STRUCTURAL CHANGE AND INCOME INEQUALITY:
EVIDENCE FROM VIET NAM

Vengadeshvaran J. Sarma & Saumik Paul

Research objectives

- **Identify if growth contributes to income inequality in Viet Nam**
  - Inverted U shaped relationship between development (structural transformation) and income inequality (Kuznets, 1955)

- **Identify what contributes to income inequality in Viet Nam.**
  - Structural transformation?
  - Geography?
  - Institutions?

- **Policy implications**
  - Targeted policies towards reducing income inequality

Background: Viet Nam

• Population of over 92.7 million (WB, 2016)

• Doi Moi (*meaning: renovation)* economic (free-market) reforms introduced in 1986:
-   Private ownership of farms and industries
-   Economic deregulation
-   Trade liberalisation and easing of foreign ownership policies

• GDP growth, on average between 5%-6% in the last three decades, since Doi Moi. (Avg. 5.5% in the 90s and 6.4% in the 2000s)

• GDP per capita (PPP): $5,995 (WB, 2016 est.)

Background: Viet Nam
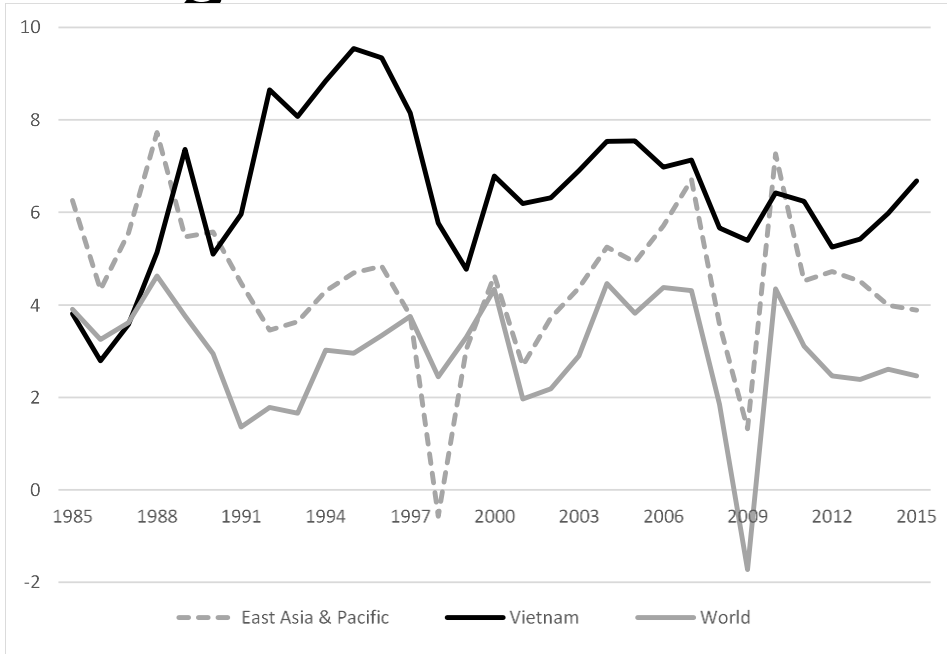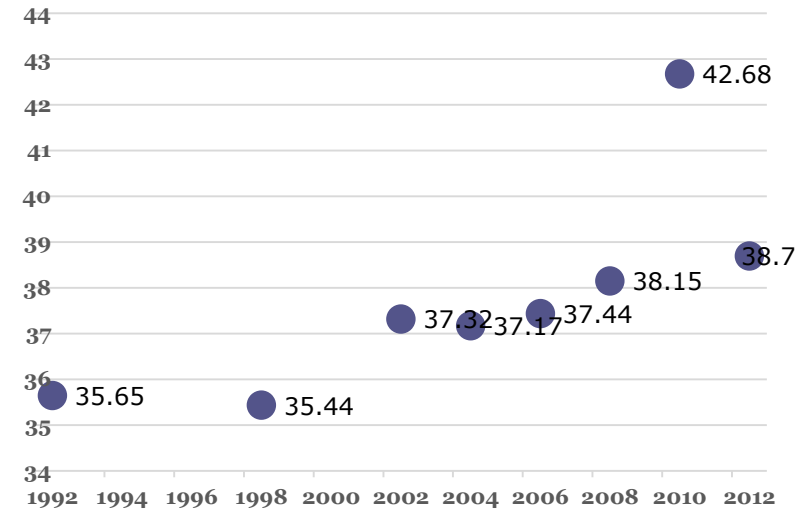

