

Research article

Growth and poverty reduction in Vietnam: A strategic policy modelling study

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Abstract: A major objective of economic development or growth is poverty reduction, and it is especially a high priority in developing, low-income economies such as Vietnam. Vietnam is an important transition open high-growth economy since Doi Moi in 1987 and with increasing global geopolitical influence in South East Asia but with concerning high poverty incidence. While poverty is recognised internationally as a multidimensional incidence with interdependent relationships among the country's many activities in the sense of Marshall or Haavelmo, rigorous studies with focus on these multidirectional causality issues for Vietnam are currently very limited. The paper addresses these issues by introducing an endogeneity or simultaneous multi-equation modelling approach with World Bank and other international data and system estimation to studying the growth-poverty relationship with Vietnam as a case study. The objective is to explore empirical evidence for this causal relationship with an economy-wide transmission mechanism and with common causality postulates for the improvement of sustainable growth and poverty reduction strategic policy analysis. The main findings show growth-poverty circular causality and the strong impact of growth on poverty reduction and of trade openness on growth. The approach advances the literature, and the findings are also a useful guide for aid consultants, economic researchers, policy makers, nongovernment organizations (NGOs), and official development assistance (ODA) donors in Vietnam in particular and in developing countries in general.

Keywords: growth; poverty reduction; transition economies; strategic economic policy modelling

JEL Codes: C36, C54, F14, F43, O11

1. Introduction

While poverty reduction has been an objective of economic development or growth worldwide in general, it is especially important in developing low-income economies in Asia such as Vietnam. Vietnam is a major ‘miracle’ transition economy in South East Asia since its Doi Moi open policy in 1987 with high growth, increasing global geopolitical influence but with high poverty incidence in recent years. The country has attracted substantial national and international focus and studies (World Bank, 2024). The recent literature also recognises that poverty is a multidimensional and intrinsically complex incidence (MOLISA, 2023; World Bank, 2024) where many domestic and international activities are potentially interrelated and mutually influenced in the sense of Marshall and Haavelmo. Despite these important characteristics, rigorous and appropriate studies of growth and poverty reduction on Vietnam are still very limited and have thus limited contribution to growth and poverty reduction analysis with credible, strategic data-based support. The paper addresses these issues by introducing an endogeneity approach to modelling the growth-poverty relationship in Vietnam and, using recent World Bank and other international data and system estimation, provides statistically and economically credible evidence for strategic poverty reduction analysis. Significantly, the paper advances the literature and contributes to the fields of knowledge for change and strategic research in the case of poverty reduction in Vietnam in particular and in developing low-income countries in general.

The paper is organized as follows. Section 2 briefly describes, for the period 2002–2021 (where the official data is available), the trends and patterns of Vietnam’s growth and poverty, as well as their potential economic-theoretic determinants and current common postulates. In Section 3, a brief critical literature review is presented and a model of simultaneous equations for Vietnam’s growth and poverty is specified and economic-theoretically justified. Section 4 describes the data and econometric methods used and provides the three-stage least-squares estimates and the modelling performance of the estimated model as evaluated by the Theil-MSE, Friedman (1953), and Kydland (2006) criteria. Based on the findings, strategic policy implications on sustainable growth and effective poverty reduction in Vietnam are described in Section 5. Section 6 concludes the paper.

2. Vietnam’s growth and poverty and their potential determinants 2002–2021

The annual trends and patterns of movement of Vietnam’s major economic development indicators during the period 2002–2021 and relevant to our study are given in Figures 1–3. Figure 1 describes two indicators of primary interest namely annual per capita growth (YHC) and annual poverty headcount ratio at national poverty levels % population (POV). YHC is adopted as growth by convention (Easterly, 2007). POV, while a monetary or incidence measure and calculated and provided by the World Bank (2024) database and most common (Anderson, 2020), is used as an available reasonable country-specific

proxy for the more acceptable, complementary and comprehensive (10-component) multidimensional (health, education, and standard of living) poverty index (MPI) (UNDP, 2024). MPI is unavailable for the whole sampling period under study. Figure 2 includes the three major growth determinants for an open economy in an economic integration theory context (WTO, 2024), namely merchandise trade/GDP (TY), foreign direct investment/GDP (FDIY), and trade in services/GDP (SY). The main potential causes of poverty according to the current literature (see detail below) in addition to growth, namely gross primary school education enrolment/population (SCP), cost of living index or inflation (CPIC), real exchange rates in '000 VND (RXR), annual agricultural growth (YCA), and population in million (POP) for the period are depicted in Figure 3.

