STORM IN A RICE BOWL

Rice reform and poverty in Vietnam in the 1990s

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Abstract   This paper analyses the poverty impact of Vietnam's reforms, especially with reference to the rice economy, during the 1990s. It reviews trade and institutional reforms that directly impinged on the rice sector, and the trends in rice production, consumption and prices throughout the 1990s. We then analyse the impact of rice production on poverty dynamics by estimating a multinomial logit model based on a panel of 4,302 households. Our results show that the increased rice production as a result of various reforms contributed to poverty reduction. We also explore whether households that are disproportionately heavy consumers of rice suffered from the price increase. We examine whether allowing the poverty line to reflect household-specific consumption bundles would change the identification of poverty dynamics. We conclude that unless the large changes in relative prices are accompanied by massive differences in consumption baskets across households accounting for differences in consumption preferences would make little difference in assessing the poverty implications of reform.

Keywords   Trade policy, poverty, rice, Vietnam.

JEL classifications   F14, I32, O24, Q17, Q18.

1. INTRODUCTION

In the late 1980s the process of *doi moi* or economic renovation started to transform Vietnam from a centrally planned to a more market-oriented economy. It led to a period of rapid growth, macroeconomic stability, greater integration with the rest of the world and significant institutional reform that encouraged private sector participation in economic activity (Niimi *et al.* 2003). It also led to an improvement in the standard of living: the headcount poverty ratio fell from about 58 per cent to about 37 per cent between 1992–93 and 1997–98 (Glewwe *et al.* 2000; Justino and Litchfield 2002).[1]

   This paper focuses on one critical aspect of the Vietnamese economy – the rice sector. The economic renovation programme included the de-collectivization of agriculture, the granting of greater land-use rights to individuals, and the

liberalization of trade and exchange rate policies as well as sector-specific policies that had a direct impact on the rice sector. The most remarkable consequence was the shift in Vietnam's position from being a net importer to a net exporter of rice, indeed, to the world's second largest rice exporter in volume terms by 1996. Rice prices increased strongly over the 1990s, substantially, we argue, due to the external liberalization of the rice market. The increases had direct implications for households: about 72 per cent of Vietnamese households both produced and consumed rice in 1992–93, rising to 83 per cent among poor households.[2] The main objective of this paper is to analyse the poverty implications of the trade reforms undertaken in the Vietnamese rice sector during the 1990s. We are limited to the period 1992–93 and 1997–98 because the necessary panel of household data from the *Vietnam Living Standard Measurement Surveys* (VLSS) was collected only in these two periods. However, as we show below, a great deal happened over this period.

The paper is organized as follows. The next section briefly illustrates the importance of rice, both in terms of production and consumption, for Vietnamese households. Section 3 reviews various general as well as sector-specific trade and institutional reforms that directly impinged on the rice sector over the 1990s. The resulting trends in rice prices, production, sales and trade are discussed in section 4. Section 5 is the heart of the analysis in which we examine the poverty impact of the rice market liberalization on households by estimating a multinomial logit model of poverty dynamics between 1992–93 and 1997–98. Previous studies have looked at the distributional welfare effect of the reforms according to households' net, not gross, position in rice. In this paper, we consider their gross positions, production and consumption. Section 5 looks mainly at the production side, while section 6 considers how sensitive our conclusions are to the differences in households' consumption patterns. The final section concludes.

2. THE RICE SECTOR

The significance of rice in the Vietnamese economy cannot be overstated. Rice is the most important food crop, so much so that all other food crops are measured in 'paddy equivalents' (FAO 1994). Rice occupies about 86 per cent of the food crop area and accounts for about 89 per cent of total food output. Rice production is concentrated primarily in the lowland areas – the Mekong River Delta (the 'rice bowl' of Vietnam), the Red River Delta and the Central Coast. The remainder of the crop – upland rice – is cultivated in the mountainous provinces. Rice exports accounted for about 7.5 per cent of rice production in 1993 and for about 11 per cent of total exports throughout the 1990s (see Table 1) .

At the household level, the data from the VLSS reveal that rice was the single most important crop for the majority of farm households who, in turn, constitute over 60 per cent of all households in 1997–98. Rice accounted for about 64 per cent of total output, 67 per cent of land acreage and 46 per cent of total sales for

Table 1 Vietnamese rice production and exports

Year	Paddy production (mill. tons)	Rice exports		Share of rice exports in (%)			
		Quantity (mill. tons)	Value (mill. US$)	Paddy production[a]	Total Vietnamese exports [a]	World rice exports	
						Quantity	Value
1990	19.2	1.62	304	8.4	12.6	13.0	3.7
1991	19.6	1.03	236	5.3	11.3	7.9	3.4
1992	21.6	1.95	313	9.0	12.1	12.1	3.6
1993	22.8	1.72	362	7.5	12.1	10.2	3.0
1994	23.5	1.98	436	8.4	10.8	11.0	5.4
1995	25.0	1.99[b]	513	8.2	9.4	8.8	3.8
1996	26.4	3.00	856	11.5	11.8	17.2	5.8
1997	27.5	3.58	876	13.4	9.5	17.0	5.2
1998	29.1	3.73	1,018	13.0	10.9	12.8	7.0
1999	31.4	4.51	1,023	14.4	8.9	17.7	..

Source: GSO statistics obtained from CIEM, various decrees and decisions by the Vietnamese government and Nielsen (2002a).
Notes:
a The share of rice exports in paddy production is a quantity share while the share in total exports is a value share.
b It is believed that in addition to this official figure, about 0.5 million tons of rice were smuggled illegally to China (Nielsen 2002a).

agricultural households in 1992–93 (see Table 2). Although these shares declined in 1997–98, rice still remains critical to the livelihood of many households in Vietnam (Benjamin and Brandt 2002).