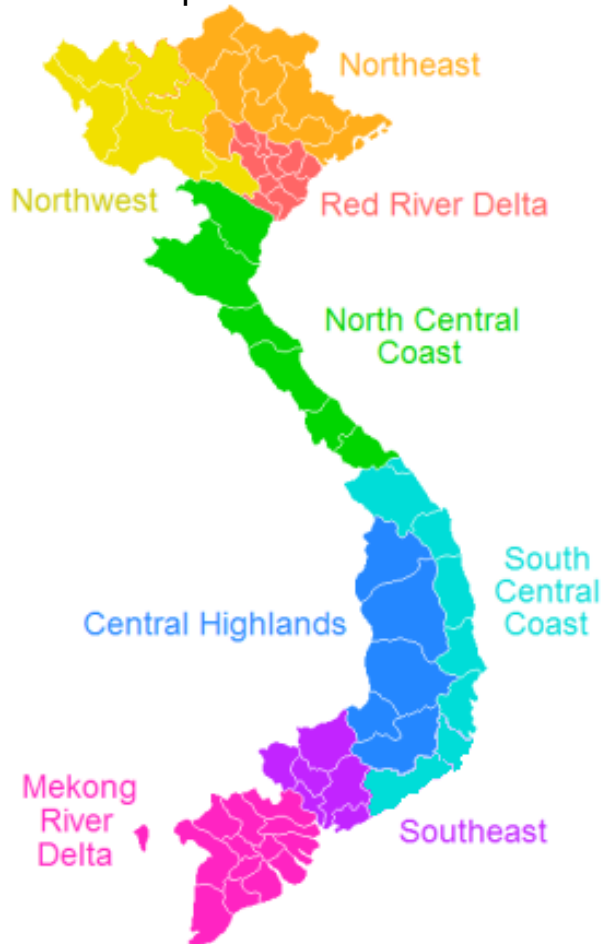**Figure 1: Annual GDP Growth**   Source: World Development Indicators.

GINI, Viet Nam
Source: World Development Indicators.

• Growth is not inclusive—Income inequality rising.

• Rising disparity between regions and within regions *(next slide)*.

Regions of Viet Nam
Adapted from: GSO Viet Nam

Poverty Rate (%)
Adapted from: World Bank (2013)

Hanoi -- Red River Delta
Ho Chi Minh -- *Southeast*
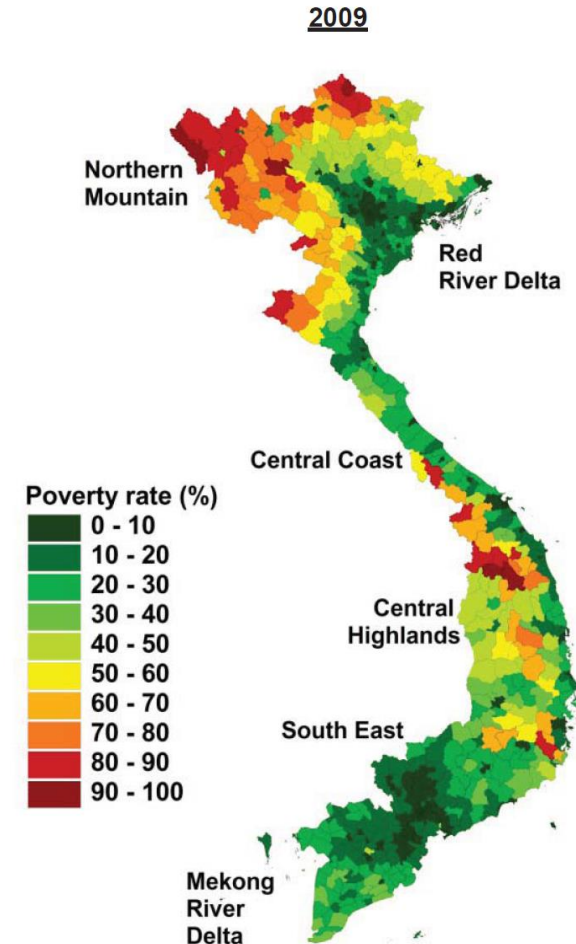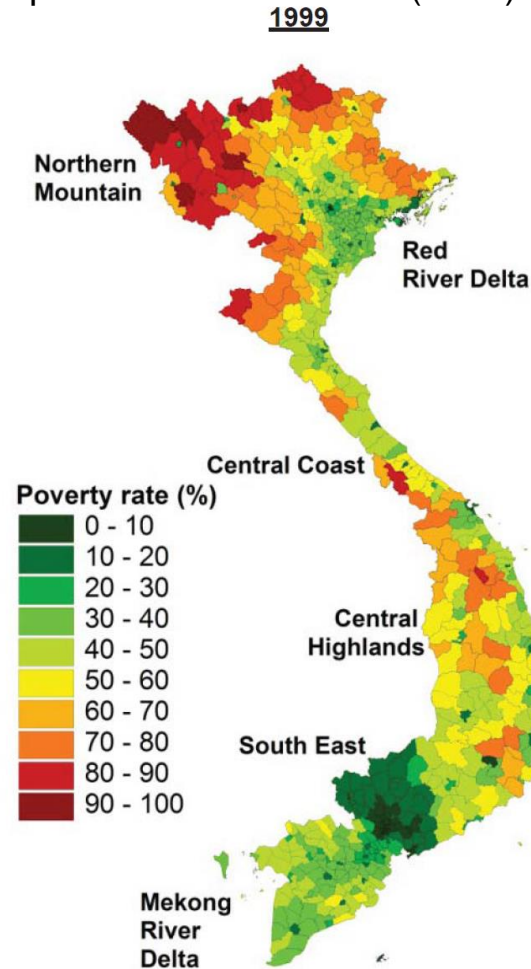
• The RRD region and Southeast have many industrial zones and service sector companies.
• The rest of the north was heavily agrarian and so was central highlands. These parts have a larger concentration of ethnic minorities than the rest of Viet Nam and poverty is disproportionately higher among ethnic minorities.

