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Devaluation and Household Welfare in Rwanda

Abstract: One of the most common criticisms of currency devaluation is that it causes disproportionate suffering among the poor. This study examines the distributional impact of price changes associated with devaluation in Rwanda using a simplified household-firm model based on household budget data. The study approximates the welfare impact on each household in the sample, making use of 'willingness-to-pay' measures of welfare impact which are theoretically superior to the standard 'consumer surplus' measure. The results indicate that price changes associated with devaluation have a proportionately greater negative impact on the real income of urban households than rural, and within each sector a greater impact on high-income households than low-income. The main reason for this pattern is that rural and low-income households tend to be insulated from price changes by being less integrated in the cash economy.

INTRODUCTION

Since the early 1980s, an increasing number of less developed countries have been forced to implement macroeconomic adjustment programmes to deal with large current account deficits, inflation, and stagnant economic growth. One of the more controversial elements of these programmes is currency devaluation. In theory, devaluation addresses the problem of external deficits by stimulating exports and dampening the demand for exportable goods and imports. However, devaluation is unpopular in less developed countries and has been criticized by some researchers for being contractionary, inflationary, ineffective in reducing external deficits, and regressive in its impact on income distribution (Krugman and Taylor, 1978; Godfrey, 1985; Cornia, Jolly and Stewart, 1987).

This controversy has generated a significant body of theoretical and empirical research on the macroeconomic effects of currency devaluation (Edwards, 1989, reviews this literature). The distributional impact of devaluation, however, is more difficult to study. Economic theory yields ambiguous results. In the short run, devaluation should benefit both labour and capital-owners in tradeable goods sectors at the expense of those in the non-tradeable goods sector. In the long run, labour will gain if tradeable goods are more labour-intensive, while owners of capital will gain if the reverse is true (Johnson and Salope, 1980). Consumers of tradeable goods, generally presumed to be high-income households, lose relative to consumers of non-tradeables. Thus, the impact on income distribution depends on the factor-intensity of each sector, demand patterns, and the structure of production.

Empirical studies are hampered by the lack of regularly collected statistics describing income distribution. A frequently used proxy is real wages, which often decline after devaluation (Cooper, 1971; Edwards, 1989). Wage statistics, however, generally refer to the urban formal sector, which is not necessarily relevant to the bulk of the poor, located in the urban informal sector and in rural areas.

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In a comparison of devaluation episodes in nine countries, Heller *et al.* (1988) conclude that that devaluation may reduce income disparities when the major export crop is produced by small farmers, while exacerbating inequality where export-oriented plantations dominate. Glewwe and de Tray (1988 and 1989), using household budget data from Peru and Côte d'Ivoire, suggest that the bulk of the poor, being rural and self-employed, should either benefit from higher farm prices or be unaffected, while the urban poor are more likely to be adversely affected. Sahn and Sarris (1991) calculate price and income indexes for the rural poor in five African countries before and after devaluation episodes. They find a mixture of gains and losses in the order of 5–10 percent, with no clear pattern in either direction. Studies using computable general equilibrium (CGE) models reveal that the effects of devaluation can vary widely, but the impact on the urban poor is generally negative, while the impact on the rural poor depends on the structure of agricultural production (Dervis, de Melo and Robinson, 1982; de Janvry, Fargeix and Sadoulet, 1988).

DATA AND METHODS

This study examines the impact of devaluation in Rwanda by combining price changes (both hypothetical and historical) and a simplified household-firm model based on household budget data[1]. The National Household Budget and Consumption Survey (ENBC) collected detailed information on income, expenditure, food consumption, and household characteristics from 570 households (see Ministère du Plan, 1988 and 1991).

Rural and urban demand models were estimated using a modified version of the Almost Ideal Demand System (AIDS)[2]. The urban and rural models had equations for 21 and 17 food categories, respectively, and nine non-food categories. The independent variables were total household expenditure, food prices, and the size and composition of the household. Non-food price elasticities could not be estimated directly and had to be derived under assumptions of strongly separable preferences (Frisch 1959).

The November 1990 devaluation raised the official price of foreign currency by 67 percent. Some simulations were run using the change in historical prices from six months before the devaluation to six months after. The interpretation of these simulation, however, is complicated by the fact that in October 1990 Rwanda was invaded by armed exiles based in Uganda. Restrictions on trade through Uganda and security measures within Rwanda affected prices even before the November devaluation.

