have nevertheless been highly vulnerable due to the fact that a substantial part of the consumption of cereals is imported, especially in the case of rice. In Mali, the overall inflation rate for the last twelve months has reached more than ten percent, and food prices have increased even more (WAEMU, 2008).

It is well known that the increase in cereals prices is likely to have substantial negative impacts on the poor (for reviews and multi-country work on this, see Ivanic and Martin, 2007; International Monetary Fund, 2008; Wodon et al., 2008; Wodon and Zaman, 2008; and World Bank, 2008a and 2008b). However, detailed work at the country level on the likely impacts of the crisis is still scarce especially in West African countries were data are often weaker.

According to field data collected in Mali, the price of rice is today about 25 percent higher than it was a year ago (USAID, 2008). Using recent household survey data, and following a well established methodology in order to identify the likely impact of the food price crisis on both consumers and producer (on this methodology see among others Deaton (1989), Barrett and Dorosh (1996) and Budd (1993)), Joseph and Wodon (2008) find that an increase in the price of cereals (rice, millet, sorghum, corn and wheat) of 25 percent would lead to an increase in the share of the population in poverty of 1.7 percentage point (this would represents close to 300,000 persons falling into poverty). The increase in the price of rice alone would increase the share of the population in poverty by 1.5 percentage point.

However, a limit of standard microeconomic work based on household surveys is that estimates of the short term effect of higher food prices through the identification of net producers and net consumers do not take into account a wide range of potential effects. For example, the increase in food prices may be partially compensated by an increase in wages for those workers who contribute to the production of food crops (see for example Ravallion, 1990; Boyce and Ravallion, 1991, Rashid, 2002; Christaensen and Demery 2007; and Ivanic and Martin, 2007). While the findings from the literature suggest that wage offsets compensate only in a limited way for the initial increase in food prices, this remains an empirical issue that must be resolved through detailed work at the country level. Changes in food prices may also lead to substantial changes in production and consumption patterns within a country as households modify their consumption patterns, and local producers aim to take advantage of new opportunities.

In this paper, our objective is to go one step further versus standard household survey analysis by relying on a dynamic CGE model in order to assess the broader impact of the shock on the economy. We focus on the impact of the increase in the price of rice, since this is the main commodity that is imported in Mali. In so doing, we follow among others on previous work by Warr (2005) and Sumarto et al. (2005) on Indonesia (on the Indonesia story as well as for a more general discussion on the experience of governments in Asia to stabilize the price of rice, see Timmer and Dawe, 2007), as well as Niimi et al. (2004) and Minot and Goletti (1998) on Vietnam. A key difference between our work and previous work is that we focus on the impact of the rice price increase in a country that is a net importer of rice (even though Mali also produces a lot of rice), while much of the previous work focused on net rice exporters.

In CGE work, a key empirical reference is the IFPRI standard model as documented in Lofgren, Harris and Robinson (2002), which is based on the classical work by Dervis, de Melo and Robinson (1982). In our model for Mali, essential elements of the model's dynamics are drawn form Thurlow (2004), and discussed by Rumpalla, Semega and Vellutini (2006) and Nouve, Rumpalla and Vellutini (2007). Our Malian model is solved for eight subsequent periods or years, from 2004 to 2012, with the price shocks starting in 2008. We use a sequential model in which static within-period equilibriums are dynamically linked between periods through optimal accumulation and allocation of the capital stocks. The growth path has an exogenous component, which is derived from available information on expected growth and the expected policy environment over the simulation period. We are interested in assessing the likely extent to which the recent food price shock will have an impact on Mali's economy and household poverty by measuring the divergence from the expected growth path induced by the shock.

We are also interested in assessing to what extent policy responses would help in transforming the current crisis into an opportunity for development. The authorities as well as development partners have essentially considered two sets of measures to deal with the crisis. The first measure has consisted in the elimination of the import tax on rice in order to help offset part of the negative impact on the poor of the increase in international prices. The second policy response is more ambitious, as the government of Mali has announced a "rice initiative" in order to boost domestic production by fifty percent by 2009. Our model enables us to simulate the potential impact of both policy responses, and to compare the effectiveness of each type of policy not only in the short run, but in the medium term as well.

The paper is structured as follows. Section 2 presents our methodology. Section 3 describes our data and assumptions, and it also outlines the various scenarios that we consider for the empirical work. Section 4 provides our empirical results. A brief conclusion follows.

2. Methodology

2.1. Static equilibrium

As mentioned in the introduction, our analysis is based on a dynamic CGE model for Mali constructed along the lines of the IFPRI standard model (Lofgren, Harris and Robinson, 2002). The static equilibrium takes place within a single period, and it is based on competitive Walrasian markets for goods and production factors (Decaluwé and Martens, 1988). Key hypotheses include: (i) profit maximization by producers under a convex technology; (ii) utility maximization by risk-averse consumers; (iii) factor payments at their marginal value products; (iv) only relative prices matter, as the model is homogenous of degree zero in prices; (v) market equilibrium achieved through instantaneous adjustment in the supply and demand of goods and factors. In addition to its neoclassical Walrasian characteristics, the equilibrium incorporates structural rigidities on the supply and demand sides. For example, a large part of food production is not sold on the market, but rather consumed within the production unit (the household). Such a behavior requires that the model explicitly accounts for home consumption, which is done in this study with the LES demand system. Thus, the static model is best described as a neoclassical structural model. On the supply side, the model accounts for sector-specificity of the capital factors. Restricted mobility of capital, although non-neoclassical, is a feature of the Malian agrarian economy.

The static model represents production with a nested technology at two levels. At the bottom of the technology nest, intermediate inputs are combined into an aggregate intermediate demand using fixed Leontief proportions; at the same level, production factors are combined into an aggregate production factor (or value added), assuming an imperfect factor substitutability which is represented by a Constant Elasticity of Substitution (CES) function. At the top of the technology nest, the aggregate intermediate demand and the value added of a given activity are combined into activity output using a Leontief technology. Because Mali is an open economy, the produced output has two alternative uses: domestic use or exports. For exported commodities, the model allows for an imperfect transformation of output into domestic sales and exports, using the Powell-Gruen's Constant Elasticity of Transformation (CET) trade function (Powell and Gruen, 1968). For non-exported commodities, the totality of the production is absorbed on the domestic market. On the demand side, domestic commodity sales are combined with imports to form an aggregate demand. Imperfect substitutability between domestic sales and imports is assumed using the Armington trade function (Armington, 1969).

