RURAL NONFARM EMPLOYMENT UNDER TRADE REFORM EVIDENCE FROM VIETNAM, 1993-2002

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Abstract

Vietnam's rural economy has substantially diversified over the past two decades. The rural nonfarm sector has grown rapidly and became an important source of employment and income for rural households. This growing nonfarm employment was associated with radical changes in the trade policy reform that has put the country to the top two or three performers in the developing world. This paper examines the potential effect of the trade policy reform on nonfarm employment in rural Vietnam during the period 1993-2002. It proposes two trade openness indices that allow changes in the trade policy at the macro level to be transmitted to rural households. The results reveal that the trade policy reform does have a material impact on rural nonfarm employment. While a more liberalized agricultural sector encourages nonfarm diversification, a lower protection level in the nonfarm sector discourages individual participation in nonfarm income-generating activities.

JEL code: F13, F16, J21

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1. Introduction

Vietnam's renovation process, commonly referred as *Doi moi*, was officially launched in 1986 and has undergone for about two decades. The country has transformed from a centrally planned economy into a dynamic market economy with a GDP growth rate of nearly 7.3%. This impressive growth has resulted in an even more impressive poverty reduction. The national poverty rate fell almost threefold (from 58% to less than 20%) between 1993 and 2004. Although this economic growth is associated with substantial structural changes towards more industry and services, agriculture has remained central to such impressive growth and poverty reduction during *Doi moi*. The decollectivization wave and land reform in the early 1990s (Fforde and Huan, 2001), promoting private sector (including household businesses), removing other barriers to trade and production in agriculture directly benefited the majority of Vietnam's population whose livelihoods were closely dependent on small-scale subsistence agriculture in the rural sector (Benjamin and Brandt, 2004).

However, the gains from correcting previous policy distortions were unsustainable and there have been concerns that agriculture will not be sufficient to absorb the country's growing labour force and continue its contribution to export growth as in first stage of the reform. The share of agriculture in total employment sunk from more than two third in 1990 to around 58 percent in 2004, and the underemployment rate was very high in the rural areas (GSO, 2002 and 2006). Vietnam's agricultural exports, which were behind much of the recent growth in agriculture, have been faced by worsening external environment due to the collapse of the world prices for its major agricultural commodities in the late 1990s (World Bank, 2006). The rural-urban migration started rising at high rates. Official statistics from the most recent population census reveals a number of 4.35 million internal migrants between 1994 and 1999 (GSO, 2001). World Bank (2005) reports uncovered 420,000 more people living in the Ho Chi Minh City than had been predicted by the census.

Under this context, there has been a growing pessimism about contribution of agriculture in employment creation and export expansion in the long term and currently it is widely assumed that

increased participation in nonfarm activities is critical to the future growth. In fact, nonfarm employment has become an increasingly important source of employment for the rural population during the 1990s. Van de Walle and Cratty (2003) reveal that the incidence of farm-only household has decreased from 75% to 52% between 1993 and 1998. It means that the incidence of households that involved in at least one nonfarm activities increased up to nearly a half of rural households within this five year period. Expansion of nonfarm employment is also reported by Hoang *et al.* (2005) and Minot *et al.* (2006) in the Red River Delta, and Northern Uplands, respectively. World Bank (1998, 2006) highlights an increasing share of nonfarm activities in rural employment and household incomes, through the incidence of nonfarm employment greatly varies across the country.

This paper examines that growing importance of nonfarm employment and particularly focuses on whether the trade policy reform has affects on this type of employment in rural Vietnam. It adapts the trade-poverty framework developed by Winters (2000), McCulloch *et al.* (2000) who argue the necessity of transmission mechanisms that transmit the trade policy changes at the macro level to household level in studying the effect of trade shocks on poor households. Within this framework, trade reform affects on employment decisions by households though its impacts on markets and enterprises. Though the theoretical implications are appealing, validating this framework requires evidence especially from empirical work. By focusing the potential effect of Vietnam's trade reform on rural employment, this paper will provide empirical evidence in this regard. In addition, it also fits to the fertile literature on the growing importance of rural nonfarm sector (RNFS) in developing countries (see Lanjouw and Lanjouw, 1995; Reardon, 1997; Ellis, 1998 for a review). Participation by individuals and households in RNFS has been intensively informed, especially in terms of factors at individual and household level underlying such participation. This literature has however informed little on the effect of trade reforms (and other policy measures) on the decision making process by rural households to participate in nonfarm activities.

The paper is structured as follows. Section two reviews the literature on RNFS in developing countries and argues that there is a 'missed' link between trade and employment in the nonfarm

sector. Section three briefly describes the dataset used and a profile of the RNFS in Vietnam drawn from this data. The empirical methodology is outlined in section four with an emphasis on the method proposed to incorporate the trade reform into the model. The empirical results are discussed in the fifth section. Finally, the paper concludes with main findings and some policy discussions in section six.

2. Trade and Rural Nonfarm Sector: A Missing Link?

The significant role of the RNFS has been neglected in development economics until recently. The old view considers the RNFS as those activities limited at individual household level and/or at village level by traditional technologies. Hymer and Resnik (1969) advocate one of the earliest models on the RNFS, in which farmers are assumed to produce two kinds of goods, food and some simple non-agricultural products, to serve their own needs; the RNFS is supposed to consist of the household or village production of handicrafts and services, including some textiles, garments and food processing for village consumption. However, as the rural economy develops, alternative uses for rural labour in cash crops and other simple type of nonfarm activities become available, consumption of goods that are either imported or produced in metropolitan centers is also possible, the RNFS will, as a consequence, wither away during this rural transformation process. Ranis and Steward (1993) criticize the traditional view by arguing that RNFS also include non-traditional and modernizing production activities such as non-agricultural processes and/or products. There is also a potential relationship between the nonfarm sector and the agricultural sector as the farm and nonfarm sectors can mutually support each other via potential linkages between the agriculture to nonagricultural sectors (Haggblade *et al*., 1989). As a result, the RNFS will grow up with the rural development process.

Recent arguments for paying attention to RNFS generally point out the perceived potential of the sector in absorbing a growing rural labour force; slowing rural-urban migration; contributing to income growth; promoting more equal distribution of income. In an important contribution to the literature on the RNFS, Lanjouw and Lanjouw (1995) argue that neglecting the RNFS would be

mistaken. In many developing countries, a large proportion of the growing population lives in rural areas. With limits to cultivable lands, it is unlikely that the agricultural sector would be productively capable in absorbing the growing rural labour force. Given this, they highlight the role of the RNFS as a contributor to growth, income distribution, and minimizing migration. In supporting this, Meier and Rauch (2000) and Haggblade *et al*. (2006) emphasize the role of the RNFS in balancing the process of economic development and propose that the growth of the RNFS is essential to absorb fast-growing and low-income rural labour forces in developing countries. Davis and Pearce (2000) argue that in the long run the development of the rural nonfarm sector is a critical factor in providing rural employment and income. In the context of transitional economies, Bright *et al.* (2000) suggest a key role of the RNFS in the reform of rural economies.

The growing importance of RNFS in the development process of developing countries has attracted a large number of empirical studies, and this literature can be loosely divided into two strands. The first strand investigates the determinants of participation in the RNFS by rural households and individuals (Reardon, 1997; Berdegue *et al.* 2001; De Janvry and Sadoulet 2001; Lanjouw and Lanjouw, 2001; Lanjouw and Shariff, 2002). This generally demonstrates strong impacts of human capital, demographic characteristics, household assets, and community-level physical and institutional infrastructures on nonfarm employment decisions. The empirical studies within the second strand have concentrated on how participation in the RNFS has affected household income, and thus rural poverty (Reardon *et al.* 1992; Ellis, 1998; Lanjouw, 1998; Lanjouw *et al.* 2001, Lanjouw, 2001).[1] While re-affirming the influence of the above factors on the decision-making process to participate in the RNFS, this second strand commonly shows the importance of nonfarm income-generating activities in total household income, and thus a considerable contribution by the RNFS to rural poverty reduction. Unfortunately, this positive effect of nonfarm diversification is not universally observed. There has evidence that the poor do not benefit from the RNFS as much as the non-poor, and the extent of benefit generated by the RNFS largely depends on the capacity of individuals and households to react to new opportunities created outside agriculture.

The review of this literature however reveals a little on the effects of policy shocks to the decision-making process of rural households and individuals to participate in the RNFS. In most of the empirical studies to date, this process is investigated by some models that emphasize the effects of individual and household-level characteristics on nonfarm diversification. Other factors that are external to households are captured in a set of 'zone-level' or 'community-level' characteristics. For instance, when documenting determinants nonfarm employment, Reardon (1997) highlights the role of the 'agro-climatic zone-level' characteristics that comprises of agro-climatic features, population, infrastructure conditions, and other "[…] forces outside the rural economy (…) influence labour use in the rural nonfarm economy" (p. 742). Under the catching-all category of 'other forces', external shocks such as natural disasters, changes in institutional and policy environment exert influence on individual's or household's participation in the RNFS (see Reardon, 1997; Lanjouw and Lanjouw, 2001 for a review).

This framework is useful in informing natural disasters or policy changes made by local authorities that directly affect their residents. However, when policy changes are at the central level, some transmission mechanisms would be required to capture the effects of these changes on the micro level (e.g. individuals and households). With regard to trade policy reforms, such transmission mechanisms are crucial as the border prices, at which the trade policy operates, and the actual prices faced by households can be substantially different due to transport costs, market structures and institutions. Winters *et al.* (2002) argue that "[…] even simple economies have several stages between the border (…) and the poor household, so one consideration is how much of any price changes get passed through the poor" (p.4). This argument is even more important in the context of the least developed countries where rural households are largely self-subsistent and thus likely to be isolated from policy changes at the macro level (see UNCTAD, 2004 for a review).

In the trade-poverty framework developed by Winters (2000), McCulloch *et al.* (2000) trade liberalization exert impacts on poor households through three transmission mechanisms or channels: a distribution channel, an enterprise channel and a fiscal channel. Through the distributions channel, border prices get passed to consumers and any costs occur during this

distribution will reduce the proportionate impacts felt by individuals relative to those on the border. In addition, as trade liberalization affect the relative demand for labour and thus returns to labour, trade policy changes will transmit their effects on wages and employment through the enterprise channel. Finally, changes tax revenue as a result of trade reform may affect households through changes in government spending and in particular through changes in anti-poverty programmes. By these transmission mechanisms, trade policy reform at national level will finally exert effects on several outcomes at household level, including their labour allocation decisions. Given this, it is reasonable to argue that trade liberalization would affect the decision-making process by households or individuals to participate in the RNFS. Although the framework is appealing in informing the effect of trade reforms at micro level, validating this potential effect of trade needs further evidence. In fact, incorporating such transmission mechanisms in econometric models is a big challenge. It is thus not surprised as the literature has been almost silent on whether trade liberalization would have any impacts on employment and earnings in nonfarm sector.