On the consumption side, rice is again central, satisfying about 75 per cent of the total calorific intake of the typical Vietnamese household (Minot and Goletti 2000). According to our calculations, rice accounted for about 44 per cent and 38 per cent of household food expenditure in 1992–93 and 1997–98, respectively,

Table 2 Share of rice in total crop output, acreage and sales (in %): 1993, 1998

	Output share		Acreage share		Sales share	
	1993	1998	1993	1998	1993	1998
North	65.3	57.6	59.1	57.6	38.3	37.9
South	63.5	50.8	72.2	68.4	49.2	41.7
Vietnam	64.3	53.3	66.5	64.1	46.4	40.9

Source: Benjamin and Brandt (2002).
Notes: Output calculated as value of production deflated by a crop price index.

and about 53 per cent and 51 per cent for poor households. Rice is thus a hugely important part of the Vietnamese diet and changes in rice production and prices as a result of liberalization are likely to have had a significant impact on the welfare of Vietnamese households and on poverty levels.

3. TRADE AND OTHER REFORMS PERTAINING TO THE RICE SECTOR

(a) Agricultural and institutional reforms

Institutional reforms in agriculture started as early as 1981 with the replacement of the centrally planned collective farming system with a contract system where farmers fulfilled individual rather than collective quotas (Ghosh and Whalley 2001). However, this process picked up momentum only in the late 1980s with the *doi moi* policies. The first step towards marketization was taken with Resolution 10 of 1988 that recognized the family as the basic unit of the agrarian economy and new land laws that leased out former cooperative land to individual farmers. State subsidies to rice production (provided through the provision of inputs in exchange for paddy) were virtually eliminated by 1989. Farmers became free to purchase inputs and sell their paddy production on the market since paddy was no longer used as exchange (FAO 1994).

Access to credit for individual farmers became available in 1991 when the Agricultural Bank of Vietnam was allowed to lend directly to households. The Fifth Land Reform Resolution in 1993 gave further long-term land-use rights to individuals. This new law included rights to exchange, transfer, lease, inherit and mortgage land, which were intended to encourage farmers to invest in land (CIE 1998). There still remained restrictions on converting rice land to other activities, however, and only recently has the government attempted to convert paddy fields to alternative uses in response to declining international rice prices (Nielsen 2002a).

(b) External trade

The late 1980s and 1990s also witnessed gradual liberalization of government controls over rice trade – both internal and external – although state-owned enterprises (SOEs) continued to predominate. The monopoly of the Ministry of Foreign Economic Relations (MERFT) was abolished in 1989. The following year saw the establishment of the Ministry of Agriculture and Food along with the main state-owned food company, the Vietnam Central Food Corporation or VINA-FOOD, consisting of three branches: VINAFOOD I, II and III in Hanoi, Ho Chi Minh City and Danang, respectively. These VINAFOOD companies have been the main channels for rice exports (FAO 1994; Nielsen 2002a).

The export duty on rice fell from 10 per cent to 1 per cent in 1991. However, in

1994 quotas on rice exports and fertilizer imports were imposed for the first time (see Table 3). The former were set by the Ministry of Agriculture and Rural Development (MARD), the State Planning Commission and the Ministry of Trade based on the estimation of domestic production and consumption in a two-step allocation process. The initial allocation was valid until September of each year when there was a second allocation after an evaluation of the domestic crop situation (Nielsen 2002a). The intense political lobbying for quotas among SOEs (Minot and Goletti 2000) and the fact that the domestic rice price was below the border price during the 1990s (see Table 4) suggest that the rice export quota was binding.

A major step in 1997 was the reform of the quota allocation system with the decentralization of rice export quotas to the Provincial People's Committees and agencies under central management (CIE 1998). In 1998 the rice export quota was raised and private sector participation in rice exports was finally permitted. The following criteria were used to allocate quotas to private traders: prior experience in the rice trade, proof of financial security, ownership of milling facilities and the capacity to export a minimum of 5,000 tons per shipment. Under the revised Trade Law foreign traders were also allowed to establish branches, offer trade services and act as agents to exporters, mainly SOEs (Nielsen 2002a). These export quotas were strictly non-transferable. In the mid-year appraisal of 1998, however, the government imposed a temporary ban on rice exports due to food shortages and a sharp rise in rice prices following the drought in the summer of 1998 (CIE 1998). Moreover, although several private companies were allocated rice export quotas, these amounted to only 4 per cent of total rice exports in 1999.[3] Although the liberalization of the Vietnamese rice

Table 3 Trade barriers pertaining to rice and fertilizer (urea)

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
Rice import tax (%)	..	..	7	7	7	7	7	10	10	15
Rice export tax (%)	10	1	1	1	1	3	3	2	0	0
Rice export quota (mill. tons)	..	..	..	..	2	2	2	3.5	4	3.9
Fertilizer (urea) import quota (mill. tons)	..	..	..	..	1.3	1.4	1.8	1.6	1.65	..

Source: GSO statistics from Central Institute for Economic Management (CIEM), various decrees and decisions by the Vietnamese government and Nielsen (2002a).
Notes:
a Rice import tax was subject to frequent changes during the course of a year. It was raised to 10 per cent on 15 October 1996.
b Quotas on the exports of rice and imports of urea fertilizers were imposed for the first time in 1994.
c Quotas on other kinds of fertilizers such as DAP, SA and potassium fertilizers were imposed in 1998 and 1999 and ranged from 0.24 to 0.35 million tons.

market over the 1990s was erratic and the government still kept a large degree of control, the changes in trade volumes and prices (see below) indicate that the reforms were effective.[4]

The quantitative restrictions were accompanied by export taxes until 1998 (see Table 3) and market price support in the form of minimum floor or 'guidance' export prices set by the Vietnam Food Association with approval of the Ministry of Trade. Yet this minimum export price had to be lowered due to declining international prices and thus was less restrictive on export contracts (Nielsen 2002a). In 1999 the import tariff on rice was raised from 10 to 15 per cent and continued to rise over the next two years to about 40 per cent in 2001.