Mali being a small country, the static model also assumes price-taking behavior on the world markets. Thus, the domestic prices of imports and exports are directly linked to exogenous world prices after accounting for differences due to exchange rate, taxes, and marketing margins. The model is closed with a set of macroeconomic and factor market clearing conditions that are extensively described in Lofgren, Harris and Robinson (2002). All prices are expressed with respect to the consumer price index, which is the numéraire. On the factor market, capital supply is fixed and sector-specific, implying sector specific rental rates. The labor supply is fixed and the labor market clears through economy-wide wages. The external market is cleared assuming a fixed exchange rate, implying that foreign savings are endogenous. The Government current account clears through endogenous savings while tax rates are assumed to be exogenous. Although private savings are exogenous in the static model, they are flexible (in the tradition of Solow) in the dynamic model to which we now turn.

2.2. Dynamics

The surge in rice prices has both immediate and longer term impacts on the economy. The immediate impact occurs in the first year of the shock, and this is typically what is captured through a static CGE model. As noted by Cline (2004) and others, however, dynamic effects of shocks may be fairly different from static effects. The dynamic analysis helps capture additional impacts of the shock in subsequent periods (or a reduction in impacts when the economy is able to adjust), after accounting for the immediate effects. The rise in rice prices is expected to increase domestic rice prices in the short run. But as the economy absorbs and adjusts to the shock, producers reallocate their resources towards rice production and consumers could update their preferences, which would ultimately attenuate the impact of the initial surge in prices. Using a multi-period model also helps incorporate exogenous growth hypotheses regarding the population and the labor force, total factor productivity, transfers and public spending.

Thurlow (2004) extensively describes the dynamics of the model that we are using here, which is essentially driven by capital accumulation in the spirit of Solow. The law of motion of capital starts with endogenous investments within a given period. Investments are financed using endogenous savings, which depend on endogenous revenues of agents with a fixed marginal propensity to save. Current investments contribute to update the capital stock of the next period, after accounting for depreciation of existing capital. In any given period, total investment is optimally allocated to various sectors. The allocation rule dictates that sectors with relatively larger returns to investment in the current period will receive a relatively larger share of the investments in the next period.

2.3. Poverty

Estimates of poverty are generally measured using household per capita income or consumption derived from nationally representative household surveys. In this paper, we rely on Mali's 2001 poverty evaluation survey or EMEP which covered 7,500 households. Since the procedure for measuring the impact of shocks on poverty using the CGE results is discussed in Rumpalla, Semega and Vellutini (2006) and Nouve, Rumpalla and Vellutini (2007) we only present the most relevant relationships. Household *h* from group *g* has a level of per capita consumption spending E_{hg} defined as the product of a price vector **p** and a consumption bundle $\mathbf{x_{hg}}(\mathbf{p},y_{hg})$, where y_{hg} is the household's disposable income, so that $E_{hg} = \mathbf{p'}*\mathbf{x_{hg}}(\mathbf{p},y_{hg})$. Denoting the base scenario by the superscript *0* and a scenario after the food price shock by the superscript *s*, per capita consumption spending after the shock E_{hg}^{s} in terms of the base year price vector is:

$$(1) \qquad E_{hg}^{s} = \left[\frac{\mathbf{p}^{0}\mathbf{x}_{g}^{s}(\mathbf{p}^{s},y_{g}^{s})}{\mathbf{p}^{0}\mathbf{x}_{g}^{0}(\mathbf{p}^{0},y_{g}^{0})}\right] * E_{hg}^{0}$$

The term in the bracket is computed from the CGE model for each scenario and each year, whereas E_{hg}^{0} is derived from the household survey data in the base year. This formulation assumes that the food price shock has different impacts across household groups, but the within-group impact is identical for all households belonging to the group. Said differently, we combine the CGE results and the household surveys to perform micro simulations[2]. We use standard *FGT* measures (Foster, Greer and Thorbecke, 1984) to compute the effects of the food price shock on poverty. For a vector of household expenditures *E*, a poverty line *z*, a total

[2] Alternatives to our approach to fully account for within-group heterogeneity of impacts are twofold. A first alternative is to specify a density function for the within-group distribution of consumption and to use this distribution to compute individual impacts within each household group. Examples include de Janvry, Sadoulet and Fargeix (1991) and Decaluwé et al. (1999) who used the lognormal and beta distribution functions, respectively. A second alternative is to include all households in the survey in the CGE model and compute the impact of the shock directly from the macro model. Cockburn (2002) is an example of the latter approach.

population N and a population living under the poverty line q, the FGT measures are computed as follows:

$$(2) \qquad P_{\alpha}(E,z) = \frac{1}{N}\sum_{hg=1}^{q}\left(\frac{z - E_{hg}}{z}\right)^{\alpha}$$

where α measures the power of the FGT indices. We present results for $\alpha = 0$ (poverty headcount), $\alpha = 1$ (poverty gap) and $\alpha = 2$ (squared poverty gap). This is done for the baseline as well as each of the scenarios.

3. Data, calibration and scenarios

3.1 Data and calibration of the model

In this section, we present our data sources, including the 2004 social accounting matrix on which the CGE model is based, the key parameters used for the static and dynamic calibration of the model, and the household survey data used for the poverty analysis. We focus our analysis on the impact of the increase in the price of rice, since this is the main imported food.

The CGE model is calibrated to a 2004 social accounting matrix (SAM), which includes 26 production sectors, 28 goods and services, 2 production factors, 11 household groups, 6 tax accounts, 2 capital accounts, and the rest of the world account (on the construction of the SAM, see Nouve et al., 2005). Rice production is captured in the SAM through two activities: food crop production whereby the paddy is produced, and cereal milling whereby the crop is transformed into the rice actually sold on markets.