While the above literature on RNFS offers a little on that hypothesized trade-RNFS, the literature on trade liberalization in developing countries does not improve our understanding on this issue as it has mainly focused on manufacturing sectors, which is referred in Krueger (1983) as the direct effect (see Leamer, 1995; Wood, 1995; Feenstra and Hanson, 1995 for a review). Within this scope, research interests have been placed on the effects of trade liberalization on employment (Currie and Harrison; 1997; Milner and Wright, 1998; Turrini, 2002; Epifani, 2003) and wages (Goldberg and Pavnick, 2001; Feliciano, 2001; Attanasio *et al.* 2003). However, as noted in Winters *et al.* (2002), "[…] there are many studies of the labour market effect of trade reform, but most of them (…) deal only with the manufacturing sector" (p.43).

In this context, this paper based on the above trade-poverty framework and argues a missing link between trade liberalization and RNFS. It thus attempts to empirically examine this issue by focusing on the effect of Vietnam's trade policy reform during the 1990s on employment in the RNFS. In the Vietnamese context, the understanding on the RNFS is currently limited. Van de Walle and Cratty (2003) provides some first insights on RNFE by showing that participating in

non-farm employment is a route out of poverty for a considerable proportion of the rural labour force. More recently, Hoang *et al.* (2005) collect information from two villages in the Red River Delta and reveal an important role of nonfarm activities. Minot *et al.* 2006 examine certain aspects of the RNFS when focusing on agricultural diversification in the Northern Uplands. The role of the RNFS in rural development is also highlighted in the recent country development report (World Bank, 2005). However, none of these studies have informed either a comprehensive picture of the RNFS or the effect of the country's trade reform on nonfarm employment during *Doi moi*.

3. Data and Background

Dataset

This paper uses the data available from the three household living standards surveys over the period from 1992 to 2003 when most of Vietnam's trade policy reforms were undertaken. These surveys were conducted by the General Statistic Office (GSO), under technical assistance of the World Bank, with funding from United Nations Development Program (UNDP) and Swedish International Development Agency (Sida). The overall approach is compatible with the World Bank's Living Standard Measurement Survey, and the surveys are widely recognized as of high quality and nationally representative. The first survey, the Vietnam Living Standard Survey (VLSS) 1992/93, was carried on a sample of 4,800 households. A number of 4,000 households from the VLSS 1992/93 were then re-interviewed in the VLSS 1997/98. The third survey, commonly referred as VHLSS 2002, was in the series of the country's living measurement survey that was planned to implement every two years in the period 2002-2010. This survey collected information from a 30,000 household sample.[2] However, there was no intention to re-interview the VLSSs' panel as the sampling for this new survey is substantially different from the two earlier surveys.[3]

Although these surveys were modified over time, especially between the two early surveys and the VHLSS, the basic content of the surveys are essentially invariant.[4] In general, the questionnaires were structured into a household and a commune module. The former covers a wide range of

information from household size and composition, health, anthropometric measures of nutrition, education, housing characteristics, employment (both primary and secondary activities), agriculture, other income sources, expenditure and food consumption, ownership of consumer durables, and savings and credit. The latter was conducted only for rural locations and it consists of questions on basic physical and demographic characteristics, general economic conditions and economic activities, physical infrastructure conditions and transportation, agricultural production, credit and savings, as well as information on school and healthcare in each commune (see World Bank, 2000 and 2001a for basic information on the VLSSs; and Phung and Nguyen, 2006 for the VHLSS 2002).

In addition to these surveys, the paper draws its trade data from the Trade Analysis and Information System (TRAINS) database of the United Nations Conference on Trade and Development (UNCTAD). The TRAINS database on Vietnam provides information on tariffs and import values of imports items since 1994.[5] Ideally, the trade data should be available for 1992/1993 1997/1998, and 2002. However, the oldest trade data on Vietnam recorded in the TRAINS database were 1994 data. In addition, no data for 1997 or 1998 were reported, but the data are available for 1996 and 1999. Given these, the trade data for 1994, 1999, and 2002 will be used construct two trade openness indices that are proposed to capture the trade effect on nonfarm employment (the details are discussed later).

An Overview of Vietnam Rural Nonfarm Sector

Vietnam's agricultural reforms that were marked by the Order No. 100 in early 1981 and Decree No.10 in 1988 of the Politics Bureau together with the formal recognition of farming households as a basic economic unit, and long-term land-use rights provided by a new Land Law in 1987 and the Amended Land Law in 1993 created strong incentives for rural households to make long-term investment. The rural economic structure has become more diversified; household businesses have mushroomed and become the most important source of job creation in the rural economy.

In this context, the RNFS has become an increasingly important source of employment for rural Vietnam, which currently account for 74 percent of the country's total population (GSO, 2006).

When employment is defined by primary jobs, the employment share of the RNFS has increased from nearly 21 percent to 32 percent between 1993 and 2002.[6] This employment expansion was mainly attributable to a strong shift of rural economy toward services. While nonfarm manufacturing activities have constantly contributed around 13% of rural employment, the share of employment in services has risen from nine to 19%.[7] During this period the employment growth of the services sector was 12 percent per annum, while the corresponding figures of the agriculture and manufacturing sector were 1.8% and 3.8%, respectively. In absolute terms, the number of new jobs created in the services sector is almost equal to those from the two remaining sectors. There is also marked difference in the structure of rural employment across the country. The Northern Uplands, Central Highlands are less diversified than other regions. The average share of RNFE in these regions is considerably lower than the national average. Meanwhile, the Red River Delta, South Central Coast, and Mekong River Delta have witnessed rapid growth of employment in the RNFS.

[Table 1]

As the rural economy has been diversified toward an increasingly important RNFS, nonfarm income became a major component of total income for rural households. Table 2 represents the share of nonfarm income in Vietnam and other developing countries. As these figures were reported using different definitions of nonfarm income sources from the surveys with distinctive scales and techniques, they are thus subject to differences in measurement method and should be interpreted with caution. With an average share of 38 percent during the period 1993-2002, the relative importance of nonfarm income in Vietnam is as high as those reported in Africa and Latin America, and higher than the average level in other Asian countries (e.g. China, Philippines, India, and Pakistan).

[Table 2]

Selected basic characteristics of rural workers are summarized in Table 3. It is notable that off-farm diversification of the ethnic minority groups is extremely limited compared with that of the Kinh majority, and this pattern remains unchanged over time. The remoteness to and isolation from

major economic clusters are obvious explanations for this poor diversification. In addition, traditional engagement in slash-and-burn agriculture also prevents ethnic minorities from diversifying their income-generating activities. It is also notable that female involvement in the RNFS increased by about 10% during the period 1993-2002. Despite of this considerable increase, women are still more concentrated on farm employment than men. In terms of age structure, approximately 60 percent of nonfarm workers aged from 20 to 40 years old. As living standards have been recently increased, young people have had more opportunities to pursue higher education. As a result, the age pattern of rural nonfarm participation has changed over time with decreasing participation by young workers. The proportion of young people aged less than 20 years old decreased from 21 percent in 1993 to nearly 13% in 2002.

[Table 3]

One of the most notable features from Table 3 is a dramatic improvement in average education of rural people during *Doi moi*. The illiteracy rate fell from more than 20 percent in 1993 to nearly two percent in 2002. It is also notable that the average educational level in the services sector was higher than those in the manufacturing sector and agriculture.[8] Table 3 also demonstrates a considerable difference in average landholding between farmers and nonfarm workers. On average, amore than 60 percent of nonfarm workers are in households with less then 500 metres squared of annual cropland per capita, which is considerably lower than the average household landholding of farmers. In addition, the figures on land endowments are relatively stable over time as most changes in rural land reallocation already took place in the early of the 1990s (Ravallion and Van de Walle, 2002).

4. Model specification

Modelling Participation in Rural Nonfarm Sector

As "[…] nonfarm means (any) activity outside agriculture and nonfarm employment means (any types of) employment of the rural household members in these activities" (Reardon *et al.*, 2001, p.396), the scope of RNFE needs to be defined before embarking on empirical analysis. In this

study, Vietnam's RNFS consists of all economic activities in the rural areas which are different from farming (which is specified as somebody who works on her/his own farm or is hired by the others to work on their farms as farmer labourer). This definition is similar to the others suggested in the literature (see for instance Reardon, 1997; Barrett and Reardon, 2000). Given this, individuals might be attached to one of the three employment outcomes according to their primary jobs.[9] The first outcome refers to those who cultivate in their farms or are hired by the others to work on their farms as traditional agricultural activities, or 'farm labour'. The second type of rural employment includes those working in the rural manufacturing sector, or 'nonfarm manufacturing employment'. Other nonfarm activities undertaken in terms of commerce and transport, public administration, and other rural services are in the final outcome of 'nonfarm services employment'.

In the literature, probability models have probably the most commonly used to examine the participation by individual and households in the RNFS. Lanjouw (1998), and Lanjouw (2001), Berdegue *et al.* (2001), Deininger and Olinto (2001) apply a Probit model to examine nonfarm diversification in Ecuador, El Salvador, Chile, and Columbia, respectively. A Logit model is sometimes employed for instance in Ruben and Van de Berg (2001). However, the model is limited to the cases where an individual has only two choices (i.e. whether or not to participate in the RNFS).[10] Given the great heterogeneity of rural nonfarm activities and the employment classification adapted in this paper, a multiple employment outcome model is probably more appropriate. Lanjouw and Shariff (2002) distinguish five occupations in rural India, and adopt adapts the Multinomial Logit (MNL) model to examine the probabilities of participation in each outcome. Escobal (2001) employs the same model to examine nonfarm employment in Peru. This paper applies the same empirical strategy to examine the participation by individuals in the above employment outcomes.