Much of the trade restriction on rice also applied to fertilizers. Fertilizers were subject to import quotas set by the MARD and the Ministry of Trade until 2001. As in the case of rice export quotas, fertilizer import quotas were adjusted following mid-year reviews of the local supply and demand conditions. Although by 1998 non-state enterprises were allowed to receive quota allocations as long as they met certain criteria, the bulk of the quota was allocated to the Agricultural Materials Corporation (Vigecam) owned by the MARD (CIE 1998). Fertilizer prices were also monitored by the government via a Price Stabilization Fund, and indeed CIE (1999) argues that the prime motive for trade restrictions on fertilizers was to ensure sufficient supply at a stable price rather than to protect domestic fertilizer producers. This is particularly so for the case of urea whose domestic production is small. Price stability was largely achieved, but at the cost of domestic fertilizer prices being well above world market prices (Nielsen 2002a). More important from our perspective, however, is that this discussion strongly suggests that observed changes in rice and fertilizer prices are reflections of policy – they are the result of conscious and informed changes in market conditions brought about by government actions.

(c) Domestic trade

There were also restrictions on internal rice trade in Vietnam, which were intended to ensure inter-regional equity in terms of security of rice supplies and to curb illegal rice flows, mainly to China (Nielsen 2002a). In 1989 taxes on inter-regional transfers of rice output were removed (FAO 1994) and since then some of the barriers to domestic rice trade have been lifted. For example, internal trade restrictions on rice were lifted in 1997 and some licences and controls on transport were eliminated (CIE 1998). However, it is not clear how effective this liberalization was, since private traders still needed a licence to operate in the internal rice market and not many private companies could meet the strict requirements of a minimum working capital of US$4.5 million and trading experience of at least three years (Nielsen 2002a).

(d) Price controls

Until recently price controls in Vietnam took the form of a state-owned monopoly marketing agency that bought rice from farmers at set prices and resold to consumers.[5] State trading agencies (STAs) are still the principal buyers of rice at government declared prices and are also main sellers in the domestic and international market (Ghosh and Whalley 2001). The government also supports farmers by providing credit at low interest rates. In 2001 an export subsidy of 180 dong per export dollar was introduced simultaneously with the removal of the export quota (Nielsen 2002a).

4. RICE PRICES AND QUANTITIES

A useful starting point for examining whether the rice policy reforms have had any welfare impact on households is to trace the movements in rice prices. Trade reforms such as the reduction or elimination of tariff and non-tariff barriers operate principally via changes in the prices of goods; these in turn affect incomes, factor prices and the cost of consumption (Winters 2002). In this section we first look at the differential between the domestic and international rice prices. Trends in domestic rice prices at the national as well as the commune level are then examined. Although price data at the household level are not available, the price data from the commune price questionnaires in the VLSS provide clear evidence of the price changes between 1992–93 and 1997–98.

(a) Prices

The international rice market is quite volatile because it is very thin: only about 5 per cent of world production is traded. There are a few large export countries plus a few large and many small import countries, so that shocks in a major exporter or importer can have a substantial effect on rice prices (Nielsen 2002a). Although Vietnam has been the second largest exporter in terms of quantities, the export price of the Vietnamese rice is discounted in the world market by about 20 per cent (CIE 1998) (see Table 4). This is partly because of Vietnam's reputation as an unreliable supplier as a result of the government's control over rice export quotas and its two-step allocation system described above (CIE 1998). More importantly, however, are the low quality of Vietnamese rice due to the lack of standardization systems, inadequate seed control and the lack of infrastructure for drying and storing rice (Nielsen 2002a). Farmers generally have little incentive to improve quality since the restrictions on internal rice trade and minimum price controls mean that they do not receive any price premium (CIE 1998).

   The price received by Vietnamese farmers inevitably falls short of the border price because of trading costs, but if the difference is large we might also infer that the rice export quota was binding.[6] Nielsen (2002b) identifies a differential of

Table 4 International, border and domestic (wholesale) prices of rice (US$ per metric ton)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
International price	..	293	268	235	268	321	339	303	304	248
Border price (f.o.b.)	..	226	207	203	218	269	267	235	265	215
Domestic price	135	164	155	159	162	202	204	183	204	183
Export tax equivalent in % of border price	20.8	27.6	24.9	21.9	25.5	24.9	23.6	22.1	23.0	14.9

Source: Nielsen (2002b) except for international prices that are obtained from World Bank (1999a).
Note: International prices are LIBOR (London Interbank Offered Rate) commodity prices.

between 20 and 25 per cent between 1990 and 1998 (Table 4), which suggests that the export quota was binding during our sample period. If so, we may reasonably infer that observed domestic price changes owe a great deal to policy changes as the export tap is turned on or off – i.e. to liberalization. The domestic price has not been allowed to fluctuate much, but between the Januaries in our two sample years GSO data record an increase of about 26 per cent in both rice and paddy real prices (i.e. deflated by the consumer price index).[7]

The VLSS data at the commune level also record the increase in rice prices during our target period (see Table 5). The real increase for rice is 29 per cent, with higher increases in the South, which includes the main suppliers of the Vietnamese rice exports, namely the Mekong River Delta and Southeast, than in the North. Similar results are reported in Edmonds and Pavcnik (2002), who argue that the larger increase in the South and the absence of price convergence in the

