

GOVERNMENT SPENDING AND POVERTY REDUCTION IN VIETNAM

Shenggen Fan
Pham Lan Huong
Trinh Quang Long

April 2004

Project report prepared for the World Bank funded project “pro-poor spending in Vietnam”, by International Food Policy Research Institute, Washington DC, and Central Institute for Economic Management, Hanoi. Shenggen Fan is a senior research fellow at the International Food Policy Research Institute, Washington DC, Pham Lan Huong and Trinh Quang Long are researchers at the Central Institute for Economic Management, Hanoi.

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I. Introduction

Vietnam has made a remarkable achievement in lifting its large number of poor out of poverty. The number of people living below the poverty line fell from 58% in 1993 to 29% in 2002. Reforms implemented in the late 1980s and early 1990s, particularly those which decentralized the responsibility for agricultural production to individual farmers, led to a dramatic increase in agricultural production. There was a 60% increase in farm income between 1993 and 1998 as well as improvements in income and employment in the service sector.

In addition to these reform programs, improvement in technology, infrastructure and education has also contributed to this rapid growth. Without these improvements, such rapid economic growth and large-scale reduction in poverty would not have been possible. Thus, government investment and spending have been crucial to growth and poverty reduction in Vietnam.

It is important to evaluate the relative contribution of government expenditures for two reasons. First, gains in poverty reduction in the past are fragile. Many of those who escaped poverty in recent years remain vulnerable to household- and community-level shocks. Moreover, an increasing number of poor people are concentrated in unfriendly environments such as mountainous areas, and belong to specific racial or ethnic groups such as minorities. Consequently, it has become increasingly hard to achieve further reduction in poverty.

Second, it is likely that public spending may decline as part of macro-economic reforms. Therefore the government is required to do more with less. Information on the relative contributions of various types of public spending will help the Vietnamese government to better target its resources in order to achieve more efficiently the twin goals of economic growth and poverty reduction.

The objective of this study is to analyse the impact of various types of government spending on growth and poverty reduction, using provincial level data over the last decade. Government spending reduces poverty through many channels such as agricultural growth and improved nonfarm employment. We will try to capture all these different effects in the analysis if the data allow. This paper opens with a review of Vietnam's economic reforms and growth over the past decade. We then sketch Vietnam's poverty profile, highlighting changes over time, regional distribution, and differences among population groups. In the next two chapters, we will review the trend and composition of government spending, agricultural R&D and infrastructure endowments in Vietnam over the last decade. Chapter 5 presents the analytical framework used to estimate the effect of various types of government spending on growth and poverty reduction. The data, model estimation, and results are presented in chapter 6. We conclude the paper by offering future priorities for government investments in chapter 7.

II. Growth and Poverty Reduction

This section reviews economic growth and poverty reduction in Vietnam for the last several decades and their associated institutional and policy reforms. Since the country's reunification in 1975, the development of Vietnam's economy can be divided into three periods:

- The period prior to the 1980s when Vietnam was a centrally planned economy (CPE);
- The period between 1980 and 1988, when the economy can be regarded as a modified-planned economy (MPE). Some microeconomic reforms were undertaken without any significant changes in macroeconomic management; and
- The period since 1989 when the economy has been in transition, striving for industrialization and international integration.

Economic Reforms and Economic Growth¹

Prior to the 1980s, Vietnam was a typical centrally planned economy with: (i) state or collective ownership of production means; (ii) government administered supply of physical input and output; (iii) lack of business autonomy, absence of factor markets, highly regulated goods and services markets; (iv) a bias toward heavy industry in investments; and (v) a single government bank and a passive financial system with no effective policies to mobilize domestic savings resulting in household reluctance to save.² Moreover, Vietnam was overwhelmingly dependent on external sources for investment and was relatively autarkic, trading mostly within the former block of socialist countries as part of the Council of Mutual Economic Assistance (CMEA). As a result, the economy was heavily distorted in resource allocation with poor incentives and restricted information flows. Lack of incentives for competition among enterprises implied an absence of pressure to raise productivity, a major source of economic growth.

During this period, the Vietnamese economy stagnated. As shown in Figure 1, in 1976, the first year after the war, the GDP growth rate was extremely high at 16.8%, but growth didn't sustain and went down quickly to minus 2.9% towards 1980, resulting in an annual average GDP growth rate of 3.6% for the period. Growth for the economy as a whole as well as for each sector was erratic. Historically, growth was mainly driven by mining, manufacturing and construction (often referred as Sector II) in Vietnam. In the late 1970s, growth became negative. Agriculture (Sector I), the largest sector of the economy, also grew modestly. Food production had fallen to a very low level, forcing Vietnam to import large amounts of rice, and the balance of payment worsened. Income accruing from domestic production could satisfy only 80 to 90% of domestic

¹ This sub-section draws primarily on Le Dang Doanh *et al* (2002), Pham Lan Huong and Vo Tri Thanh (2003).

² Real deposit interest rates were negative.

consumption. The failure of the centrally planned system had become apparent and pressures for reform increased.

During the period 1980-88, the economy was classified as a 'modified' planned economy (MPE). By the end of the 1970s, spontaneous measures attempting to operate outside the centrally planned economy (so-called 'illicit contracting' in agriculture and 'fence breaking' in manufacturing sector) took place and were institutionalised in the 6th Central Plenum of CPV in 1979. Some microeconomic reforms were introduced in 1981 to recognize and legalize these operations, so they can be seen as 'bottom-up' reforms. The reforms included the 'Three-plan System' for State-Owned Enterprises (SOEs) and the 'Contract System' for the agricultural sector. These micro-reforms made a breakthrough in Vietnam's economic policy, which created new incentives for producers in raising outputs during the period 1982-85. The economy became more dynamic and as a result, Vietnam enjoyed a high rate of economic growth in the first half of the 1980s. Moreover, for the first time, Vietnam was food sufficient in 1985.

However, growth was not sustainable and headed to a decline as the effects of the microeconomic reforms became exhausted. The financial reform implemented in 1985 in an attempt to reverse the situation also failed as it was introduced without addressing the fundamental problems of resource misallocation and macroeconomic imbalances in the economy. Consequently, output expansion dropped and the rates of inflation accelerated to several hundred percent per year with a peak of 774.7% in 1986. The real income of the majority of government employees fell sharply. Poor weather and poor incentives led to a miserable agricultural harvest in 1987, with grain production down by nearly one million tons from the 1986 level. Regional food shortages caused real hardship in some areas. In the North, supply did not meet the demand, leading to a starvation in 21 provinces and cities in the early 1988, affecting 9.3 million people, representing 39.7% of farm households, of which 3.6 million people were subject to serious starvation (Nguyen Van Bich and Chu Tien Quang 1996).

The Sixth Party Congress in December 1986 was a turning point in Vietnam's economic policies. It recognized the existence and the essential role of a multi-ownership structure in Vietnam's economy. It also emphasized the importance of expanding opportunities and choices for people in order to promote economic development and improve standards of living. However, significant changes in this direction occurred only sometimes after the approval of the *Doimoi* (Renovation) program by the Congress. In March of 1989, Vietnam adopted a radical and comprehensive reform package aimed at stabilizing and opening the economy, and enhancing freedom of choice for economic units and competition so as to change fundamentally the economic management system in Vietnam.

Thus, economic reforms in Vietnam had been slow until the economic reform package of 1989, which was considered most successful since the basic conditions were created for the transformation into a market-oriented economy. Since then the transition has been well under way. The government has adopted a range of reforms in pricing policy, fiscal policy, the SOE sector, the external sector, the private sector, the financial sector and the labour market, all of which have been necessary for the transition.

During the 1990s the economic reforms have turned Vietnam into one of the fastest growing economies in the world, with an average GDP growth rate of 7.2% per annum. Inflation was kept under control at a low single-digit level. Between 1991 and 2000, Vietnam's GDP doubled. Agriculture grew at slightly over 5.6%, while industrial value-added increased rapidly at an average rate of 11.2% per year, albeit from a very low base. The service sector expanded at 7% each year. High agricultural growth during the 1990s has turned Vietnam from a rice-importing country into the second largest rice exporter in the world. Vietnamese agricultural competitiveness has improved to the extent that it has become a major exporter of some agricultural products such as cashew nut, coffee, and pepper, in addition to rice. Vietnam has boosted its exports from 854.2 million US\$ in 1987 to 11,540.0 million US\$ in 1999. We present below the key reforms undertaken since 1989.

Macroeconomic Stabilisation

Stabilisation of the economy has been achieved through several measures. These included controlling growth in credit and government expenditures. Money printing to finance the budget deficits was replaced by issuing bonds and borrowing abroad. Interest rates were increased to positive levels in real terms. The government subsidies to SOEs were reduced and household consumption subsidies were eliminated. Military demobilisation and cutback in public investment also helped reduce government spending. Tight monetary and fiscal policy brought inflation down to a manageable level, from 775% in 1986 to 5% in 1993.

Macroeconomic stabilisation was successful in conjunction with price liberalization. Artificially low price setting by the government for most goods and services were abolished, which created incentives for manufacturers and farmers to produce, and at the same time relieved the fiscal burden. Other factors that contributed to overall price stabilisation included a large devaluation and unification of the multiple exchange rates.

Private Sector Development

The Vietnamese government has taken several measures to increase the private sector participation in production and distribution. These include recognition and encouragement of the private sector and creation of a legal framework for the operation of private businesses including FDI (Foreign Direct Investment). A legal framework for the corporate sector has gradually been created through promulgation and amendment of business-related laws and regulations. Rapid growth in services and construction during the 1990s mainly came from a quick response of the private entrepreneurs. Nearly 2 million newly established household businesses in urban areas helped to enhance the performance of the economy and improve considerably the retail sales and service network. Some 23 thousand private enterprises, limited liability and joint-stock companies were registered under the Law on Private Enterprises and Company Law.

SOE Reform

In an attempt to make the operation of SOEs viable, the government has substantially reduced subsidies, diminished concessional credit to these enterprises and given them greater autonomy. Furthermore, inefficient and money-losing enterprises have been liquidated. From 1990 to 1994, the number of SOEs fell from 12 thousand to 6.3 thousand, and 1.5 million SOE workers (out of the 4.05 million total SOE employees) retired or were converted to part-time workers (Fahey 1995). SOEs relinquished habits of relying on the state subsidies and bailing out. Many of them acquired business autonomy, and reorganised production and management to adapt themselves to markets. Others established joint-ventures with foreign partners from which they acquired new technologies, technical and managerial skills, and export markets. These reforms led to some positive improvements in the growth performance of the SOE sector in the first half of the 1990s. Further reforms took place in the early 2000 through asset sales and leasing out of the SOE sector to reduce the role of the government.

