Agricultural Trade Liberalization and Poverty Dynamics in Three Developing Countries

Julie Litchfield, Neil McCulloch and L. Alan Winters[1]

May 2003

Introduction

Many developing countries have implemented sweeping reforms in the agricultural sector over the course of the last decade. These have included the removal of quotas and price controls, changes in international trade barriers, and the commercialization and privatization of state marketing boards for key crops. These reforms have often generated intense criticism from groups claiming that they have had a negative impact upon poor farmers and poor households. This concern has generated an extensive literature on the economics of agricultural trade reform in developing countries, much of which has focused on explaining the large variations in supply response across countries, regions and households (e.g. Key, Sadoulet and De Janvry, 2000). In addition, a number of papers have attempted to simulate the impact on poverty using household survey data and actual or predicted price changes – e.g. Ravallion and Van der Walle (1991).[1] However, in many cases the true impact of agricultural reform is difficult to determine. In part this is because the analysis is based upon households surveys at a single point in time, so that the final (post-adjustment) consequences of a shock for individual households are unknown. Also, even where observations are available over time, it has so far proved difficult to disentangle the effects of trade and agricultural liberalization from other contemporary shocks.

Julie Litchfield is Director of the Poverty Research Unit at Sussex and a member of the Department of Economics at the University of Sussex; Neil McCulloch is a Research Fellow at the Institute of Development Studies, Brighton, and L.Alan Winters is Professor of Economics at the University of Sussex. We are grateful to Patricia Justino, Yoko Niimi and Puja Vasudeva-Dutta of the Poverty Research Unit for their excellent contributions to this research and to several colleagues and seminar participants who have provided valuable comments: Bob Baulch, Rhys Jenkins, Lina Song, Andy McKay, Shujie Yao, Barry Reilly and Linxiu Zhang. This research was funded by the UK Department for International Development, "The Impact of Trade Reforms and Trade Shocks on Household Poverty Dynamics" (ESCOR-R7621) as part of the Globalisation and Poverty Research Programme.

This paper reports the results of a research project on the empirics of Trade Liberalization and Poverty. It exploits detailed household survey data from more than one period in time to look at the impact of agricultural and other liberalization in three developing countries: Vietnam, China (Sichuan), and Zambia. The research is based on a conceptual framework linking trade liberalization to poverty – e.g. Winters (2002) and Winters, McCulloch and McKay (2002). This helps significantly with the identification of different effects. Given the framework and the fact that the surveys span periods of intense liberalization, this study offers an almost unique chance of identifying the poverty effects of liberalization *ex pos*t.

The Conceptual Framework

Winters (2002) starts from a 'farm household' model, in which poverty is related to the prices and quantities of the goods and services produced by the household (including factor services, most notably labour), other sources of income such as transfers and remittances, and, implicitly, household structure. Two key transmission mechanisms from trade reforms or shocks to household living standards are identified here. The first and most direct of these is price changes. Even simple economies have several stages between the border, where trade policy/shocks bite, and the poor household, so one consideration is how much of the price change gets passed through to the poor. This depends on the nature of the distribution sector, especially its degree of competition. It is also important to consider how households accommodate shocks, for strong 'second round' effects could affect prices and employment in local markets. Even more important is whether markets exist at all: trade reform can both create and destroy markets. Extreme adverse poverty shocks are mostly associated with losing market access, while strong

poverty alleviation can arise when new markets provide opportunities for previously untraded or unavailable goods.

Trade reform is also likely to have major effects on labour markets: if it boosts the demand for labour-intensive products, it will boost either wages and/or employment (or a combination of both). However, the effects on poverty are a function of whether the poor depend heavily on the favoured type of labour and where the new wages lie relative to the poverty line, as well, of course, on whether labour intensive products are actually stimulated by reform. The latter will not always be true, especially for goods produced by the very least skilled workers.

Winters (2002) also discusses the links to poverty via government tax and expenditures and economic growth. These are likely to be important – especially the latter – but are very difficult to identify with the available short time series of household survey data. Hence we focus our research on the most direct transmission mechanisms: prices, wages and employment.

The Empirical Challenge

The research faces two important empirical challenges. First attribution: identifying the effects of trade on household poverty dynamics is difficult since other factors may be important. Demographic events such as births, deaths or family splits and other events such as spells of ill-health change the ratio of household needs to income. Environmental shocks, such as unusually high or low rainfall levels or diseases, or other shocks, e.g. to distribution infrastructure affect earnings ability. Even if movements in or out of poverty can be traced to shifts in employment, wages or prices, these need to be attributed to trade rather than other economic reforms. And of course, the trade reform itself may comprise of several different events and concern several different sectors in offsetting ways.