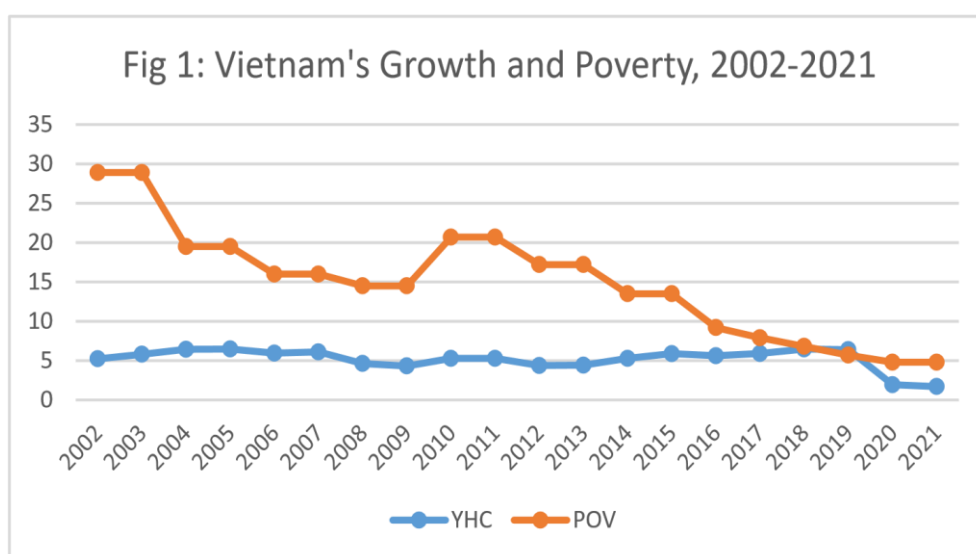


Figure 1. Vietnam's growth and poverty, 2002–2021. Notes: Data sources for Figures 1–3: World Bank (2024), ERS-USDA (2024). YHC = Vietnam's per capita growth, POV = Vietnam's poverty headcount ratio.

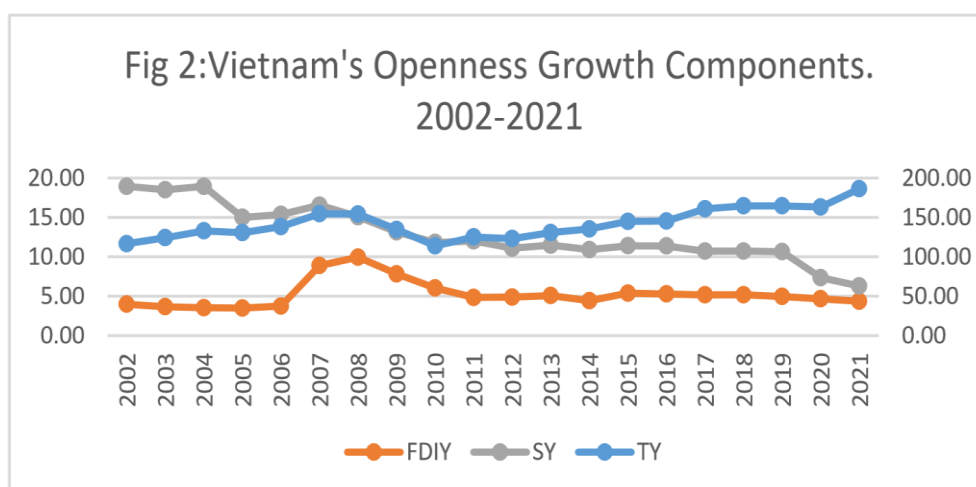


Figure 2. Vietnam's openness growth components, 2002–2021. Notes: FDIY = Foreign Direct Investment/GDP, SY = Trade in Services/GDP, TY = Trade/GDP (secondary axis).

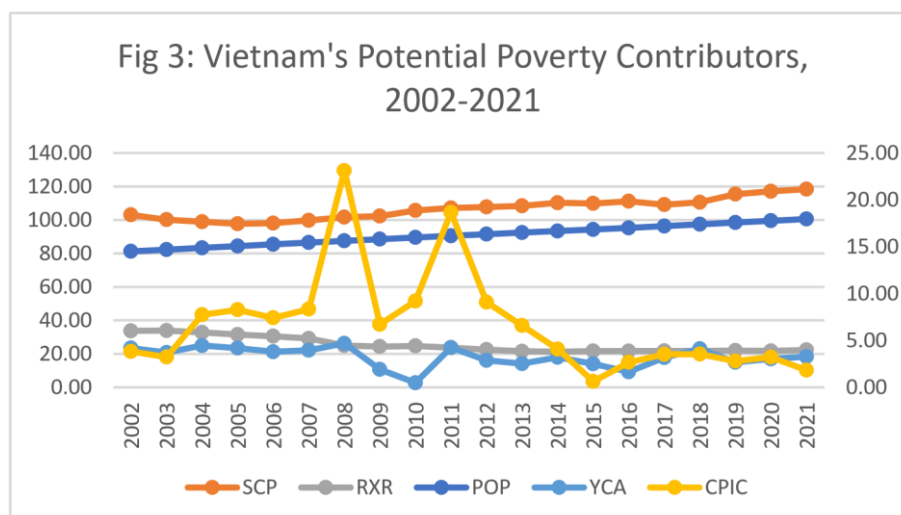


Figure 3. Vietnam's potential poverty contributors, 2002–2021. Notes: YCA = Agricultural Growth (secondary axis), SCP = Gross Primary School Enrolment/Population, Real Exchange Rates ('000 VND), CPIC = Cost of Living (secondary axis), POP = Population (in million).