According to the SAM, as shown in Table 1, the value of local rice production (milling) in Mali amounted to CFAF69 billions in 2004 (approximately US$ 140 million), representing 3.1 percent of the GDP of the year. Nearly 80 percent of the value of rice production comes from the purchase of intermediate inputs, mainly paddy. The rest of the production value goes to the payments of production factors (nearly 21 percent) and taxes (1.4 percent). Although rice milling contributes for less than one percent to total GDP (0.6 percent), paddy production represents more than one percent of GDP so that overall, the rice sector accounts for more than 2 percent of GDP in Mali.

Additional insights on the Malian rice economy can be derived from the SAM using demand analysis. Total demand for rice represents approximately 5 percent of GDP, with a 2004 nominal value of nearly CFAF108 billions. Considering all forms of demands, more than one quarter of total demand (26.1 percent) comes from home consumption whereas the remaining three quarters are purchased on the market (table 1). Home consumption is even slightly more important if we only consider the demand by households (28.2 percent of total household demand for rice in 2004—see Column 2 in table 2). The SAM shows that households represented more than 90 percent of the market demand for rice in 2004, which represents more than 3 percent of GDP (table 1), since this also includes demand satisfied through rice imports which account for about 40 percent of total rice consumption. Regarding the value of market supply, it can be decomposed into domestic sales by rice producers (50 percent), imports (31 percent), marketing costs or margins (16.5 percent) and taxes (2.3 percent).

Although the SAM includes 11 household groups, which serve as the basis for poverty analysis, the presentation will focus on the six groups indicated in table 2. These include four urban and two rural household groups: (i) households in which the head live in urban area and works in industry; (ii) urban households with a head that is a public servant; (iii) urban households with heads working in private services; (iv) urban households with the heads working in non-industry and non-services sectors; (v) rural households with heads working in agriculture; and (vi) rural households with heads working outside agriculture.

The combined rice demand (from home production as well as imports) from these six household groups amounted to more than CFAF100 billion in 2004. Home consumption is important for all household groups, representing between 22 percent and 30 percent of total household rice consumption (table 2). Even in households where the head works in public or private services, own production of rice is important as many non-agricultural workers, particularly in secondary towns, own small plots where they grow food and cash crops. Using the SAM, it is also possible to appreciate the share of rice in household consumption. Rice budget shares vary from less than one percent for households headed by an urban dweller working in public services to close to 11 percent for households for which the head derives his/her livelihood for rural non-agricultural activities.

The calibration of our CGE model is based on a SAM for 2004 which relies in part on data from the 2001 EMEP survey. Since then, a new survey has been implemented in Mali (the 2006 ELIM survey). Estimates of rice consumption and production from the 2006 ELIM remain of the same order of magnitude than the values used for the 2004 SAM. According to Joseph and Wodon (2008) who used the 2006 ELIM to conduct an analysis of the impact on poverty of the increase in food prices (but without taking into account general equilibrium effects), more than 90 percent of the population consume rice and the average level of spending among those who consume rice is 153,000 FCFA per year per household. The household surveys does not distinguish between imported and locally produced rice, but a comparison of data on the income received from rice production with data on the consumption of rice suggests that the average value of consumption is about two times higher than the average income received from rice. It is likely that consumers pay a mark up over the producer price of rice (given the need to transport and market the locally produced rice), but it is also likely that some of the rice produced in Mali is exported to neighboring countries. Therefore, one can assume that about 40 percent to 50 percent of the rice consumed in the country is locally produced, which is the common perception in the country, and is also what one finds in the SAM data. The household survey suggests that rice is consumed as frequently in rural than in urban areas, although rural consumption of rice relies more on auto-consumption. However, the data also suggests that rice is consumed more intensively by urban and comparatively richer households than by the rural poor. In the top quintile of consumption per capita, rice consumption per household is almost five times higher than in the bottom quintile.

It is important to mention that beyond rice, other cereals also matter, but it is the price of rice that is likely to have the largest effect on households. The 2006 ELIM survey data suggest that millet and sorghum consumption is at about the same level on average as rice consumption, while the consumption of corn and wheat and bread is five times smaller. As for rice, more than nine out of ten households consume millet and sorghum, but the key difference is that most of the consumption of millet and sorghum is locally produced, and a very high share of that production is auto-consumed. The same is true for corn (by contrast, wheat and bread tend to be imported, but these goods are much smaller in terms of their share of total consumption). Thus, because millet and sorghum are essentially auto-consumed, changes in prices for these cereals are likely to have a much lower impact on the overall economy and household poverty than changes in rice prices.

In addition to the 2004 SAM, additional data used to calibrate the static model include behavioral elasticities for production, demand, and trade. Demand elasticities have been calibrated from the LES demand using the Frisch parameter and household specific expenditure elasticities that have been estimated from household survey data. Rampulla, Semega and Vellutini (2006) provide details on each of these parameters, including production and trade elasticities. An important parameter for the analysis in this paper is the elasticity of substitution between domestic sales and imports of rice. This elasticity has been set to 2 for a first set of results, corresponding to an Armington's function exponent of 0.5. That is, imported rice and domestic rice are only partial substitutes, as many Malians prefer the local variety over imports (as noted in USAID, 2008). For sensitivity analysis, we also present a second set of results under conditions of lower substitutability, with the Armington function elasticity set at 1.2.

Regarding the calibration of the dynamic model, emphasis has been put on identifying a realistic exogenous growth path of the economy in the medium run. The assumptions are shown in table 3. In particular, fiscal efficiency is assumed to improve moderately by 0.5 percent per year. As explained by Rampulla, Semega and Vellutini (2006), this reflects recent efforts by the Government to increase the tax base. In addition, population is assumed to grow at 2.2 percent, and the growth in population contributes to increase aggregate demand via the effects on subsistence consumption from the LES demand system. Labor supply is assumed exogenous, with a two percent annual growth. Total factor productivity growth was set to 1.5 percent per year, based on data from IMF (2006), and capital stock was assumed to depreciate by four percent per year. Finally, the grant from the rest of the world to the Government will continue to grow by five percent per year, whereas the annual growth of the Government current expenditures will stay at four percent.