Second the research requires detailed and reliable household data before and after the trade reform. For Vietnam we use a nationally representative panel data set of 4,302 households, the Vietnam Living Standards Survey (with data on household expenditures, employment, production, demographics, schooling and other household and community characteristics) for 1992/93 and 1997/98, a period during which there were significant changes in trade policy, especially on rice. For China we use a rich five-year panel data set with similar data on 3,311 households in rural Sichuan between 1991 and 1995, the most populous province, spanning a period of major changes in the central government's quota and pricing regime for the grain market – the most important market for the poor. Analytically Sichuan is equivalent to a small open economy facing exogenous shocks from the world economy. Finally, in Zambia a pseudo-panel has been constructed from three nationally representative LSMS household surveys covering the 1990s – a period which included a major reform of maize pricing and marketing. From these data, we are able to determine movements in and out of poverty and relate these to shifts in policy whilst controlling for demographic and other shocks and for unobserved heterogeneity across households.[2]

Vietnam

This section applies the framework to estimate the direct, static, impact of trade liberalisation on poverty in Vietnam.[3] In data terms, Vietnam is an ideal candidate for such an application but for attribution it is not. Since the start of the *doi moi* reforms in the late 1980s the Vietnamese economy has undergone a broad but sometimes halting and confused transition. A major challenge has been to separate the international trade reforms from other shocks and plot their transmission through to poor households.

Poverty fell strongly between the two VLSS surveys: the headcount ratio fell from 58% to 37%.[4] However, the gains were not uniform: of the panel, around 28% remained poor in both years, 5% fell into poverty, 27% of households escaped poverty and just under 40% were not poor in either year (Litchfield and Justino, 2003).

On the trade side, the *doi moi* included: the removal of constraints on trade outside the CMEA bloc, the liberalisation of foreign exchange controls, the relaxation of quantitative controls and greater use of tariffs, export promotion and the establishment of export processing zones, integration with the world economy via regional and multilateral trading agreements, and the adoption of the international Harmonised System (HS) for tariffs.

The multiplicity of instruments and reversibility of many reforms make it very difficult to trace the effects of tariff and other policy changes on households, so we had to rely on outcomes – observed prices and quantities - rather than policies to identify the impact of the trade liberalisation. In these we detect dramatic changes, and there must be at least a reasonable presumption that they have been heavily influenced by the policy changes noted. The share of international trade in GDP increased from about 52% to 71% between 1993 and 1998 (GSO statistics). Imports grew by 293% dominated by machinery and intermediate goods (amounting to approximately 70% of total imports), while exports grew by 213% – apparently in line with comparative advantage. Agriculture, forestry and fisheries exports expanded but less than the share of coffee (a new product), handicrafts and light industrial goods. One of the most dramatic changes was from being a net importer of rice in 1992, to the world's second largest exporter by volume in 1998 (Minot, 1998). From around 1990 domestic rice prices were liberalised, export quotas removed and trading rights extended. Exports boomed and prices rose (by 29% in real terms relative to the CPI). Real fertiliser prices fell by 19% between 1993 and 1998, again as a

result of policy change. Real prices of other tradables also changed considerably: e.g. seafoods by over +40% and woollens –38%. These changes alone suggest that trade policy was effective.

Wage data are extremely confused in Vietnam, but trade affects wages by changing the output-bundle, so we also identified the commodities for which exports and imports changed most over 1993-98 and then traced these back to their producing industries and occupations. Prima facie, if trade "matters", these are sectors and occupations that we would expect to show up most strongly in explaining household experiences. The export sectors are clothing, footwear, sea-food and food-processing[5] and the import sectors textiles, machinery, leather, chemicals and metal industries.[6]

We then tested the extent to which the observable liberalisation-induced changes contributed to the reduction of poverty at the household level. We estimated a multinomial logit model on household data, and asked whether the production activities and characteristics that would a priori dispose a household towards an escape from poverty actually did so. Starting from a "standard" demographic multinominal logit model of household poverty dynamics we add a number of additional variables to reflect the trade links[7]: rice and coffee production, land and fertiliser use, and the proportion of household members working in export industries. With one exception, all the variables refer to households' characteristics or activities in the initial period. This is partly to avoid problems of simultaneity whereby poverty experience might determine the behaviour modelled on the right hand side of the equation rather than vice versa. But it also reflects the desire to test the conceptual framework as a predictive tool. That is, to see how well the framework would predict the effects of trade reform if it were applied ex ante using only the information available in the initial period.