Agricultural Sector Reform

Under the new agricultural policy, the farming household as basic economic unit in the rural economy has been formally recognised and the long-term land use rights has been granted. Reform also entitled farmers to purchase, sell, and transfer factors of production in the market, which were previously banned. They were also allowed to sell their output surplus after fulfilling their obligations to the government. All these measures created strong incentives for 10 million farming households to make long-term investment and expand agricultural production. The reform of the agricultural sector was essential to poverty reduction as it is the largest sector of the economy and provides income to some three quarters of the population.

Trade and Investment Reform

Vietnam has substantially liberalised its trade and investment policies since the late 1980s. In an attempt to integrate its economy with the rest of the world, Vietnam has entered into trade agreements with about 60 countries and has trade relations with some 150 countries. It has implemented preferential trade agreement with the European Union since 1992. In addition, Vietnam has been a member of the Association of South East Asian Nations (ASEAN) since June 1995 and the Asia Pacific Economic Cooperation since 1998. Furthermore, it has signed an US-Vietnam bilateral trade agreement in 2000 and has been negotiating for a WTO membership.

Liberalisation of investment climate has resulted in rapid growth in foreign investment between 1993 and 1997. The country has received foreign investment from some 60 countries. The Law on FDI promulgated in 1987 and subsequent amendments enabled Vietnam to attract a large volume of capital (about 8% of GDP) to renew technology and expand the markets. FDI has indeed become an important factor in Vietnam's economic growth during the 1990s (Le Dang Doanh 1999).

Banking Sector Reform

To facilitate the development of trade and the investment sector, the government has also introduced reforms in the banking sector. In 1988, the mono-banking system was replaced by a two-tier system where functions of a central bank and commercial banks were separated. However, the two-tier system could function only in 1990, when the laws on banking authorized the State Bank of Vietnam to assume traditional central bank functions such as the conduct of monetary policy and the supervision of the financial system. Also, sectoral restrictions on the specialised banking activities and the entry barriers were abolished. At present, in addition to the six state-owned commercial banks, a number of joint-stock banks, credit cooperatives/funds, joint-venture banks and foreign banks are in operation in the country.

Poverty and Inequality

Vietnam has made substantial and steady progress in poverty reduction over the past decade (see Table 1). Rural and urban poverty declined sharply during the 1990s, regardless of the poverty line used.³ The proportion of the population living below the poverty line declined from over 70% at the end of 1980s to 58% in 1993, 37% in 1998, and 29% in 2002. The proportion of the food-poor fell from 25% in 1993 to 15% in 1998 and 11% in 2002.⁴ The depth of poverty also declined for all population groups.

Available studies and statistics suggest that the decline in poverty in Vietnam reflects rising household expenditures and GDP per capita due to an increase in real income during the 1990s. Table 2 clearly shows that income, and consequently, expenditure levels have been improved significantly over the 1990s. The real annual per capita expenditure was 1,936 thousand Vietnamese dong (VND) (equivalent to 130 US\$) in 1992-93, 2,764 VND in 1997-98, and 3,229 VND in 2002. The annual average household per capita expenditure rose by 7.4% between 1993 and 1998, and by 4.0% between 1998 and 2002. These figures indicate a considerable improvement in living standards over the 1990s.

However, Vietnam still faces great challenges in poverty reduction in the future:

- The poor is increasingly concentrated in rural areas. More than third of the rural population was still under the poverty line in 2002, and rural poor accounts for more than 90% of the total poor. Rural poverty was also deeper and more severe.
- Ethnic disparity is very striking in Vietnam's poverty profile. Ethnic minorities had substantially higher poverty rates and witnessed much smaller reductions over the 1990s. The poverty incidence within ethnic minority people was the highest across all social groups. In 2002, ethnic minority people were still as poor as the whole nation in the early 1990s. The regional poverty incidence

³ The poverty line mentioned in this paper is calculated as expenditures required, given Vietnamese food consumption patterns, to deliver 2100 calories per person per day and a minimum quantum of non-food expenditure. The poverty line in 2002 is VND 1.916 million (US\$ 124) per person per year.

⁴ Sources: Poverty Working Group (1999), and data provided by GSO based on VLSS 3.

suggests that the poorest ethnic minorities reside in the Central Highlands. Poverty among ethnic minorities was also the most severe. While economic gains were widespread, they barely reached the remote areas where the ethnic minorities are concentrated, and consequently ethnic people are beginning to lag behind.

- The gain in poverty reduction is characterized by large regional variations. While the incidence of poverty fell by 20.3 percentage points in the Northern Uplands (from 64.2 to 43.9%), it decreased by only 0.6 percentage points in the Central Highlands (from 52.4 to 51.8%) (Table 3). Poverty declined the most in the Southeast region. The proportion of the population living under the poverty line now varies from 10.6% in the South East to 58.1% in the Central Highlands.

Therefore, despite the rapid decline in the number of poor during the past decade, progress in poverty reduction has slowed down. Moreover, poverty remains widespread, especially in mountainous and isolated areas, and among ethnic minorities. To maintain the past success in poverty reduction, the Vietnamese government should adopt poverty reduction policies specific to Vietnam's diverse regions and to targeted groups. In this regard, public spending policy can play an important role.

III. Government Expenditure

This section will review the trends and composition of government spending for the last decade. This will provide background information on how these spending has contributed to the formation of public capitals which in turn have contributed to economic growth and poverty reduction. The chapter will also highlights the recent decentralization of government spending and its impact on regional development.

Trends and Levels

Figure 2 reveals that between 1993 and 2000, total expenditure on basic physical and social infrastructure (education, healthcare, road, electricity, irrigation, water supply and telecommunication) has been rising in real terms. There was a sharp reduction in the government budget share for these sectors in 1994, but it was gradually recovered by 1998. Over the last decade, the government has shifted its spending priorities towards the sectors providing public goods and dedicated to the development of human capital.

The most favoured sectors in terms of public spending during the 1993-2000 period were those that appeared to have large impact on poverty reduction (Tables 5 and 6). They received the highest share of the government budget and also enjoyed higher rates of growth than the overall government budget. These sectors were: education, which shared 13.78% of the annual budget and grew at 13.7% per annum; roads accounting for 9.3% of the annual budget and growing at 13.8%; and health care with 6.22% of the annual budget and an annual growth rate of 7.47% between 1993 and 2000.

Most of these sectors had been enjoying increasing shares of the government budget until the late 1990s when economic growth slowed down after the Asian financial crisis. Consequently, government expenditures on electricity power and telecommunication declined, with the levels of government expenditure in these two sectors in 2000 being substantially lower than those in 1993. Among the seven sectors, electricity accounted for the largest share of government spending in 1993, but both the growth and share of this sector has been plummeting thereafter. Government spending on telecommunication declined sharply after 1996. Among other things, a possible explanation for the decline in public spending on electricity and telecommunication is that they provide private goods rather than public ones, and the private sector has geared its investments in these two sectors.

The government has also designed special spending programs specifically for poverty reduction. These include government budget spending for: the National Program for Hunger Eradication and Poverty Reduction and its associated programs; the Program for Especially Disadvantaged Communes in Mountainous and Remote areas, targeting of spending on education and health, cash transfers from richer to poorer provinces through the central government budget; and pro-poor bias in the Public Investment Program 2001-2005.

Fiscal Decentralisation and Regional Allocation

Fiscal decentralisation from the national to sub-national governments has been underway since 1992, and has been institutionalised through the implementation of the 1996 Budget Law and its amendments. The decentralisation of expenditures showed a steady increase at the sub-national level from 26% of total expenditures in 1992 to 43% in 1998.⁵

The decentralisation process combined with the provincial revenue redistribution by the national government allows poorer provinces to support a higher level of basic service delivery. As illustrated in Figure 3, although richer regions (the South East and Red River Delta) were able to collect much higher level of revenues per capita (up to above 25 times of the poorest region - the North West), per capita expenditure tended to be lined up, with some favour towards poorer regions such as the North West and North East. A similar trend of equalising per capita budget expenditure also has been observed over time. Nevertheless, the size of the net transfers is not strongly related to the depth and incidence of poverty in the provinces. The spending in two other poor regions of Vietnam (the North Central and Central Highlands) is rather low. The net transfers together with the retained revenue may not be sufficient to fully cover the basic services for the poor due to the geographic disadvantages of the region.

⁵ Source: Joint Government and Donor Working Group (2000).

IV. Agricultural R&D, Physical and Human Capital Development

As a result of government investments, public capitals such as roads, education, telecommunication, electrification, and irrigation should have improved. This section reviews developments of these public capitals which are fundamental forces behind economic growth and poverty reduction.

Agricultural Research and Development (R&D)

Despite the government's efforts to increase public investment in agricultural research and development (R&D) during the past decade, this type of expenditure accounted for only 1.7% of total public agricultural expenditure, which was much lower than that of Thailand and China (10% and 6% respectively; Fan and Pardey 1998). Between 1992 and 2002, the growth rate of public expenditure on agricultural R&D was 4.83% per annum in real terms. In contrast to the reduction in recurrent expenditure (minus 8.34% per annum), investment in capital experienced a high growth rate of 13.48% per annum, which to a larger extent was caused by the soaring expenditure on construction works (with an average growth at 23.74% per annum). The share of capital investment in total agricultural R&D expenditure increased from 37.93% in 1992 to 83.79% in 2002.

However, the increasing share of capital investment led to reduction of public expenditure for research activities. According to a report by the joint Government and Donor Working Group (2000), only VND 10.5 million was spent on salary and recurrent expenditure for each of the 4,773 research staff working for the 30 agricultural research institutions in 1999. As a result, domestic research institutions can currently meet only 10% of farmers' demand for high-yield crop varieties and livestock breeds, resulting in a heavy reliance on imports (Vietnam News Agency, quoted in Asia Online Times).

In the coming years, as highlighted in the Public Investment Program 2001-05, agricultural research should focus on creating and disseminating new varieties with high yield and value (Socialist Republic of Vietnam (SRV) 2003). In addition, new technologies such as biotechnology, post-harvesting and processing technologies will be developed in order to raise the value added of agricultural products. To achieve these objectives, it is required to undertake institutional and budgetary reform measures within the existing agricultural research system.