Change in sectoral participation by region

Source: VHLSS 2002, 2006, 2010 (Authors' calculations)

■ Agri 2002-2006   ■ Agri 2006-2010   ■ Manuf 2002-2006   ■ Manuf 2006-2010   ■ Services 2002-2006   ■ Services 2006-2010
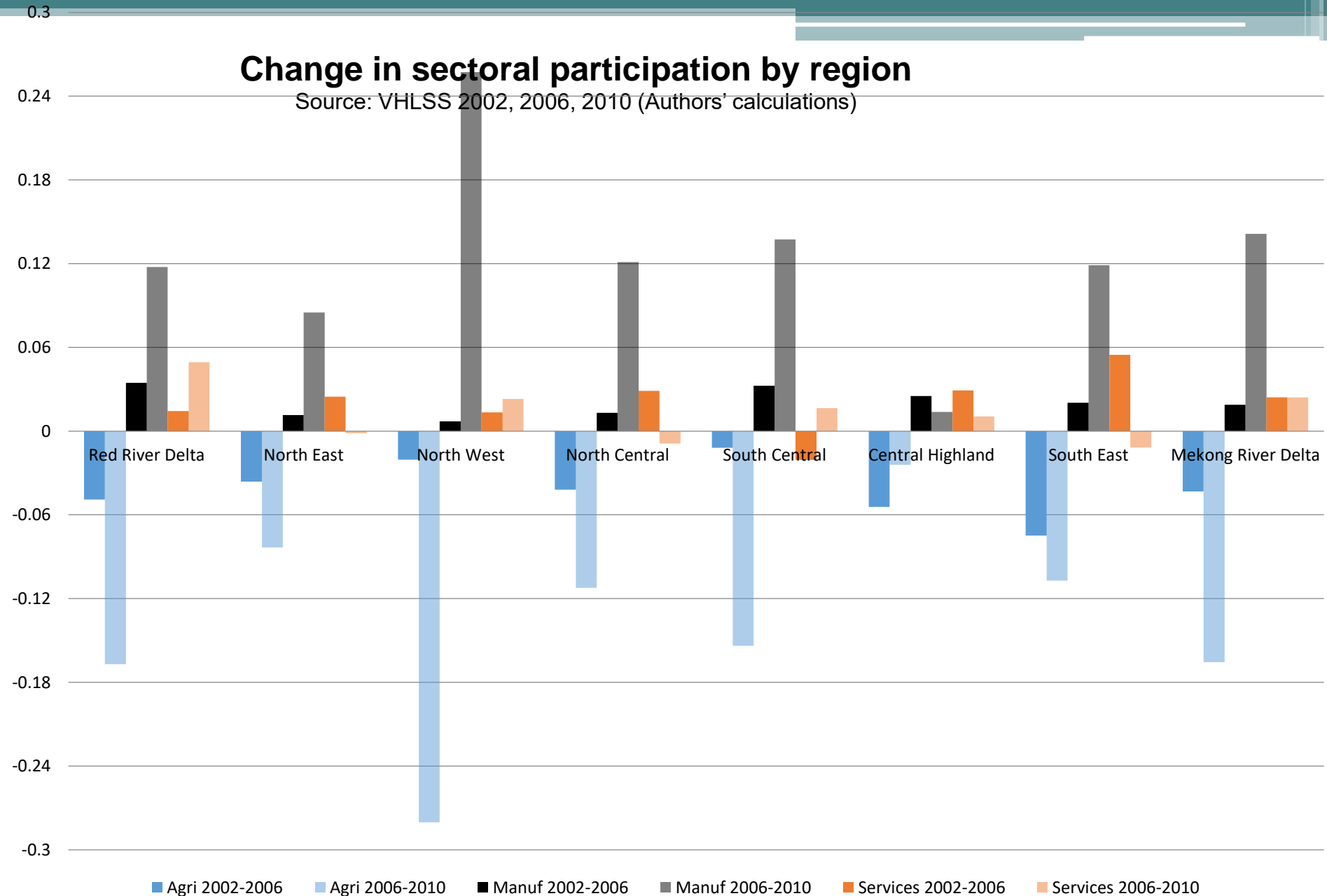
•**There is evidence of regional differences in the rate of structural transformation. In general, growth of manufacturing is more pronounced in the north west (since 2000s) and the southern regions.**