In light of these complications, other simulations were run using hypothesized price effects of a 'pure' devaluation. The following assumptions were used.

- The designation of goods as tradeable or non-tradeable was done at the level of the ENBC product codes (400 in the rural survey, 825 in the urban). These were then aggregated to the level of the budget categories used in the regression.
- Based on Edwards (1989) study of 29 devaluation episodes, it was assumed that the ratio of tradeable prices to non-tradeable prices rises by 60 percent of the increase in the cost of foreign exchange.
- Again based on Edwards (1989), it was assumed that agricultural and non-agricultural real wages fall 3.5 percent and 8.5 percent, respectively.

The model simulates the effect of the changes in wages and prices on the demand for each good by each household in the sample, incorporating the income effect, the substitution effect, and the profit effect (the influence of output prices on income and hence demand). Changes in food consumption are combined with nutritional coefficients to estimate the impact of the price changes on caloric intake for each household. This information also allows us to estimate the welfare impact of the price changes for each household.

This study differs from previous studies of the welfare impact of devaluation in two respects. First, the welfare and nutritional impact is calculated for each household in the sample rather than for all households in a given region or income group. This allows the results to be aggregated to any desired sub-group of the population and provides information about the variability within each group. Second, the welfare impact is measured using equivalent variation and compensating variation. These measures represent the change in income equivalent to the price changes in terms of impact on household welfare and the change in income necessary to compensate the household for the price changes. These two 'willingness-to-pay' measures are theoretically superior to the standard 'consumer surplus' measure, yet require no more information about the demand function[3]. They are calculated using the method suggested by Vartia (1983) which involves numerical integration of the compensated (Hicksian) demand function[4].

RESULTS

The simulated impact of the hypothetical prices on caloric intake and household welfare are shown in Table 1. The first column shows the effect of wage and price changes on household income, the profit effect. Supply response is assumed to be zero in this simulation. Urban incomes fall 7.8 percent on average, less than the assumed fall in non-agricultural wage rates. In other words, reductions in wages (which constitute 44 percent of urban income) are partially offset by smaller reductions in non-wage incomes. Rural incomes fall by 3.8 percent on average. This figure reflects the fact that food crop sales (mostly nontradeable) are twice as important a source of income in rural areas as tradeable 'cash crop' sales. In addition, the importance of non-marketed output reduces the magnitude of the impact, measured as a percentage of total income.

The second and third columns provide the impact of consumer prices on purchasing power, as measured by equivalent variation and compensating variation, respectively. These figures are close to zero because consumer prices have been normalized.

The fourth and fifth columns show the net impact, combining the producer impact and consumer impact. The negative welfare impact (expressed as a percentage of total expenditure) is over three times greater for urban households than for rural households. The price changes associated with devaluation are equivalent to a 3 percent reduction in the income of rural households and a 10 percent drop in income for urban households. In addition, the reduction is twice as great for the richest 20 percent of households as it is for the poorest 20 percent. Households whose primary occupation is farming are least affected, while wage earners are most affected. Female-headed households are slightly more adversely affected than male-headed households, with devaluation being equivalent to 4.1 percent and 3.5 percent reductions in income, respectively.

The last column of Table 1 shows that, in spite of the reductions in real income, the impact of the price changes on caloric intake is either slightly positive for all groups considered. Two factors are at work. First, non-food items are more likely to have a large tradeable component and thus to experience greater price increases. Thus, the change in relative prices results in a shift from non-food to food consumption. Second, the food items with a large tradeable component (rice, bread, factory beer, and sugar) are relatively expensive sources of calories. Thus, relative price changes also induce a shift toward the cheaper sources of calories.