Table 5 Rice (ordinary rice) and fertilizer (urea) prices ('000 dong per kg)

	Rice prices			Fertilizer prices		
	1992–93	1997–98	% change	1992–93	1997–98	% change
Vietnam	2.617	3.366	28.6	2.779	2.138	−23.1
North	2.659	3.257	22.5	2.854	2.155	−24.5
Red River Delta	2.576	3.197	24.1	2.701	2.145	−20.6
South	2.570	3.490	35.8	2.696	2.115	−21.6
Mekong River Delta	2.474	3.385	36.8	2.689	2.070	−23.0

Source: Calculations based on the data from the commune price questionnaires.
Notes:
a Prices are deflated by CPI to convert to 1998 January prices.
b North includes Northern Uplands, Red River Delta and North Central, while South includes Central Coast, Central Highlands, Southeast and Mekong River Delta.

domestic market are the evidence of the increased integration of the Vietnamese rice sector into international markets.

Another important price is that of fertilizer, which represents the largest component of farm input cash expenses (Minot and Goletti 2000). As noted above, the price is subject to close control, so the 23 per cent decline between 1992–93 and 1997–98 may be clearly interpreted as a policy-driven liberalization.[8]

(b) Rice production, sales and exports

A full assessment of the poverty impact of rice reform must consider rice production and consumption as well as the prices charged at household level.

Rice production and the commercialization of the rice sector increased strongly throughout the 1990s, with production and sales increasing on average by 26 per cent and 96 per cent respectively between 1992–93 and 1997–98. There was, however, a strong regional dimension to this growth. Rice production increased more rapidly in the South than in the North; on average it increased by 14 per cent in the North while it increased by 35 per cent in the South. This indicates the differential effect of liberalization of the rice market on the two regions; the South has the advantage of being the relatively low-cost producer and hence seems to have benefited more from the expanded export and domestic marketing opportunities (Benjamin and Brandt 2002). The traditional position of the South as the rice bowl of Vietnam was thus strengthened during the 1990s with the Mekong River Delta producing the bulk of the national rice output whereas most other regions became the net importers of rice (Minot and Goletti 2000).

It should, though, be noted that the proportion of households producing rice in the Mekong River Delta is smaller than the national average. Yet the percentage of net producers and net sellers in this region is relatively large. For instance, in 1997–98 while on average 73 per cent and 54 per cent of those households producing rice were net producers and net sellers, the figures for the Mekong River Delta were 90 and 83 per cent respectively. Thus, the scale and concentration of rice production are greater in the Mekong River Delta and its rice sector is much more commercialized than the rest of the country.

The increased commercialization of the rice sector is also reflected in the growing importance of rice exports. About 7.5 per cent of rice production was exported in 1993 and about 13 per cent in 1998, although the rice share in total exports was static at about 11 per cent. Following *doi moi*, Vietnam switched from being a net rice importer to a net rice exporter: its share of the world market increased from 1 per cent in 1986, through 10 per cent in 1993 to 17 per cent in 1997 and 1999 in terms of volume (see Table 1).[9] However, since Vietnam's rice exports are primarily of intermediate and low quality, its value share of the world market was only 3 per cent in 1993 growing to 7 per cent by 1998 (Nielsen 2002a).

As far as fertilizer is concerned, there was a steady rise in imports during the 1990s: from 0.8 million tons in 1990 to 1.9 million tons in 1999,[10] matched by

strongly increased fertilizer usage at the household level. This increase was led by the fall in urea/paddy price ratios (see Table 5) and increased cropping intensity of rice production (Nielsen 2002b), although it should be noted that the increase in fertilizer usage was significantly greater for non-rice crops than rice.

5. TRADE LIBERALIZATION AND HOUSEHOLD WELFARE

Although it is not possible to trace the effects of individual reforms through to the observed changes in the rice sector, it seems evident enough that the rice policy changes of the 1990s would have affected prices, production and sales. Given that rice plays such an important role in the livelihoods of many households and because most of the trends identified above also apply to the case of poor households, the reforms to the rice sector seem very likely to have had poverty implications. In order to assess whether the observable dimensions of liberalization significantly influenced household welfare and contributed to poverty alleviation, we estimate a multinomial logit model. This builds on the work of Glewwe *et al.* (2000), who first described poverty in terms of the VLSS samples.

The multinomial logit (MNL) model analyses the probability of being in a particular state out of several unordered alternatives. We examine the poverty transition between 1992–93 and 1997–98 in terms of multiple states – specifically (1) being poor in both periods; (2) being non-poor in the first period and becoming poor in the second period; (3) being poor in the first period and becoming non-poor in the second period; and (4) being non-poor in both periods. The probability that household i experiences outcome j is expressed as:

$$\text{Prob}(Y_i = j) = \frac{\exp(\beta_j' x_i)}{\sum_{j=1}^{4} \exp(\beta_j' x_i)}, \quad j = 1, 2, 3, 4. \tag{1}$$

where Y_i is the outcome experienced by household i, x_i is the $(n \times 1)$ vector of characteristics for household i, and β_j is the $(n \times 1)$ vector of coefficients on x_i applicable to households in state j. The model is identified only up to an additive vector since adding, say, vector m to each β_j leads to the same probabilities. We set β_j to zero for outcome 1 (poor in both periods), since we are primarily interested in detecting whether trade helps households to escape from poverty.