Sectoral change

Source: WDI and Mcgain and Pavcnick (2013)
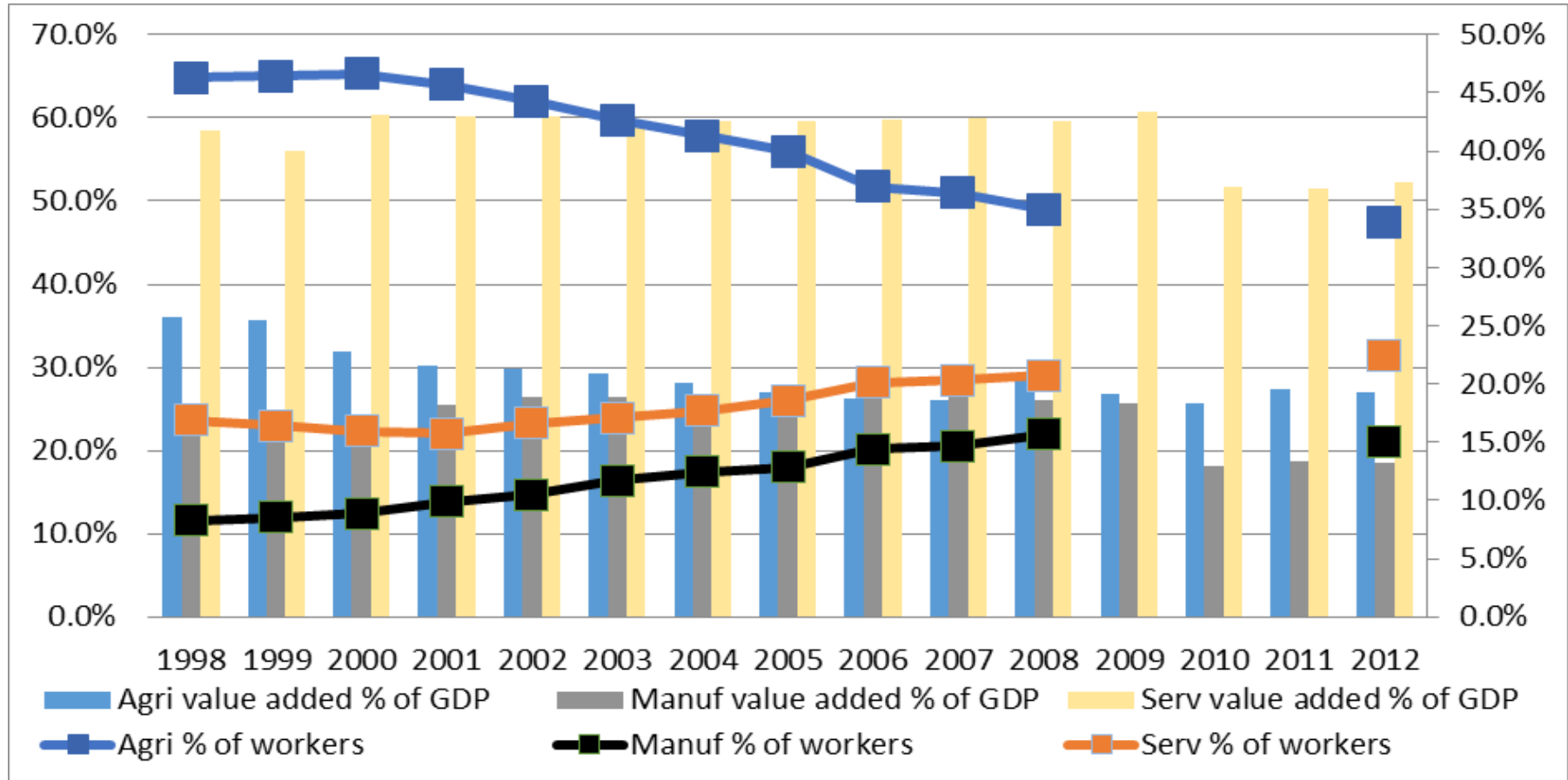
•**Contribution of agriculture to GDP decreasing but at a lower rate than that of services. Employment share of agriculture persistently declining while those of manufacturing and services increase.**