Irrigation

Over the past years, a substantial amount of resource has been invested in the formation of a well-functioning irrigation system. On average, public expenditure on building-up and maintaining the country's irrigation system has increased considerably at both the national and provincial levels. During 1993-2000, investment in the irrigation system increased by 12.40% per annum at the national level, and by 19.41% at the provincial level. Furthermore, capital expenditure grew at a much higher rate than recurrent expenditure, resulting in a reduction in the share of recurrent expenditure in

total public expenditure on irrigation from 11.35% in 1993 to 7.89% in 2000 at the national level, and from 21.48% to 9.85% at the provincial level. Outcome of this pattern of expenditure allocation is that new irrigation works have been built up at the expense of operation and maintenance activities, which secure the long-term operation and reliability of the existing irrigation works.

Allocation of investment in irrigation has not been evenly distributed among regions with bias against under-developed areas. The largest irrigation works are usually located in more developed areas such as the Red River Delta, Mekong River Delta, North Central and South East regions. In fact, 60 to 80% of total investment in irrigation system has been poured into those regions.

Despite uneven resource allocation between regions, government investment in irrigation has resulted in the drastic increase in the percentage of irrigated land from only 18% of arable land in 1961 to 70% in 2002. Today, most of the flat land is under irrigation, and a large percentage of crops is produced from irrigated land. This development has fostered the high growth of the agricultural sector in the last few years, and has allowed a greater number of crops in a single year, from 1.3 up to 2-2.2 or even 2.4-2.7 harvests in some areas. In some localities, four crops were cultivated in a year, generating up to VND 60-80 million per hectare in comparison with about VND 10 million when only two crops were harvested (World Bank 2001b).

In the coming years, the Government considers investment in irrigation works as one of the priority areas in order to enhance the agricultural productivity. However, it should be borne in mind that it has become more difficult to convert more land to irrigated areas because these lands may not be suitable for irrigation or crop production. The returns from future irrigation investment may decline as a result.

Roads

The rehabilitation and modernization of the country's decaying transport infrastructure has been recognized as one of the main instruments to foster economic growth, and facilitate the process of poverty reduction. This priority was reflected in the continuously increasing resource allocation for the transport sector, both from the state funding and private sources. Among all transport sub-sectors, road network is considered the most important. As a result, the rehabilitation and modernization of the road network accounted for the largest share of public expenditure and for 94% of total transport spending, an increase of 17 percentage point from 1994 (Joint Government and Donor Working Group 2000). Moreover, public spending for upgrading the country's road network grew at a rapid rate of around 13.51% per annum during the period 1993-2000.

As a result, the national average road density increased from 0.46 km road per km² in 1994 to 0.52 km of road per km² in 1998. Many new roads have been built and connected. However, higher investment in expanding the road network means lower public expenditure allocated for recurrent expenditure including that on operation and maintenance, given the total public expenditure for the sector. In fact, positive outcomes of the bias toward investment in the road network are just short-run, but adverse outcomes will be visible in the longer run. Firstly, in the future, the cost to rehabilitating

and maintaining those newly build roads will take much of the future budget for the sector, therefore resources for developing new roads will be insignificant. Secondly, the life of roads existing today with inadequate spending on operation and maintenance will be substantially shorter.

Public spending on roads was not evenly distributed among regions, thus leading to disparities in the level of road network development. The Red River Delta is the most developed region in terms of road density with 1.72 km of road per km². In the Delta, 100% communes have roads that allow access of automobiles to the commune centre. Some other regions, including the Southeast region, also developed relatively good rural road network (World Bank 2001b). In contrast, roads were still rather under-developed in the poor regions. By the year 2000, 8.2% of all communes in the Northern Uplands still have no motorized road to their centres. However, the figure was lower in the Mekong River Delta, where as much as 12.9% of total communes did not have motorized road to the centres (World Bank 2001b). Nevertheless, the transportation system in Mekong River Delta was still viewed as more developed than that in the Northern Uplands because of the high density of navigable waterway (river and canal).

There appears to be a close relationship between the level of economic development and the availability of a road network. Statistics show that around 85.9% of communes without access to road were poor, which accounted for 19.1% of total poor communes. This figure is three times higher than the national average. In the Northern Uplands for instance, poor communes without access to road made up 18.5% of total poor communes while the figures for the Central Coasts and Mekong River Delta were 23.8% and 29.9%, respectively.

From the discussion above, it can be seen that in the recent years, both national and sub-national governments have focused their efforts in developing a modernized, well-connected road system in developed areas and neglected or paid less attention to the development of a road system in the underdeveloped areas. This may result in widening inequality between regions. In order to close the gap, the Vietnamese government has identified in the Public Investment Program for the period 2001-05 that top priority has been given to the investment for rural development and national target programs, especially those for poverty reduction and job creation (SRV 2003).

Electricity

In contrast to the investment trends in road and irrigation during the 1990s, public investment in electricity experienced a downward trend at the rate of -32.23% although the recurrent expenditure still rose by 5.93% in real terms. In contrast, at the provincial level, investment in electricity power continuously increased by as much as 19.04% per annum in real terms.

The pattern of investment in the electricity power sector, however, reflected a high demand in Vietnam. Currently, reach of on-grid electricity supply at the district level is reasonable high at 96.4%. The problem lies in the poor distribution system from the district centre to communes and from communes to households. While 96.4% of all districts benefit from the national power system, only 81.9% of the commune and 73.5%

of households have access to that system. In fact, this end-of-the-grid-line distribution system was mostly financed by the provincial budget. This partly explains relatively big gaps between regions and provinces. In some regions such as the Red River Delta, South East, and Mekong River Delta, access to the national power system is relatively easy, as opposed to the situation in the Northern Uplands and Central Highlands. Nearly 55% and 72% of the communes in the Northern Uplands and Central Highlands respectively could not reach the national power system.

There is some correlation between poverty and electricity power provision, where up to 63.4% of poor communes do not have electricity as opposed to a much lower proportion of non-poor communes having no electricity (just 2.1%). Thus, electrification in these poor communes requires a new way of financing electrification where huge financial assistance from the Government and specific conditions may be needed.

Telecommunication

There are two separate periods with regard to the pattern of public expenditure on telecommunication. The first half of the decade was characterized by huge investment of public resources to modernize the telecommunication network. The annual average expenditure growth rate for the sector between 1993 and 1996 was extraordinarily high at 148.70%. However, in the subsequent years from 1997 onward, this figure fell drastically to minus 54.23%. This trend reflected the fact that in the first half of the decade, a large amount of resources was used to modernize the sector with the "state-of-the-art" equipment, and then the demand for new equipment decelerated in the second half of 1990s, when public expenditure at the national level was turned to equipment maintenance and development of a new cable network. At the provincial level, a similar expenditure pattern for the sector was also found.

Heavy investment in equipment for this sector during the first half of 1990s has facilitated the rapid growth of the total number of telephone lines. During the period 1996-2000, the number of telephone lines rose by 2.8 times, or at an average rate of 37.3% per annum. Although rural areas experienced a lower rate of growth than in urban areas, this figure was still high at 27% per annum. The percentage of communes with telephones was also up to 84.4% in 2002 from 31.5% in 1996. However, the number of telephone lines differs among regions. The Red River Delta, South East and Mekong River Delta continue to have higher shares of communes with telephones while the figures were lower than the national average for the Northern Uplands, North Central Coast and Central Highlands. The above pattern of telephone coverage reflects the uneven allocation of resources in public expenditure on telecommunication, under which greater attention has been paid to develop and upgrade the telecommunication infrastructure in the urban and more developed areas, and at the same time services were underdeveloped in disadvantaged and remote regions.

Education

For a long time, the Government has considered education was not an end but a mean for poverty reduction and economic development. A considerable amount of

resource had poured into this sector. During the period 1993-2000, the government spending for this sector increased by 13.40% per annum, and the provincial expenditure on education also rose by 15.03% per annum. Total expenditure for education was equal to 2.2% of Vietnam's GDP in 1992, and increased to 3.5% in 1998. Correspondingly, education sector received 17.4% of total public expenditure, an increase of 6.5 percentage points from 1992 (Joint Government and Donor Working Group 2000).

During the same period, salaries and wages, and non-wage recurrent expenditure grew at respectively 31.43% and 16.03% per annum, resulting in an increase in their share of total public expenditure on education from 26.71% in 1993 to 75% in 2000. This high share of recurrent expenditure over total public expenditure for the education sector was in line with international experiences, particularly when associated with a high school enrolment ratio, although there were still complaints that the current level of teachers' salaries is not sufficient to adequately remunerate and motivate teachers. Higher growth rate of recurrent expenditure implies that the share of capital investment will be correspondingly reduced, which in turn would lead to either poor conditions of schools or continuation of a poor access to schools in some underdeveloped areas. However, comparing with other countries at a similar level of economic development, Vietnam has successfully maintained a fairly significant level of capital investment for education sector.

The existing financing mechanism, under which the district education authorities use provincial resources to pay pre-primary and primary school teachers' salaries as well as most expenditure at the central level, poured into the higher education system, leading to widening inequality between regions and between provinces. In fact, differences in the level of financial resources available at the local level created the large variation in resources available at the school level. Thus, richer provinces tend to collect more revenue, and also to spend substantially more on education. In contrast, provinces, which rely exclusively on the central subsidies, are much more constrained in their actual spending for education.

Thanks to large expenditure in the sector, Vietnam has achieved remarkable results in reducing illiteracy, and in raising enrolment rates in all schooling levels. Nearly all communes have at least one primary school. However, only 84.43% of communes have at least a lower-secondary school. Currently, the national educational network consists of more than 12,000 pre-school units, 11,633 primary schools, 5,900 lower secondary schools, and 644 upper secondary schools.

The illiteracy rate in Vietnam has astonishingly dropped in the last three decades, from 19% in 1971 to 7% in 1999. Most young Vietnamese have the ability to write and read, contributing to growth in both the farm and non-farm sectors. Enrolment in primary education has expanded, especially in rural areas although some regions, including the Central Coast, Central Highlands and the Mekong Delta, still lag behind. In contrast with some other developing countries, access to education of girls in Vietnam was not much different from that of boys. In some provinces, girls enrolment in the highest grade (grade five) of primary education even represents 45% of all children enrolled. Expansion has also been remarkable for the next two levels of education. Over the last five years, there has been a two-fold increase in enrolment in lower secondary education, and a four-fold increase in enrolment in upper secondary education.