Table 1 *Effect of Hypothetical Devaluation on Rwandan Households*

	Producer impact (PS)	Consumer impact (EV–PS)	Consumer impact (CV–PS)	Net impact (EV)	Net impact (CV)	% change in caloric intake
Sector						
Rural	–3.8	0.7	0.6	–3.1	–3.2	1.3
Urban	–7.8	–2.7	–3.5	–10.4	–11.3	0.8
Mean	–4.0	0.5	0.4	–3.5	–3.6	1.3
Expenditure quintile						
1st	–4.0	1.5	1.4	–2.5	–2.6	0.4
2d	–4.0	1.0	0.9	–2.9	–3.0	0.7
3d	–2.6	–0.0	–0.1	–2.6	–2.8	1.9
4th	–4.3	0.7	0.6	–3.6	–3.8	0.7
5th	–5.1	–0.6	–0.9	–5.7	–6.0	2.6
Mean	–4.0	0.5	0.4	–3.5	–3.6	1.3
Principal occupation						
Farmer	–3.4	1.0	0.9	–2.5	–2.6	1.1
Artisan	–6.5	–0.2	–0.5	–6.7	–7.0	1.5
Merchant	–3.2	–1.6	–1.9	–4.8	–5.1	2.3
Employee	–6.9	–1.7	–2.2	–8.6	–9.1	2.7
Various	–4.8	–0.1	–0.3	–4.9	–5.1	1.0
Mean	–4.0	0.5	0.4	–3.5	–3.6	1.3
Sex of head of household						
Male	–3.9	0.5	0.4	–3.4	–3.5	1.5
Female	–4.5	0.5	0.4	–4.0	–4.1	0.5
Mean	–4.0	0.5	0.4	–3.5	–3.6	1.3

Source: Simulation based on Rwandan ENBC data.

Even after separating rural and urban households, the positive relationship between income level and the percentage reduction in real income due to devaluation remains. In rural areas, the impact on real income increases from –2.4 percent for the poorest quintile to –4.4 percent for the richest quintile. In the urban areas, the impact rising from –7.6 percent to –11.6 percent.

Other simulations were carried out using historical price changes from six months before the devaluation to six months after. Although the prices of tradeable goods did rise

more than those of non-tradeables on average[5], the historical prices of individual goods bear little resemblance the hypothesized trends, due in part to the invasion and subsequent security measures. In spite of these differences, estimated nutritional and welfare impact of the historical prices is quite similar to that of the hypothetical prices, as shown in Table 2.

Table 2 *Effect of Historical Price Changes on Households*

	Producer impact (PS)	Consumer impact (EV–PS)	Consumer impact (CV–PS)	Net impact (EV)	Net impact (CV)	% change in caloric intake
Sector						
Rural	16.2	–20.3	–21.4	–4.1	–5.1	–2.5
Urban	1.4	–16.0	–19.1	–14.6	–17.8	0.8
Mean	15.5	–20.1	–21.3	–4.7	–5.8	–2.3
Expenditure quintile						
1st	16.7	–20.2	–21.2	–3.6	–4.5	–3.3
2d	16.7	–20.0	–20.8	–3.3	–4.1	–2.6
3d	15.8	–20.7	–22.0	–5.0	–6.3	–2.8
4th	16.0	–20.5	–21.6	–4.5	–5.6	–3.0
5th	12.1	–19.1	–20.6	–6.9	–8.5	–0.2
Mean	15.5	–20.1	–21.3	–4.7	–5.8	–2.3
Principal occupation						
Farmer	17.2	–20.7	–21.	–3.4	–4.3	–2.2
Artisan	10.6	–19.2	–21.2	–8.6	–10.6	–3.3
Merchant	12.1	–17.5	–18.8	–5.4	–6.7	–3.1
Employee	4.4	–16.4	–19.1	–12.0	–14.7	–2.2
Various	15.0	–20.4	–21.7	–5	–6.6	–2.1
Mean	15.5	–20.1	–21.3	–4.7	–5.8	–2.3
Sex of head of household						
Male	15.2	–20.0	–21.1	–4.8	–6.0	–2.3
Female	16.6	–20.7	–21.8	–4.1	–5.1	–2.4
Mean	15.5	–20.1	–21.3	–4.7	–5.8	–2.3

Source: Simulation based on Rwandan ENBC data.

Compared to the simulation using hypothetical prices, the simulation using historical prices yields a larger impact but one with similar distributional patterns. The welfare impact of the historical wages and prices was equivalent to a 4.1 percent reduction in income for the average rural household and a 14.6 percent decrease in income for the average urban household. The impact is almost twice as great, in proportional terms, for the richest quintile (–8.5 percent) as for the poorest quintile (–4.5 percent). As in the simulation using hypothetical prices, agricultural producers are relatively protected, while wage-earners are hardest hit. In contrast to the hypothetical price scenario, historical price data indicate that male-headed households were more seriously affected (–6.0 percent) than female-headed households (–5.1 percent).