Table 1 reports the coefficients on the trade variables as relative risk ratios. Collectively the trade variables are strongly statistically significant and loosely speaking, allowing for trade variables improves one's ability to explain poverty dynamics by 10%. Ceteris paribus, a household whose production of coffee in 1992 is one standard deviation above the mean has more than double the mean chance of escaping from poverty in 1998. Similarly, a one standard deviation increase in rice output increases the chances of escape by 75% in general (although less in the Mekong Delta where farms are larger than average and hired labour is more common (Minot, 1998).[8] As fertiliser prices fell heavy users could sustain increases in real consumption. We distinguished between rice and non-rice fertiliser effects, because the latter may reflect greater opportunities for exploiting the fall in price as farmers can switch between crops rather than just increase use for a single crop.

There are at least three ways of linking initial employment in an export sector to escape from poverty. Existing workers could get real wage increases or longer hours, or it may be that initial employment indicates a location close to exporting firms and hence better chances of the household obtaining more jobs as the firms expand. In order to explore the third more closely, we broke our rule of using only initial values as explanatory variables, and added the change in the proportion of adults with employment in export sectors. Incumbency does have advantages in escaping poverty but so too does a household's ability to supply new export workers.[9] Methodologically the lesson is that for predicting the poverty effects of trade liberalisation, agricultural elements may be well captured by initial activity in the affected sector because mobility is relatively low in these sectors.[10] For manufacturing, however, although initial employment captures some of the likely effects, some will be less predictable because mobility into manufacturing jobs is high.

While the trade effects appear to be estimated sufficiently precisely to reject the hypothesis that they have arisen by chance, we also should consider their contribution to explaining poverty dynamics. The increase in the pseudo-R^2 from 0.234 to 0.266 suggests that trade adds a further 14% to the explained variation in poverty experience but that much variation remains unexplained. The proportions of correct predictions from the model tell a similar story. The basic model classifies 59.90% of households correctly, over-predicting no-change outcomes and strongly under-predicting the changes. Adding the trade variables improves the overall success rate by about 1.5 percentage points or 2.5% and materially improves the predictions for escapees from poverty.

The results so far lend considerable weight to the conceptual framework proposed and to the view that 'trade matters'. They do not, however, tell us directly whether trade reform reduced poverty in Vietnam. For that, we need to create a counterfactual – '1998 without trade reform' – and it is here that uncertain attribution takes its toll. As noted above we use initial household characteristics as variables and then essentially infer the change in their value between 1993 and 1998 from the estimated coefficients. Hence, we can estimate the effects of trade reform on overall poverty by setting the 'trade-related' coefficients in the multinomial logit to half (@?) their estimated values and recalculating the predicted changes in poverty.[11] If none of the trade effects had applied, about 100 fewer households (out of 4302) would have escaped from poverty and nearly 300 more would have been in poverty in 1998 - about 10% of the observed values in each case. Hence we conclude that for Vietnam, trade liberalisation not only mattered but that it was directly responsible for a significant share of the dramatic poverty reduction observed during the period.

China (Sichuan)

There were major reforms undertaken in the grain market in Sichuan during the early 1990s: parts of Sichuan eliminated mandatory procurement quota requirements in 1992; both the urban grain rationing and compulsory procurement system were successfully liberalised in the entire province by 1993 (Rozelle et al., 1997), and some regions also relaxed restrictions on grain trade in free markets (Sicular, 1996). However, these reforms came to an abrupt halt in 1994 after 24% inflation brought on by a severe grain price hike (Wang and Davis, 2000). As a result price controls were re-imposed and reforms in the grain rationing system in urban areas were abandoned. To encourage farmers to meet their production quota, the government raised contract purchase prices by 44% in 1994 (Wu, 1997) and again in 1995. By 1995 the old system of compulsory procurement through a two-tier system of quota and above-quota sales and subsidised grain for urban areas had been re-introduced in 29 of China's 35 major cities (Wang and Davis, 2000).

These reforms (and their reversal) are of particular interest because they are "trade like" reforms in the sense that they were centrally determined, uniform in their application and affected the price of the commodity of most importance to poor people. However, attribution is again a problem as there was a drought in many parts of the province in 1993, a rapid expansion in the number of Township and Village Enterprises (TVEs), and the government began a major anti-poverty initiative in designated "poor counties" some of which are included in our sample.