From Figure 1, we note the features that have made Vietnam a miracle and important economy with increasing geopolitical influence in South East Asia since its Doi Moi open policy in 1987 (i.e., high and stable growth). In fact, with a respectable annual average growth of 5.18% during 2002–2021, the country shows, due to its transition status, only a moderate impact of the global financial crisis (GFC) on its growth at 4.32% in 2009 and of the euro crisis at 4.38% in 2012. Vietnam performed best one year after it became a WTO member in 2007 and one year before it joined the Comprehensive Progressive Trans-Pacific Partnership Agreement (CPTPP) in 2019 posting in both cases the highest growth of 6.47%. However, this growth was severely damaged by the global Covid-19 pandemic early in 2020 and attained only 1.94% and 1.70% in 2020 and 2021, respectively. Also from Figure 1, the data shows Vietnam's poverty reduction had been remarkable, starting early in the period at 28.9 and ending at 4.8 in 2021. In regional comparison of the comprehensive poverty indicator MPI, an estimate of the year was 0.008 for Vietnam, 0.024 for the Philippines in 2017 and 0.002 for Thailand in 2019 (UNDP, 2024). However, this decline in poverty was continuous as there was a surge of poverty incidence from 14.5 in 2009 to 20.7 in 2010. This may be due to the delayed effect of the GFC. There is however no evidence that the Covid-19 pandemic had any adverse impact on poverty reduction in Vietnam as the poverty ratio was 5.70 in 2019 and 4.80 for 2020 and 2021.

From Figure 2, we note the three major outcomes of Vietnam's Doi Moi policy on promoting free market growth, namely merchandise trade openness (TY), FDIY and trade in services SY. With an annual average of 142.29% during the period 2002–2021, the country's TY is relatively high and reflects the success of its trade or exports-led growth priority. As expected, this indicator was severely affected by the GFC in 2009 (to 134.71%) and its lingering effects in 2010 (to 113.98%). Surprisingly, in spite of the Covid-19 pandemic, Vietnam's trade openness posted its highest level of 186.47% in 2021. In contrast, the country's FDIY during the sample is, despite its FDI-led growth focus, low with an annual average only of 5.27%, It surged with the country's WTO membership in 2007 (8.89%) and peaked in 2008 before the GFC at 9.96%. Since then the trend had been generally falling ending at 4.36% in 2021.

Finally, with an infant services sector, Vietnam's trade in services/GDP (SY) had been moderate with an annual average of 12.87% and generally declining. This indicator appears affected by the GFC and especially the Covid-19 pandemic posting a low 7.35% and 6.30% in 2020 and 2021 respectively.

In Figure 3, we note the movements of major potential economic and non-economic contributors to poverty in Vietnam during 2002–2021. They cover economic-theoretic postulates or stipulated determinants in previous descriptive or empirical studies (see citations below) and include Vietnam's major structural characteristic, YCA, human capital, component, SCP, external factors, RXR, CPIC, and POP. These movements are seen to be diverse representing either natural stable increases over time in the case of SCP and POP with an annual average growth of 0.55 and 1.00% respectively, a mild continuous decline (appreciation) for RXR with an annual average of 25,300 VND, highly volatile cost of living CPIC with an annual average of 6.73% or a mildly fluctuating agricultural growth YCA with an annual average of 3.23%. Both inflation and YCA are seen to be severely affected during times of crises such as the GFC and the euro crisis.

The data presented and briefly described in Figures 1–3 reflects the state of growth, poverty and their potential major related contributing factors in Vietnam during the volatile period 2002–2021 with global crises and domestic reforms. They show a complex pattern of movements with possible multidimensional causality with intrinsically interrelated relationships among the data in the classic sense of Marshall or Haavelmo. In this context, a descriptive, statistical correlation or standard simulation computable equilibrium with structural elasticity calibration analysis (Siddiqui and Kemal 2006; Anderson 2020), while common and useful, is not adequate or suitable from a rigorous econometric perspective. The present state of rigorous studies in the field is also very limited (see citations below). To address these issues and contribute to the literature and, importantly, to credible strategic growth poverty policy analysis in Vietnam, the present paper adopts an endogeneity approach and advanced econometric methodologies and official data. Various generic applications of the approach have been undertaken in the fields of free trade agreements (Tran, 2005), energy emissions (Tran and Limskul, 2013), tourism (Tran et al., 2020), and national export strategies (Tran et al., 2021).

3. A new policy model of Vietnam's growth and poverty

Numerous studies have been carried out in recent years to investigate Vietnam's growth and poverty reduction with different levels of rigour and detail. An early study is by the Centre for International Economics in 2002 in which the situation of poverty in Vietnam was described to inform the government and donors. At the same time, Dollar and Kraay (2002) of the World Bank pointed out Vietnam's institutional weaknesses affecting growth and poverty. In 2003, a paper produced by the ADB analyzed the data from the two Vietnam Living Standards Surveys 1992–1993 and 1997–1998 and provided a list of microeconomic determinants of poverty in the country. More specifically, from this data, Balisacan et al. (2003) found a surprising result that growth benefited the poorest quintile more than the top 20% or 40% of the population in Vietnam. Giroud (2004) described growth determination and how FDI is relevant to poverty reduction in the ASEAN in general and in Vietnam in particular. A study by Le and Koo (2007) uses household surveys to point out agricultural growth and labor shifts (to service) as important contributions to Vietnam's poverty reduction. Le et al. (2014) estimated Vietnam's poverty elasticities in a model including retail sales,

agricultural output and consumer prices, and pointed out the importance of trade in poverty reduction. Paweenawat and McNown (2014) extended the growth-poverty nexus to a related area, namely growth-inequality studies in Thailand. Pham and Reidel (2019) specified a poverty model for Vietnam and with 2010–2016 data and 2SLS estimation and showed that growth has no impact on poverty reduction and the agricultural sector did and population growth hindering it. Zhu et al. (2022) built a regression model of growth for Vietnam to test for its long-run relationships with inequality, poverty, and including investment, education, employment, population as determinants. World Bank (2022) assessed Vietnam's last mile achievements and next mile concerns including chronic poverty and the country's aspiration after the Covid-19 pandemic and the slowing down of globalisation.