Let $Y_{ij} = 1$ if the i^{th} individual chooses the j^{th} alternative employment outcome, the probability that an individual i experiences (unordered) outcome j is expressed as follows (the individuals subscript i is suppressed for simplicity)

$$P(Y=j)=\frac{e^{\boldsymbol{x}'\beta_j}}{\sum_{j=1}^{3} e^{\boldsymbol{x}'\beta_j}} \qquad \text{for } j = 1, 2, 3 \tag{1}$$

where $P(Y=j)$ with $j = 1, 2, 3$ represents the probability of an individual being in either farm labour, employment in the manufacturing sector, or employment in the services sector, respectively (as above); $\boldsymbol{x}$ is a (kx1) vector of characteristics for each individual in the sample; β_j is a (kx1) vector of coefficients on $\boldsymbol{x}$ vector applicable in state j. The model is identified only up to an additive vector. In this paper the Theil normalization is applied to coefficients of outcome one (i.e. farm labour or $Y = 1$). Equation (1) then reduces to the following:

$$P(Y=1)=\frac{1}{1+\sum_{j=2}^{3} e^{X'\beta_j}} \quad \text{for } j = 1 \qquad \text{and} \qquad P(Y=j)=\frac{e^{X'\beta_j}}{1+\sum_{j=2}^{3} e^{X'\beta_j}} \quad \text{for } j = 2, 3 \tag{2}$$

Clearly, the credibility of the empirical results from estimating the reduced form of the expression (2) largely depends on the 'quality' of the $\boldsymbol{x}$ vector. Following Reardon (1997), the $\boldsymbol{x}$ vector will include variables at the individual, household, and community levels. At the individual level, education levels are commonly found as one of the most important factors in the decision-making process of nonfarm participation (see De Janvry and Sadoulet, 2001; Barret *et al.* 2001; Lanjouw and Shariff, 2002). In addition, Moser (1996) argues that age has a considerable influence on the ability to cope with economic difficulties. As men and women have different options and responsibilities in processes of livelihood generation and these influence the choices they make in taking up income-generating activities, gender as an important driver of off-farm diversification is also highlighted in Ellis (1998), Newman and Canagarajah (2001), Niehof (2004). Beside these, ethnicity and religion are also important factors as these may raise transaction costs of being employed in the RNFS (Smith, 2002; Janowski and Bleahu 2001).

At the household level, family size and structure affects the capacity of the household to supply labor to the RNFS (Behrman and Wolfe, 1984). Household landholding is commonly referred as having a central role in nonfarm participation, though the net effect of landholding is unequivocal (Liedholm and Kilby, 1989; Rief and Cochrane, 1990; Walker and Ryan, 1990). In addition to land,

other household physical assets also play an important role in the decision-making process of participation in the RNFS (Reardon, 1997). Physical asset are sometime discussed in relation with access to credit, which is important to start nonfarm businesses or pay for transaction costs of having nonfarm employment, especially in the presence of under-developed rural credit market.

At the community level, access to road, communication facilities, and markets are amongst the most important factors that affect participation in the RNFS (Bright *et al.*, 2000; Lanjouw, 2001; Lanjouw *et al.*, 2001; Berdegue *et al.*, 2001). Distance to towns and/or cities also play important role in the decision making process of nonfarm participation (Jacoby, 2000; Fafchamps and Shilpi, 2001). Lack of access to formal loans severely affects the involvement in the RNFS by individuals and households, especially the poor (Diagne *et al.*, 2000; Davis *et al.* 2002). In addition, Wandschneider (2003) emphasizes that natural resource endowments exert a certain influence on nonfarm activities as a significant proportion of nonfarm activities can be directly linked to the natural resource base in the surrounding areas. Availability, quality, and organization of services available to individuals and households in supporting their nonfarm involvement, and opportunities created by local, regional, and national government policies are also supposed to have a positive correlation with nonfarm employment and incomes (Bright *et al.*, 2000).

Ideally, empirical studies on nonfarm employment should take into account as much of the above factors as possible. In fact, the choice of these variables depends on data availability and, more importantly, concerns of endogeneity. The problem of endogeneity is probably most pronounced for the variables that reflect welfare of individuals and/or their households. According to Von Braun and Pandya-Lorch (1991) rural households seek nonfarm activities either for 'good' or for 'bad' reasons. Using Hart's (1994) terminology, some rural households may be 'pushed' into nonfarm activities in their struggle to survive, while others may be 'pulled' into them by their desire to accumulate. Regardless of motivates underlying participation in the RNFS, household welfare is highly likely to be endogenous to nonfarm employment decisions.

With this consideration, this paper only estimates the reduced form MNL model given in equation (2). A 'sequencing' approach is employed to ensure the best set of covariates. This involves

starting with the simplest set of variables at the individual level. Each of the above potential variables is then included in the model. This process ends up with a rich set of variables at the individual, household, and community level. A brief description and summary statistics of these variables are provided in Table A1 of the Appendix.

Incorporating Trade Effect in the Model

Obtaining an appropriate proxy for trade openness is central to examine the effect of Vietnam's trade reform on nonfarm employment. There has been a debate on trade measures in the literature. Edwards (1993) emphasizes the difficulty of constructing reliable measures for trade policy changes, while Rodrik (1995) argues that in most studies on trade liberalization and economic performance "[…] the trade-regime indicator used is typically measured very badly" (p. 2941). Winters (2004) highlights difficulties in defining and measuring openness, in identifying causation and isolating the effects of trade liberalization. In this context, a number of trade openness measures have been developed such as the World Bank's 'outward orientation index', the IMF's trade restrictive index, Dollar's (1992) 'index of real exchange rate distortion' and 'index of real exchange rate variability', Sachs and Warner's (1995) index, Anderson and Neary's (1996) trade restrictiveness index. However, "[…] despite of significant efforts and ingenuity there hasn't been much progress in this area" (Edward, 1997, p.6) and none of the above measures fully reflect the trade openness (see Edward, 1997; Rodriguez and Rodrik, 2001 for a review).

In addition to the lack of consensus on trade openness measures, constructing a good proxy for trade openness is also sophisticated by data requirement in many cases, especially in the presence of both tariffs and quantitative restrictions. Winters *et al.* (2002) point out that effective openness requires predictability, transparency, and convenience of the trade regime, as well as low barriers *per se*. "[…] For example, tariff need to be aggregated, quantitative restrictions assessed and then aggregated, and the levels of credibility and enforcement measured" (p.8) in order to derive an appropriate openness measure. Therefore, constructing a good measure for trade openness can be very data demanding in practice. Given these difficulties in measuring trade openness, the choice of

openness measures in many empirical studies is a practical issue that depends on the data availability and specific research objectives.

Given the interest of this paper, incorporating the trade effect in the model firstly requires a method that allows the trade policy changes at the national level to be transmitted to the household level through the trade-poverty framework reviewed earlier. In the case of Vietnam, the seven geographical regions exhibit great heterogeneity in resource endowments, which range from highly fertile river deltas (the Red River Delta, Mekong River Delta) to less productive costal lowland and infertile regions (the North and South Central Coast) and erosion-prone hilly and mountainous hinterlands (the Northern Uplands, Central Highlands). This regional heterogeneity results in very uneven development potential among regions and thus reinforces the necessity for such transmission as one trade policy reform may substantially differently affect these regions. In addition, the 'relevant' openness should be derived for the three years when the surveys are available (i.e. 1993, 1998, and 2002). Therefore, the trade data used for this task should be available for these three years. This rules out the possible usage of the trade data that may be extracted from input-output tables or social accounting matrices (SAMs) as the Vietnamese IO tables and SAMs are only available for 1997 and 2000.[11] Given this, the tariff data from the TRAINS database is employed to develop trade openness indices (as said above, this provides the data on Vietnam's import tariffs and values over this period).

This paper then proposes a procedure to construct two trade openness indices at the commune level by using the information available from the three household surveys to 'adjust' the nationally aggregate tariff data to the commune level. Commune is selected as it represents the lowest in the four-level administration system in Vietnam (see Saumier, 2003). Using commune will then allows adjusting the tariff data to the lowest administrative level. This selection is also a practical choice as the surveys collected necessary information through the commune questionnaire (as above). These indices are given as follows:

$$Agricultural\ Openness\ Index = T_f^c = \sum_{f=1}^{F}\left(\frac{Q_f^c}{\sum Q_f^c}\right)TR_f \qquad (3)$$

$$Nonfarm\ Openness\ Index = T_{nf}^{c} = \sum_{k=1}^{K}\left(\frac{E_k^c}{\sum E_k^c}\right)TR_k \quad (4)$$

Q_f^c is the output value of farming activity *f* at that commune; TR_f is the weighted-average tariff of agricultural crop *f*; E_k^c is the number of people working in nonfarm sector *k* in that commune; TR_k is the weighted-average tariff of nonfarm sector *k*.

By the expression (3), the national weighted-average tariffs on agricultural crop *f* are adjusted by the output weight of that crop at each commune.[12] Similarly, the expression (4) allows an adjustment of the aggregate tariffs on nonfarm sector *k* by the employment weight of that sector at each commune.[13] Therefore, this procedure is likely to allow for some transmission from the borders, where the trade policy operates, down to rural households. Figure 1 reveals great variations of these indices (represented by dots) from the national average tariff levels (represented by straight lines). It clearly demonstrates the merit of this procedure over the use of some aggregate openness measures. In addition, compared to the other approaches to proxy for trade liberalization adopted in Niimi *et al.* (2003) and Litchfield *et al.* (2006), who proposed the use of prices, share of employment in export sectors, rice productions as measures of the trade effect, these openness indices provide better insights on the direct impact of the trade reform.[14]

[Figure 1]

These openness indices are then incorporated in the $\boldsymbol{x}$ vector of the expression (2) to capture the effect of the trade policy reform on the different nonfarm employment outcomes.[15] It is however important to note that the above openness indices are also subject to a pitfall in using the tariff data as tariffs can be a poor proxy for trade liberalization especially when trade reform is characterized by removal of non-tariff barriers (NTBs). While import penetration or export ratios can provide alternatives but these are constrained by data available to the current paper (see above). Therefore, the estimated effects of these openness indices on nonfarm employment need to be interpreted with caution.

5. Empirical Results

Although the main interest is placed on the effect of the trade policy reform on nonfarm employment, investigating the effects of the other factors will provide a broader picture of the decision-making process to participate in the RNFS. This section therefore starts with the marginal and impact effects of some selected variables before focusing on the estimated effects of the trade openness indices (the details are reported in Table 4).[16]

Determinants of Participation to Nonfarm Sector

At the individual level, it is firstly notable that women are less likely to be employed in nonfarm activities than men. Although the magnitude of this gender effect varies from year to year, this tendency is however invariant over time.[17] This is common to other studies on the RNFS. For instance, Lanjouw and Shariff (2002) show that women are more likely to be involved in agricultural labour than any of the other occupational categories considered. This result is also found in the case of El Salvador (Lanjouw 2001) and Tanzania (Lanjouw *et al.* 2001). Ethnic minorities groups are at disadvantage to the Kinh (and Chinese) majority in the rural labour market.[18] This is however understandable as ethnic minority groups are more likely to be poor and actually subject to several disadvantages than the Kinh (and Chinese) majority (see Baulch *et al.*, 2004 for a review).

[Table 4]

Predictably, education is of considerable importance to nonfarm diversification in all the cases. The better-educated individuals are, the more likely they are to be employed in the RNFS. In particular, having upper secondary qualification or higher implies much more opportunities to work in nonfarm activities, especially in rural services.[19] Van de Walle and Crafty (2003) using the first two surveys also report that an additional year of schooling for the household head and other household adults have substantial positive impacts on participation to the RNFS. This positive effect of education on nonfarm diversification is a widespread finding in the literature on the RNFS (see for instance Lanjouw, 1998; Newman and Canagarajah, 2001).