3.2 Scenarios

We consider six different scenarios (table 4). The *base* scenario is the business as usual scenario. Rice prices, rice taxes, and rice productivity all remain unchanged. The second scenario is based on an increase in the international price of rice of 80 percent between July 2007 and July 2008. This is the level of the increase actually observed in FCFA. The third scenario considers an increase in international rice prices of 110 percent, corresponding to the increase in US dollar terms. The difference between the two scenarios stems from the fact that the FCFA is pegged to the Euro and has thus appreciated against the US dollar over the same period. Next, we consider four other scenarios based on two policy responses from the authorities. A first response consists in eliminating the import taxes on rice. A second policy response consists in implementing interventions to increase the productivity of rice production by 15 percent (this is an arbitrary level of productivity gains used for illustrative purposes). Thus, we first run the model assuming that the only response is the import tax cut, and next we add to the import tax cut a second response which is meant to increase agricultural productivity.

Compared to the no intervention scenarios, the tax cut should help reduce the increase in rice prices, but its impact may be limited when compared to the magnitude of the shock. Indeed, before the crisis, the total cumulative tax rate on imported rice was at 32.48 percent. This overall tax rate results from the following: an import tax of ten percent according to the West African Economic and Monetary Union common external tariff, a tax of one percent levied to support the collection of statistical data in the country, another tax of one percent (solidarity levy) to support the secretariat of the West African Economic and Monetary Union, a community levy of 0.5 percent for the ECOWAS (Economic Commission of West African States) secretariat, and finally a value added tax of 18 percent (note of these taxes tends to be applied to local rice since sales of local rice are largely informal). Thus, while total taxation on imported rice is high, it is still well below the actual increase in the international price of imported rice, and to date, only the import tax on rice has been temporarily eliminated by the authorities. It must be noted that in the SAM underlying our CGE, rice taxes appear to be smaller than expected since they represent only 7.4 percent of imports (while the tax rate is supposed to be at 10 percent). Because of this relatively small fiscal pressure in the SAM, we can anticipate that removing import taxes on rice would have only limited impact on consumer prices and more generally the economy as a whole.

The additional intervention simulated here is that of an increase in productivity. This simulation is provided because the government of Mali has also adopted a 2008-2009 Rice Initiative through which land should be set aside and agricultural equipment and inputs should be provided to increase the production of paddy by fifty percent to reach 1.6 million tons per year, which would provide one million tons of marketable rice (including potentially some production that could be exported). The assumptions for this increase in local rice production include higher yields, which require higher productivity. The total cost of this program was estimated at CFAF 42.65 billion (more than US$80 million), one fourth of which would be allocated to the purchase of seeds and fertilizers. In our simulations, we factor a somewhat smaller increase in rice production than the level targeted by the authorities because the government's plan is very ambitious, and we assume that this increase will come from higher productivity and the supply response on the part of producers (we do not model here the additional allocations in terms of investments to be made by the government of Mali for this expansion of rice production).

4. Results

Tables 5 through 8 provide our empirical results on supply, demand and prices (tables 5-6), and on poverty (tables 7-8). Table 5 shows that the average price of rice (which covers both imported and locally produced rice) increases by 21 percent in 2008 against the base scenario. This is a much lower increase than the 80 percent increase in the international price of rice in large part because a majority of the rice consumed is produced domestically, and this proportion increases when the price of imported rice shoots up. Given that international and domestically produced rice are imperfect substitutes, and that there is anecdotal evidence that Malians find imported rice to be of lower quality than domestically produced rice, it is actually not too surprising that average rice prices increase by a significantly lower proportion than international prices. The estimated increase in the price of rice is also very much in line with what has been observed in the country. According to the latest brief from USAID Mali (2008), the price of rice today is approximately 25 percent higher than it was one year ago. If Mali had not been partially protected from higher rice prices thanks to the appreciation of the Euro and the CFAF versus the US dollar, the increase in the average price of rice of the country would have been 26 percent according to our model.

The removal of import tax duties on imported rice does not seem to have a large effect on the average price of rice, since depending on the year the reduction in the price increase thanks to the tax cuts is only of one to two percentage points. This is perhaps less than expected, but stems again from the fact that imported and domestic rice are imperfect substitutes, and from the fact that the removal of taxes is relatively small as compared to the exogenous increase in international prices for rice. The scenarios under which productivity is increased have a larger impact on rice prices, with a downward pressure on prices of about seven percent.

Producer prices are increasing substantially less than consumer prices. There are various potential explanations for this. First, it may be that the margins made by intermediaries are larger than they initially were. Second, the producer price as presented in table 5 is an average over total production, including production used for auto-consumption. Third, the model may have not fully accounted for on-the-ground capacity constraints to rice production, such as the actual availability of additional irrigated land or farm equipment. As a consequence, the outward shift in supply that increases production and lowers prices may have been overestimated.

The model predicts a substantial supply response and a sharp decrease in imported rice to the benefit of domestic rice. Under the scenario corresponding to the 80 percent increase in international prices, rice production increases by 24 percent in the first year, and up to 28 percent by 2012. Under the additional measures taken by the authorities, including measures to boost productivity, the increase is larger, reaching 32 percent in the first year, and up to 43 percent by 2012. These are very large increases in production, but they are still below the announced (and very ambitious) objectives of the Government of Mali to increase rice production by 50 percent by 2009 through a range of measures to boost productivity in the rice sector. As production of rice increases, imports decrease. The total demand for rice (imported and domestic) decreases by three to seven percentage points depending on the scenarios and years of the simulations.

One could argue that the above results could be partly driven by our assumption of a relatively high degree of substitution between imports and domestic rice production (Armington elasticity equals 2 in the simulations presented thus far). However, it turns out that the results are not too sensitive, at least qualitatively, to this assumption. Under the alternative assumption of lower substitution (with an elasticity of 1.2), domestic prices increase faster by 3 percentage points; production increases less rapidly by 9 percentage points (so the difference in impacts is larger here); and imports decrease less rapidly by 16 percentage points (see table 6). Despite these changes, the main conclusions of the analysis remain robust.