Our analysis of the effect of trade on poverty in Sichuan takes a slightly different approach because the household surveys include information on income sources. Firstly changes in per adult equivalent income giving rise to movements in and out of poverty were decomposed into the changes in the various sources of household income and changes in the number of adult

equivalents in the household. This exercise showed that changes in household income were generally a much more important reason for movements in and out of poverty than changes in household composition: changes in household income were responsible for entries and exits in more than 90% of cases, and of these, changes in profit income (which includes farm profits) were by far the most common cause of a poverty transition, with changes in employment income accounting for less than 5% of all cases. When looking just at profit income, changes in farming income dominate, although changes in livestock income are also important. Interestingly changes in farming income are a much more important cause of exits from poverty between 1993 and 1994 than they are of entries into poverty – potentially reflecting the large rise in the government procurement price in 1994.

This decomposition analysis does not account for differences in household characteristics or external shocks faced by the household. To identify the impact of grain market reforms whilst controlling for these other factors, a discrete-time proportional odds model was estimated, with the results shown in Table 2.[12] Several of the control factors play a strong and statistically significant but here we focus on those variables that reflect trade reform. (see McCulloch and Cao, 2003, for the full set of results). Notwithstanding the many other factors, grain market variables play an important and statistically significant role. A higher grain quota or market prices significantly reduces the probability of entering poverty, [13] and being a net seller of grain greatly increases the chance of exit. Households who are both net sellers and who live in areas with high grain market prices substantially reduce their risk of entering poverty (although surprisingly it also reduces the risk of exiting poverty too). Interestingly, it is the market price that is doing all the work – the interaction of the quota price with net sales has no statistically significant effect.

Overall these results do not present convincing empirical evidence of a large impact from grain market reform – too much else is going on. However, they do show that the impact of grain reforms can be identified and that in rural Sichuan they do appear to have had a statistically significant effect in reducing entry into poverty particularly among households who were net producers of grain (and conversely for net consumers). This is exactly the result that our conceptual framework predicts.

Zambia

Implementing the conceptual framework is especially difficult in the Zambian case study as there are no nationally representative panel survey data sets available. Instead the national LSMS-style households surveys are used to create a pseudo-panel of household types based on shared geographical and household characteristics (Litchfield and McCulloch, forthcoming).

One of the key reforms in Zambia that took place during the 1990s is reform of the maize sector, involving the removal of the ban on maize exports, abolition of the state maize marketing board (that previously provided inputs as well as purchasing outputs) and the consequent end to pan-territorial and pan-seasonal maize pricing. In addition, the price of copper began its decline during the latter part of this period.

Poverty in Zambia during the 1990s was persistently high so there was little movement across the poverty threshold observed between 1991 and 1998. However there was much more movement across quintiles. Hence the limited dependent variable model approach adopted for Vietnam is replaced by a consumption growth model. Table 3 summarises the trade-related results for the rural pseudo-panel. The first observation is that few coefficients are statistically significant, suggesting that grouping by age of household head and district creates some groups

that are too small to yield precise estimates. The second observation is that only one of the trade-related variable coefficients is statistically significant, marketisation of hybrid maize: cohorts who initially sold a high proportion of their hybrid maize harvest experienced higher growth of consumption expenditures. However, even though almost all of the coefficients on the trade related variables are not statistically significant most have the sign expected: cohorts with greater proportions of workers employed by parastatals, in the private sector and as employers suffered lower growth of median consumption expenditure, as did those with high proportions employed in heavy manufacturing and services. Cohorts with higher proportions of household heads engaged in agriculture and with fewer non-agricultural households appear to have done better than others, although the results are not statistically significant. Although the lack of statistical significance of the trade-related variables is somewhat disappointing the results do suggest that some trade effects can be identified using the conceptual framework.

Common Themes and Conclusions

In this paper we have presented what we believe to be one of the first attempts to empirically measure, rather than simulate, the effects of trade reform on poverty by applying a conceptual framework to household survey micro-data. In each of the three countries, trade liberalisation of a major agricultural staple was analysed: rice in Vietnam, grains in Sichuan, China and maize in Zambia. Each of these commodities were initially highly regulated but underwent considerable liberalisation during the 1990s.