Other experiments were carried out to determine the sensitivity of the result to changes in assumptions. Simulations were run assuming; (1) no change in real wage, (2) positive

agricultural supply response, and (3) zero price elasticities of demand. In all of these simulations, the proportional impact of the devaluation was more adverse for urban households than for rural households and more adverse for low-income households than high-income households (see Minot, 1992).

Table 3 *Importance of Cash Expenditure by Rural and Urban Expenditure Quintiles*

Expenditure quintile	Home production as a % of food expenditure	Food consumption as a % of total expenditure	Home production as a % of total expenditure	Cash purchases as a % of total expenditure
Rural sector				
1st	77.1	86.0	67.8	32.2
2nd	74.8	85.3	64.3	35.7
3rd	77.4	83.7	65.9	34.1
4th	75.1	83.1	63.5	36.5
5th	74.9	80.0	62.0	38.0
Urban sector				
1st	38.0	80.7	32.4	67.6
2nd	24.2	73.2	19.5	80.5
3rd	18.3	66.0	13.7	86.3
4th	14.3	59.3	11.5	88.5
5th	9.6	53.7	6.2	93.8

Source: Rwandan ENBC.

DISCUSSION

The most intriguing aspect of these simulations is that the results are not sensitive to many of the assumptions used in the simulation. One hypothesis is that urban and high-income households spend a larger share of their income on imported (tradeable) goods. The data for Rwanda provide only weak support for this hypothesis. The share of cash expenditure allocated to tradeable goods rises with income in the urban areas (from 31 percent to 40 percent), but shows no pattern in the rural areas. Oddly, the share of tradeable goods in cash expenditure is barely larger in urban areas (39.2 percent) than in rural areas (36.6 percent). Urban households spend more on tradeable food (for example, rice, bread, sugar) as well as on transportation, which is largely tradeable. On the other hand, rural households' cash spending includes a significant share allocated to clothing, which is almost entirely tradeable. In fact, almost half of rural spending on tradeables is on clothing, particularly used clothing.

Another hypothesis is that the importance of home production isolates rural and low-income households from the effects of all price changes, including those associated with devaluation. Table 3 confirms that this is an important factor. Rural households and low-income households obtain a larger share of their food from home production and food is a larger share of overall expenditure. Thus, cash purchases account for just 32.2 percent of total expenditure for households in the poorest rural quintile, but 93.8 percent of total expenditure for the richest urban quintile. This helps explain why the hypothetical and

historical price changes, which were quite different from each other, resulted in similar distributional effects in the simulations.

CONCLUSIONS AND POLICY IMPLICATIONS

In Rwanda, and, by extension, in similar semi-subsistence agricultural economies, the relative price effects of devaluation have a relatively moderate impact on rural households and the poor in general. In all the scenarios considered, the effect of a major devaluation on the poor was equivalent to a reduction in income of 4 percent or less. The impact on caloric intake was even less. The effect on urban and high-income households was two to three times as large in proportional terms. This study confirms the conventional wisdom that the urban poor are hit harder than the rural poor, but is at odds with the common perception that low-income urban households are affected more than higher-income households in the cities. These patterns are not caused by the differences in the propensity to purchase imports, but rather by the fact that rural and low-income households are insulated from price changes by the importance of home production.

These results suggest that, for economies similar to that of Rwanda, the distributional impact of devaluation should not be a major issue in weighing the advantages and disadvantages. Two caveats, however, should be mentioned in this context. First, the model simulates only the relative price (or 'expenditure-switching') effect of devaluation. It does not attempt to model the effect of devaluation on output, unemployment, or aggregate expenditure (the 'expenditure-reducing' effect). Second, without making assumptions about the marginal utility of money, it cannot be inferred that the 3 percent reduction in real incomes in rural areas is less 'painful' than the 10 percent reduction in real income in urban areas.

There is no simple way to alleviate the impact of devaluation on rural households. The same factor that protects them from devaluation, limited integration in the cash economy, also insulates them from the benefits of price policy. Manipulation of food prices, even if it were feasible, would leave many rural households unaffected and have mixed effects on the remainder. On the other hand, the simulation indicates that increased prices of clothing account for almost half of the negative effect of devaluation on low-income rural households. Reduction or elimination of import duties on clothing, particularly used clothing, could be considered.