The most important results are those obtained for poverty measures (tables 7-8). Under the first scenario, which corresponds to an increase in the price of rice of 21 percent in the country, the headcount index of poverty increases by 0.7 percentage point in the first year versus the baseline, and the overall increase after five years is 0.89 point. Given that Mali's population is at around 12 million people, this means that 107,000 people would fall into poverty. If Mali had not been protected by the appreciation of its currency, so that the international price of rice would have increased by 110 percent and the average price in the country by 26 percent, the increase in poverty would have reached 0.99 percentage point under scenario (2) by the year 2012. These are substantial impacts, although they are lower than that estimates obtained using the 2006 ELIM survey by Joseph and Wodon (2008) who find an increase in the headcount index of about 1.5 percentage point with a 25 percent increase in the price of rice. The fact that under the CGE model the impact is lower than with the survey-based work was to be expected since the CGE model includes a supply response for rice production as well as other adjustments in the economy and in the consumption patterns of households, while the survey based work does not.

The beneficial impact of the import and other tax cuts on rice is fairly limited, with these policies generating a gain in poverty reduction of only a tenth of a percentage point for most scenarios and simulation years. By contrast, the impact of an increase in productivity is much larger, since as of the year 2009, this increase in productivity is such that poverty is actually reduced following the initial price shock. The largest reduction in poverty observed in 2012 comes from the combination of the tax cut and the productivity gains. The findings with the poverty gap and squared poverty gap are qualitatively similar to those obtained with the headcount index, although the impacts are smaller in percentage points since these measures are also smaller in magnitude than the headcount.

In the absence of productivity gains, the impacts are largest for agricultural and informal non-agricultural households. But when productivity gains are factored in, these households benefit substantially, due to the interactions between the production of paddy rice and other sectors of the economy (including in the rice value chain). Households working in industries and public services are by contrast less affected as they tend to be better off and can therefore cope with the shock. The headcount index behaves more erratically for urban households working in private services, suggesting that a fair number of these households may be located near the poverty line (many of these households are active in the informal sector and tend to be poor or near poor). The scenarios indeed appear to have a "wave" effect on this group, with poverty measures swinging somewhat widely depending of the magnitude of the impact, the policy measures taken and the years for the simulations. However, when we move to the higher order poverty measures such as the poverty gap and squared poverty gap which are less sensitive to movements near the poverty line, the estimates suggest that this group is relatively less vulnerable to the rise in rice prices. Also, our estimates of the impact on poverty of various scenarios tend not to be very sensitive to the substitution assumption between imports and domestic production.

5. Conclusion

We have provided in this paper a general equilibrium analysis of the potential impact on poverty in Mali of the recent increase in the international price of rice. Our simulations suggest that the average price of rice in the country should have increased by about 20 percent to 25 percent, which is indeed what has been observed in the country over the last year. Without policy responses, the share of the population in poverty would increase by 0.7 percentage point, and the increase would have been even larger if the FCFA had not been appreciating versus the US dollars. While a reduction in indirect taxes on rice would have only a limited effect on prices, production, and poverty, an increase in the productivity of the rice sector could have major effects, and could lead in the medium term to a reduction in poverty rather than an increase. This suggests that the emphasis placed by the government of Mali on boosting rice production through various measures in the recently announced “rice initiative” is appropriate.

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Table 1: Structure of rice supply and demand in Mali, 2004 SAM

Items	Values and shares	Item as a percentage of GDP
Total production (in billions CFA francs)	**69.0**	**3.1%**
Share of intermediate demand in total production	77.6%	2.4%
Share of value added in total production	20.9%	0.6%
Share of production taxes in total production	1.4%	0.0%
Total demand (in billions CFA francs)	**107.9**	**4.8%**
Components of total demand		
Share of home consumption in total demand	26.1%	1.3%
Share of market demand in total demand	73.9%	3.6%
Components of market demand		
Share of households' demand in market demand	90.6%	3.2%
Share of other uses in total demand	9.4%	0.3%
Components of market supply		
Share of imports in market demand	31.3%	1.1%
Share of domestic sales in market demand	49.9%	1.8%
Share of taxes in market demand	2.3%	0.1%
Share of marketing margins in market demand	16.5%	0.6%

Source: Authors' estimation based on the 2004 SAM.

Table 2: Characteristics of household demand for rice in Mali, 2004 SAM

Household groups	Home demand for rice (bn. CFA francs)	Market demand for rice (bn. CFA francs)	Total demand for rice (bn. CFA francs)	Total expenditure (bn. CFA francs)	Share of home in total demand (%)	Share of rice in total expenditure (%)
Urban industry	0.207	0.730	0.936	74.509	22.1%	1.3%
Urban public services	0.451	1.041	1.493	176.206	30.2%	0.8%
Urban private services	0.920	2.105	3.025	296.775	30.4%	1.0%
Other urban activities	0.401	1.012	1.413	84.544	28.4%	1.7%
Agriculture	13.249	36.899	50.148	573.924	26.4%	8.7%
Other rural activities	12.978	30.460	43.437	402.087	29.9%	10.8%
Total	28.206	72.247	100.453	1,608.046	28.1%	6.2%

Source: Authors' estimation based on the 2004 SAM.

Tableau 3: Assumptions for the dynamic CGE model

Variables	Exogeneous baseline annual growth rates
Labor force	2,0 %
Total factor productivity*	1,5 %
Population	2,2 %
Public consumption	4,0 %
Fiscal efficiency	0,5 %
Government's transfers to domestic institutions	4,0%
Rest of the world's transfers to Government	5,0 %
Capital depreciation rate	4,0 %

Source: Based on Rampulla, Semega and Vellutini (2006) and FMI (2006).

Table 4: Scenarios of rice price changes and policy responses

Scenario	Scenario Description	Percentage change in rice prices	Percentage reduction in rice taxes	Percentage change in productivity
Base	Base scenario (business as usual)	0%	0%	0%
(1)	Rice price shock in CFAF (+80%)	+80%	0%	0%
(2)	Rice price shock in USD (+110%)	+110%	0%	0%
(3)	Scenario (1) with 100% tax cut on rice	+80%	-100%	0%
(4)	Scenario (2) with 100% tax cut on rice	+110%	-100%	0%
(5)	Scenario (3) with 15% rice productivity gain	+80%	-100%	+15%
(6)	Scenario (4) with 15% rice productivity gain	+110%	-100%	+15%

Source: Authors.