In spite of these extensive and varied methodological studies, rigorous studies of Vietnam's growth and poverty with econometric endogeneity under the country's openness, trade-led, FDI-led, and reform policies amid regional and global crises and with appropriate credible data-based policy recommendations, while highly desirable, have been very limited. The gap is addressed in the sections below from an econometric approach using the representative data described in Section 2 and other related economic-theoretic and empirical contributing factors in contemporary literature.

To rigorously explore the causal relationship between Vietnam's growth and poverty, based on the representative dataset described in Figures 1–3 above, namely economic openness growth contributors (i.e., TY, FDIY, and SY), and also key testable poverty determinants in contemporary use (such as YCA, SCP, RXR, POP, and CPIC) and, importantly, major relevant crisis events or reforms (Johansen, 1982) for Vietnam during the period 2002–2021, an econometric model for Vietnam's growth and poverty in an open market framework encompassing key current study causal postulates or hypotheses is developed as follows.

Adopting a new class of so-called openness models for growth causality study (as proposed previously in Tran and Limskul, 2013; Tran et al., 2018; Tran and Vu, 2020, Tran et al., 2020), we consider, for convenience and without loss of generality, a simple model of two simultaneous (circular causality) implicit or arbitrary functions for GDP and poverty (i.e., Equation (1) and (2) respectively) and their key testable determinant variables (Figures 2–3) and crises and reforms in an openness growth framework. Currently, Vietnam is a signature to 18 active or planned FTAs. In this model, the underlying theoretical assumptions and testable hypotheses are as follows. First, Vietnam's GDP is determined principally not by conventional production (i.e., capital and labor) or income (i.e., wages and profits) factors but by economic openness engines of growth (WTO, 2024), namely, trade openness, FDI, trade in services, and additionally by Vietnam's endogenous poverty, domestic and external economic factors, and shocks or reforms (Johansen, 1982). Second, poverty is simultaneously determined by both Vietnam's economic performance such as its GDP, domestic and external economic factors and other non-economic factors. Conceptually, this model incorporates, in one important structural specification aspect, not only economic factors but also geographic or demographic attributes (Frankel and Romer, 1999; Johansen, 1982) or demographic dynamics (Kydland, 2006). Thus, for simplicity and importantly in implicit (function-free) functional form, the two functions for Y and P can be written for a sample N as:

$$Y_t = F1(a, O_t, FDI_t, P_t, W1_t, S1_t), t = 1, \dots, N, \quad (1)$$

$$P_t = F2(b, Y_t, W2_t, S2_t), t = 1, \dots, N, \quad (2)$$

where $F1$ and $F2$ are two implicit functions linking simultaneously GDP and poverty to their theoretically plausible and empirically testable causal determinants (variables), and a and b are two vectors of parameters. In this model, Y is defined as per capita real income (Easterly, 2007). P is defined as poverty headcount ratio of national poverty levels (for country-specific reasons), O is exports, imports or, more conventionally, openness (exports plus imports/GDP). FDI denotes foreign direct investment, and F for trade in services. $W1$ and $W2$ denote relevant economic factors (fiscal, monetary, trade and poverty reduction policy—see Sala-i-Martin, 1991), and $S1$ and $S2$ are two vectors representing non-economic variables (e.g., country size or population, policy reforms, and external shocks—see Johansen, 1982; Tran, 2005; for justification) relevant to Vietnam's growth and poverty policy. Importantly for our feasible empirical study especially for developing or transition economies where data is often limited, in addition to the official time-series data for Y , O , FDI , F , and P , and identification of relevant influencing national and global events in S , continuous or discrete data for W must be available and consistent with published time-series data from national statistical offices in a standard Kuznets-type accounting framework (e.g., System of National Accounts, SNA93/08), the accounting system of Stone (1988), or the recent World Bank datasets.

For empirical implementation to derive required elasticities, the model in implicit form can be proxied by planar approximations into linear forms where all continuous variables are expressed in their rates of change (Tran, 1992; Tran et al., 2018). With the nature of our datasets where some variables are not continuous, the two Equations (1) and (2) can be more appropriately represented in full for testing as two linear stochastic Equations:

$$YHC_t = a1 + a2TY_t + a3FDIY_t + a4SY_t + a5POV_t + a6W1_t + a7S1_t + u_{1t}, \quad (3)$$

$$POV_t = b1 + b2YHC_t + b3W2_t + b9S2_t + u_{2t}, \quad (4)$$

In Equations (3) and (4), the equations are linear and interdependent or simultaneous, while $a1$ and $b1$ are constant terms, $a2$ – $a6$ and $b2$ – $b3$ are the structural parameters, and $a7$ and $b9$ are impact parameters. Each u is another unknown factor outside the model (Frankel and Romer, 1999), or the usual disturbances with standard statistical properties.

The main economic-theoretic features and the hypothesis synthesis support of the model, based on our datasets and current literature, can be described as follows (see also studies cited above). In Equation (3), YHC is conceptually and primarily determined, since Doi Moi and subsequent reform policy, by its TY (see also Le et al., 2014), $FDIY$, and SY , the POV , $W1$ such as external financial conditions or RXR , YCA , $CPIC$, SCP , POP , domestic reforms, and regional and global crises $S1$. In (4), the case of poverty incidence is postulated as being affected by YHC , and its testable components of $W2$ such as YCA (see Le and Koo, 2007; Le et al., 2014; Pham and Reidel, 2019), primary school education SCP a component of MPI (Zhu et al., 2022), RXR , $FDIY$ (Giroud, 2004), TY , $CPIC$ (Le et al., 2014), SY (see Le and Koo, 2007), and POP (Zhu et al., 2022).