We find that in Vietnam a clear empirical link can be identified between movements in and out of poverty and households' status as producers of rice, including differences between regions (due to differences in the structure of the rice sector) and technology. In addition, the

effects of liberalization on coffee producers and employees in other sectors are identified as well. In Sichuan, changes in grain prices have had an important effect upon movements in and out of poverty in China, but changes in the government grain quota have had much less impact. In Zambia non-agricultural households were negatively affected by policy reforms, whereas the combined effect of output and input market reforms appears to have muted the impact upon rural farmers.

The policy significance of this work is not the generation of universal rules linking trade to poverty – that was never expected nor intended. Rather, we have shown the importance of trade in specific cases and shown how governments can use the conceptual framework to predict the likely poverty impacts of their policy reforms. Although trade reform is only one of several influences on poverty outcomes, it is one of the most easily and quickly manipulated. Thus this work contributes to the advice that liberal trade, supplemented where necessary with flanking measures, has a lot to contribute to the reduction of poverty.

References

Chen, S., and M. Ravallion. "Data in Transition: Assessing Rural Living Standards in Southern China." *China Economic Review* 7, no. No. 1(1996): 23-56.

McCulloch, N., and B. Baulch. "Simulating the Impact of Policy upon Chronic and Transitory Poverty in Rural Pakistan." Journal of Development Studies 36, no. 6(2000): 100-130.

McCulloch, N., and M. Calandrino (2002). "Poverty Dynamics in Rural Sichuan Between 1991 and 1995." IDS Working Paper. Institute of Development Studies.

McCulloch, N., and M. Calandrino. "Vulnerability and Chronic Poverty in Rural Sichuan." World Development forthcoming (2003).

McCulloch, N., and Y. Cao. "What caused changes in households income and poverty in rural Sichuan in the early 1990s?, University of Sussex Working Paper (2003).

Rozelle, S., A. Park, J. Huang and H. Jin (1997). "Liberalization and Rural Market Integration in China." American Journal of Agricultural Economics **79**: 635-642.

Sicular, T. (1996). Redefining State, Plan and Market: China's Reforms in Agricultural Commerce. China's Transitional Economy. A. Walder, Oxford University Press.

Wang, L. and J. Davis (2000). China's Grain Economy: The challenge of feeding more than a billion, Ashgate.

Wu, H. X.(1997). "Reform In China's Agriculture - Trade Implications." Briefing Paper Series No. 9, Department of Foreign Affairs and Trade, Australia.

Glewwe, P; Gragnolati, M and Zaman, H (2000) "Who gained from Vietnam's boom in the 1990s?: an analysis of poverty and inequality trends", *Policy Research Working Paper 2275*, Washington, D.C.: World Bank.

Justino, P. and Litchfield, J. (2003) "Poverty Dynamics in Rural Vietnam: Winners and Losers during Reform", *Poverty Research Unit at Sussex Working Paper* no 10, University of Sussex.

Key, N., Sadoulet, E. and De Janvry, A. (2000) "Transaction costs and agricultural household supply response", *American Journal of Agricultural Economics*, v82, pp. 245-259.

Litchfield, J. and P.Justino (2003), "Welfare in Vietnam During the 1990s: Poverty, Inequality and Poverty Dynamics", forthcoming.

Litchfield, J. and McCulloch (forthcoming) "Poverty in Zambia: Assessing the Impacts of Trade Liberalisation in the 1990s".

Niimi, Y., Vasudeva-Dutta, P., and Winters, L.A. (2003a) "Trade Liberalisation and Poverty Dynamics in Vietnam", *Poverty Research Unit Working Paper* no 17.

Niimi, Y., Vasudeva-Dutta, P. and Winters, L.A. (2003b) "Linking Trade Liberalisation and Poverty: An Illustration from Vietnam in the 1990s", forthcoming.

Ravallion, M. and D. Van de Walle (1991), "The Impact on Poverty of Food Pricing Reforms: A Welfare Analysis for Indonesia", *Journal of Policy Modelling* 13, pp. 281-99.

Winters, L.A.(2002) "Trade, Trade Policy and Poverty: What Are the Links", *The World Economy*, vol 25(9): 1339-1367.

Winters, L. A., McCulloch, N. and McKay A (2002). 'Trade Liberalisation and Poverty: The Empirical Evidence', University of Sussex Discussion Paper in Economics, No. 88.

World Bank (1999) Vietnam Development Report 2000: Attacking Poverty, Donor-NGO Working Group, Consultative Group Meeting for Vietnam, December 14-15, 1999.