Table 5: Impact of scenarios on rice production, consumption and prices (Armington elasticity for rice = 2.0)

Scenarios	2007	2008	2009	2010	2011	2012
	Consumption prices for rice (index vs. baseline of 1.00)					
(1)	1.00	1.21	1.18	1.17	1.16	1.15
(2)	1.00	1.26	1.22	1.20	1.19	1.19
(3)	1.00	1.20	1.16	1.15	1.14	1.14
(4)	1.00	1.25	1.20	1.18	1.18	1.17
(5)	1.00	1.20	1.09	1.09	1.09	1.09
(6)	1.00	1.25	1.13	1.12	1.12	1.12
	Producer prices for rice (index vs. baseline of 1.00)					
(1)	1.00	1.06	1.02	1.01	1.00	0.99
(2)	1.00	1.07	1.02	1.01	1.00	0.99
(3)	1.00	1.04	1.00	0.99	0.98	0.98
(4)	1.00	1.05	1.01	0.99	0.98	0.97
(5)	1.00	1.04	0.93	0.92	0.92	0.92
(6)	1.00	1.05	0.93	0.92	0.92	0.92
	Domestic Production of rice (index vs. baseline of 1.00)					
(1)	1.00	1.24	1.27	1.28	1.28	1.28
(2)	1.00	1.30	1.33	1.35	1.35	1.35
(3)	1.00	1.25	1.28	1.29	1.30	1.30
(4)	1.00	1.32	1.35	1.36	1.37	1.37
(5)	1.00	1.25	1.36	1.36	1.36	1.36
(6)	1.00	1.32	1.42	1.43	1.43	1.43
	Imports of rice (index vs. baseline of 1.00)					
(1)	1.00	0.46	0.44	0.43	0.42	0.42
(2)	1.00	0.36	0.34	0.33	0.33	0.32
(3)	1.00	0.45	0.43	0.42	0.41	0.41
(4)	1.00	0.35	0.33	0.32	0.32	0.32
(5)	1.00	0.45	0.39	0.38	0.38	0.38
(6)	1.00	0.35	0.30	0.30	0.30	0.30
	Total demand for rice (index vs. baseline of 1.00)					
(1)	1.00	0.95	0.95	0.95	0.95	0.95
(2)	1.00	0.93	0.94	0.94	0.94	0.94
(3)	1.00	0.95	0.95	0.96	0.96	0.96
(4)	1.00	0.94	0.94	0.95	0.95	0.95
(5)	1.00	0.95	0.98	0.98	0.98	0.98
(6)	1.00	0.94	0.97	0.97	0.97	0.97

Source: Authors.

Table 6: Impact of scenarios on rice production, consumption and prices (Armington elasticity for rice = 1.2)

Scenarios	2007	2008	2009	2010	2011	2012
	Consumption prices for rice (index vs. baseline of 1.00)					
(1)	1.00	1.24	1.19	1.19	1.18	1.18
(2)	1.00	1.31	1.25	1.24	1.24	1.24
(3)	1.00	1.23	1.18	1.17	1.17	1.17
(4)	1.00	1.30	1.23	1.23	1.22	1.22
(5)	1.00	1.23	1.11	1.12	1.13	1.13
(6)	1.00	1.30	1.16	1.17	1.18	1.18
	Producer prices for rice (index vs. baseline of 1.00)					
(1)	1.00	1.06	0.99	0.99	0.98	0.98
(2)	1.00	1.08	0.99	0.98	0.98	0.98
(3)	1.00	1.04	0.96	0.96	0.96	0.96
(4)	1.00	1.06	0.96	0.96	0.95	0.95
(5)	1.00	1.04	0.84	0.87	0.89	0.89
(6)	1.00	1.06	0.84	0.87	0.88	0.89
	Domestic Production of rice (index vs. baseline of 1.00)					
(1)	1.00	1.15	1.18	1.18	1.18	1.18
(2)	1.00	1.19	1.23	1.24	1.24	1.24
(3)	1.00	1.15	1.19	1.19	1.19	1.19
(4)	1.00	1.20	1.25	1.25	1.25	1.25
(5)	1.00	1.15	1.26	1.25	1.25	1.24
(6)	1.00	1.20	1.32	1.31	1.30	1.30
	Imports of rice (index vs. baseline of 1.00)					
(1)	1.00	0.62	0.60	0.60	0.60	0.60
(2)	1.00	0.55	0.52	0.52	0.52	0.52
(3)	1.00	0.62	0.59	0.59	0.59	0.59
(4)	1.00	0.54	0.51	0.51	0.51	0.51
(5)	1.00	0.62	0.57	0.57	0.58	0.58
(6)	1.00	0.54	0.49	0.50	0.50	0.50
	Total demand for rice (index vs. baseline of 1.00)					
(1)	1.00	0.94	0.95	0.95	0.95	0.95
(2)	1.00	0.93	0.93	0.93	0.93	0.93
(3)	1.00	0.94	0.95	0.95	0.95	0.95
(4)	1.00	0.93	0.94	0.94	0.94	0.94
(5)	1.00	0.94	0.97	0.97	0.97	0.97
(6)	1.00	0.93	0.96	0.96	0.96	0.96

Source: Authors.