In the coming year, in order to improve the quality of human capital and public education for the nation, the Government has determined to devote more resources for this sector. About 5.3% of total investment will be used for the sector, of which the state investment will account for 67% (SRV 2003).

V. Effects of Government Spending: Econometric Model

Government spending reaches the poor through many different ways. For example, government fiscal spending in agricultural research improves agricultural productivity, which in turn reduces rural poverty. Moreover, improved agricultural productivity may also help to develop the rural non-farm economy and increase rural wages through the so-called linkage effect. In addition, government spending in infrastructure and education may also promote growth in employment and wages in the non-farm sector, thereby contributing to poverty reduction. Thus, we use a simultaneous equation model to track these different effects on rural poverty.

$$(1) \quad Y = f_1(LAND, FERT, LABOR, DANIMAL, TRACTOR, PIRRI, LITE, PHONE, ELECT, ROADS, RS),$$

$$(2) \quad NFE = f_2(LITE, ROADS, PHONE, ELECT, LP),$$

$$(3) \quad P = f_3(LP, NFE, UPOP).$$

Equation (1) is a neo-classical production function for the agricultural sector. The dependent variable is the value of agricultural production measured in constant prices (Y), while the independent variables are conventional inputs such as land ($LAND$), labour ($LABOR$), fertilizers ($FERT$), tractors ($TRACTOR$), draft animals ($DANIMAL$) and a set of public input variables including roads ($ROADS$), telephone ($PHONE$), electricity ($ELECT$), irrigation ($PIRRI$), and education ($LITE$), and the stock of agricultural research investment (RS).

Equation (2) is a non-farm employment determination equation. Non-farm employment (NFE) is determined by public input variables such as education, roads, electricity, telecommunication and growth in agricultural labour productivity ($LP = Y/LABOR$).

Equation (3) models poverty determination in rural Vietnam. The dependent variable (P) is the percentage of population below the poverty line. The independent variables are growth in agricultural labour productivity, improved non-farm employment, and urbanization ($UPOP$, or the percentage urban population in total population). The inclusion of agricultural growth and nonfarm employment in the poverty equation (instead of urban growth) is because rural poor accounts for more than 90% of the total poor in Vietnam. Improved rural wages may also affect poverty. But due to data unavailability, the variable is not included. This may not cause a serious problem since there still exist a large labour surplus in rural Vietnam and rural wages may have not improved much in the past.

The marginal impact of government spending, taking the example of agricultural research and education investment as examples, can be derived from these three equations as follow:

$$(4) \quad dP/dRS = (?P/?LP)(?Y/?RS) + (?P/?NFE)(?NFE/?LP)(?Y/?RS),$$

$$(5) \quad dP/dLITE = (?P/?LP)(?Y/?LITE) + (?P/?NFE)(?NFE/?LP)(?Y/?LITE) \\ + (?P/?NFE)(?NFE/?LITE).$$

Equation (4) measures the marginal effect of poverty reduction of the research stock variable.⁶ The first term on the right hand side is the direct poverty impact of growth in agricultural production due to increased agricultural research. The second term measures the impact of agricultural research through improved non-farm employment due to research induced production growth in agriculture.

Equation (5) is the marginal poverty reduction effect of improved education. Similar to equation (4), the first two terms on the right hand side are the direct poverty reduction effect of improved education from growth in agricultural production and the indirect effect from improving non-farm employment opportunities. The third term captures the direct impact on poverty reduction by improving non-farm employment due to improved education.

To estimate the stock of public spending, we proceed as follow. Beginning with the work of Griliches, a large number of studies have included some aspects of government expenditures on agricultural research as explanatory variables in production or productivity functions. The relationship between government expenditures on agricultural research and changes in the stock of capital is sometimes referred to as a capital formation or stock accumulation process. Usually this stock cannot be observed directly, so it is more a part of the conceptual apparatus than an empirical tool. An empirically useful variant of the capital formulation or accumulation function, and the one described by equation 4, is the function that relates output (or productivity) to weighted sum of lagged values of government expenditures, r_{t-k} , given by

$$(6) \quad RS_t = r_{t-1}w_{t-1} + r_{t-2}w_{t-2} + \dots + r_{t-l}w_{t-l}.$$

where w_k 's are weights of past expenditures and are normalized to one. In this study, we estimate separate effects of public research and non-research expenditures. These types of expenditures have different, but largely unknown, lag structures between the commitment of the public resources and their effects on agricultural output. For expediency, we restricted the lag length for research expenditures to be seven years with the lag structure defined by the following weights: 0.05, 0.1, 0.2, 0.3, 0.2, 0.1, and 0.05 for $i = 1, 2, \dots, 7$, respectively in equation (3). Alston, Craig, and Pardey (1997) have argued

⁶ It is assumed that there is a constant return to scale. Under this assumption, the effect of growth in labour productivity on poverty reduction is equivalent to that of growth in agricultural production, i.e., $(?P/?Y)(?Y/?RS) = (?P/?LP)(?Y/?RS)$.

persuasively (and shown empirically using U.S. data) that these lag structures ought to be much longer (perhaps best modelled as infinite) and this is an issue we plan to explore with these data at a subsequent time. The length and form of these lag structures are of paramount importance when evaluating the returns to research. This is not attempted here. Our aims are much more modest, namely to explore the links between government spending and output growth and to ascribe some share of that output growth to these public investments.

For investment in irrigation, electricity, roads, equations (7) to (11) model the relationships between improved physical capitals and monetary stocks of these variables which are functions of the past government investments.

$$(7) \quad IRRI = f4(IRRIK)$$

$$(8) \quad ELECT = f5(PWRK)$$

$$(9) \quad PHONE = f6(TELEK)$$

$$(10) \quad ROADS = f7(TRANSK)$$

$$(11) \quad LITE = f8(EDUK)$$

The monetary stocks of these variables are calculated using the perpetual inventory approach

$$(12) \quad K_t = I_t + (1 - d)K_{t-1}$$

where K_t is the capital stock in year t , I_t is gross capital formation in year t , and δ is the depreciation rate (5%). To obtain initial values for the capital stock, we used a similar procedure to Kohli (1982):

$$(13) \quad K_0 = \frac{I_0}{(d + r)}$$

Equation (13) implies that the initial capital stock in year 0 (K_0) is capital investment in year 0 (I_0) divided by the sum of real interest rate (r) and depreciation rate. In the case of Vietnam, we assume a real interest rate of 5%. Sensitivity analyses were

conducted to see whether different depreciation rates and real interest rates would affect our final results. We found the impact to be negligible.

To calculate the marginal return in terms of poverty reduction of different types of government spending such as roads, education, and irrigation, we use derivatives of the following form, using education as an example:

$$(14) \quad dP/dEDUK = dP/dLITE * \partial LITE / \partial EDUK$$

Equation (14) implies that marginal return to capital stock in education (*EDUK*) is the product of marginal return to improvement in the literacy rate (derived in Equation (5)) and marginal impact of capital stock on the literacy rate.

VI. Data, Model Estimation and Results

This section first describes the data, their sources and definitions. Then the model estimation procedure and results are presented.

Data

Most of our data used in this study come from the Ministry of Agriculture and Rural Development (MARD), the Ministry of Finance (MOF), and the Central Institute for Economic Management (CIEM). MARD and CIEM compiled these variables from various published and unpublished official government documents. MOF data are extracted from its database.

Poverty. Poverty is measured as the percentage of population below the official poverty line.

Agricultural Output. Agricultural output is measured as the total production value produced in the agricultural sector expressed in constant prices. The agricultural sector in Vietnam includes crop, animals, fishery, and forestry sub sectors.

Non-farm Employment. We use the percentage of rural non-farm employment in total rural employment as our non-farm employment variable.

Urbanization. The percentage of urban population in total population is used as the urbanization variable.

Agricultural Labour. Agricultural labour is the total number of workers in the agricultural sector.

Land. Land input is total agricultural land used in agricultural production.

Fertilizer. The fertilizer variable refers to total chemical fertilizer used in agricultural production. Manurial fertilizer is also important in Vietnamese agriculture, but is excluded from input use due to data unavailability.

Tractor. The total number of tractors is used as the machinery variable. Due to lack of information, the number of tractors has not been converted into a standardized size.

Draft Animal. The draft animal input is measured as total number of draft animals. In the case of Vietnam, draft animals are mainly water buffalos.

Irrigation. The irrigation variable is measured as percentage of cropland irrigated.

Education. We use the percentage of rural population who are literate as our education variable.

Roads. The road variable is measured as length of roads in km per thousand square km.

Telephone. The number of telephone connections is used as the telephone variable. This variable is used to proxy for the development of telecommunication.

Electricity. The percentage of rural households that has electricity connection is used as the electricity variable.

Agricultural Research. Research stock is used as our research variable. We use the equation (5) to convert past research expenditures into a research stock variable.

Government Spending. Government spending on education, electricity, telecommunication, roads, and irrigation includes spending on both fixed and current expenditures. The data are taken from the Ministry of Finance.

Empirical Results

We first present the results of the estimated equation system, and then report the marginal returns to public spending in terms of both increased agricultural production and reduced poverty.

Estimates of the Equations System

As we have discussed in the previous section, policy reforms and institutional changes have made great contribution to the rapid growth in rural Vietnam, in addition to increased input use, technological change, and improvement in rural infrastructure and education. However, it is not our purpose to quantify these specific effects on rural growth and poverty reduction. In order to avoid or minimize the bias on our estimates of the impact of public spending, we use year dummies in all equations in the system to proxy the year-specific policy reforms. Vietnam is also diverse geographically so to capture the impact of agro climatic effects, we also include provincial dummies in all equations.

The estimated coefficients of the equation system are presented in Table 7. Since we use double-log form for all the equations included in the system, the coefficients are elasticity of the dependent variables with respect to their independent variables in each equation. For example, the coefficient for labour is 0.187 in the agricultural production function, and this indicates that for every one percent increase in labour, agricultural production will increase by 0.187%.