The poverty line used in this analysis is the official poverty line, which is based on calorific intake.[11] Based on the consumption basket of the third quintile of households in 1992–93, the poverty line is the cost of purchasing 2,100 calories per head per day plus an allowance for non-food costs. Its value is 1.16 million dong in 1992–93 and 1.79 million dong in 1997–98, measured in terms of January 1993 and January 1998 national prices respectively. To compare them with these poverty lines, consumption expenditures in the VLSS (which are sampled over the

whole year) are deflated for each household by monthly and regional price indices. Since the poverty lines and these deflators are, with one exception, based on fixed, not household-specific, baskets of goods, a household's poverty status is largely independent of its actual consumption basket. In this respect our results are quite different from those of, say, Minot and Goletti (1998) or Benjamin and Brandt (2002) who consider households' net positions in rice as a way of predicting the poverty effects of rice reform. This section explores these 'common basket' poverty measures, while the following section explores the definitions of poverty and the importance of differences in consumption baskets in defining the poverty status of households.

Our analysis builds on Glewwe *et al.* (2000), explaining poverty dynamics in terms of demographics, infrastructure, location, etc., and then adding variables to reflect the trade and agricultural reform – rice production, coffee production, land and fertilizer use, and the ratio of household members working in the leading export industries (seafood, food processing, garments and shoes) to the number of adults in the household.[12] The inclusion of the output data in 1992–93 is designed to capture the benefits for self-employed workers of prior specialization in a booming export sector. The inclusion of variables on land is an attempt to see whether liberalization affected the poor via (implicit) land rents, while the inclusion of fertilizer is to capture the income effect of its significant price decline. The larger a household's use of fertilizer, the larger its net income gain as the price falls. In addition, there may be benefits to having an initial crop-mix that could take advantage of the decline in price and increased availability of fertilizers. For rice, part of the effects of land and fertilizer usage should be captured by the production variable – gross income from a kilo of rice is the same no matter how you produce it. However, as noted, fertilizer usage also has direct income effects via the input vector, and land or irrigation may have asset-type advantages or reflect the availability of technologies that allow stronger or weaker than average responses to price shocks. Given our focus on rice, it is at least worth checking these things. The benefits of being employed in the export sectors initially are represented by the employment variables.

Table 6 summarizes the estimated results for the trade and agricultural variables, which are our main concerns here. Niimi *et al.* (2003) discuss the estimation and results for non-trade variables as well as for the employment variables in detail. We report results for the third category (being poor in 1992–93 and non-poor in 1997–98) with the first category (being poor in both years) treated as base. The table gives the impacts of each explanatory variable on the odds ratio rather than the actual coefficients of the MNL model. The odds ratios are the ratio of the probability of each outcome relative to the probability of the base category. Since all continuous variables have been standardized, the coefficients represent the impact of a one standard deviation change in each explanatory variable on the odds ratios of the household escaping from poverty. Any coefficient less than one implies that the variable reduces the probability of the household coming out of

poverty. The percentage change in the probability is given by the coefficient minus one, multiplied by one hundred. This rule applies to both dummy and continuous variables.

Table 6 starts with our basic 'trade-inclusive' model (column A), in which we include among the regressors the household's initial production of rice and coffee and the proportion of workers initially holding jobs in the export industries (see Niimi *et al.* 2003 for details of the other coefficients). All have positive effects and the first two are strongly significant, both in the system of three equations as a whole and in explaining just the escape from poverty. For example, *ceteris paribus*, a one standard deviation increase in rice output increases the probability of escaping from poverty by over 50 per cent.

One important refinement to the rice result is its regional dimension (column B). The production effect is weaker in the Mekong River Delta than elsewhere.[13] We noted above that the Mekong is characterized by larger farms and a much greater use of hired labour (Minot 1998). Thus, as production increases less accrues to the householder as a producer and more to the labour he hires; correspondingly, household income owes more to wages deriving from others' rice production than it does elsewhere in Vietnam. We tried to test this last effect by including in the equation the proportion of household members reported to be working on someone else's farm (we cannot isolate rice farms, however). Its effect was positive but not statistically significant. A similar, but weaker, extenuation is also evident in the other major rice area, the Red River Delta; we do not have a ready explanation for this case, but note the coefficient is quite close to 1 and significant only at the 10 per cent level. Once these two regional variants are included the rice production effect elsewhere in the country increases to above two, and even in these two regions it is still positive and significant at the 1 per cent level.

Column C of Table 6 adds variables for the initial use of fertilizer. As fertilizer prices fell, heavy users should be able to make material increases in their real consumption. This is verified by the estimation. In the light of the huge growth in non-rice fertilizer use, we distinguished between rice and non-rice fertilizer effects. The logic is that non-rice use may reflect greater opportunities for exploiting the fall in price because farmers can switch between crops rather than just increase use for a single crop. Large initial users for non-rice crops may grow crops, or farm under circumstances, which respond to fertilizer usage and thus have greater opportunities for substitution than those who use little fertilizer to start with. The table shows strong positive effects from fertilizer use, although non-rice use is significant only at 10 per cent.

We have also explored whether the technologies of rice production affected households' poverty dynamics. First, we test whether fixed inputs into agriculture had effects additional to those of the main outputs and inputs – column D. Adding a dummy for land rights (land for 'long-run' use) and per capita availability of irrigated land produced insignificant coefficients and of the wrong sign for land

Table 6 Odds ratios for escaping from poverty (results for trade variables)

	A	B	C	D	E
Agricultural variables					
Quantity of rice production	***1.55	***2.29	**1.67	**1.69	
In Mekong River Delta		***0.59	**0.63	**0.63	
In Red River Delta		*0.87	*0.86	*0.86	
Quantity of coffee production	***3.00	***3.02	***2.32	***2.32	***2.35
Expected quantity of rice production[a]					0.65
In Mekong River Delta					**0.68
In Red River Delta					**0.85
Residuals					*1.19
Quantity of fertilizer – rice			***1.41	***1.41	***3.32
Quantity of fertilizer – non-rice			*1.59	*1.62	*1.61
Land rights				0.94	
Area of irrigated land per capita				1.01	
Employment variables					
Ratio of household members working in export[b]	*1.11				
Pseudo-R^2	0.26	0.26	0.26	0.26	0.26

Source: Calculations based on the VLSS, 1992–93 and 1997–98.
Notes: *** significant at 1 per cent level; ** significant at 5 per cent level; * significant at 10 per cent level in the equation for 'escape from poverty'.
a The variable 'expected quantity of rice production' was constructed from the following regression: $Q = f$ (labour, land, irrigated land per capita, fertilizer for rice).
b The export sector includes seafood, food processing, garment and shoes (plus rubber and plastic products).