Table 7: Impact of scenarios on poverty (percentage point difference in poverty measure versus baseline projection; Armington elasticity = 2.0)

Scenarios	Headcount index					Poverty Gap					Squared Poverty Gap				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
	National														
(1)	0.70	0.77	1.14	0.87	0.89	0.78	0.74	0.73	0.74	0.75	0.60	0.56	0.55	0.55	0.55
(2)	0.75	0.88	1.44	1.03	0.99	0.97	0.91	0.90	0.90	0.91	0.74	0.69	0.67	0.67	0.67
(3)	0.67	0.78	1.14	0.84	0.80	0.76	0.72	0.70	0.71	0.71	0.58	0.54	0.52	0.52	0.52
(4)	0.75	0.85	1.37	0.97	0.98	0.94	0.88	0.87	0.87	0.88	0.72	0.66	0.64	0.64	0.64
(5)	0.67	-0.31	-0.14	-0.29	-0.42	0.76	-0.15	-0.23	-0.26	-0.27	0.58	-0.08	-0.13	-0.15	-0.15
(6)	0.75	-0.11	-0.02	-0.13	-0.22	0.94	0.01	-0.08	-0.10	-0.11	0.72	0.04	-0.02	-0.04	-0.04
	Urban industrial														
(1)	0.00	0.00	0.00	0.00	0.00	0.21	0.22	0.24	0.25	0.26	0.12	0.12	0.12	0.12	0.12
(2)	0.00	0.00	0.00	0.00	0.00	0.27	0.27	0.29	0.31	0.33	0.15	0.15	0.15	0.15	0.16
(3)	0.00	0.00	0.00	0.00	0.00	0.22	0.23	0.24	0.25	0.26	0.12	0.12	0.12	0.12	0.12
(4)	0.00	0.00	0.00	0.00	0.00	0.27	0.28	0.30	0.31	0.33	0.15	0.15	0.15	0.15	0.16
(5)	0.00	0.00	0.00	0.00	0.00	0.22	-0.19	-0.23	-0.25	-0.26	0.12	-0.10	-0.11	-0.12	-0.11
(6)	0.00	0.00	0.00	0.00	0.00	0.27	-0.14	-0.18	-0.19	-0.20	0.15	-0.07	-0.09	-0.09	-0.09
	Urban public services														
(1)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(2)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(3)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(4)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(5)	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	0.00	-0.01	-0.01	-0.01	-0.01
(6)	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	0.00	-0.01	-0.01	-0.01	-0.01
	Urban private services														
(1)	0.28	0.00	2.42	0.00	2.96	0.19	0.21	0.21	0.22	0.22	0.07	0.08	0.08	0.08	0.08
(2)	1.13	0.00	2.42	0.00	2.96	0.24	0.27	0.27	0.27	0.27	0.09	0.10	0.10	0.10	0.11
(3)	0.28	0.00	2.42	0.00	2.96	0.20	0.22	0.22	0.23	0.22	0.08	0.08	0.08	0.09	0.09
(4)	1.13	0.00	2.42	0.00	2.96	0.25	0.27	0.28	0.28	0.28	0.10	0.10	0.10	0.11	0.11
(5)	0.28	-2.42	0.00	-2.11	-0.88	0.20	-0.12	-0.16	-0.17	-0.16	0.08	-0.05	-0.07	-0.07	-0.07
(6)	1.13	-0.87	0.00	-0.50	-0.76	0.25	-0.08	-0.11	-0.12	-0.12	0.10	-0.03	-0.05	-0.05	-0.05
	Other urban activities (informal)														
(1)	0.89	0.60	1.84	1.19	0.63	0.31	0.32	0.33	0.33	0.34	0.14	0.14	0.14	0.14	0.14
(2)	0.92	0.60	1.94	1.66	0.76	0.39	0.40	0.41	0.41	0.42	0.17	0.17	0.17	0.17	0.18
(3)	0.89	0.60	1.84	1.19	0.63	0.32	0.33	0.33	0.33	0.34	0.14	0.14	0.14	0.14	0.14
(4)	0.92	0.60	1.94	1.66	0.76	0.40	0.41	0.41	0.41	0.42	0.18	0.17	0.17	0.17	0.18
(5)	0.89	-1.57	-0.85	-0.36	-1.06	0.32	-0.31	-0.34	-0.36	-0.37	0.14	-0.12	-0.14	-0.14	-0.14
(6)	0.92	-1.46	-0.78	-0.36	-0.99	0.40	-0.24	-0.27	-0.29	-0.30	0.18	-0.09	-0.11	-0.11	-0.11
	Agricultural														
(1)	0.98	0.97	1.22	1.18	0.97	1.05	0.99	0.98	0.99	1.00	0.84	0.78	0.77	0.77	0.78
(2)	0.98	1.14	1.48	1.49	1.07	1.30	1.22	1.20	1.21	1.23	1.04	0.96	0.94	0.94	0.95
(3)	0.89	0.91	1.22	1.09	0.97	1.02	0.95	0.94	0.94	0.96	0.82	0.75	0.73	0.73	0.74
(4)	0.98	1.04	1.40	1.31	1.07	1.27	1.17	1.15	1.16	1.18	1.02	0.93	0.90	0.90	0.91
(5)	0.89	0.03	0.02	-0.03	-0.51	1.02	0.01	-0.09	-0.13	-0.15	0.82	0.02	-0.06	-0.09	-0.10
(6)	0.98	0.26	0.05	0.19	-0.07	1.27	0.21	0.11	0.08	0.06	1.02	0.18	0.10	0.07	0.06
	Other rural activities														
(1)	0.57	0.91	0.91	0.75	0.84	0.91	0.87	0.84	0.84	0.85	0.71	0.66	0.64	0.64	0.64
(2)	0.58	0.93	1.40	0.76	0.90	1.12	1.06	1.03	1.03	1.04	0.87	0.81	0.78	0.78	0.78
(3)	0.57	0.91	0.91	0.75	0.59	0.88	0.83	0.80	0.80	0.81	0.68	0.63	0.61	0.60	0.60
(4)	0.58	0.93	1.29	0.76	0.89	1.09	1.02	0.99	0.98	0.99	0.84	0.78	0.75	0.74	0.74
(5)	0.57	0.00	-0.10	-0.35	-0.16	0.88	-0.27	-0.37	-0.39	-0.39	0.68	-0.17	-0.23	-0.24	-0.25
(6)	0.58	0.01	0.12	-0.35	-0.09	1.09	-0.09	-0.19	-0.21	-0.22	0.84	-0.03	-0.10	-0.11	-0.12

Source: Authors

Table 8: Impact of scenarios on poverty (percentage point difference in poverty measure versus baseline projection; Armington elasticity = 1.2)