Household landholding is found as the most important household-level determinants of nonfarm employment in rural Vietnam. Annual crop land, as the most important type of agricultural lands, exerts a strong and negative effect on participation in the RNFS.[20] Access to other types of lands also has negative impacts on nonfarm employment. This finding is at odd to an ambiguous effect of landholding suggested in the literature. On the one hand, landholding may raise the probability of diversification through a wealth effect as land can be used as collateral for credit. On the other hands, having more lands may also drift households away from off-farm diversification as it increases their concentration in agriculture. In the case of Vietnam, the latter effect probably outweighed the former due to the lack of well-functioning land market. Ravallion and van de Walle (2002) demonstrate that also bold reforms measures were initiated during the 1990s, land was not actually owned, and land-use rights were not generally well formalized during the 1990s.

As noted earlier the variables that capture household welfare status are potentially important determinants of nonfarm diversification (see Reardon *et al*, 1992 for a discussion). The reduced form MNL model that is estimated in this paper only includes types of house. This variable is probably exogenous to labour supply decisions in the sense that houses are big fortune and buying a house is a life-time decision for any rural households. To this extent, it can be treated as pre-determined to the employment decisions made at the current period. The results demonstrate that individuals living in semi-permanent or temporary houses are less likely to be employed in the RNFS compared to those in permanent houses. This can be taken to suggest that individuals in the better-off families are more likely to be active in the nonfarm sector.[21]

In common with the empirical literature on the effects of community-level characteristics on nonfarm activities, infrastructure conditions are found as important factors of nonfarm diversification.[22] Individuals with accesses to transport road, public transport facilities, post office are more likely to be involved in the RNFS. Having a daily market in the commune also produces a positive effect on nonfarm diversification, especially for services activities. This is probably due to the fact that a considerable proportion of nonfarm activities are taken place in terms of self-employment in small household businesses or petty trading (Long *et al.* 2000). This re-affirmed the

evidence reported by Hoang *et al.* (2005) on the importance of the community-level factors on participation in the RNFS. The estimates also reveal that access to the authorities' support programmes generally enhances the nonfarm diversification. This provides evidence the effect of local, regional, and national government policies on the RNFS as argued in Bright *et al.* (2000).

Trade Effect on Rural Nonfarm Employment

The paper now turns to the effect of the trade policy reform, captured by the two openness indices, on nonfarm employment. The results reveal that the trade policy reform does have a material impact on employment in the RNFS during the 1990s. A more liberalized agriculture sector is found to encourage nonfarm diversification, while a lower protection level in the nonfarm sector, in contrast, discourages nonfarm income-generating activities.

With regard to the agriculture sector, on average and *ceteris paribus*, one percentage point reduction in the agricultural openness index, which is given in percentage, increases the probability of individual to participate in the manufacturing sector by 0.29 percentage point in 1993, 0.42 percentage point in 1998, and 0.34 percentage point in 2002. The same decline in the agricultural openness index produces a slightly smaller impact on nonfarm participation in the services sector. As a reduction in the trade openness index implies greater exposure to trade in the agriculture sector, this can be taken to imply that a more liberalized agriculture sector encourages participation by individuals in the RNFS. In contrast, greater nonfarm trade exposure at the commune level is found to be negative to nonfarm employment. Controlling for other factors, one percentage point reduction in the nonfarm trade openness index (also given in percentage) decreases the probability that individuals to be employed in the manufacturing sector by 0.19 percentage point in 1993, 0.34 percentage point in 1998, and 0.26 percentage point in 2002. The same reduction in the nonfarm openness index has however no effects on nonfarm employment in rural services. As decreasing nonfarm openness implies a more liberalized nonfarm sector, the result suggests that a lower protection for the RNFS has a negative effect on nonfarm employment in manufacturing activities.

Table 5 further illustrates this trade effect by a simple 'grossing-up' simulation of the employment effect induced by one percentage point reduction in the two openness indices. These figures are

calculated based on (i) predicted probabilities of each of the three employment outcomes; (ii) the number of working people aged from 15 to 65 years in rural Vietnam; and (iii) the estimated marginal effects of the trade openness indices. The reliability of this 'grossing-up' procedure largely depends on the power of explanation of the MNL models. Given the magnitude of the Pseudo R^2 reported in Table 4, it is reasonable to pursue this estimation. Based on these numbers, a reduction in the agricultural openness index in 1993 by one percentage point produces a *ceteris paribus* increase in nonfarm employment by 0.29% and 0.23% in the manufacturing and services sector, respectively. At the same time, such liberalization decreases employment in agriculture by 0.42%. Therefore, the net effect of one percentage point reduction in the agricultural openness index is a reduction in the total rural employment by 0.32% (or approximately 96 thousand jobs loss). Compared to the employment effect in 1993, the trade effect is considerably higher in 1998, which implies a 0.52% loss in the total rural employment by the same reduction in the openness index. Therefore, greater exposure to trade in the agricultural sector raised rural unemployment. As the underemployment rate was already high in Vietnam (World Bank, 2005), this effect is worrying as it would raise the pressure on rural-urban migration (see Nguyen and White, 2002; Dang *et al.*, 2003 for a discussion on the growing rural-urban migration in Vietnam).

[Table 5]

The trade reform outside agriculture works in an opposite direction with that of agricultural trade liberalization. The employment effect in absolute terms of one percentage point reduction in the nonfarm openness index was also found to be the strongest in 1998. In this year, one percentage point reduction in the nonfarm openness index produces in a *ceteris paribus* loss of nonfarm employment by nearly 0.45%. Meanwhile, this greater nonfarm openness also results in a gain of 0.32% employment in agriculture. As the agriculture sector was dominant, the net effect of one percentage point reduction in the nonfarm openness index is an employment gain of 0.26% (or 81 thousands new jobs created). The results prove that the effect of trade liberalization on employment in agriculture and nonfarm manufacturing activities (or tradable activities) is stronger than that on the services sector (or nontradables). This finding is not surprised as if the trade reform has a

material effect on employment, it should firstly exert such influence on the tradable sector as the first round effect before any (second round) effects can be released to the nontradable activities.

The fact that the employment effect of the changes in the openness indices tends to increase from the early to the late 1990s, and then decrease in 2002 is noteworthy. This pattern coincides with the pace of the trade reform during the 1990s. While the trade reform, as a component of the whole reform process under *Doi moi*, was officially launched by the end of 1980s, major changes did really take place in the early 1990s and reinforced considerably during that decade. By the end of the 1990s, there was a concern on the stagnation of *Doi moi* after the earlier measures (Vo, 2000; World Bank, 2001b). In this context, the trade reform during the 1999-2002 was not as rigorous as it was during the 1993-1998 period (see Auffret, 2003; Athukorala, 2005 for a review).[23]

Sensitivity of the Trade Effect

This paper uses the 1997 SAM developed by the International Food Policy Research Institute (IFPRI) (see Nielsen, 2002 for more details) to derive import penetration ratios necessary to calculate the trade openness indices given in equation (3) and (4) in 1997. The purpose of this is to test the reported trade effect in 1998 is sensitive to whether the data on tariff (from the TRAINS) or import penetration ratios (from the 1997 SAM) is used to calculate the commune-level trade openness indices. As the IO tables or SAMs of Vietnam are not available for the other years under consideration (i.e. 1993 and 2002), this test thus is only feasible for 1998.

[Table 6a,b]

Table 6a demonstrates that using the import penetration results in relatively different indices: while the new agricultural openness index is slightly higher than the old value, the reverse is observed for the nonfarm openness index. However, the variations of these indices (in terms of standard deviations, maximum and minimum bounds) are essentially the same. The marginal effects of these trade openness indices are then reported in Table 6b.[24] The results suggest that the trade effect in 1998 is not sensitive to whether the tariff data or import penetration is used. Although the data

constraint prevents us from duplicating this test for the two remaining years, it can be taken to inform the reliability of the trade effect on nonfarm employment reported in this paper.

6. Conclusion

Over the period 1992-2002, the rural labour force has been diversifying into nonfarm employment activities. Within one decade time, the RNFS have become the most important employment source for the rural population outside of agriculture. The broad picture which emerges from this paper is that the probability of participating in the RNFS is determined by a set of individual, household, and community level characteristics. Gender, ethnicity, and educations are reported as main individual-level drivers of nonfarm diversification. Lands as most important physical assets of rural households are found to be negative to nonfarm employment as more lands encourage greater concentration in agriculture. In addition, infrastructures, both physical and institutional, exert important influences on individual participation in the RNFS.

A distinctive feature of this study is to provide some insights on the impact of the trade reform in Vietnam on employment in the RNFS during *Doi moi*. To the author's knowledge, this is probably the first empirical study that explicitly links trade reforms to the literature on the RNFS in developing countries. The paper bases on the trade-poverty framework of Winters (2000), McCulloch *et al.* (2000) and proposes the two trade openness indices that are argued to take into account (partly) transmissions of the trade policy reforms at the macro level to the rural households. Using these two openness indices, it reveals that the trade policy reform does have a material impact on employment in the RNFS. While a more liberalized agriculture sector encourages nonfarm diversification, a lower protection level in the nonfarm sector discourages nonfarm income-generating activities.

Given this, the paper argues that as the RNFS has been an increasingly important source of rural employment and income, supporting the development of a buoyant RNFS is crucial for rural transformation and rural poverty reduction. In pursuing this support, investment into education and rural infrastructure development will promote nonfarm diversification. This is important not only

because such diversification contributes to household income, and thus rural poverty reduction, but also because it can provide a potential solution to problems associated with the growing rural-urban migration. In addition, the development of a robust RNFS is likely to reduce the persistent reliance of females on agriculture and housework, and thus improve their positions in the households and society.

With regard to the trade policy reform, unless the trade reform toward a more liberalized agriculture sector is associated with other policy measures to facilitate the development of a more dynamic and productive RNFS, this would probably results in considerable job loss in the rural labour market. In the presence of obstacles to labour mobility, rural people will suffer from such liberalization, especially as the rural underemployment rate was already high in Vietnam. In addition, given the dispersed and low competitive RNFS, lowering the protection level for the RNFS would be likely to reverse the transformation process toward a more diversified rural economic structure. While direct subsidies are no longer allowed as Vietnam has recently become the 150th member of the WTO, investing to improve rural infrastructures, both physical and institutional, should be considered as main support targets.