The estimated agricultural production function suggests that conventional inputs such as land, labour, and fertilizer are still important in Vietnamese agriculture, with elasticities ranging from 0.137 to 0.187. The coefficients for tractor and draft animal inputs are statistically insignificant, however. One important finding from the estimated agricultural production function is the high significance level of the public input variables. In particular, the education variable, measured as the literacy rate of rural population, is the most significant, and is the largest in magnitude. The rest of the public variables such as irrigation, roads, access to telephone and electricity and agricultural research have all contributed to growth in Vietnamese agriculture. However, the electricity and telephone variables are not statistically significant although they have positive sign. This is because these variables are highly correlated with the road variable.

The estimated non-farm equation shows that all variables including improvement in education, roads, and access to telephone and electricity have significant impacts on rural non-farm employment. Growth in agricultural production has also a positive impact on rural non-farm employment.

The estimated poverty equation shows that growth in agricultural productivity and non-farm employment has important impact on alleviating rural poverty in Vietnam. For every one percent growth in agricultural productivity, 0.56% of rural poor will be lifted above the poverty line. More importantly, the non-farm employment variable has an elasticity of 0.997, indicating that every one percent increase in nonfarm employment, almost 1% of poor will be lifted above the poverty line. But considering the indirect effect of agricultural growth on poverty reduction through the development of the nonfarm employment, the effects of these two variables are roughly the same.

Table 8 reports the results of the estimates of the relationship between monetary stocks and physical stocks of various types of public investments (except for agricultural R&D). All coefficients are statistically significant, implying that we can use these relationships to calculate the returns in agricultural growth and poverty reduction per unit of capital stock.

Marginal Returns to Government Spending

Table 9 presents the marginal returns in agricultural growth to various types of government spending measured as returns in dong per dong spending.⁷ This is equivalent to benefit-cost ratios. Among all types of government spending, agricultural research has the largest return in agricultural production. For every dong spent, 12 dong of agricultural production value would be produced. Road investment has the second largest return, and for every dong invested, 3.01 dong of agricultural production value would be produced. Education investment also has good returns, with benefit-cost ratios of 2.06. In contrast to other types of investments, the benefit-cost ratio for irrigation investment is less than one, meaning the benefit generated from irrigation cannot cover the cost.⁸ Government investments in electricity and rural telephone do not show any significant impacts on agricultural production.

⁷ The marginal return to agricultural research is calculated as: $\partial Y/\partial RDS = E_r*(Y/RDS)=0.005*(Y/RDS)$ where E_r is the production elasticity of agricultural research stock variable in table 7, and Y is agricultural output and RDS is agricultural research stock in year 2000. Marginal returns to education is calculated as: $\partial Y/\partial EDUC = \partial Y/\partial LITE*\partial LITE/\partial EDUC = E_e*Se*(Y/EDUC)=1.25*0.099*(Y/EDUC)$, where E_e is the production elasticity of the literacy variable shown in Table 7 and S_e is the coefficient of the educational stock variable in the equation that models relationship between the literacy rate and education stock variable shown in Table 8.

⁸ Alston *et al.* (2000) developed an approach to convert a benefit-cost ratio to an internal rate of return or vice versa. It is assumed that the benefit stream is a perpetual annual flow, B , per year while the cost is a one time spending, C at time t . Thus the net present value of B is: $PV(B)_t = \sum_{j=0}^{\infty} B/(1+i)^{t+j} \approx \sum_{j=0}^{\infty} B/(1+i)^j = B/i$ and the net present value of cost is $PV(C)_t \approx C_t = PV(B)_t$ (at IRR) $\approx B/IRR$. Therefore, the benefit-cost ratio is:

$$BC_t = PV(B)_t \div PV(C)_t \approx (B/i) \div (B/IRR) = IRR/i.$$

Regional disaggregation reveals large regional differences. For education investment, it is in the Southeast, in the Red River Delta, and Mekong River Delta where the returns are the largest. For road investment, the regional difference is relatively small and road generate high returns in all regions. It was not possible to calculate the regional impact of agricultural research investment as this type of investment is conducted at the national level.

Table 10 is the estimated marginal effects of government investment on poverty reduction, measured as number of poor lifted per billion dong invested (measured in 2000 prices).⁹ Among all types of government spending, agricultural research has the largest return in poverty reduction. For every billion dong spent on education, 339 poor people would be lifted above the poverty line. The poverty impact of roads ranks second, and every billion dong spend on roads lift 132 poor people above the poverty line. Investments in education also have very favourable return in poverty reduction. Every one billion dong invested in education would lift the number of poor people out of poverty by 76. Among all types of spending that is statistically significant in affecting poverty, irrigation has the smallest impact on poverty. For every one billion dong spent, only 13 poor people are lifted above the poverty line. The effect is less than 4% of that of agricultural research spending. Since telephone and electricity can be considered as private goods, we didn't calculate their returns in poverty reduction.

Great variations are observed among regions in the effects of public investment on poverty reduction. For example, the largest poverty reduction impact from road investment occurs in North Central Vietnam, while the return from education is the largest in the Southeast.

Where i is the discount rate, IRR is the internal rate of return, and BC is the benefit cost ratio. Hence we can also approximate the IRR as $BC \cdot i$. If $BC > 1$, then IRR is always greater than i .

⁹ Taking education as an example, this is calculated as: $\partial P / \partial \text{EDUK} \cdot (\text{P} / \text{EDUK})$ where $\partial P / \partial \text{EDUK}$ is derived in Figure 7, and P is number of poor and EDUK is education investment stock in year 2000. One billion dong is equivalent to \$60,000 at the current exchange rate.

VII. Conclusions

This section reports the major findings from this study, highlighting the implications for future government investment priorities, and pointing out the limitations and future research directions.

Major Findings

Agricultural growth and poverty reduction in Vietnam have been impressive for the last one and half decades. Contributing to this performance is a series of policy reforms and improvements in technology, infrastructure, and education, which in turn result from government investments for the past several decades.

Using provincial data on agricultural production, rural non-farm employment, poverty, and government investments, this study develops a simple econometric multi-equation system to estimate the returns of various types of government investments on agricultural growth and poverty reduction. The results reveal that government investment in agricultural research has the largest poverty reduction impact, followed by roads and education. In contrast, irrigation investment has the smallest impacts on agricultural growth. Interestingly, the ranking of these investments by poverty effect is exactly the same as the ranking by agricultural growth effect. This implies that there is no trade-off between agricultural growth and poverty reduction when selecting investment priorities. Due to the nature of the private goods of rural telephones and electricity, we were not able to calculate their impact on poverty reduction.

Priorities for Future Government Investment

It is clear that government spending has played an important role in agricultural growth and poverty reduction. However, it is worrisome that the Vietnamese government has reduced its investment in these areas. To gain further growth in agriculture and in poverty reduction, the government has to gear up its investment in agricultural research, education and rural infrastructure.

In terms of regional investment priorities, it is obvious that if the Vietnamese government intends to maximize the poverty reduction impact, more public resources should be targeted to the North Central and Highlands regions of Vietnam. However, if the government's objective is to maximize agricultural growth, then resources should be targeted to the Southeast and the Highlands. It seems that more investments in the Highlands can achieve both higher growth and greater poverty reduction.

Limitations and Future Research Directions

This study has several limitations. First, the most critical limitation is the data constraint. Many indicators related to rural public investment are not only lacking, but the poor quality and inconsistency of data pose serious problems concerning the reliability of results. Many assumptions had to be made to arrive at our final results,

although they were not totally unrealistic. While we will continue to improve our data collection, the government should put serious effort in organizing and coordinating such effort in long run. In particular, government spending data disaggregated by sector, by region, by rural and urban areas, and over time are lacking. Data on physical and human capitals such as road density, education level, rural electricity consumption, and irrigation also need to be standardized and systematically compiled over time and by region. Without such data or information, it is difficult for the government to monitor and evaluate the impacts of these various types of investments and to set government investment priorities to achieve its stated objectives of promoting economic growth and reducing poverty.

Second, a general-equilibrium analysis is needed to analyse how government investment in rural areas affects not only the agricultural sector and rural areas, but also other sectors and cities. Ignoring these impacts severely underestimates the overall impact of public investment on poverty. A similar effort is also needed to analyse the impact of urban investment on poverty reduction. Without such information, it is difficult to convince national policymakers to change urban bias of existing investment policies.

Finally, an analysis of the political and institutional context of public investments and conditions for efficient provision of public goods and services is needed to improve the efficiency of public investments. In particular, more attention needs to be given to how the government can design a mechanism (policies, regulations, fiscal systems) to mobilize public resources to invest in rural areas, and how public provision can be made more efficient by improving incentive systems, accountability, human capital, and management.

Table 1: Poverty Incidence, 1992-2002

	<i>Food poverty</i>			<i>General poverty</i>		
	<i>1993</i>	<i>1998</i>	<i>2002</i>	<i>1993</i>	<i>1998</i>	<i>2002</i>
Total	24.9	15.0	10.9	58.1	37.4	28.9
<i>Urban/Rural</i>						
Urban	7.9	2.5	1.9	25.1	9.2	6.6
Rural	29.1	18.6	13.6	66.4	45.5	35.6
<i>Ethnicity</i>						
Kinh & Chinese	20.8	10.6	6.5	53.9	31.1	23.1
Others	52.0	41.8	41.5	86.4	75.2	69.3
<i>Gender</i>						
Male	26.0	16.2	12.0	61.0	39.9	31.2
Female	21.0	10.6	6.6	48.3	28.2	19.9
<i>Region</i>						
Red River Delta	24.2	8.5	5.3	62.7	29.3	22.4
Northern Uplands	42.3	32.4	21.1	81.5	64.2	43.9
North Central Coasts	35.5	19.0	17.5	74.5	48.1	43.9
South Central Coasts	22.8	15.9	9.0	42.7	34.5	25.2
Central Highlands	32.0	31.5	29.5	70.0	52.4	51.8
South East	11.7	5.0	3.0	37.0	12.2	10.6
Mekong River Delta	17.7	11.3	6.5	47.1	36.9	23.4

Sources: CIEM.