	Coefficient	Robust std dev.
Labour (no. of household members aged 6 or above)	***112.06	13.91
Land rights	*168.87	99.74
Irrigated land per capita	*0.24	0.14
Quantity of fertilizer used for rice	***3.92	0.43
Constant	***–247.03	96.09

Note: $R^2 = 0.584$. This regression was run only for those households who produced rice (3,088 households). For those who did not produce any rice, the expected quantity of rice and residuals are '0' in the regressions above.

rights (reducing the probability of escaping poverty). Their inclusion slightly raises the positive effects from rice production and fertilizer use but changes nothing else fundamentally.

Second, we experimented to see if households with exceptional rice productivity fared better than others. For this purpose we created an instrumental

estimate of rice production from a regression of output on labour (above six years of age), land rights, irrigated land per capita and fertilizer use for rice – see notes to Table 6. We then included in column E both the instrumental estimate and the residual from the instrumental equation. All the instruments are significant in the first stage and in the second stage the residual was significant at 10 per cent while the expected rice output was not. In fact, higher expected output appears to lower the chance of escaping poverty – but its effect on the fitted value is offset by a huge increase in the coefficient on fertilizer use. This outcome reflects the strong effects of fertilizer on rice output in stage 1 and hence on poverty and the perverse or negligible effect of measured land rights and irrigation on poverty dynamics in column D. The just-significant effect from the residual of the instrumental equation suggests that unexplained factors behind rice output (i.e. yield) correlate slightly with improved poverty dynamics. Overall, however, columns D and E suggest that once we have included rice output and fertilizer use in the MNL equation there is no role for the non-purchased determinants of that output. This is as it should be: fertilizer has a direct income effect, while a kilo of rice yields the same net income whether you grow it on land to which you have firm rights or not.

In sum, the results from our MNL models seem to suggest that the reforms of the rice sector contributed significantly to poverty reduction over the 1990s, perhaps via an increase in domestic rice prices and greater market opportunities for rice producers. In addition, the increased availability of fertilizer and a sharp fall in fertilizer prices also had a favourable welfare effect on some households.

6. CONSUMPTION

The previous section identifies quite marked effects on households' poverty status and dynamics according to their output of rice and fertilizer use. As we noted in the introduction, however, this does not correspond perfectly to the theoretical framework, which relates welfare effects to net, not gross, positions. This section seeks to rectify the analysis by introducing households' consumption.

(a) Poverty lines and price indices

The problem in the previous section is that the income measures and poverty lines used to define households' poverty status are, with one exception, based entirely on fixed consumption baskets that are common to all consumers. As a result the categorization of households is quite independent of their particular consumption or preferences. In this section we try to account for consumption differences and test whether this affects our results. Since the paper concerns rice we focus exclusively on the rice/other goods dichotomy.

The 1992–93 VLSS poverty line is based on the expenditure necessary to purchase a diet of 2,100 calories per person per day (World Bank 1999b). This turned out to be roughly the average calorific intake of VLSS sample households in

the third income quintile and so the average basket of this quintile was used to define the physical quantities of food required. These quantities were then valued at the median commune prices from the VLSS, after the observed prices had been converted to a national January 1993 basis using regional and monthly price indices. Both of these price indices were Laspeyre's indices using 'average Vietnam household' weights; the regional indices were based on VLSS prices and the temporal one on the GSO's national consumer price index. Finally, the food poverty line was grossed up to cover non-food items based on the third quintile's consumption basket. The final poverty line in national January 1993 prices is 1.16 million dong. The 1997–98 food poverty line is based on basically the same basket of goods valued at national January 1998 prices, using essentially the same procedure. Non-food expenditure was just the 1993 level inflated by 1.225 based on the GSO's non-food consumer price series. The final figure was 1.79 million dong.

To determine a household's poverty status, its income (measured in a specific month and region) must be converted to the 'national January' bases. The regional indices are Laspeyre's indices of either VLSS (1993) or GSO (1998) prices using the average VLSS average consumption basket as weights. The monthly index, on the other hand, is partly based on the household's own consumption. The household's expenditures on rice, other food and non-food are deflated by GSO national indices for these three categories. The result is that, within the year, a household's poverty status depends partially on its own consumption: a household that consumes disproportionately much rice will have this reflected in its poverty status to the extent that relative rice prices change between January and its sample month.[14]

For classifying households within a year the discussion above is sufficient, but if one is interested in the evolution of real income one needs to link the January 1993 and January 1998 bases. This is done in the VLSS by applying a common inflation factor of 1.456, derived from the GSO price indices with Vietnam average consumption weights. Thus this major component of the real income comparison is also independent of household individual consumption patterns.

(b) Household-specific consumption

In this section we recalculate the common price indices on a household-specific basis to allow for their different preferences between rice and other goods.[15] Write the price index used to deflate household income as:

$$p = a_r p_r + a_g p_g + (1 - a_r - a_g) p_o \qquad (2)$$

where subscript r refers to ordinary rice, g to glutinous rice and o the other goods, a to expenditure weights and p to prices (indices). We approximate a_r and a_g (which are based on national average expenditures) from the whole VLSS sample, take p from the VLSS and p_r and p_g from either VLSS or the GSO price series. From

these we infer the value of p_o used in the VLSS calculation and then use household-specific weights, to create a new, household-specific, price index of p_r, p_g and p_o.