Tables

Table 1: Relative Risk Ratios for Escaping from Poverty in Vietnam

Agricultural variables	
Quantity of rice production	***1.75
In Mekong River Delta	**0.60
In Red River Delta	**0.85
Quantity of coffee production	***2.32
Quantity of fertiliser – rice	***1.46
Quantity of fertiliser – non-rice	*1.70
Other Trade variables	
Ratio of household members working in exports	***1.25
Change in the ratio of export workers	**1.17
Pseudo R^2	0.27

Notes: *** significant at 1% level; **5% level; * 10% level; All continuous variables are included in standardised form.
Source: Niimi, Vasudeva-Dutta and Winters (2003a)

Table 2: Discrete Time Proportional Odds Model of Poverty Entry/Exit in Sichuan

	Entry into poverty		Exit from poverty	
	Odds Ratio	z-stat	Odds Ratio	z-stat
Grain market variables				
Grain quota price	0.67	-3.50	1.03	0.74
Grain market price	0.68	-3.04	1.02	0.24
Net sales pae	4.09	0.70	13.04	2.34
Net sales * Grain market price	0.14	-1.72	0.23	-1.69
Net sales * Grain quota price	2.34	0.52	0.42	-1.35
Hazard				
Ln(time)	15.20	11.64	102.10	15.15
Pseudo R^2	0.204		0.389	

Source: McCulloch and Cao (2003).

Table 3: Rural Consumption Growth in Zambia (Trade Related Variables)

Prop of hh heads that work as:		Prop of hh that grow:	
Self-employed	0.232	Hybrid maize	0.159
Govt employee	1.733	Local maize	0.777
Parastatal	-0.645	Hybrid maize sold	0.542 *
Private employee	-3.274	Local maize sold	0.058
Employer	-25.120	Distance to	
Unpaid family worker	-3.189	Food market	-0.009
Other	-5.917	Post office	0.093
Prop. hh heads employed in:		Primary school	-0.136
Agriculture	1.979	Secondary school	-0.067
Mining	0.454	Health facility	0.078
Light manu	18.259	Water supply	0.285
Heavy manu	-0.367	Public transport	0.012
Electricity etc	17.061		
Services	-2.697	Proportion of non agricultural household	-2.013
Public admin.	-11.179		
N	147	Adj R^2	0.27

Notes: * indicates coefficient is statistically significant at the 5% level or better. Results refer to changes in (ln) per adult equivalent expenditures between 1991 and 1998.

Source: Litchfield and McCulloch (forthcoming)

[1] Chen and Ravallion's recent piece on China is another good example of this: the Impact of Trade Reforms on Household Welfare in China …

[2] We are grateful to the General Statistical Office in Hanoi, Vietnam, the Household Survey Division of the Rural Survey Organization in the National Bureau of Statistics, China, the Central Statistical Office in Lusaka, Zambia, and to the World Bank LSMS for providing access to the household data and documentation.

[3] See Niimi, Vasudeva-Dutta and Winters (2003a) for more details.

[4] The official poverty line is used here, and is based on a specific basket of goods that provide 2100 calories per person per day plus some non-food expenses (World Bank, 1999, Glewwe, Gragnolati and Zaman, 2000).

[5] We do not include agriculture because (a) it offers relatively little wage-employment (as opposed to self-employment) and (b) most food is at least partly processed before it is exported.

[6] We also conducted a factor-content of trade analysis and found some evidence of increased demand for unskilled labour (Niimi, Vasudeva-Dutta and Winters, 2003b).

[7] Niimi, Vasudeva-Dutta and Winters (2003a), Justino and Litchfield (2003), Litchfield and Justino (2003) discuss the properties, shortcomings and alternatives to the multinomial logit and conduct various sensitivity tests, including the choice of poverty line and equivalence scale.

[8] The rice production effect in the Mekong is an increase of 5% in the chance of escaping = 100*(1.75*0.60 - 1).

[9] We also experimented with employment in import industries and manufacturing but to no avail.

[10] By the same token negative shocks will hit hard in agriculture, as, for example, the decline in coffee prices since 1997 is reported to have done in Vietnam's Central Highlands.

[11] This exercise is essentially a simulation. We are comparing predictions under two sets of conditions, not actual and predicted values.

[12] This model assumes that the relative odds of entry into (or exit from) poverty is equal to the relative odds of a baseline hazard scaled by $\exp(\beta'X)$. An alternative is to assume a proportional hazard – both models give similar results.

[13] An "average" household in an area with a quota or market price one standard deviation above the mean would experience a reduction in their probability of entry into poverty of around 20% (a fall in the odds ratio of a third).