Finally, it is necessary to mention some limitations inherent in the paper. The use of tariff data implies that the estimated effects of the openness indices do not fully capture the possible impacts of the other trade policy changes that were targeted to other NTBs. Although the usage of the 1997 SAM suggests that the trade effect is not sensitive to whether the tariff data or import penetration is employed to construct the openness indices in 1998, this exercise is not feasible for the two other years. In addition, the rural employment outcomes were specified on the basis of primary jobs without taking into account other secondary activities. This is likely to underestimate the significance of the RNFS as part of nonfarm employment activities can be considered second-job or multiple-job holdings. These two issues warrant caution in interpreting the results presented here.

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Table 1: Structure of Rural Employment, 1993-2002

	Agriculture			Manufacturing sector			Services sector		
	1993	**1998**	**2002**	**1993**	**1998**	**2002**	**1993**	**1998**	**2002**
*Panel A: % of rural samples**									
Rural Vietnam	78.54	71.97	67.90	12.46	13.57	12.86	9.00	14.46	19.24
Northern Uplands	90.59	88.23	85.47	6.07	6.35	4.04	3.34	5.43	10.49
Red River Delta (incl. Hanoi)	82.77	71.21	58.70	8.88	11.57	17.19	8.34	17.22	24.11
North Central Coast	83.89	70.84	74.66	10.59	15.31	8.30	5.52	13.85	17.04
South Central Coast	77.87	70.78	57.07	11.30	12.64	16.74	10.82	16.59	26.19
Central Highlands	89.42	88.54	82.52	6.08	3.75	7.32	4.50	7.71	10.16
Southeast (incl. HCMC)	51.50	52.29	59.71	27.57	25.32	20.34	20.94	22.39	19.95
Mekong River Delta	69.83	64.51	61.48	18.45	18.17	16.10	11.73	17.33	22.42

Source: calculations from the VLSS 1992/93, VLSS 1997/98, and VHLSS 2002

Notes:

a. Employment is classified on the basic of primary jobs;

b. The definition of the regions was changed during the period 1993-2002. In this table, the definition of the seven regions applied to the VLSS 1992/93 is used.

Table 2: Share of Nonfarm Income in Developing Countries

Country	Years	Share of nonfarm incomes (%)
Africa (average) [a]	(*various*)	**42**
Botswana [1]	1985-86	77
Burkina Faso [2]	1981-84	37
Ethiopia [3]	1989-90	36
Kenya (central) [4]	1974-75	42
Tanzania [5]	1980	25
Uganda (Mbale district) [6]	2001	50
Latin America (average) [a]	(*various*)	**40**
Chile [7]	1990	32
Mexico [8]	1992	50
Mexico [8]	2002	76
Ecuador [9]	1995	41
Asia (average) [a]	(*various*)	**32**
Pakistan [10]	1988-89	31
India [11]	1993-94	34
China (Guangdong) [12]	1989	34
Philippines (Mindanao) [12]	1984-85	23
Vietnam [b]	1993-2002	***38***
Vietnam	1993	*36*
Vietnam	2002	*46*

Sources: [a] average figures: Haggblade, Hazell, and Reardon (2006); [1]: Botswana: Valentine (1993); [2]: Burkina Faso: Reardon *et al.* (1992); [3]: Ethiopia: Webb and von Braun (1994); [4]: Kenya: Collier and Lal (1986); [5]: Tanzania: Collier *et al.* (1990); [6]: Uganda: Ellis and Bahiigwa (2003); [7]: Chile: Berdegue *et al.* (2001); [8]: Mexico: Verner (2005); [9]: Ecuador: Lanjouw and Lanjouw (2001); [10]: Pakistan: Adams and He (1995); [11]: India: Lanjouw and Shariff (2002); [12]: China and Philippines: Delgado and Siamwalla (1997); [b]: own calculations.

Table 3: Main Characteristics of Nonfarm Workers, 1993-2002

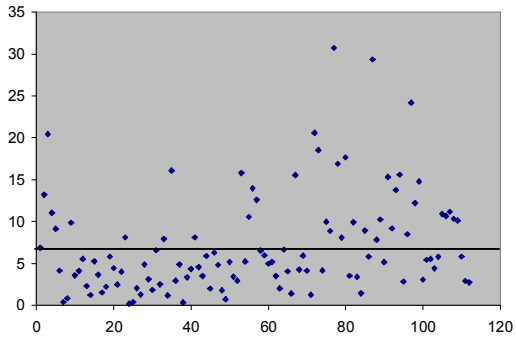
	1993			1998			2002		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Male worker (%)	46.20	58.85	52.21	45.76	54.93	54.95	46.65	51.82	55.77
Kinh majority (%)	0.83	0.92	0.95	0.78	0.93	0.93	0.83	0.94	0.95
Age structure (%)									
Less than 20 years	20.85	27.19	14.94	16.23	21.62	11.20	12.28	18.58	8.06
From 20 to 29 years	25.97	32.37	26.70	28.98	32.05	26.05	29.34	33.18	26.76
From 30 to 39 years	23.20	21.98	28.83	27.52	24.65	30.20	28.67	24.31	31.57
From 40 to 49 years	13.21	10.30	16.58	18.02	14.91	20.91	19.77	15.75	22.46
From 50 to 59 years	9.98	5.37	7.29	6.51	4.66	8.27	7.07	5.49	8.11
More than 60 years	6.80	2.82	5.65	2.50	2.13	3.37	2.90	2.67	3.03
Educational attainment levels (%)									
Illiteracy	26.59	27.11	22.35	15.76	10.64	5.79	2.37	2.63	1.86
Primary education	34.77	40.62	29.29	37.31	38.48	29.37	47.30	43.29	33.02
Lower secondary education	27.74	20.95	27.02	36.66	38.21	38.72	40.29	37.37	34.56
Upper secondary education	5.28	5.56	7.83	7.73	9.76	15.58	7.62	11.27	12.76
Technical worker	2.35	2.38	4.55	1.00	1.09	2.14	0.67	2.58	2.62
Vocational training	2.61	2.58	5.68	1.20	1.35	5.23	1.40	1.74	8.20
Higher education	0.65	0.79	3.16	0.33	0.47	3.18	0.35	1.11	6.98
Per capita annual cropland									
Less then 500 m^2	32.33	59.32	63.29	35.00	62.13	60.01	34.97	71.19	68.09
From 500 to 1000 m^2	44.45	26.61	23.20	36.51	24.19	25.24	31.03	19.84	20.68
From 1000 to 1500 m^2	12.71	6.10	5.52	13.16	7.72	5.72	12.31	4.31	4.96
From 1500 to 2000 m^2	3.96	3.91	2.36	5.12	1.49	3.12	6.65	1.99	2.07
More than 2000 m^2	6.54	4.07	5.63	10.21	4.47	5.91	15.05	2.67	4.20

Source: calculations from the VLSS 1992/93, VLSS 1997/98, and VHLSS 2002

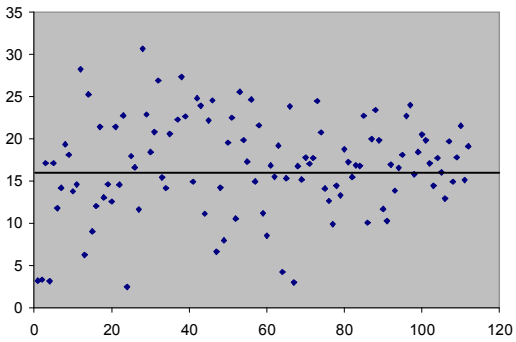
Notes: (1), (2) and (3) stand for farm labour, nonfarm employment in the manufacturing sector, and nonfarm employment in the services sector, respectively; these figures are obtained from the rural samples without controlling for any characteristics.

Figure 1: Trade Openness Indices in Agriculture and Nonfarm Sector, 1993-2002

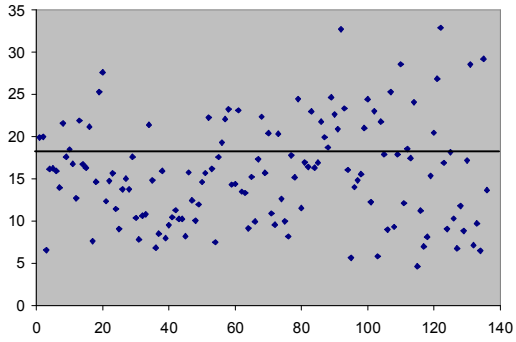
1993 agricultural openness index



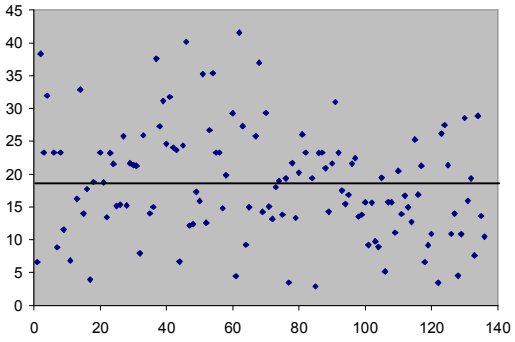
1993 nonfarm openness index



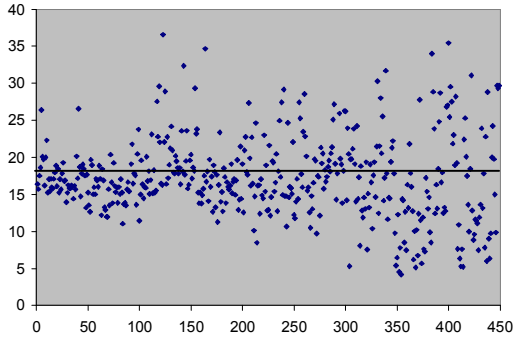
1998 agricultural openness index



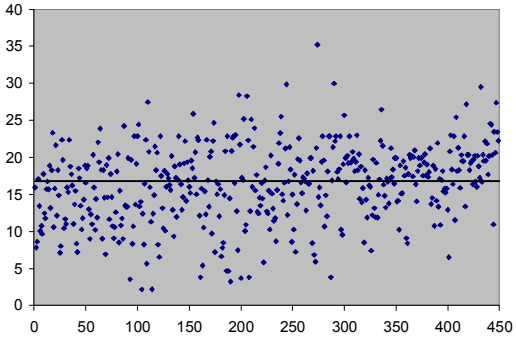
1998 nonfarm openness index



2002 agricultural openness index



2002 nonfarm openness index



Source: calculations from the VLSS 1992/93, VLSS 1997/98, VHLSS 2002, and TRAINS database

Notes: Each dot represents the trade openness index at one rural commune; the straight lines are the weighted average tariff rates derived from the TRAINS database at the national level.