We use the new household price indices to rework the VLSS categorization of poverty status in 1998. Instead of the nominal price exercise described above, we deflate 1998 nominal income by the household-specific price index and compare the result to the 1998 poverty line deflated by the standard inflation factor 1.456.[16] In both cases we accept the 1993 measure of real income and poverty status as correct and re-estimate the 1998 figures. It would, of course, be possible to take 1998 as correct and re-calculate 1993, but for reasons that will become apparent, we did not think it worthwhile.

The household-specific weights for rice were determined from the VLSS data. For each of 1993 and 1998, we regressed the share in expenditure of ordinary and glutinous rice on log (real income) and certain of the household characteristics used in the MNL exercise (urban, region, demographic structure, ethnicity, and access to a road and a daily market).[17] From these equations we calculate predicted rice shares for 1998 to allow for the observable reasons for the rice share to deviate from average, and also capture the regression residuals to represent the idiosyncratic component of the household's preferences. We then work with five sets of constructed weights:

A   predicted by the 1993 equation (using 1998 values of the independent data);
B   A + the 1993 residual;
C   predicted by the 1998 equation;
D   C + the 1998 residual (= 1998 actuals); and
E   C + the 1993 residual.

Table 7 reports the mean predicted rice shares, the mean household deflators and the mean real 1997–98 per capita expenditures for the five sets of weights, along with their standard deviations. Columns 2 and 4 are based on VLSS prices, while columns 3 and 5 use GSO sources.

It is plain that changing the weights of the price indices or the source of the rice price data makes relatively little difference. Even though the mean rice share changed quite considerably between 1992–93 and 1997–98, the net effect on the mean price indices and real expenditures is muted. That the recalculated price indices are below the assumed inflation norm reflects the facts that the adjustments reduce the mean rice share and that rice prices increased more than average over 1993–98. The inflation factors for ordinary rice, glutinous rice and other goods were 1.69, 1.61 and 1.38 respectively using VLSS data, and 1.87, 1.79 and 1.32 using GSO data.

As might be expected from the construction of the data, the re-estimations reduce the estimated real consumption of households with children (because they have higher rice shares). More interestingly, they significantly increase the

Table 7 Predicted price indices and real expenditures

Prices	Mean rice shares	Mean deflators		Mean real expenditure	
		Commune prices	GSO prices	Commune prices	GSO prices
O	0.248	1.456	1.456	1,947.5 (1,531)	1,947.7 (1,531)
A	0.164 (0.117)	1.430 (0.035)	1.410 (0.064)	2,017.2 (1,687)	2,080.0 (1,836)
B	0.164 (0.149)	1.430 (0.046)	1.410 (0.082)	2,018.0 (1,676)	2,081.9 (1,812)
C	0.211 (0.096)	1.445 (0.029)	1.435 (0.053)	1,991.1 (1,647)	2,029.8 (1,752)
D	0.211 (0.113)	1.445 (0.034)	1.435 (0.062)	1,987.7 (1,616)	2,023.0 (1,688)
E	0.211 (0.134)	1.445 (0.041)	1.435 (0.074)	1,991.9 (1,637)	2,031.9 (1,733)

Source: Calculations based on the VLSS, 1992–93 and 1997–98 and GSO data.
Note: O denotes the original data.

estimates for households with education and with white-collar jobs. Among the trade/agricultural variables, the only significant effect of the recalculation is to increase the estimated real expenditure for households using fertilizer for non-rice crops heavily. Presumably these households also have below-average rice consumption shares.

We now use the re-estimated data to re-classify households into poor/non-poor classes in 1998. The majority of households are classified as the same category, i.e. poor in both years (P→P), falling into poverty (NP→P), escaping from poverty (P→NP) or non-poor in both years (NP→NP), regardless of the deflator used. Table 8 reports the number of households that are classified differently from the original classification depending on which of the adjusted deflators (A to E) is used. The striking feature is how small they are. Given the total sample of 4,302 households, these re-classifications are minor. To check this we have re-estimated the MNL model used in section 5 using the new classifications. The differences in

Table 8 Poverty transition matrices with different deflators

	P→P	*NP→P*	*P→NP*	*NP→NP*
A	−22	−8	+22	+8
B	−14	−18	+14	+18
C	+2	−5	−2	+5
D	+1	−14	−1	+14
E	+6	−11	−6	+11

Source: Calculations based on the VLSS, 1992–93 and 1997–98.
Note: The table reports the differences in the number of households relative to original VLSS classification.

the coefficients and odds ratios are very small and the inference completely unaffected.

One's first – and largely correct – reaction to these results is that differences in preferences across households make no difference to the conclusions about the poverty implications of trade and agricultural reform. Essentially rice consumption appears to be sufficiently similar across households to have no systematic effect on net positions in rice. All the systematic variation in the latter is driven by the output side, so that our exercise based on initial outputs of rice is adequate.[18] This result is obviously rather case-specific because it depends on the variance of rice shares over households and the differences in the evolution of rice and other prices, but it has some general content. In the absence of major variation in these two dimensions, it appears that it is not necessary to rework aggregate consumption data and poverty lines to allow for household-specific preferences.

There is, however, one caveat. As noted above, one aspect of the VLSS analysis does (inconsistently, but perhaps correctly) allow for household-specific weights. It is the within-year price correction. It turns out that during 1998 relative rice prices changed strongly: relative to January, the December price indices for rice, non-rice food and non-food were 1.256, 1.023 and 1.027 respectively.[19] Thus for late-sampled households, heavy rice consumers are correctly more likely to be deemed poorer than average. The relative rice price change over January to September 1998 nearly equals that over January 1993 to January 1998, so maybe, in fact, our results do already allow for the main effect of differences in preferences!