Sectoral productivity (contribution to GDP/ share of employment)
Source: Wordl Bank, GSO

Agri Productivity   Manufacturing Productivity   Services Productivity
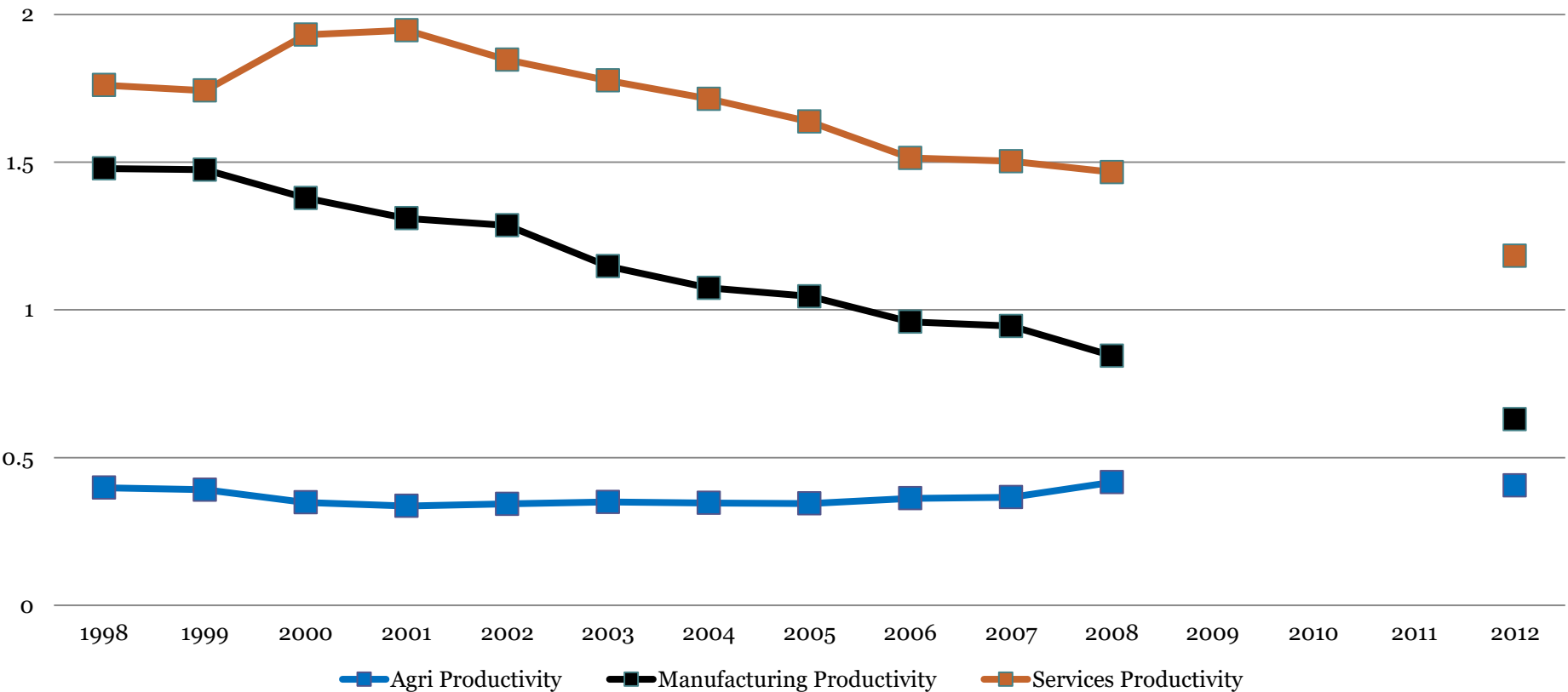
•**As more and more people move out agriculture and with improved technology, agricultural productivity has marginally improved. Meanwhile as more people crowd manufacturing and services, the productivity of those sectors has declined.**