In its empirical implementation form given in Equations (3) and (4), circular and instantaneous causality in the sense of Marshall and Haavelmo within the openness framework exists or is regarded in our study as a testable hypothesis. A system estimation method such as the 3SLS (three-stage

least-squares) is therefore econometrically appropriate. In their exact or non-stochastic forms (in which all disturbances are idealistically zero), these estimated equations form the basic structure of a time-series data-based class of the computable general equilibrium/global trade analysis project (CGE/GTAP) models of the Johansen class, in which all elasticities and impact parameters are not assumed (calibrated) to be given or known a priori and the impact of endogenous or endogenized variables (YHC) on POV is dependent on the exogenous variables and calculated system-wise, using such iterative procedures as the Gauss-Euler algorithm with a known sparse matrix of elasticities. In econometric studies, the impact is usually carried out by reduced-form analysis.

Significantly, it can be verified that our growth and poverty Equations (3) and (4) in the model above are econometrically identified in the sense of mathematical consistency (order condition). The three-stage least-squares estimation method with all relevant and exogenous instrumental variables (given in Table 1) is suitable and adopted.

4. Empirical implementation and substantive finding

4.1. Data

Data sources—The 2002–2021 data for the model’s economic variables of interest described in Section 2, namely, YHC, POV, TY, FDIY, SY, YCA, and SCP is annual, and obtained from the World Bank’s 2024 *World Development Indicators* database. For other economic and demographic variables, such as RXR, CPIC, and POP, they are officially defined and provided from the ERS-USDA 2024 database. The event data is compiled from historical records. The following data management should be noted. First, as the data for POV is available only biannually, for our computation, we assume that the incidence reported by the World Bank for each year remains unchanged the following year. Second, as the more appropriate data for secondary school enrolment is not available, SCP is used as a proxy. Third, as a relevant variable namely, the number of education years, remained constant (seven years) over the sampling period 2002–2021, this variable has been omitted in view of singularity issue in estimation.

Variable definition and data processing—In addition to the above variables, their definitions and their sources, the qualitative binary variables S1 and S2 reflect, in a conventional manner, the major domestic, regional and global event dates, with the assumption of long-term non-decaying effects on growth and poverty. All these event variables and their identification are given in full in Table 1, In addition, in the model, we assume a unidirectional direction of comprehensive trade to growth in a causal context. That is, the model deals with Vietnam’s trade (in goods, FDI, and services) and their causal impact on the country’s growth and not vice versa. Major reforms and crises and economic variables that have been identified or assumed as exogenous or acceptable instrumental variables, affecting simultaneously Vietnam’s growth and poverty, are listed in the empirical findings table in the next section. In addition, the use of ratio for TY, FDIY and SY is consistent with the definition of trade openness and standard in this kind of studies.

The p-values for the Phillips-Perron unit root test for all variables in the model are as follows: Vietnam’s growth = 0.647, Vietnam’s agricultural growth = 0.213, poverty incidence = 0.627, trade openness = 0.828, FDI/GDP = 0.924, services/GDP = 0.560, RXR = 0.998, Vietnam’s inflation = 0.314, primary school enrolment = 0.507, and population growth= 0.993. Showing all variables used in the

estimation are stationary at the 1% significance level. The empirical findings reported below are thus statistically not spurious in an econometric sense.

4.2. The estimated model and Friedman-Kydland modelling performance

To provide empirical insights into Vietnam's growth and poverty reduction experience with the various key testable causal, postulated or previously found, and contributing factors (the instrumental variables), the full model (3) and (4) which can be regarded as an experimental model in the sense of Kydland (2006), has been appropriately estimated with available World Bank and international data for the period 2002–2021. The basic findings on the structural and impact parameter estimates and diagnostic tests are reported in full in Table 1 below, and their graphical and statistical evaluations are given in Figures 4–5 and Table 2. As mentioned above, the model is econometrically identified according to the order identification tests, and all its included (non-binary) variables have been found to be statistically stationary according to the usual Phillips-Perron unit root tests.

Table 1. Vietnam's growth and poverty determination. 3SLS Estimates. 2002–2021.

Variables	Growth	Variables	Poverty
Const	−97.238**	Const	−476.409**
Trade/GDP (TY)	0.125**	Lagged Poverty (lagged POV)	−0.605**
FDI/GDP (FDIY)	0.012	Vietnam's Growth (YHC)	−6.067**
Services/GDP (SY)	−0.483**	Agricultural Growth (YCA)	−0.844**
Poverty (POV)	−0.125**	Trade/GDP (TY)	0.274**
Agricultural Growth (YCA)	−0.147	FDI/GDP (FDIY)	0.167
Real Exchange Rates (RXR)	0.968**	Services/GDP (SY)	−1.684**
Inflation (CPIC)	0.062**	Inflation (CPIC)	0.570**
Primary School Ratio (SCP)	0.029**	Primary School Ratio (SCP)	2.511**
Population Growth (POPC)	45.330**	Population Growth (POPC)	61.554**
Reform 2005	1.056**	Real Exchange Rates (RXR)	6.390**
Post GFC 2009	0.109	Iraq War 2003	23.991**
Euro Crisis 2011	−0.462	Post Iraq War 2004	1.693
Post Euro Crisis 2013	−0.274	Post GFC 2009	5.683**
Reform 2015	0.941**	Euro Crisis 2011	2.048**
Reform 2018	1.595**	Post Euro Crisis 2013	1.729*
Covid-19 2020	−6.682**	Reform 2016	−8.486**
Recovery 2021	1.776**	Pre-Covid-19 2019	2.437**
		Covid-18 2020	−36.806**
RSQ	0.999		0.999
DW	2.543		2.589
PP p-value	0.145		0.116