7. CONCLUSION

This paper discussed the reforms to Vietnam's rice sector over the 1990s, most notably those associated with international trade policy. Given the huge importance of rice in the production and consumption baskets of Vietnamese households, especially the poorer ones, this is the obvious place to start looking for the implications of reform for poverty. We demonstrated that the reforms had significant effects on the prices of rice and fertilizer and on the quantities produced, used and sold. Whereas other researchers have used first-order welfare approximations to move from price changes to inferences about households' welfare based on their net position in rice, we have attempted to test whether differences in rice positions are reflected in households' measured poverty status.

Our methodology depends on identifying the links from changes in policy to variables that affect households. We bring this into a multinomial logit model explaining households' poverty status in each of two periods and find convincing evidence that higher rice prices disproportionately benefited households already specialized in rice and that lower fertilizer prices disproportionately benefited big users of fertilizer. There is some, largely explicable, variation in the strength of the rice result across regions. We also found that, as predicted by theory, given these effects

there were no further systematic effects related to production technologies or yields. For lack of space, we did not pursue the matter here, but in Niimi *et al.* (2003) we show that allowing for these various effects helps to explain Vietnamese household poverty dynamics significantly better, and that the trade and agricultural reforms over the period 1992–93 and 1997–98 reduced poverty by around 10 per cent.

Theory suggests that one must consider households' consumption as well as their production activities in assessing the poverty effects of rice reform. The VLSS do not lend themselves to this, but we reworked the categorization of households' 1998 poverty status to allow for differences in their consumption baskets. In fact, we found that this made very little difference, although perhaps because one aspect of household-specific preferences had slipped into the VLSS data almost by accident. We conclude that unless there are massive differences in consumption baskets across households, *and* massive changes in relative prices, accounting for differences in preferences is not a top priority in assessing the poverty implications of reform.

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NOTES

1 These statistics and our calculations below are based on the panel dataset of 4,302 households from the 1992–93 and 1997–98 *Vietnam Living Standard Measurement Surveys* (VLSS). These surveys were carried out by the General Statistical Office (GSO) and the

Ministry of Planning and Investment, with financial assistance from the United Nations Development Programme (UNDP) and the Swedish International Development Agency (SIDA) and technical assistance from the World Bank.

2 Poor households are defined as those whose consumption expenditure is below that required to obtain a balanced diet of 2,100 calories per day – see section 6.

3 Although SOEs still retained their monopoly, the private sector played an important role in rice trade as SOEs with quotas generally subcontracted the actual trading work to private traders (CIE 1998).

4 Further reforms have been undertaken recently: rice export quotas and fertilizer import quotas were eliminated in May 2001 and all agents with a licence to trade food or agricultural commodities were permitted to participate in rice exports (Nielsen 2002a). Unfortunately, the effects of these reforms do not figure in our data period.

5 This form of price control has to be supplemented with foreign trade intervention (e.g. with export quotas) (Ghosh and Whalley 2001).

6 This argument might not be entirely true, as the rice produced for export may be different from that produced for domestic consumption. However, in the absence of disaggregated data, it is not possible to explore this.

7 The consumer price index (CPI) was obtained from the GSO but detailed information on the basket of goods and services that were used to construct the CPI and the weight of each commodity is not available.

8 The 23 per cent refers to urea, which is the main chemical fertilizer that Vietnam imports and farmers use, but similar trends are also observed for other types.

9 Exports dipped to 13 per cent of the world total in 1998 due to the drought.

10 Based on the GSO statistics obtained from CIEM.

11 See World Bank (1999b) and Glewwe *et al.* (2000) for the detailed construction of the poverty line and our discussion in section 6.

12 As well as adding variables, we also measure various non-trade effects slightly differently from Glewwe *et al.* (2000). For the explanation for the choice of the employment variables as well as for the estimated results of the various MNL models, see Niimi *et al.* (2003).

13 The rice production effect in the Mekong in column B of Table 6 is an increase of 36 per cent in the chance of escaping = $100*(2.289*0.593-1)$.

14 For example, if relative rice prices increase, the household's nominal income will go less far and it may be declared to be poor even though another household with equal nominal income is not. Its preference for rice, however, will not be recognized in the comparisons between its income and the poverty line in January prices.

15 The within-year price index already makes this allowance and since we are concerned with the dynamics of specific households, which, by definition in the VLSS, have not changed region, we do not need to consider the regional indices. (If a household did move between 1992–93 and 1997–98 we would not identify it as the same household.)

16 Notionally, we are comparing the deflated incomes with the 1993 poverty line, but from VLSS we know that the cost of the poverty bundle inflated by 1.543 between 1993 and 1998 rather than the national average factor of 1.456. To ensure that our correction relates only to the relative weights of rice and not to the overall 'excess inflation' of the poverty bundle, we absorb the latter into our poverty line by grossing up the 1993 poverty line by (1.543/1.456). The net effect is equivalent to deflating the 1998 poverty line by 1.456.

17 Real income is as calculated by VLSS, which we are in the process of challenging. However, the error from using this rather than our recalculated values would be clearly second-order or smaller, while using the calculated values (which depend on the rice share which we are now estimating) would be rather complex.

18 We are not saying that rice price rises do not hurt consumers, but that they hurt households roughly equally. To the extent that they do not have equal effects, the differences appear to be of no use in explaining movements in and out of poverty.

19 The increase in the rice price was largest in the second quarter and the index reached 1.265 by September.

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