Table 4: Determinants of Participation to the Rural Nonfarm Sector in 1993-2002: Marginal and Impact Effects

	1993			1998			2002		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Trade openness measures									
Agricultural openness index	0.0042**	-0.0029***	-0.0023***	0.0074***	-0.0042***	-0.0032***	0.0041***	-0.0034***	-0.0027***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Nonfarm openness index	-0.0017**	0.0019***	0.0012	-0.0037***	0.0034***	0.0002	-0.0037***	0.0026***	0.0011
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Individual characteristics									
Gender	-0.0635***	0.0459***	0.0176***	-0.056***	0.0209***	0.0351***	-0.0713***	0.0138***	0.0575***
	(0.009)	(0.007)	(0.006)	(0.009)	(0.005)	(0.007)	(0.005)	(0.003)	(0.004)
Marital status	0.0697***	-0.0542***	-0.0154**	0.0592***	-0.0311***	-0.0281***	0.076***	-0.0481***	-0.0279***
	(0.011)	(0.009)	(0.007)	(0.012)	(0.007)	(0.009)	(0.006)	(0.004)	(0.005)
Aged from 20 to 29	-0.0351***	0.0192**	0.0159*	-0.0736***	0.0206***	0.053***	-0.1211***	0.019***	0.1021***
	(0.014)	(0.01)	(0.009)	(0.014)	(0.008)	(0.012)	(0.009)	(0.005)	(0.007)
Aged from 30 to 39	-0.0596***	0.0132	0.0464***	-0.082***	0.0041	0.0779***	-0.0984***	-0.0128**	0.1111***
	(0.016)	(0.012)	(0.01)	(0.017)	(0.009)	(0.013)	(0.01)	(0.005)	(0.008)
Aged from 40 to 49	-0.04**	-0.0093	0.0493***	-0.0483***	-0.0194*	0.0676***	-0.0383***	-0.0402***	0.0785***
	(0.018)	(0.014)	(0.011)	(0.018)	(0.01)	(0.014)	(0.01)	(0.006)	(0.009)
Aged from 50 to 59	0.0278	-0.0444***	0.0166	0.0398*	-0.0732***	0.0334**	0.0824***	-0.0833***	0.0009
	(0.021)	(0.017)	(0.014)	(0.022)	(0.014)	(0.017)	(0.012)	(0.007)	(0.01)
Aged than 60 years	0.0011	-0.0515**	0.0504***	0.139***	-0.1249***	-0.0141	0.1622***	-0.0958***	-0.0664***
	(0.028)	(0.023)	(0.017)	(0.031)	(0.022)	(0.023)	(0.017)	(0.011)	(0.014)
Household head	0.0102	0.0057	-0.0159**	-0.0055	0.0149**	-0.0095	-0.0136**	0.006	0.0077
	(0.012)	(0.009)	(0.007)	(0.012)	(0.007)	(0.009)	(0.006)	(0.004)	(0.005)
Kinh majority (and Chinese)	-0.0881***	0.055***	0.0331***	-0.0871***	0.0547***	0.0324**	-0.1232***	0.0425***	0.0807***
	(0.016)	(0.012)	(0.011)	(0.016)	(0.01)	(0.013)	(0.009)	(0.006)	(0.008)
Primary education	0.0031	-0.0053	0.0022	-0.0662***	0.0216***	0.0445***	0.021	-0.0127	-0.0083
	(0.011)	(0.008)	(0.007)	(0.016)	(0.008)	(0.013)	(0.017)	(0.01)	(0.014)
Lower secondary education	-0.0027	-0.0202**	0.023***	-0.0998***	0.0228***	0.0769***	0.0093	-0.0078	-0.0015
	(0.013)	(0.01)	(0.008)	(0.016)	(0.009)	(0.013)	(0.017)	(0.01)	(0.014)
Upper secondary education and higher	-0.0536***	0.0024	0.0512***	-0.1817***	0.0303***	0.1514***	-0.0497***	-0.003	0.0527***
	(0.015)	(0.012)	(0.009)	(0.018)	(0.01)	(0.014)	(0.017)	(0.01)	(0.014)
Suffered from medical treatment	0.0286***	-0.0199***	-0.0087	0.0056	-0.006	0.0004	0.0188***	-0.0092**	-0.0096**
	(0.01)	(0.007)	(0.006)	(0.008)	(0.005)	(0.006)	(0.006)	(0.004)	(0.005)
Household characteristics									
Number of children under 5 years old	0.0223***	-0.0151***	-0.0072*	0.0286***	-0.0119***	-0.0167***	0.0422***	-0.0168***	-0.0254***
	(0.006)	(0.005)	(0.004)	(0.007)	(0.004)	(0.006)	(0.004)	(0.003)	(0.004)

	1993			1998			2002		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Number of children from 6 to 17 years old	0.0162***	-0.0062*	-0.0099***	0.0137***	-0.009***	-0.0047	0.0367***	-0.0139***	-0.0228***
	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)
Number of the elderly aged more than 60 years	0.0207***	-0.0043	-0.0164***	0.0216***	-0.0154***	-0.0062	0.0264***	-0.0123***	-0.0141***
	(0.008)	(0.006)	(0.005)	(0.007)	(0.004)	(0.006)	(0.004)	(0.002)	(0.003)
Household size	-0.0112***	0.0073***	0.0039*	-0.0055	0.0055***	0.0019	-0.0084***	0.0089***	-0.0005
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)
Having semi-temporary house	0.0501***	-0.0382***	-0.012	0.0147	-0.0099	-0.0048	0.0769***	-0.014***	-0.0629***
	(0.014)	(0.011)	(0.008)	(0.015)	(0.01)	(0.011)	(0.007)	(0.004)	(0.005)
Having temporary house	0.0552***	-0.0246**	-0.0306***	0.0043	-0.0058	0.0016	0.1275***	-0.0105**	-0.117***
	(0.016)	(0.012)	(0.009)	(0.018)	(0.011)	(0.014)	(0.008)	(0.005)	(0.007)
Per capita annual crop land	0.0997***	-0.0642***	-0.0355***	0.1123***	-0.0585***	-0.0539***	0.1544***	-0.0761***	-0.0782***
	(0.007)	(0.006)	(0.004)	(0.006)	(0.004)	(0.005)	(0.003)	(0.002)	(0.003)
Access to perennial land	0.0845***	-0.0514***	-0.0331***	0.0829***	-0.0418***	-0.0412***	0.1414***	-0.06***	-0.0814***
	(0.009)	(0.007)	(0.006)	(0.009)	(0.006)	(0.007)	(0.005)	(0.003)	(0.004)
Access to forest land	-0.008	0.0029	0.0052	0.0083	-0.0037	-0.0046	0.0603***	-0.026***	-0.0343***
	(0.016)	(0.012)	(0.011)	(0.018)	(0.011)	(0.015)	(0.01)	(0.007)	(0.009)
Access to watersurface	0.1007***	-0.0582***	-0.0425***	0.011	0.0005	-0.0115	0.1008***	-0.043***	-0.0578***
	(0.011)	(0.009)	(0.007)	(0.013)	(0.008)	(0.011)	(0.006)	(0.004)	(0.005)
Access to other types of lands	0.0555***	-0.0403***	-0.0152*	0.0684***	-0.0219***	-0.0464***	0.0836***	-0.0476***	-0.036*
	(0.014)	(0.011)	(0.009)	(0.01)	(0.006)	(0.007)	(0.025)	(0.016)	(0.021)
Location and seasonality									
Northern Uplands	0.227***	-0.1201***	-0.1068***	0.1991***	-0.0747***	-0.1244***	0.1461***	-0.1046***	-0.0415***
	(0.023)	(0.017)	(0.016)	(0.019)	(0.011)	(0.016)	(0.011)	(0.007)	(0.009)
Red River Delta	0.2036***	-0.101***	-0.1026***	0.1388***	-0.0729***	-0.0659***	0.0893***	-0.0495***	-0.0398***
	(0.019)	(0.014)	(0.012)	(0.018)	(0.011)	(0.014)	(0.01)	(0.006)	(0.008)
North Central Coast	0.2093***	-0.1232***	-0.0861***	0.09***	-0.0324***	-0.0576***	0.158***	-0.0977***	-0.0603***
	(0.021)	(0.016)	(0.014)	(0.018)	(0.01)	(0.014)	(0.011)	(0.006)	(0.009)
South Central Coast	0.2215***	-0.1423***	-0.0792***	0.0993***	-0.0498***	-0.0495***	0.0283***	-0.0413***	0.013*
	(0.019)	(0.014)	(0.012)	(0.016)	(0.01)	(0.012)	(0.01)	(0.006)	(0.008)
Central Highlands	0.2289***	-0.1385***	-0.0904***	0.1659***	-0.0882***	-0.0778***	0.1378***	-0.0691***	-0.0688***
	(0.029)	(0.023)	(0.02)	(0.022)	(0.015)	(0.017)	(0.015)	(0.009)	(0.013)
Mekong River Delta	0.0207	-0.0343***	0.0136	0.0229	-0.0296***	0.0067	-0.0022	-0.0329***	0.0352***
	(0.018)	(0.013)	(0.011)	(0.017)	(0.009)	(0.012)	(0.009)	(0.005)	(0.008)
Interviewed in the 1st quarter of the year	0.0021	0.0122	-0.0143	0.0222*	-0.0188**	-0.0034	-0.0214***	0.0233***	-0.0019
	(0.015)	(0.011)	(0.01)	(0.014)	(0.008)	(0.011)	(0.006)	(0.004)	(0.005)
Interviewed in the 2nd quarter of the year	-0.0113	0.0018	0.0095	0.0317***	-0.0154**	-0.0163*	-0.0245***	0.0083**	0.0162***
	(0.012)	(0.009)	(0.008)	(0.012)	(0.007)	(0.009)	(0.006)	(0.004)	(0.005)