Table 2: Real Annual per Capita Expenditure, 1993-2002

<i>Region</i>	<i>Real annual per capita expenditure (thousand VND)</i>		<i>Annual growth in per capita expenditure (%)</i>		
	<i>1993</i>	<i>1998</i>	<i>2002</i>	<i>1993-98</i>	<i>1998-2002</i>
Whole Vietnam	1936	2764	3229	7.4	4.0
<i>Urban/rural</i>					
Urban	3013	4829	5812	9.9	4.7
Rural	1669	2166	2447	5.4	3.1
Gap (urban/rural)	1.8	2.2	2.4	an	an
<i>Quintile</i>					
1. Poorest	854	1099	1197	5.2	2.2
2. Near poorest	1233	1632	1796	5.8	2.4
3. Middle	1582	2125	2386	6.1	2.9
4. Near richest	2098	2929	3401	6.9	3.8
5. Richest	3911	6032	7363	9.1	5.1
Gap (richest/poorest)	4.6	5.5	6.2	an	an
<i>Ethnicity</i>					
Kinh & Chinese	2041	2968	3454	7.8	3.9
Others	1245	1524	1655	4.1	2.1
Gap (Kinh/others)	1.6	1.9	2.1	an	an
<i>Gender</i>					
Male	1849	2603	2981	7.1	3.4
Female	2237	3349	4189	8.4	5.8
Gap (female/male)	1.2	1.3	1.4	an	an

Sources: CIEM.

Table 3: Contribution of the Regions to Total Poverty, 1993-2002

<i>Region</i>	<i>1993</i>		<i>1998</i>		<i>2002</i>	
	<i>Share of poverty</i>	<i>Share of population</i>	<i>Share of poverty</i>	<i>Share of population</i>	<i>Share of poverty</i>	<i>Share of population</i>
Red River Delta	25.5	23.7	17.9	22.9	17.1	21.9
Northern Uplands	18.9	13.5	25.2	14.7	22.2	14.6
North Central Coast	16.4	12.8	17.8	13.8	20.4	13.4
South Central Coast	7.7	9.4	7.8	8.5	7.4	8.5
Central Highlands	3.8	3.2	5.2	3.7	10.4	5.8
South East	9.6	15.1	4.9	15.0	5.3	14.6
Mekong River Delta	18.1	22.4	21.2	21.5	17.2	21.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Sources: CIEM.

Table 4: Poverty by Occupation for People from 15 Years or Older Who Have Job in the Past 12 Months

<i>Sector</i>	<i>Poverty Incidence</i>			<i>Share of total poverty</i>			<i>Share of population</i>		
	<i>1993</i>	<i>1998</i>	<i>2002</i>	<i>1993</i>	<i>1998</i>	<i>2002</i>	<i>1993</i>	<i>1998</i>	<i>2002</i>
Agriculture, forestry and fishery	66.1	44.4	38.9	85.7	84.3	84.0	73.9	67.1	58.7
Mining, manufacturing and construction	37.8	20.9	15.3	7.4	8.0	8.5	11.1	12.8	17.0
Services	28.1	12.7	9.9	5.7	6.4	6.4	11.6	15.5	18.6
Others	20.8	9.1	4.9	1.2	1.3	1.1	3.4	4.7	5.7
Total	57.0	34.8	27.6	100.0	100.0	100.0	100.0	100.0	100.0

Sources: CIEM.

Table 5: Government Budget Spending by Sectors, 1993-2000**(billion VND, 1994 price)**

	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
1. Roads	2,678	3,286	4,158	4,404	4,918	5,353	5,891	6,639
2. Electricity power	6,463	2,002	654	525	379	286	365	433
3. Irrigation	808	813	976	1,187	1,332	1,673	1,760	1,933
4. Water supply	108	394	268	277	516	414	402	402
5. Telecommunication	67	92	260	1,049	228	19	21	22
6. Education-training	4,020	5,011	5,918	6,137	7,359	8,638	8,534	9,901
7. Health	2,451	2,557	2,638	2,823	3,192	3,528	3,823	4,058
Total of 7 sectors	16,593	14,155	14,871	16,402	17,925	19,912	20,796	23,389
Total budget	42,385	44,655	46,657	49,031	52,175	49,742	54,335	63,910

Sources: CIEM.

Table 6: Government Budget Shares by Sector, 1993-2000

	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>Average 93-00</i>
Roads	6.32	7.36	8.91	8.98	9.43	10.76	10.84	10.39	9.26
Electricity	15.25	4.48	1.40	1.07	0.73	0.58	0.67	0.68	2.76
Irrigation	1.91	1.82	2.09	2.42	2.55	3.36	3.24	3.02	2.60
Water supply	0.25	0.88	0.57	0.57	0.99	0.83	0.74	0.63	0.69
Telecommunication	0.16	0.21	0.56	2.14	0.44	0.04	0.04	0.03	0.44
Education-training	9.48	11.22	12.68	12.52	14.10	17.37	15.71	15.49	13.78
Health	5.78	5.73	5.65	5.76	6.12	7.09	7.04	6.35	6.22
Total of 7 sectors	39.15	31.70	31.87	33.45	34.36	40.03	38.27	36.60	35.75

Sources: CIEM.

Table 7: Estimated the Equation System

<i>Agricultural Production Function</i>					
Y	=	0.137 LAND (5.71)*	+ 0.187 LABOR (4.32)*	+ 0.162FERT (2.73)*	+ 0.018 TRACTOR (1.47)
		-0.055 ANIMAL (-2.33)	+ 0.035 PIRRI (1.77)*	+ 1.25 LITE (3.58)*	+ 0.111 ROADD (2.62)*
		+ 0.038 PHONE (1.44)	+ 0.004 ELECT (0.56)	+0.055 RDS (2.42)*	+0.011 RAIN (0.54)
		R ² = 0.964			
<i>Rural Non-farm Employment Equation</i>					
NFE	=	+ 0.185 LITE (1.78)*	+ 0.044 ROADD (4.11)*	+ 0.029 PHONE (1.98)*	+0.0244 ELECT (2.21)*
		+0.148 LP (3.06)*			
		R ² =0.925			
<i>Poverty Equation</i>					
P	=	-0.561 LP (-8.11)*	- 0.977 NFE (-5.48)*	+0.041 UPOP (1.21)	
		R ² =0.855			

Notes: The numbers in parentheses are t test value and * indicates that the coefficients are statistically significant at the 5% level.

Table 8: Estimated Investment Equations

IRRIP	=	0.113 IRRIK (3.06)*	$R^2 = 0.554$
LITE	=	0.099 EDUK (8.63)*	$R^2 = 0.935$
ROADD	=	0.638 TRANSK (8.56)*	$R^2 = 0.868$
PHONE	=	0.411 TELEK (4.56)*	$R^2 = 0.756$
ELECT	=	0.293 PWRK (3.32)*	$R^2 = 0.876$

Notes: The numbers in parentheses are t test value and * indicates that the coefficients are statistically significant at the 5% level.

Table 8: Returns in Agricultural Production

	Agricultural R&D	Irrigation	Roads	Electricity	Telephone	Education
	<i>Dong Per Dong Spending</i>					
The Whole Country	12.22	0.42	3.01	N.S.	N.S.	2.06
Northern Uplands		0.21	1.87	N.S.		0.95
Red River Delta		0.40	3.26	N.S.		2.08
North Central		0.22	3.27	N.S.		1.01
Central Coast		0.21	2.44	N.S.		1.23
Highlands		0.28	3.09	N.S.		1.97
Southeast		1.33	3.30	N.S.		4.66
Mekong River Delta		0.37	3.40	N.S.		2.08

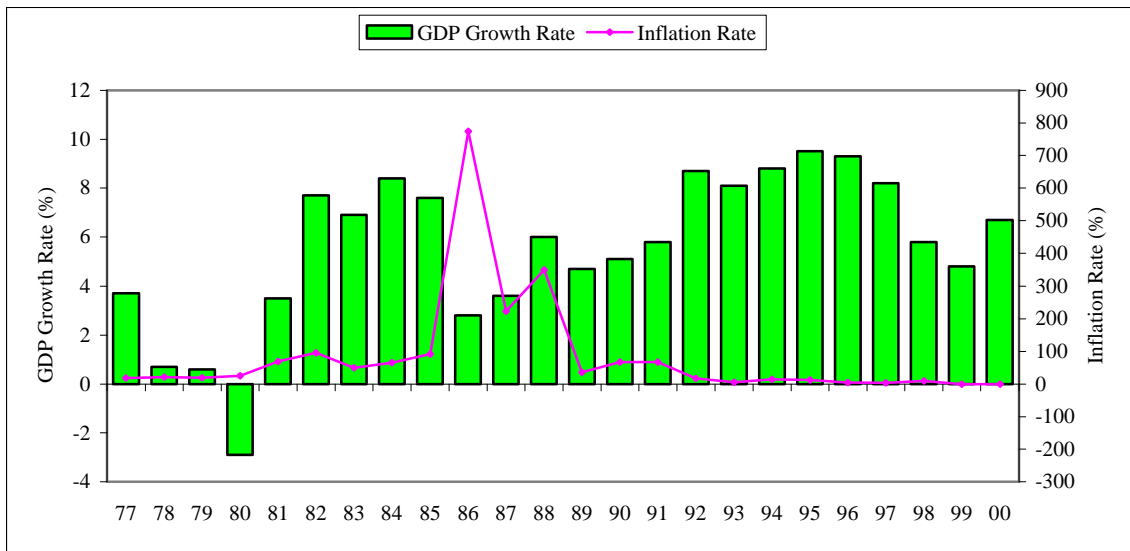
Notes: N.S. indicates not statistically significant.