With regard to research methods, this study shows that household budget data can be a rich source of information on distributional impact of policies such as devaluation. Furthermore, calculation of exact 'willingess-to-pay' welfare measures is feasible, even in the context of micro-simulation in which the impact of policy is simulated for each household in the sample. Finally, this study suggests that variation in the degree of market integration may be at least as important as variations in the propensity to consume imports in determining the distributional impact of currency devaluation.

NOTES

[1] A household–firm model incorporates the effect of changing prices of goods and services produced by the household on household income and demand patterns (see Barnum and Squire, 1979). The version used here is simplified in that labour-leisure decisions are not explicitly modeled.

[2] The AIDS was developed by Deaton and Muelbauer (1980). This study follows Swamy and Binswanger (1983) by adding a squared income term so that budget share may rise and then fall with income.

[3] Perhaps the most common welfare measure, consumer surplus, is not well-defined in that, for multiple price changes, the result depends on the order in which the price changes are introduced in the calculations. In contrast, the two willingess-to-pay measures give consistent results.

[4] The Vartia method involves dividing the price changes into a large number of increments. After each increment, income is adjusted to compensate for the price change and new demand quantities are calculated. The sum of the income adjustments is the compensating variation (equivalent variation) if one starts at the original (final) equilibrium point for the calculations.

[5] From one month before the devaluation to seven months after, the price of tradeable rose 31 percent relative to that of non-tradeables (Minot, 1992).

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DISCUSSION OPENING — Godfrey Tyler *(University of Oxford, UK)*

I should like to congratulate Dr. Minot on his paper for the clarity with which it was written. By using sample household expenditure data in Rwanda, he was able to confirm the conventional wisdom that the relative price effects of devaluation hit the urban poor rather than the rural poor. It was comforting to see that the effect of a devaluation as high as 67 percent apparently decreases the income of the poor in general by 4 percent or less. Sadly, devaluation must now be the least of their worries. Higher income groups are hurt proportionally more, which he attributes not to higher propensities to purchase imports but to the fact that they rely much more on purchased rather than home produced goods. Low income and rural households are thus more insulated from price changes.

These results seem reasonable and I am mostly convinced by them, given the limitations of the study which Dr. Minot freely admits e.g., that it does not take into account the important effects of devaluation on output, employment and so on. However, I have a number of questions and comments.

Firstly, I was worried about how far the assumption (that following devaluation the real agricultural wage fell by 3.5 percent and the real non-agricultural wage by 8.5 percent) was driving the results. The author says that other simulations were carried out assuming no change in real wages; he still found that the impact was more adverse for urban than for rural households, but he was found that the impact was more adverse for low rather than high income households. But if most of the income of the urban poor comes from wages and the real wage is constant. Why should they suffer any adverse effects?

Secondly, I have a question about the breakdown of the overall effect of devaluation into the producer and consumer impacts and the different pattern between the hypothesized price changes and the historical price changes. Taking, for example, the farmer occupation in Table 1 (hypothetical prices) and using the compensating variation measure, the producer effect is –3.4 percent and the consumer effect +0.9 percent. In table 2 (historical prices) the producer effect is +17.2 percent and the consumer effect –21.5 percent. Could Dr. Minot explain these large differences and particularly why there is a switching in the signs of these effects?

This leads me on to my third point. The author says (page 6) that 'the historical prices of individual goods bear little resemblance to the hypothesized trends, due in part to the invasion and subsequent security measures'. He says only 'in part'. Would he therefore agree that a large part of the difference may lie in the fact that most goods and services lie on a continuous spectrum between the extremes of tradeable and non-tradeable, that they do not neatly fall into one or other categories (a convenient simplification for theoretical discussion) and that therefore their prices are likely to change in very different ways?

Finally, it appears Dr. Minot put transportation into the tradeable box, as he says on page 8 it is 'largely tradeable'. From what I have just said, it is obvious that I would not

want to put it into any box but I understand that internal transport (buses, taxis, donkeys, camels?) is usually classified as a non-tradeable.

If buses and taxis are anything like those in Harare, I certainly would not put them in the tradeable category. I doubt whether any of them could get anywhere near the border!