	1993			1998			2002		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Interviewed in the 3rd quarter of the year	-0.0096	0.0095	0.0012	0.009	-0.0097	0.0007	-0.013**	0.0152***	-0.0022
	(0.012)	(0.01)	(0.008)	(0.011)	(0.007)	(0.009)	(0.006)	(0.004)	(0.005)
Community characteristics									
Access to transportable road	-0.036**	0.0444***	0.0083	-0.0216	0.026***	0.0476***	-0.0561***	0.026***	0.0301**
	(0.017)	(0.012)	(0.012)	(0.016)	(0.009)	(0.013)	(0.015)	(0.009)	(0.012)
Access to public transports	-0.0585***	0.0423***	0.0161*	-0.0223**	-0.0006	0.0229***	-0.0213***	0.0009	0.0204***
	(0.013)	(0.01)	(0.009)	(0.009)	(0.006)	(0.007)	(0.006)	(0.004)	(0.005)
Access to post office	-0.0344***	0.0192**	0.0152**	-0.0478***	0.0146**	0.0332***	-0.0261***	0.0086*	0.0174***
	(0.011)	(0.008)	(0.007)	(0.011)	(0.007)	(0.009)	(0.007)	(0.004)	(0.006)
Access to daily market	-0.0226**	0.007	0.0297***	0.0144	0.0248**	0.0254***	-0.0184***	0.0376***	0.0219***
	(0.011)	(0.009)	(0.007)	(0.01)	(0.006)	(0.008)	(0.007)	(0.004)	(0.006)
Suffered from disasters in the year	-0.0187*	0.0303***	-0.0116*	-0.036***	-0.0129**	-0.0231***	0.0604***	-0.0206***	-0.0398***
	(0.011)	(0.008)	(0.007)	(0.009)	(0.006)	(0.007)	(0.005)	(0.003)	(0.004)
Having traditional occupations	0.0092	0.0043	-0.0135**	-0.0181*	0.0293***	-0.0111	-0.0244***	0.0251***	-0.0007
	(0.01)	(0.007)	(0.006)	(0.009)	(0.006)	(0.007)	(0.005)	(0.003)	(0.004)
Having factories located within 10km	-0.0156*	0.0087	0.0069	-0.0438***	0.004	0.0398***	0.0005	0.0046	-0.0051
	(0.01)	(0.007)	(0.006)	(0.009)	(0.005)	(0.007)	(0.007)	(0.005)	(0.006)
Access to job creation programmes	-0.0325	0.0868***	0.0543	-0.0171*	0.0219***	0.0048	0.001	0.0138***	0.0148***
	(0.044)	(0.028)	(0.035)	(0.01)	(0.006)	(0.008)	(0.006)	(0.003)	(0.004)
Access to infrastructure projects	-0.0113	0.0032	0.0081	-0.002	0.0101**	0.0081	-0.0507***	0.0163***	0.0344***
	(0.011)	(0.009)	(0.007)	(0.008)	(0.005)	(0.006)	(0.008)	(0.005)	(0.006)
Other statistics									
Predicted probabilities	0.8546	0.0785	0.0668	0.8013	0.0864	0.1123	0.7184	0.0995	0.1821
Log likelihood	-4773.8			-6518.5			-36591.9		
Pseudo R^2	0.199			0.2168			0.1801		
Number of observation	8599			10377			50015		

Notes:

- (1), (2), (3) refer to the three employment outcomes: farm labour, nonfarm employment in the manufacturing sector, and nonfarm employment in the services sector, respectively; ***, **, and * refers to 0.01; 0.05; and 0.1 level of significance, respectively.
- The marginal effects of changes in variable X on the probability of the non-normalized outcomes (i.e. $j = 2, 3$) are given by: $\frac{\partial P(Y=j)}{\partial X} = P(Y=j)\left[\beta_j - \sum_{k=2}^{3}\beta_k P(Y=k)\right]$ while that of the base category is computed as $\frac{\partial P(Y=1)}{\partial X} = P(Y=1)\left[0 - \sum_{k=2}^{3}\beta_k P(Y=k)\right]$
- For dummy variables, these impacts are calculated as changes in the probability caused by a discrete change of the dummy variable from 0 to 1.

Table 5: Estimated Employment Effects of Trade Openness, 1992-2002

	Total sample			
	(1)	**(2)**	**(3)**	**Total[c]**
1993				
Predicted employment	25,673,186	2,358,232	2,006,750	30,038,168
One percentage point reduction in agricultural openness index				
Number (person)[a]	-108,365	6,809	4,683	-96,873
Percent (%)[b]	-0.42	0.29	0.23	-0.32
One percentage point reduction in nonfarm openness index				
Number (person)[a]	43,776	-4,561	-2,466	36,749
Percent (%)[b]	0.17	-0.19	-0.12	0.12
1998				
Predicted employment	24,954,460	2,690,709	3,497,299	31,142,468
One percentage point reduction in agricultural openness index				
Number (person)[a]	-183,664	11,207	11,174	-161,284
Percent (%)[b]	-0.74	0.42	0.32	-0.52
One percentage point reduction in nonfarm openness index				
Number (person)[a]	91,110	-9,224	-779	81,106
Percent (%)[b]	0.37	-0.34	-0.02	0.26
2002				
Predicted employment	23,598,676	3,268,469	5,981,791	32,848,936
One percentage point reduction in agricultural openness index				
Number (person)[a]	-96,755	4,576	16,151	-76,028
Percent (%)[b]	-0.41	0.14	0.27	-0.23
One percentage point reduction in nonfarm openness index				
Number (person)[a]	87,315	-8,498	-6,580	72,237
Percent (%)[b]	0.37	-0.26	-0.11	0.22

Notes:

a. (1), (2), (3) refer to the three employment outcomes: farm labour, nonfarm employment in the manufacturing sector, and nonfarm employment in the services sector, respectively;

b. The predicted number of employment in each outcome is calculated by multiplying the predicted probability (obtained from estimating the reduced form MNL models) for the respective outcome and the number of working people aged from 15 to 65 in each outcome (are computed from the VLSSs, and VHLSS 2002 using the sample weights);

c. [a] 'number' is obtained by multiplying the marginal effect of one percentage point reduction in the openness indices (from the average levels) with the predicted number of employment in relevant outcome;

d. [b] 'percent' is obtained as percentage of the 'number' in the total employment in each outcome;

e. [c] 'total' is equal to the sum of (1), (2), and (3).

Table 6a: Trade Openness Index: Tariff vs. Import Penetration (%)

	Agricultural Openness Index		Nonfarm Openness Index	
	1999 TRAINS	1997 SAM	1999 TRAINS	1997 SAM
Average value	15.8261	18.2532	23.3735	20.8755
Standard deviation	6.118	9.562	21.713	17.736
Minimum value	4.612	2.647	2.880	3.512
Maximum value	32.889	42.198	167.790	142.675

Notes:

a. These figures obtained from the procedure given in (3) and (4);

b. In '1999 TRAINS' columns the tariff data in 1999 retrieved from the TRAINS database was used in this calculation;

c. In '1997 SAM' columns import penetrations extracted from the 1997 SAM was employed as alternative to the tariff data.

d. The derivation of the import penetration from the 1997 SAM requires mapping a number of 85 commodities of the 1997 SAM into the VLSS 1997/98's industry codes. This mapping was made based on the textual description of these codes. However, as it is a mapping between commodity-based codes and industry-based codes, it (necessarily) results in approximate figures. Therefore, these figures should be interpreted with caution. Details of this mapping are not presented here but available from the author upon request.

Table 6b: Marginal Effects of the Openness Indices: Tariff vs. Import Penetration

	(1)	(2)	(3)
Using 1999 tariff data from the TRAINS			
Agricultural openness index	0.0074***	-0.0042***	-0.0032***
	(0.0012)	(0.0024)	(0.0013)
Nonfarm openness index	-0.0037***	0.0034***	0.0002
	(0.0009)	(0.0011)	(0.0023)
Using import penetration extracted from the 1997 SAM			
Agricultural openness index	0.0069***	-0.0046***	-0.0028***
	(0.0019)	(0.0013)	(0.0011)
Nonfarm openness index	-0.0039***	0.0038***	0.0014
	(0.0014)	(0.0012)	(0.0019)

Notes:

a. These are the marginal effects of the trade openness indices, computed using either the 1999 tariff data from the TRAINS or the import penetration extracted from the 1997 SAM, on the probabilities of individuals being employed in the different employment outcomes.

b. (1), (2), (3) refer to the three employment outcomes: farm labour, nonfarm employment in the manufacturing sector, and nonfarm employment in the services sector, respectively;

c. See also notes of Table 4 for the formula to derive the marginal effects from the estimated coefficients of the MNL models;

d. The marginal (impacts) effects of the other variables are not reported here for brevity.

Appendix

Table A1. Description and Summary Statistics of Variables

Variables	Brief Description	1993	1998	2002
Gender	= 1 if male, = 0 otherwise	0.4843	0.4837	0.4933
Marital status	= 1 if married, = 0 otherwise	0.6273	0.6402	0.6929
Aged less than 20	= 1 if aged less than 20, = 0 otherwise	0.2147	0.1865	0.1386
Aged from 20 to 29	= 1 if aged from 20 to 29, = 0 otherwise	0.2735	0.2402	0.2428
Aged from 30 to 39	= 1 if aged from 30 to 39, = 0 otherwise	0.2400	0.2480	0.2682
Aged from 40 to 49	= 1 if aged from 40 to 49, = 0 otherwise	0.1339	0.1793	0.2116
Aged from 50 to 59	= 1 if aged from 50 to 59, = 0 otherwise	0.0929	0.0997	0.1005
Aged than 60 years	= 1 if aged more than 60, = 0 otherwise	0.0451	0.0464	0.0383
Household head	= 1 if head of the household, , = 0 otherwise	0.3255	0.3198	0.3352
Kinh majority	= 1 if Kinh majority and Chinese, , = 0 otherwise	0.8520	0.8187	0.8702
Illiteracy	= 1 if illiterate, = 0 otherwise	0.3246	0.1329	0.0172
Primary education	= 1 if having primary education, , = 0 otherwise	0.3192	0.3574	0.3204
Lower secondary school	= 1 if having lower secondary, = 0 otherwise	0.2463	0.3781	0.2954
Upper secondary & higher	= 1 if having upper secondary, = 0 otherwise	0.1099	0.1316	0.3670
Suffered medical treatment	= 1 if suffered from medical treatment, = 0 otherwise	0.2572	0.4129	0.1796
Children under 5 years old	Number of children under five years old	0.7308	0.5274	0.3902
Children aged 6-17	Numbers of children under 17 years olds	1.8955	1.7902	1.5252
Number of dependents	Numbers of the elderly aged more than 60 years old	0.3511	0.3627	0.3229
Household size	Household size	5.7880	5.5408	5.1163
Permanent house	= 1 if having a permanent house, = 0 otherwise	0.1150	0.0767	0.1172
Semi-permanent house	= 1 if having semi-permanent house, = 0 otherwise	0.4920	0.6289	0.5991
Temporary house	= 1 if having temporary house, = 0 otherwise	0.3930	0.2943	0.2819
Per capita annual cropland	Per capita annual crop land in 1000 m^2	0.7729	0.8465	0.8282
Access to perennial land	= 1 if having access to perennial land, = 0 otherwise	0.5658	0.3941	0.3960
Access to forest land	= 1 if having forest plots, = 0 otherwise	0.1141	0.0953	0.0919
Access to watersurface	= 1 if having watersurface, = 0 otherwise	0.2608	0.1361	0.1823
Access to other lands	= 1 if having access to other land, = 0 otherwise	0.1585	0.7146	0.0119
Northern Uplands	= 1 if residing in the Northern Uplands, = 0 otherwise	0.1563	0.1701	0.1593
Red River Delta	= 1 if residing in the Red River Delta, = 0 otherwise	0.2463	0.1628	0.2316
North Central Coast	= 1 if residing in the North Central Coast, = 0 otherwise	0.1276	0.1322	0.1137
South Central Coast	= 1 if residing in the South Central Coast, = 0 otherwise	0.1065	0.1177	0.1090
Central Highlands	= 1 if residing in the Central Highlands, = 0 otherwise	0.0392	0.0915	0.0400
Southeast	= 1 if residing in the Southeast, = 0 otherwise	0.0845	0.1169	0.0838
Mekong River Delta	= 1 if residing in the Mekong River Delta, = 0 otherwise	0.2396	0.2088	0.2625
Interviewed in the 1st quart.	= 1 if being interviewed in the 1st quarter, = 0 otherwise	0.1350	0.1545	0.2629
Interviewed in the 2nd quart.	= 1 if being interviewed in the 2nd quarter, = 0 otherwise	0.2936	0.3226	0.2431
Interviewed in the 3rd quart.	= 1 if being interviewed in the 3rd quarter, = 0 otherwise	0.3175	0.3349	0.2470
Interviewed in the 4th quart.	= 1 if being interviewed in the 4th quarter, = 0 otherwise	0.2538	0.1880	0.2469
Commune-level variables				
Access to transport. road	= 1 if having access to paved road, = 0 otherwise	0.8391	0.8505	0.9661
Access to public transports	= 1 if having access to public transports, = 0 otherwise	0.5026	0.5631	0.8083
Access to post office	= 1 if having access to post office, = 0 otherwise	0.3491	0.2371	0.8536