Table 9: Returns in Poverty Reduction

	Agricultural R&D	Irrigation	Roads	Electricity	Telephone	Education
Number of Poor per Billion Dong						
The Whole Country	338.96	12.93	132.34	N.S.	N.S.	76.40
Northern Uplands		12.03	153.04	N.S.		65.60
Red River Delta		7.93	91.38	N.S.		49.40
North Central		14.90	311.57	N.S.		81.28
Central Coast		12.99	215.58	N.S.		92.31
Highlands		8.37	130.54	N.S.		70.14
Southeast		27.85	98.64	N.S.		117.64
Mekong River Delta		5.68	74.14	N.S.		38.24

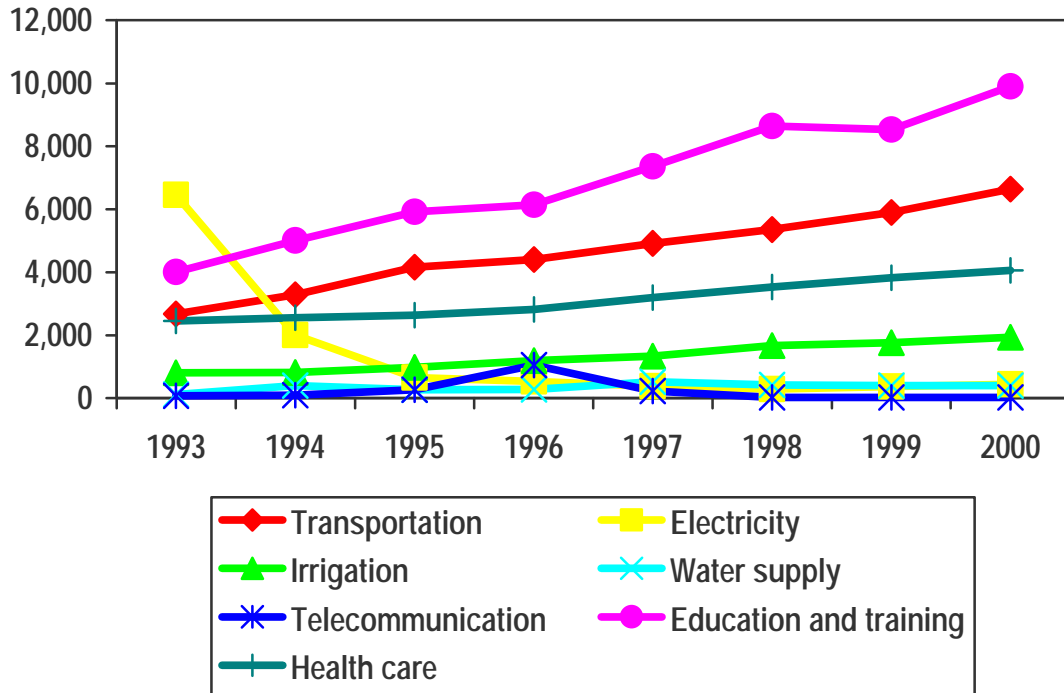
Notes: N.S. indicates not statistically significant.

Figure 1: Vietnam's Economic Growth and Inflation, 1976-2000



Source: Le Dang Doanh et al (2002).

Figure 2: Government Spending on Infrastructure and Basic Services, 1994 prices, (billion VND)



**Figure 3: Per Capita GDP, Budget Revenue and Budget Expenditure by Region
(Thousand VND), 2000**

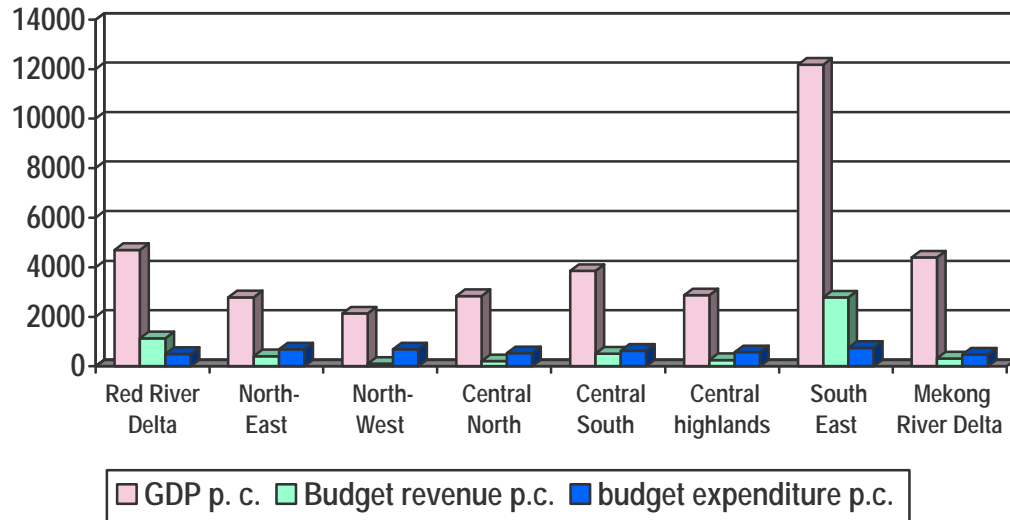
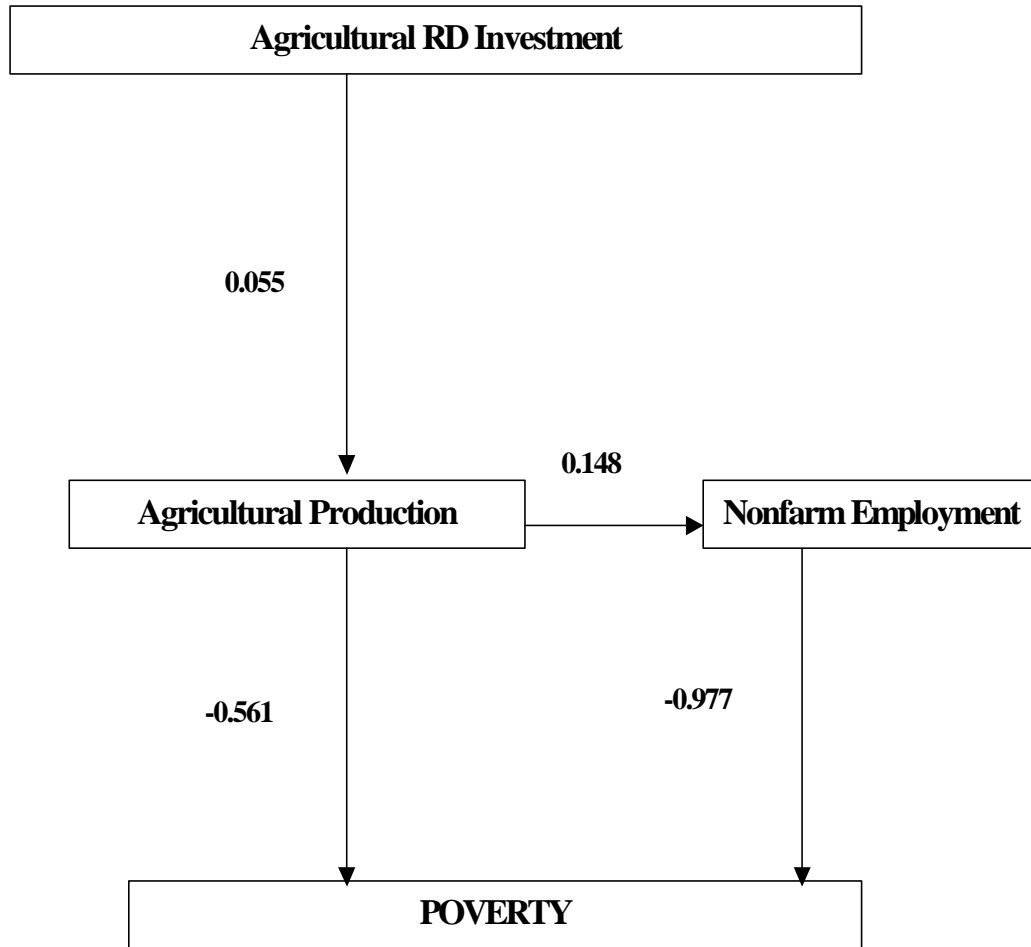


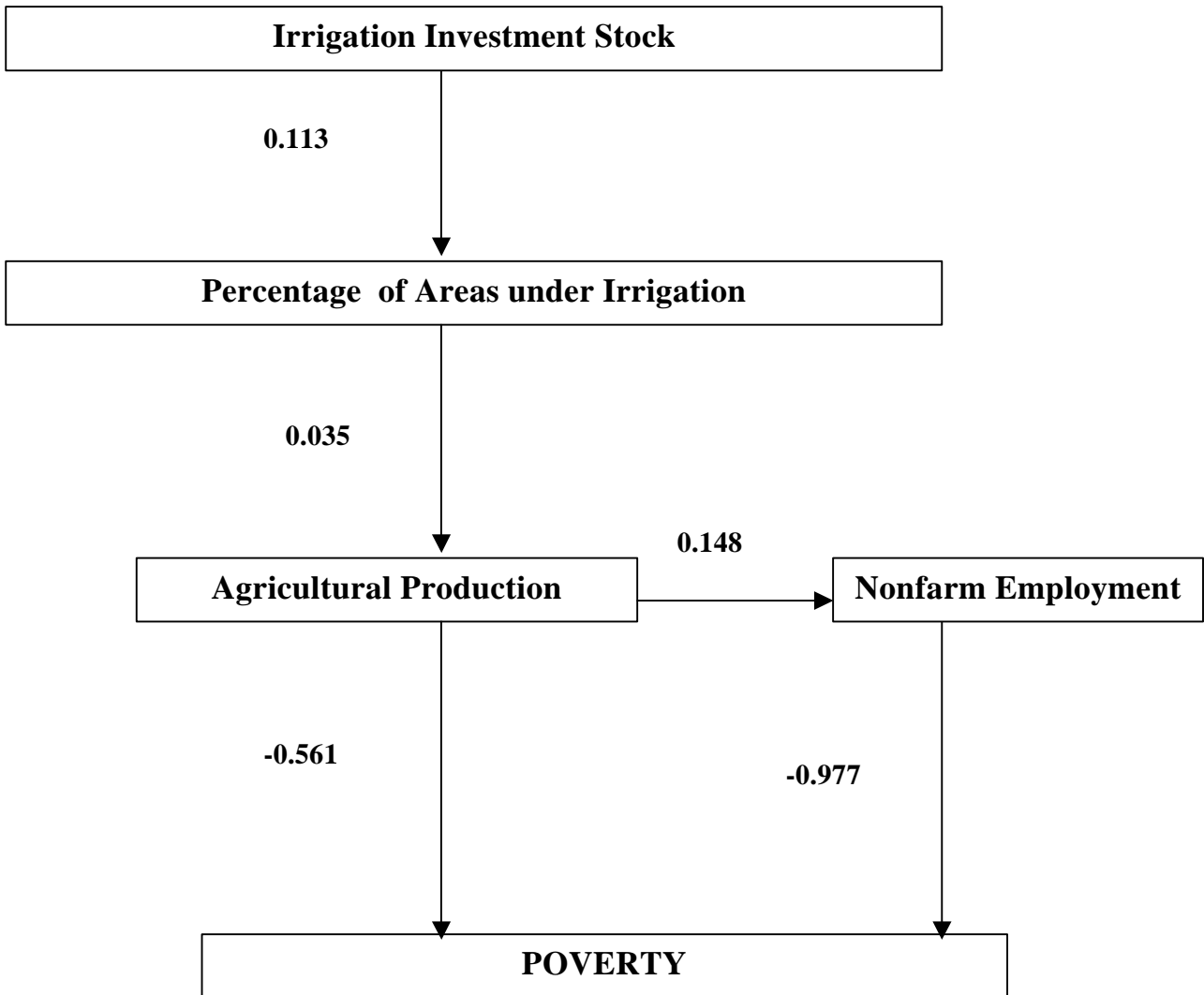
Figure 4: Effect of Agricultural R&D on Poverty