Notes: Sample size=20, GFC = Global Financial Crisis, RSQ = R-squared, ** = Significant at the 5% level, * = Significant at the 10% level, PP p-value = Phillips-Perron p-value of the unit root test on the residuals. Software used for estimation = TSP-Oxmetrics 6.

The modelling performance of the estimated equations for Vietnam’s growth and poverty using our approach has also been measured, importantly, by the Friedman (1953)-Kydland (2006) data-model compatibility or simply empirical fit criterion (Figures 4–5) which, unlike many other empirical models in related studies, show excellent fits. More specifically, the estimated model emulates very well the trends, volatile peaks, troughs and the turning points of both growth and poverty over the whole sample period and especially over the deeply turbulent period of the GFC 2008–2009, the so-called euro crisis in the early 2010s, and the Covid-19 pandemic 2020–2021.

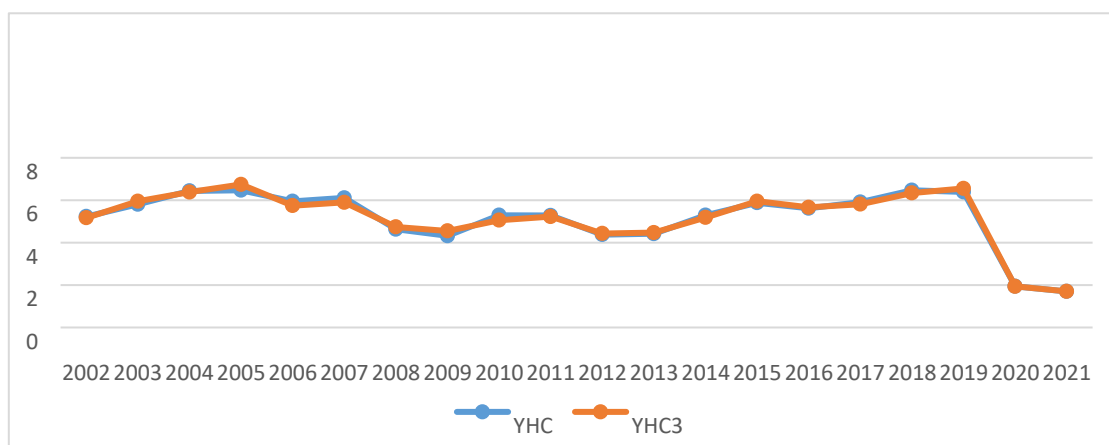


Figure 4. Friedman-Kydland modelling performance of Vietnam’s growth (%), 2002–2021. Notes: YHC and YHC3 = Vietnam’s per head growth and its 3SLS estimate, POV and POV3 = Vietnam’s poverty headcount ratio and its 3SLS estimate.

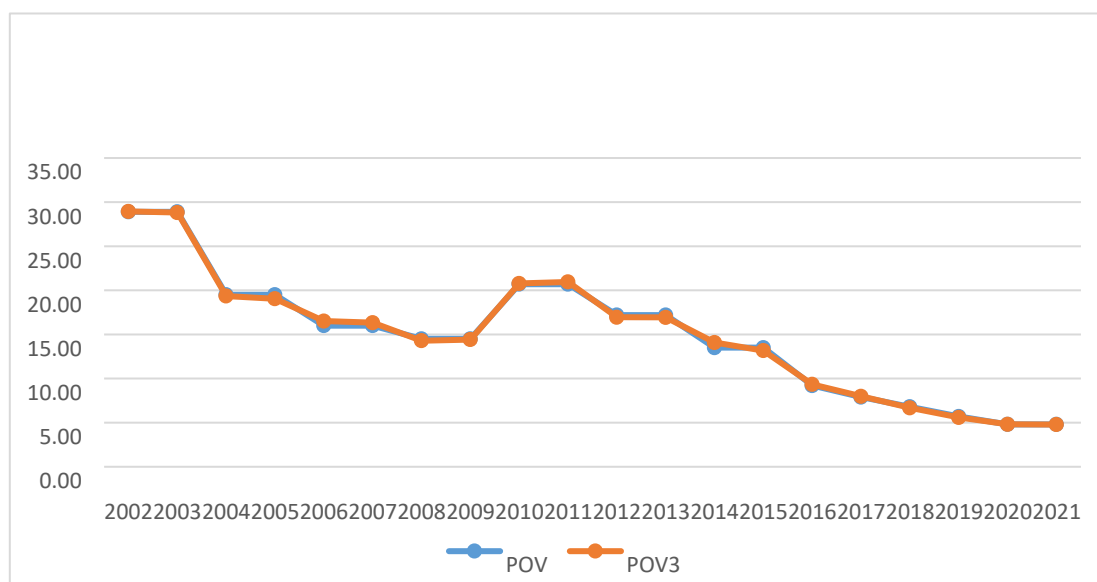


Figure 5. Friedman-Kydland modelling performance of Vietnam’s poverty (headcount ratio), 2002–2021. Notes: YHC and YHC3 = Vietnam’s per head growth and its 3SLS estimate, POV and POV3 = Vietnam’s poverty headcount ratio and its 3SLS estimate.