Variables	Brief Description	1993	1998	2002
Having daily market	= 1 if having daily markets at commune, = 0 otherwise	0.5564	0.5122	0.8222
Suffered from disasters	= 1 if suffered from natural disasters in the year	0.7563	0.6854	0.6210
Having traditional occup.	= 1 if having traditional occupations, = 0 otherwise	0.5548	0.2691	0.3470
Having factory within 10km	= 1 if having factories within 10 from the commune	0.4868	0.3969	0.8534
Access to job creation prog.	= 1 if having job creation programs, = 0 otherwise	0.0092	0.2310	0.7680
Access to infras. project	= 1 if having infrastructure development projects	0.2580	0.4796	0.9173
Agricultural openness	Agricultural openness index given in equation (3) (%)	7.426	15.826	17.383
Nonfarm openness index	Nonfarm openness index given in equation (4) (%)	17.128	23.373	16.447
Number of observations	Number of observations in the samples	8651	10458	50015

Source: calculations from the VLSS 1992/93, VLSS 1997/98, and VHLSS 2002.

[1] Some of the studies listed here discuss both the decision-making process to participate in the RNFS and its impact on income and poverty, for instance Berdegue *et al.* (2001), Lanjouw and Shariff (2002).

[2] Another 45,000 households sample was also interviewed on income but the official release of the VHLSS 2002 does not include data on this income module.

[3] While the samples of the VLSSs were developed from the 1989 Population Census, that of the the VHLSS 2002 was specified from the 1999 Population and Housing Census (Phung and Nguyen, 2006 for more details)

[4] In the VLSSs, the questionnaires were approximately 120 pages long with about 1000 questions. In the VHLSS 2002, the questionnaire was substantially simplified to cover 45 pages in length with a number of around 450 questions. Such simplification makes the questionnaire more understandable and avoids complicated calculations that surveyors need to implement during the data collection process.

[5] Before 2000, the Vietnam's tariff data was available for all import commodities classified by the Harmonized System (HS) at the two-digit and four-digit levels. As part of the trade reform process in the 1990s, Vietnam applied a six-digit tariff nomenclature system in 2000, the Vietnam's tariff lines and import values were thus available at the six-digit level after this year.

[6] There are no official statistics on the RNFS in Vietnam. The statistical practices applied by the General Statistic Office (GSO) classify economic activities by provinces, industries, and types of ownerships. The national accounts figures on outputs are then aggregated from these data. There is no distinction between a farm component and a nonfarm component in output statistics of any specific province, industry, or economic sector. Therefore, this section is based on information reported in the VLSSs and the VHLSS 2002.

[7] As this paper examines the effect of the trade policy reform on nonfarm employment, the employment classification thus distinguishes between nonfarm employment in manufacturing activities (tradable) and services (nontradable). This is expected to allow some insights on whether the trade policy reform has effects (if any) differently on nonfarm employment in tradable and nontradable activities.

[8] At the first glance, it could be argued that the presence of public administration the services sector is likely the reason. However, the public administration actually accounts for roughly 8% of employment in the services sector.

[9] It should be noted that the employment outcomes are classified here by the primary jobs, which are defined as the most time-consuming job. Therefore, these do not take into account any multiple-job activities. This might underestimate the importance of the RNFS as one important role of nonfarm activities is to provide work in the slack periods of the agricultural cycle, and hence nonfarm employment can be undertaken in terms of multiple-job holdings. However, investigating this issue, which requires a considerably more complicated methodological framework than what proposed in this paper, is not a primary objective of the current study.

[10] In addition to these models, the count data models are sometimes used. Mduma and Wobst (2005), for instance, employ the Negative Binomial and Zero Inflated Poisson (ZIP) models to examine the RNFS in Tanzania.

[11] The 1997 SAM, commonly referred as the IFPRI VIETSAM 1997, is constructed by the International Food Policy Research Institute (IFPRI) between 1996 and 1997. This includes 97 producing sectors with eight agricultural sectors, two agricultural service sectors and 13 food processing industries (more information can be found at http://www.ifpri.org/data/VietNam01.htm). The 2000 SAM is a product of a technical assistance project at the Central Institute for Economic Management in Hanoi (see Tarp, Ronald-Holst, and Rand, 2003). These two SAMs were both estimated from the official I/O table for the year 1996 (GSO, 1999) and the VLSS 1997/98. There is also another SAM published by the United Nations in the mid 1990s. However, it was highly aggregated and relied on an outdated 10-sector Input-Output table in 1989 (Tarp *et al.* 2003).

[12] Computing these weights requires converting the crop output given in quantity into monetary terms. The unit values of each main crop are then calculated and used to convert the output data from quantities into monetary values. The unit values are common alternatives when data on prices is either noisy or not sufficient (which is actually the case in the Vietnamese household surveys) (see Niimi *et al.* (2003), Litchfield *et al.*, (2006) for more details)

[13] It is not possible to construct a single trade openness index for each commune due to data availability. For nonfarm activities, the number of employees in each activity can be obtained from the surveys. However, it is not the case for agricultural crops. In fact, the data on crop output was reported but it is not possible to calculate the number of farmers involved in each main crop as farmers simultaneously worked on these crops and no data on work hours were available.

[14] Another alternative approach to (partially) capture of the effect of the trade reform on rural household is employed in Niimi *et al.* (2003), and Litchfield *et al.* (2006). In these studies, the effect of trade liberalization on household welfare is proxied by rice production, employment in export sectors, changes in prices. While this approach is useful in establishing an impact of trade liberalization on household welfare, these variables are actually outcomes of trade liberalization rather than proxies for trade reforms.

[15] This procedure also requires some mapping exercises. The first mapping is to ensure the nonfarm activities and agricultural main crops are consistent specified among the three surveys. The second mapping is then necessary to find the tariffs from the TRAINS database for each nonfarm activity and agricultural main crops. While the textual description was used as the basic in the former, the concordance tables published by the UN's Statistics Division were employed in the latter to ensure these mapping as precise as possible. These mapping results are not discussed here for brevity but available from the author upon request.

[16] The assumption of independence of irrelevant alternatives (IIA) is statistically justified on the basic of the Small-Hsiao's (1985) test. This test is preferred compared with other tests given its reliance on the classical testing tradition (Wills, 1987). The Wald test statistics for combining any two among the unordered employment outcomes are statistically significant at a conventional significance level. Therefore, no conflation among the three employment outcomes is justified. Test results and the coefficient estimates are available from the author upon request.

[17] In an earlier version of this paper, this *ceteris paribus* gender effect was also decomposed into an endowment component and a treatment component using a modified version of the Blinder-Oaxaca method. The decomposition result reveals a degree of unequal treatment against women in the RNFS. This issue is however not the main interest of this paper and thus not discussed here for brevity.

[18] Ideally, a further breakdown of ethnic minority groups (rather than a simple majority-minority distinction) is desirable. However, these groups account for a very small proportion of the samples in the two earlier VLSSs, and dividing the ethnic minorities into sub-groups will result in very small size for each groups and this is also not the primary interest of this paper. Further details on the effect of *Doi moi* on the ethnic minorities can be found in Van de Walle and Gunewardena (2001) and Baulch *et al.* (2004).

[19] It is desirable to further break the upper secondary education and higher' dummy to a greater detail as having completed upper secondary school is expected to be less rewarding as having university degrees. However, the information provided by the two early VLSSs shows that less than three percent of the rural economically active labour force has had undergraduate degrees and higher.

[20] Irrigated crop land can be separated from the total crop land in the first two surveys. However, this separation is not possible in the VHLSS 2002. To ensure consistence of the analysis over time, no distinction between irrigated and non-irrigated land was made in this paper.

[21] This paper also adapts a 2SLS approach to instrument consumption expenditure per head using a set of instruments that includes household durable assets in order to retrieve the expected expenditure in the reduced form MNL model. However, these instruments performed poorly and further attempts to identify valid instruments are constrained by the data available to this paper. Omitting this variable may introduce bias to the estimation results but including this variable in the model without adequately resolve its endogeneity is even more problematic. This problem is also acknowledged in the previous studies on Vietnam, for instance Van de Walle and Cratty (2003), Litchfield *et al.* (2006).

[22] One possible alternative to this set of commune-level determinants is to use a set of commune dummies to control for the commune fixed effects as in Van de Walle and Cratty (2003), Baulch *et al.* (2004). This method however throws away certain commune-level attributes which are potentially critical to nonfarm employment.

[23] The above econometric analysis on the trade impact on rural employment captures the possible impact of geographical locations by allowing intercept shifts for the seven different regions (with the Southeast is set as the base). To examine whether there are regional differences in the effect of the trade reform on nonfarm employment, a set of interaction terms are introduced to the reduced form MNL models by multiplying the openness indices with the regional dummies. However, the estimated impacts of these terms are poorly determined (on the basis of the Wald test using variance-covariance matrix routine) and thus not reported here for brevity. This is probably due to the fact that certain regional differences are already accounted for by the construction of the openness indices and the inclusion of community-level variables.

[24] It should be noted that the marginal (impact) effects of the other variables when using the 1997 SAM to construct the trade openness indices are essentially the same as those obtained earlier. These results are not reported here for brevity.