Net Migration
Source: GSO Viet Nam

Legend: Rest of South | Rest of North | Hồ Chí Minh | Bình Dương | Hà Nội
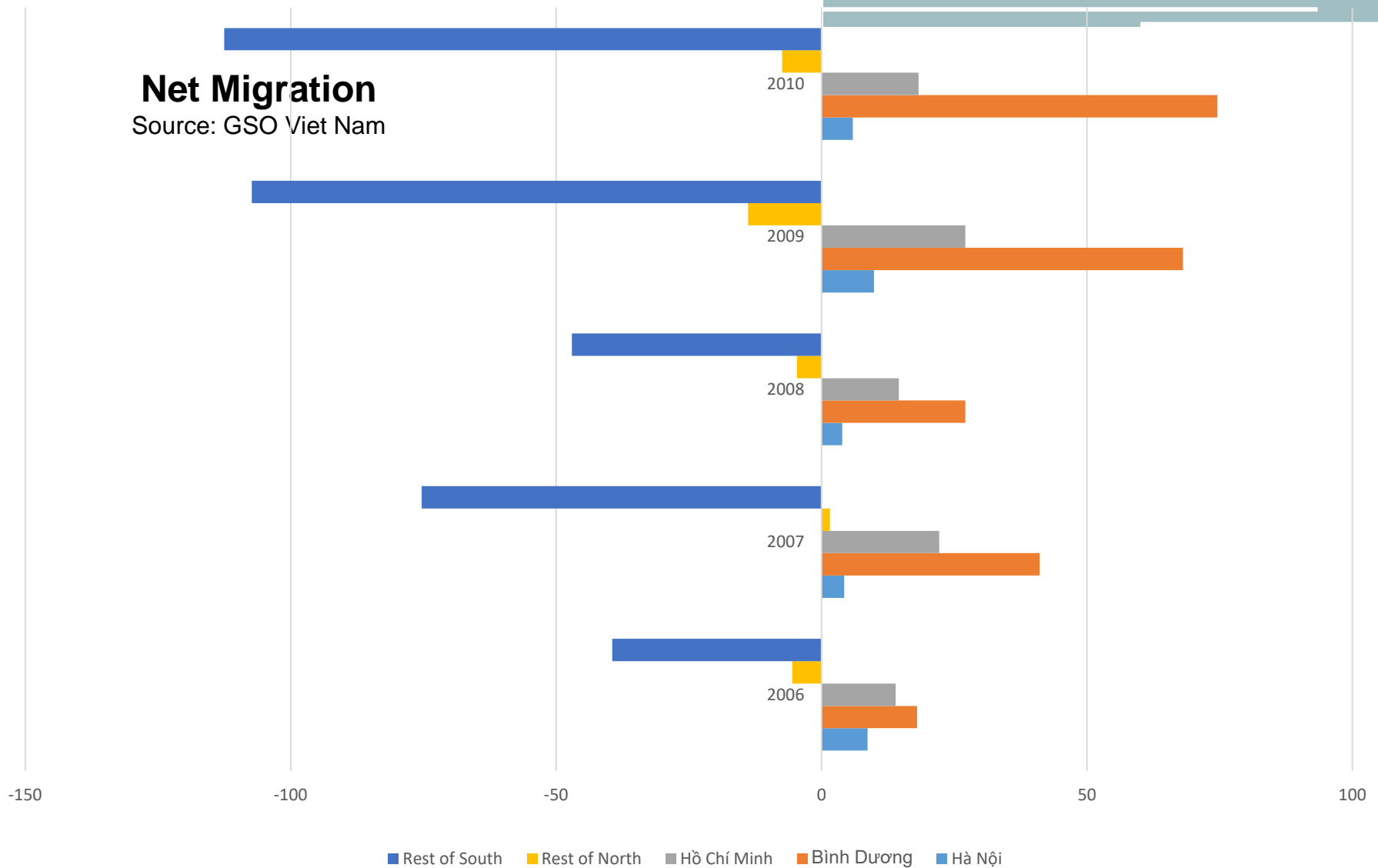
• **Better job opportunities in manufacturing and services available in HCM, Binh Duong, and Ha Noi, cause net migration to be very large in these areas. There is also some evidence that people from other parts of the north move to Ha Noi, while people from the rest of the South move to HCM and Binh Duong.**
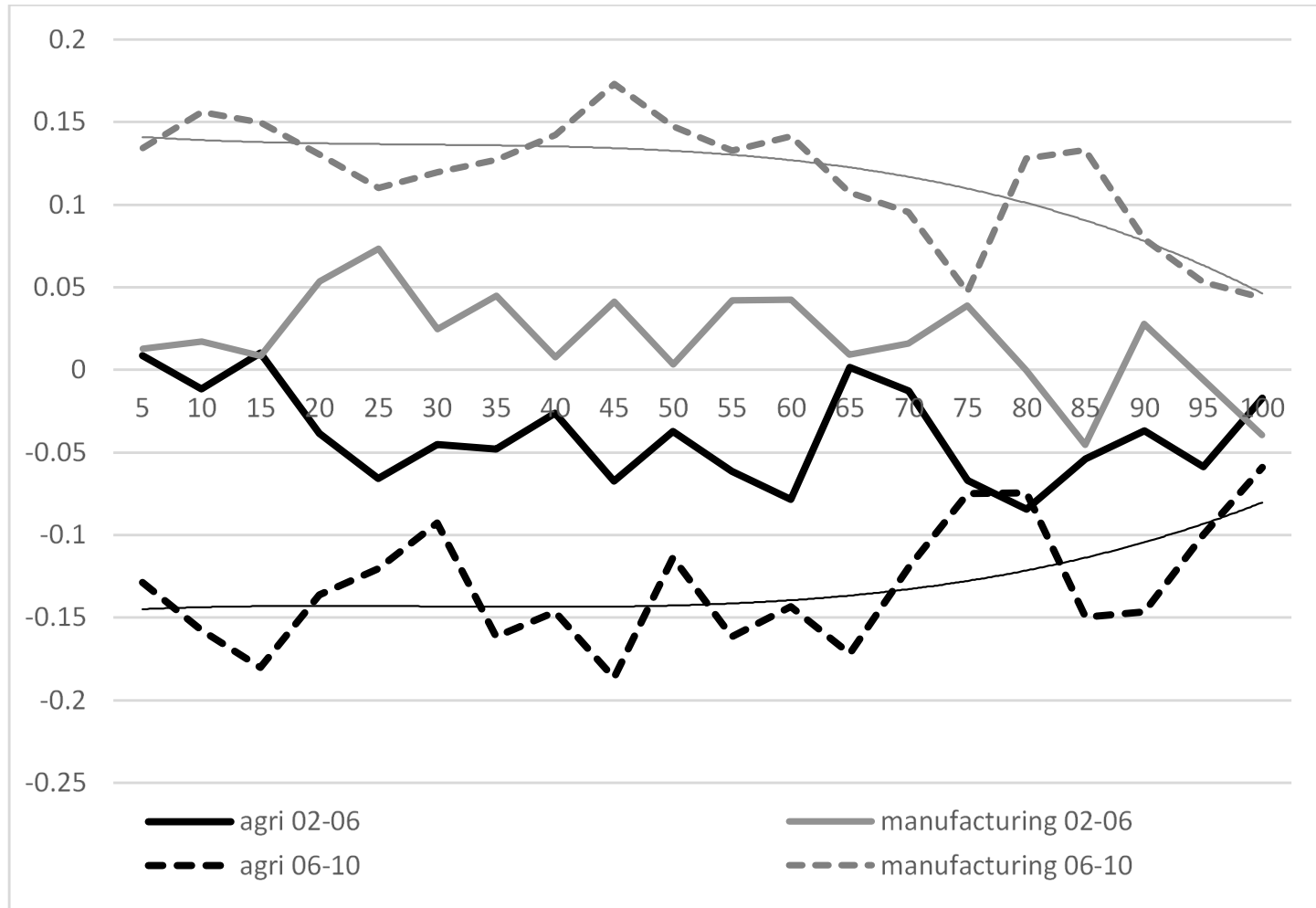
Figure 1: Sectoral participation by income quantile
Source: Authors' calculations based on VHLSS 2002, 2006 and 2010.