In addition, modelling performance is measured by their empirical statistical characteristics, using Theil-MSE decomposition, and given in Table 2. Other standard diagnostic tests available for OLS estimation and residuals are not appropriate for 3SLS residuals. As assessed by these various modelling diagnostics reported in Figures 4–5 and Table 2, the estimated model first performs very well in emulating the trend and volatile movements of Vietnam’s growth and poverty data over the whole sample period 2002–2021. Second, the Theil-MSE findings show the closeness of data in the form of the model’s first two moments bias (m_b), variance (m_s), and especially the high covariance (m_c) of 0.989 and 0.999 for the growth and poverty equations respectively. The model’s residuals have also been tested for evidence of unit roots, with a Phillips-Perron p-value of 0.145 for growth and 0.116 for poverty establishing statistical stationarity and modelling credibility. In addition, in the estimated model, the values for R^2 (0.999 for growth and 0.999 for poverty) and DW (2.543 for growth and 2.589 for poverty) appear acceptable and show no first-order autocorrelation problem.

Table 2. Growth and poverty modelling performance—THEIL-MSE decomposition.

	Growth		Poverty	
	Actual	3SLS	Actual	3SLS
Mean	5.177	5.175	14.990	14.990
St. Dev.	1.345	1.338	7.688	7.084
RSQ	0.989		0.999	
RMSE	0.139		0.261	
Mean Error	0.002		0.001	
m_b	0.000		0.000	
m_s	0.002		0.000	
m_c	0.998		1.000	

Notes: RSQ = R-squared, $m_b+m_s+m_c = 1$. See Pindyck and Rubinfeld (1998).

The discussions of the findings and substantive implications for Vietnam’s growth and poverty reduction policy are based on these empirical findings and given in Section 5.

5. General findings and major policy implications

As mentioned earlier, the literature of growth and its impact on poverty reduction in Asia in general and with respect to Vietnam in particular since the country’s Doi Moi in late 1980s has been extensive with diverse descriptive and empirical findings (e.g., CIE, 2002; Dollar, 2002; ADB, 2003; Giroud, 2004; Le and Koo, 2007; Le et al., 2014; Pham and Reidel, 2019; Zhu et al., 2022; World Bank, 2022). However, rigorous empirical studies with endogeneity featuring the fundamental openness features of the country with interdependent economic and political activities in the sense of Marshall and Haavelmo have been, while appropriate and desirable, very limited. The issue is more acute with the emergence of global crises such as the GFC, the euro crisis and the Covid-19 pandemic which have severely affected growth and poverty reduction especially in developing and open economies such as Vietnam. These characteristics require new directions in fundamental research and

policy analysis that better reflect these fundamental characteristics and global developments and provide appropriate and credible and effective policy recommendations and implementation.

This paper makes use of these contemporary issues and foci and their deficits to develop a new approach to address these characteristics and developments, the so-called openness expenditure approach (e.g., Tran and Limskul, 2013; Tran et al., 2018; Tran and Vu, 2020; Tran et al., 2020). The objective was to advance the literature and at the same time to provide substantive evidence for credible and appropriate policy analysis in the specific case of Vietnam's sustainable growth and its impact on the country's major concern, poverty reduction. The findings by 3SLS estimation using official 2002–2021 data of the model's two Equations (3) and (4) with reported results in Table 1 and their modelling characteristics (Figures 4–5 and Table 2), show interesting credible results and insights for the impact of openness and other contributing factors on growth and poverty reduction in the face of damaging crises and pandemic in Vietnam during the volatile period 2002–2021. These would contribute to improved and effective growth and poverty reduction policy development and implementation in Vietnam in particular (MOLISA, 2023) and similar countries in general as emphasised by the World Bank and other international organisations.

It should be noted that, as these findings are from an endogenous and simultaneous multi-equation econometric study for an open economy with acceptable empirical fit (see above), these time-series databased findings represent another perspective of macro-economic modelling and using official real-life data. As expected, they may not be consistent with expectations or with other findings from alternative approaches such as survey studies, CGE/GTAP simulation, Granger (1969) short-term causality, Engle and Granger (1987) long-term co-integration, regression analysis, and related studies, some of which have been cited earlier.

The main findings are as follows. First, to the principal research question of whether Vietnam's growth contributes to the country's poverty reduction (as represented by our monetary indicator POV and especially what its strength is during the turbulent period 2002–2021 that is marked by major domestic reforms and regional wars (e.g., the Iraq War in 2003), global crises (e.g., the GFC in 2008 and the euro crisis in the early 2010s), and the Covid-19 pandemic in 2020–2021, the findings show that the answer is strongly in the affirmative with an impact of -6.067 . This is in contrast to the no-impact result of Pham and Reidel (2019). Our result indicates support to the country's significant pro-poor growth policy and through programs such as national targets for sustainable poverty reduction (MOLISA, 2023).