Scenarios	Headcount index					Poverty Gap					Squared Poverty Gap				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
	National														
(1)	0.64	0.72	1.09	0.66	0.90	0.75	0.71	0.72	0.73	0.75	0.58	0.54	0.54	0.55	0.56
(2)	0.71	0.84	1.45	0.94	0.97	0.96	0.91	0.91	0.93	0.96	0.75	0.69	0.69	0.70	0.71
(3)	0.61	0.72	1.06	0.65	0.88	0.74	0.69	0.69	0.70	0.72	0.57	0.52	0.52	0.53	0.54
(4)	0.71	0.87	1.44	0.93	0.96	0.95	0.88	0.89	0.90	0.93	0.73	0.67	0.67	0.68	0.69
(5)	0.61	-0.39	-0.07	-0.35	-0.47	0.74	-0.16	-0.21	-0.22	-0.22	0.57	-0.08	-0.11	-0.12	-0.11
(6)	0.71	-0.19	-0.01	-0.17	-0.18	0.95	0.03	-0.02	-0.02	-0.02	0.73	0.06	0.03	0.03	0.04
	Urban industrial														
(1)	0.00	0.00	0.00	0.00	0.00	0.16	0.18	0.20	0.21	0.23	0.09	0.10	0.10	0.10	0.11
(2)	0.00	0.00	0.00	0.00	0.00	0.21	0.24	0.26	0.28	0.29	0.12	0.13	0.13	0.14	0.14
(3)	0.00	0.00	0.00	0.00	0.00	0.17	0.19	0.20	0.22	0.23	0.09	0.10	0.10	0.11	0.11
(4)	0.00	0.00	0.00	0.00	0.00	0.21	0.25	0.26	0.28	0.30	0.12	0.13	0.13	0.14	0.14
(5)	0.00	0.00	0.00	0.00	0.00	0.17	-0.22	-0.26	-0.27	-0.28	0.09	-0.11	-0.12	-0.12	-0.12
(6)	0.00	0.00	0.00	0.00	0.00	0.21	-0.16	-0.20	-0.21	-0.21	0.12	-0.08	-0.10	-0.10	-0.09
	Urban public services														
(1)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(2)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(3)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(4)	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(5)	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	0.00	-0.01	-0.01	-0.01	-0.01
(6)	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	0.00	-0.01	-0.01	-0.01	-0.01
	Urban private services														
(1)	0.28	0.00	0.87	0.00	2.96	0.13	0.17	0.17	0.18	0.18	0.05	0.06	0.07	0.07	0.07
(2)	0.28	0.00	2.42	0.00	2.96	0.17	0.22	0.22	0.24	0.24	0.07	0.08	0.09	0.09	0.09
(3)	0.28	0.00	0.87	0.00	2.96	0.14	0.18	0.18	0.19	0.18	0.05	0.07	0.07	0.07	0.07
(4)	0.28	0.00	2.42	0.00	2.96	0.18	0.23	0.23	0.24	0.24	0.07	0.09	0.09	0.09	0.09
(5)	0.28	-2.42	-0.50	-2.96	-0.88	0.14	-0.15	-0.19	-0.20	-0.18	0.05	-0.06	-0.08	-0.08	-0.08
(6)	0.28	-2.42	0.00	-2.11	-0.88	0.18	-0.10	-0.14	-0.15	-0.14	0.07	-0.05	-0.06	-0.06	-0.06
	Other urban activities (informal)														
(1)	0.78	0.64	1.53	0.76	0.70	0.24	0.27	0.28	0.28	0.29	0.10	0.11	0.12	0.12	0.12
(2)	0.89	0.64	1.84	1.30	0.81	0.31	0.35	0.36	0.37	0.38	0.14	0.15	0.15	0.16	0.16
(3)	0.78	0.64	1.53	0.76	0.70	0.24	0.28	0.28	0.28	0.29	0.11	0.12	0.12	0.12	0.12
(4)	0.89	0.64	1.84	1.30	0.81	0.31	0.36	0.37	0.37	0.38	0.14	0.15	0.15	0.16	0.16
(5)	0.78	-1.85	-0.91	-0.47	-0.99	0.24	-0.33	-0.37	-0.39	-0.39	0.11	-0.13	-0.15	-0.15	-0.15
(6)	0.89	-1.42	-0.78	-0.36	-0.95	0.31	-0.25	-0.30	-0.31	-0.31	0.14	-0.10	-0.12	-0.12	-0.12
	Agricultural														
(1)	0.70	0.85	1.39	0.90	0.93	0.99	0.93	0.93	0.95	0.98	0.79	0.73	0.73	0.74	0.75
(2)	0.80	1.03	1.67	1.23	1.00	1.27	1.18	1.19	1.21	1.24	1.01	0.93	0.93	0.94	0.96
(3)	0.66	0.85	1.34	0.90	0.90	0.97	0.90	0.90	0.91	0.94	0.77	0.70	0.70	0.71	0.72
(4)	0.80	1.03	1.65	1.22	0.99	1.25	1.15	1.15	1.17	1.20	0.99	0.90	0.89	0.91	0.92
(5)	0.66	-0.20	0.06	-0.05	-0.34	0.97	-0.14	-0.19	-0.20	-0.20	0.77	-0.07	-0.11	-0.11	-0.11
(6)	0.80	0.08	0.12	0.13	0.08	1.25	0.12	0.06	0.05	0.06	0.99	0.12	0.08	0.08	0.09
	Other rural activities														
(1)	0.57	0.91	1.00	0.75	0.84	0.90	0.85	0.84	0.86	0.87	0.71	0.65	0.65	0.65	0.66
(2)	0.58	0.93	1.37	0.76	0.90	1.16	1.08	1.07	1.09	1.11	0.91	0.83	0.82	0.83	0.84
(3)	0.57	0.91	0.91	0.75	0.84	0.88	0.82	0.81	0.82	0.83	0.69	0.63	0.62	0.62	0.63
(4)	0.58	0.93	1.34	0.76	0.90	1.13	1.04	1.03	1.05	1.07	0.89	0.80	0.79	0.80	0.81
(5)	0.57	0.00	0.09	-0.35	-0.16	0.88	-0.29	-0.35	-0.35	-0.34	0.69	-0.18	-0.21	-0.21	-0.20
(6)	0.58	0.01	0.12	-0.22	-0.09	1.13	-0.06	-0.12	-0.12	-0.10	0.89	0.00	-0.04	-0.04	-0.02

Source: Authors.