The elasticity of poverty reduction with respect to agricultural R&D investment:

$$\begin{aligned}
 dP/dRS &= (?P/?LP)(?Y/?RS) + (?P/?NFE)(?NFE/?LP)(?Y/?RS) \\
 &= -0.561 * 0.055 + (-0.977) * 0.148 * 0.055 = -0.039
 \end{aligned}$$

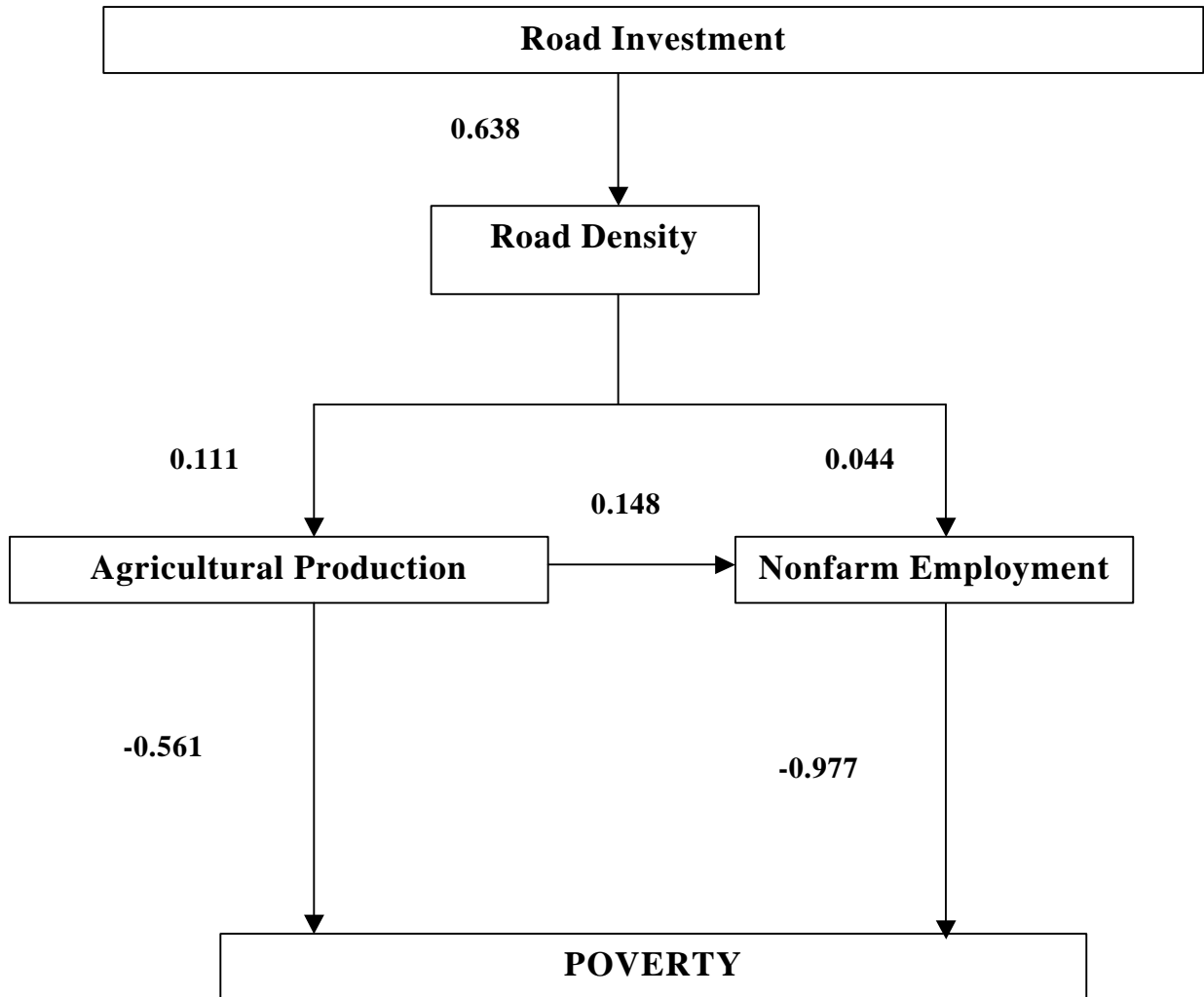
Figure 5: Effect of Irrigation Investment on Poverty



The elasticity of poverty reduction with respect to irrigation investment:

$$\begin{aligned}
 dP/dIPPIK &= dP/dIPPI * dIPPI/dIPPK \\
 &= \{(\partial P / \partial LP)(\partial Y / \partial PIRRI) + (\partial P / \partial NFE)(\partial NFE / \partial LP)(\partial Y / \partial PIRRI)\} * dIPPI/dIPPK \\
 &= \{(-0.561 * 0.035 + (-0.977) * 0.148 * 0.035)\} * 0.113 = -0.0027
 \end{aligned}$$

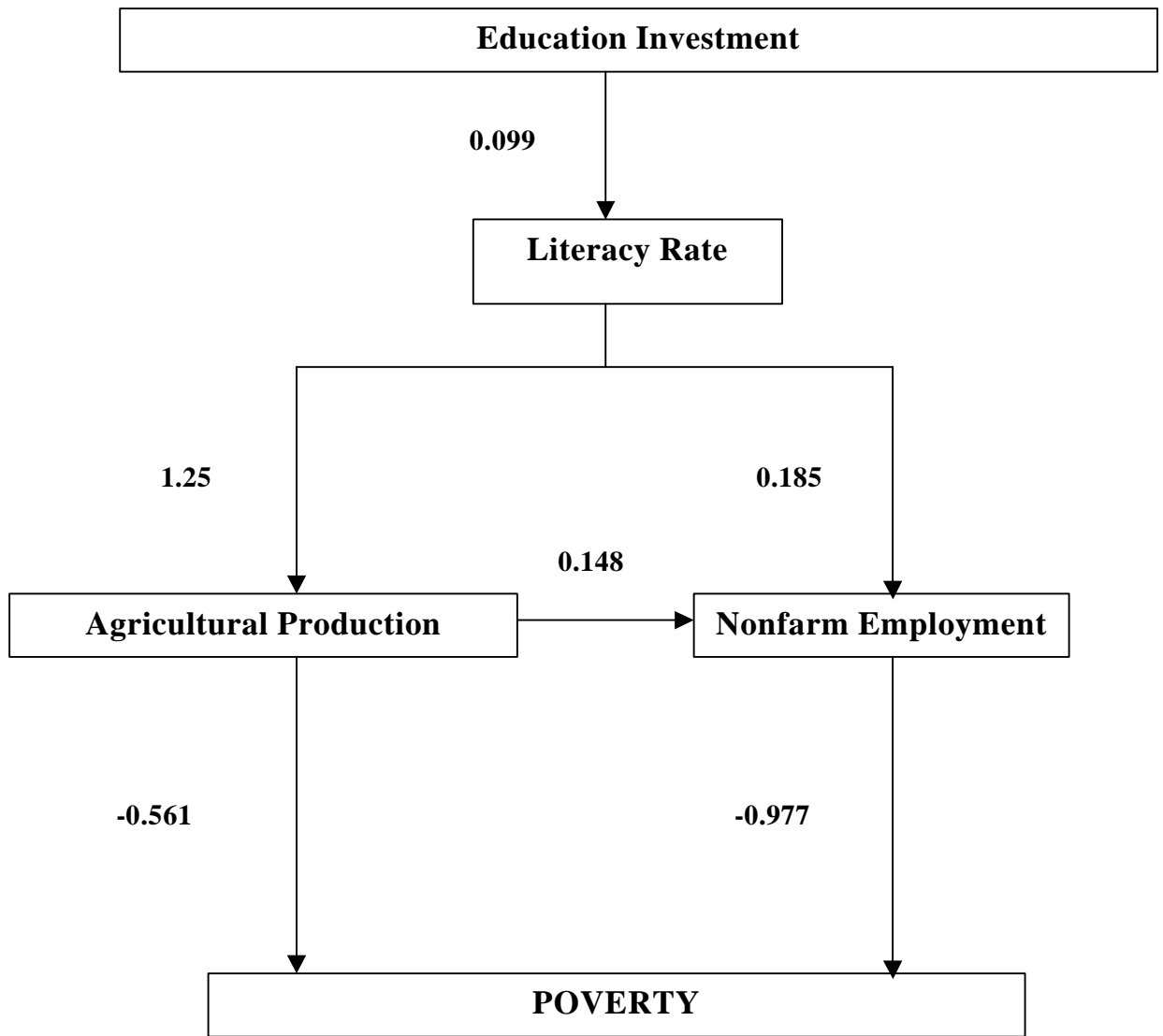
Figure 6: Effect of Road Investment on Poverty



The elasticity of poverty reduction with respect to road investment:

$$\begin{aligned}
 dP/dTRANSK &= dP/dROADD * dROADD/dTRANSK \\
 &= \{ (?P/?LP)(?Y/?ROADD) + (?P/?NFE)(?NFE/?LP)(?Y/?ROADD) \\
 &\quad + (?P/?NFE)(?NFE/?ROADD) \} * ROADD/dTRANSK \\
 &= \{ (-0.561 * 0.111 + (-0.977) * 0.148 * 0.111 + (-0.997) * 0.044 \} * 0.638 = -0.0712
 \end{aligned}$$

Figure 7: Effect of Education Investment on Poverty



The elasticity of poverty reduction with respect to education investment:

$$\begin{aligned}
 dP/dEDUK &= dP/dLITE * dLITE/dEDUK \\
 &= \{ (?P/?LP)(?Y/?LITE) + (?P/?NFE)(?NFE/?LP)(?Y/?LITE) \\
 &\quad + (?P/?NFE)(?NFE/?LITE) \} * dLITE/dEDUK \\
 &= \{ (-0.561 * 1.25 + (-0.977) * 0.148 * 1.25 + (-0.977) * 0.185 \} * 0.099 = -0.105
 \end{aligned}$$

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