In addition, the findings support some previously cited studies in that Vietnam's agricultural growth (Le and Koo, 2007; Le et al., 2014) and increase (shifts) in its services sector (Le and Koo, 2007) have a significant impact on poverty reduction (-0.844 and -1.684 , respectively). These reflect both the importance of the country's agriculture base as harbouring poverty and shifts to services (which are more productive) as a means to poverty reduction. Surprisingly and contrary to some expectations, major indicators such as trade (Le et al., 2014) and education (primary school enrolment ratio) (Le and Koo, 2019) appear to worsen the poverty incidence (0.274 and 2.511 , respectively). An explanation may be that trade benefits remain mainly with the export sector and the available indicator primary school enrolment may not be a good indicator for employment and therefore poverty reduction. The findings also show that inflation (0.570) (see Le et al., 2014), FDI (0.167 , weakly, see Giroud 2004; Zhu et al., 2022), the weakening of the VND (6.390), and population growth (61.554) (see Zhu et al., 2022) have worsened the incidence of poverty in Vietnam. Significantly, the Iraq war (23.991),

the GFC (5.683), and the euro crisis in 2011 and its aftermath in 2013 (2.048 and 1.729, respectively) all have increased the incidence of poverty in Vietnam, but the country's reforms in 2016 (−8.486) and the global Covid-19 pandemic in late 2019 and especially 2020 (−14.877 and −36.806, respectively) have significantly reduced it (see Figure 1).

On the second principal research question of what has contributed to Vietnam's remarkable per capita growth during 2002–2021 which has had a deep impact on the country's poverty reduction, the findings are as follows.

First, in terms of the three pillars of growth components of Vietnam's openness policy, namely, trade, FDI, and services, the results are mixed. Trade openness only appears a significant contributor (0.125), confirming the benefits of the country's 1987 Doi Moi policy. The impact of FDI is positive but weak (0.012) reflecting the low FDI rate (Figure 2) and the on-going problem of appropriate FDI distribution destinations in the country. As expected, due to their infant industry status in a socialist with market orientation country, services have not been able to contribute to growth (−0.483) but have impacted poverty reduction (see above). Concerns and improvement suggestions on the services sector in Vietnam have recently been raised by the World Bank (2023). Second, poverty seems to be a drag on economic growth (−0.125) and agricultural growth (−0.147, statistically insignificant) has no impact. However, the major contributing factors to growth that have been postulated or observed in previous related studies (cited above) include primary school enrolment (0.209), inflation (0.062), the weakening of the VND (0.968), and population growth (45.330), all are confirmed. Third, importantly, contrary to the case of poverty determination above, we note the different effects of global crises and domestic reforms on growth in Vietnam in this study. As a transition economy with less external exposure, Vietnam was hardly affected by the GFC (0,109) and the euro crisis in 2011 (−0.462) and its aftermath in 2013 (−0.274). Its growth however had benefitted from the reforms in 2015 (0.941) and 2018 (1.595) that had led to significant poverty reduction in 2016 and 2019. The country suffered with the rest of the world on the onset of the Covid-19 pandemic in 2020 (−6.682) but showed its resilience with strong revealed comparative advantages with a notable recovery (1.776) in 2021 (see Figure. 1) (see also Tran et al., 2023)

The findings above are diverse and comprehensive in the sense that they cover major growth and poverty determinants that have been theoretically postulated or empirically observed in the current literature. Due to their appropriate fundamental endogenous interrelated relationships, strong robust and excellent modelling results, several important policy implications on poverty reduction in Vietnam can be derived. First, the study lends strong empirical support to Vietnam's growth-by-openness priority policy to continue supporting both its national development aspirations and ongoing poverty concern (World Bank, 2022, 2023; MOLISA, 2023). Vietnam currently is a member of 18 regional and global FTAs despite the emerging discussion about reglobalization or a restricted form of original globalisation, and the recent impact of global geo-economic fragmentation (Fernandez-Villaverdez et al. (2024). Second, the study suggests it is imperative to develop policies to improve the services sector (due to its current negative finding) to increase growth, productivity and as a result multidimensional, sustainable and inclusive poverty reduction. Third, care in policy setting is required when some activities such as inflation, real exchange rates, primary school enrolment ratio and population growth in the model have conflicting impacts on growth and poverty. A fine balance of policies in this case is necessary to reduce domestic and external pressures and to accommodate education requirements and natural demographic

increases to achieve net positive outcomes for both sustainable growth and poverty reduction. Fourth, the findings strongly indicate the importance of global crises and domestic reforms on growth and poverty in Vietnam. This requires national and international collaboration to support beneficial reforms and to prevent or mitigate future damaging crises. Finally, the approach is generic and applicable to other developing countries for similar rigorous and effective growth-poverty studies.

6. Conclusions

The paper addresses two important contemporary issues globally and in Vietnam, namely growth and its circular impact on poverty reduction and a lack of rigorous empirical studies to support practical policies for use by national (e.g., MOLISA, 2023) and World Bank agencies, donors, and research analysts. The new approach introduced in the paper is consistent with contemporary sustainable global growth for open economies and poverty policy development focus especially for developing countries (World Bank, 2024) and suitable modelling methodological advances. Using the *World Development Indicators* and other international data, the study has provided several interesting and useful results with our representative poverty measure, namely that growth-poverty circularity exists, growth strongly supports poverty reduction and trade openness helps growth in Vietnam. These findings are useful for practical strategic policy analysis and implementation by national and World Bank agencies and donors. The findings and policy implications are also supported by rigorous economic-theoretic considerations, official data, and robust advanced econometric modelling analysis. Finally, the approach adopted is in the so-called class of openness policy econometric modelling and its generics and has wide applications in related fields of impact research and strategic policy analysis, including growth-inequality in developing countries.

Use of AI tools declaration

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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