·**The non-linear trend lines for participation in agriculture and manufacturing across the two-time periods indicate that the shift in participation from agriculture to manufacturing is prominent for those in the 30th to 65th percentile of the income distribution.**
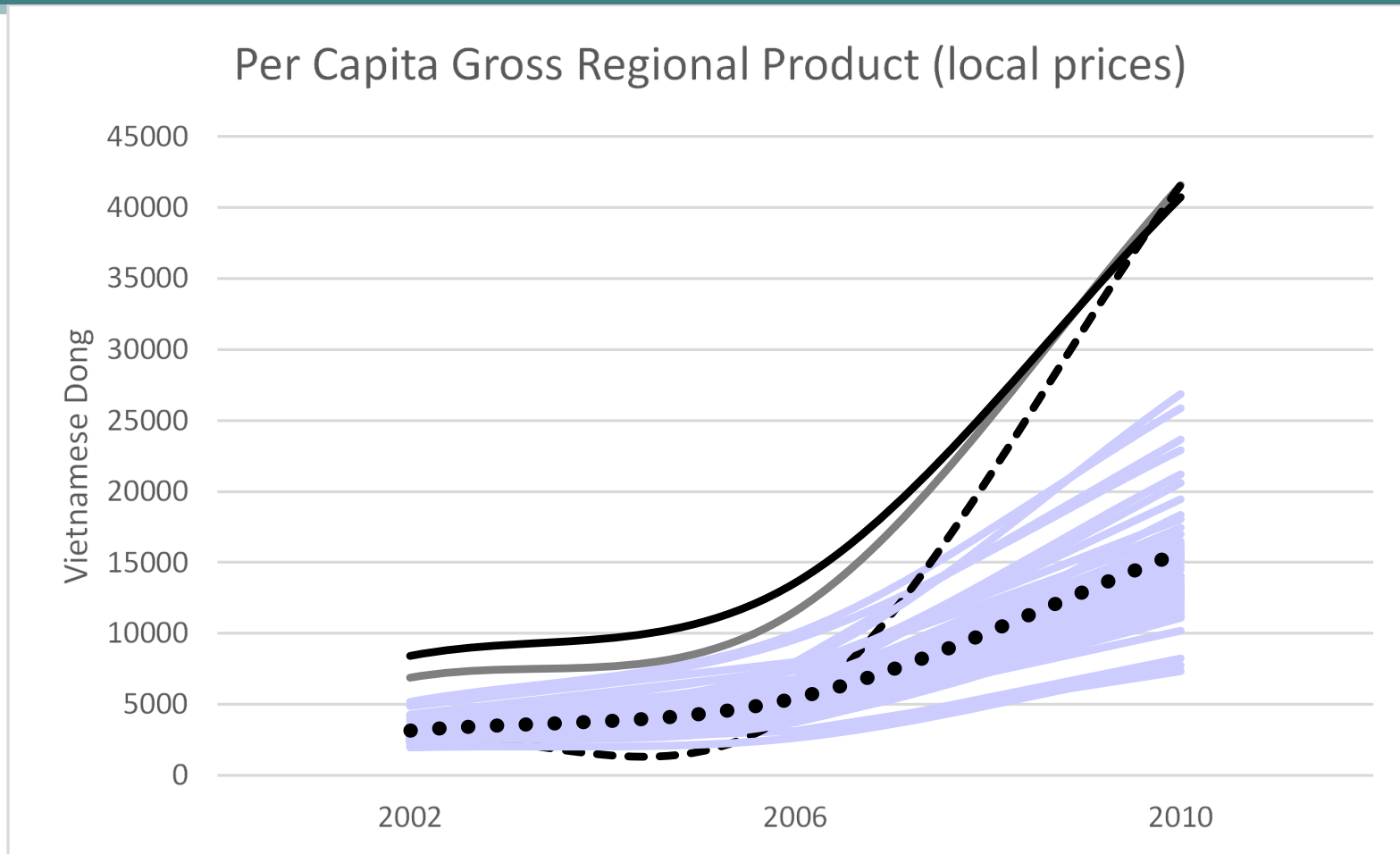
Figure 1: Per Capita Gross Regional Product (local prices)

Source: Authors' calculations based on VHLSS 2002, 2006 and 2010.

Note: The black line represents HCM, the grey line Ha Noi, the dashed line Ha Tay and the large dotted line Viet Nam.

•**Disparity in income growth within provinces is widening. There is a strong positive correlation between in-migration and provincial per capita income.**

Background: Literature

• Structural change leads to productivity and growth. From 1990-2005 Asian countries experienced 3.9% labour productivity growth, of which 16% can be attributed to structural change. (McMillian and Rodrick, 2011)

• In Viet Nam, 5.1% growth in labour productivity during same period, 38% can be attributed to structural change. (McCaig and Pavcnick, 2013)

•Vietnam's reforms are not pro-poor but have created a peasant class differentiation (Akram-Lodhi, 2004 & 2005).

•Private lease of agricultural land, opening up for exports contributed rice yield to increase from 3.33 to 4.90 tons per hectare during 1992-2006. (Benjamin et al, 2009)

• Rice is primarily grown in the south and RRD, the rest of the north and central highlands grow vegetables and beans. (Benjamin et al, 2009)

• Structural change and growth accelerated in the 2000s compared to 1990s. (McCaig and Pavcnick, 2013)
- Younger cohorts directly entering manufacturing or services.
- Workers leaving agriculture at a faster rate
- Internal migration

Background: Literature

• Heterogeneity in rate of structural transformation among regions and within provinces. Regions closer to seaports experienced rapid move into manufacturing through industrial zones. (McCaig and Pavcnick, 2013)

• Wages have steadily grown in the manufacturing sector and returns in Agriculture have improved. (McCaig, Benjamin and Brandt, 2015)

• Despite structural transformation being heterogeneous, dividends of growth spread throughout country (Vietnamese academy of social sciences, 2011): in the North West for example, poverty rate dropped 35 percentage points over 15 years from 1993.

• Income inequality between regions and urban and rural areas is declining, but inequality in income along ethnic lines is increasing. (McCaig, Benjamin and Brandt, 2015)

Data

- **Vietnam Household Living Standards Surveys (VHLSS) – 2002, 2006, 2010**
  Conducted by GSO, Viet Nam; based on the World Bank LSMS

- **Nationally representative**
  - Stratified geographically.
  - Smallest unit of analysis is the commune. The communes are drawn from the 1999 census (for 2002 and 2006 VHLSS) and 2009 census (for the 2010 VHLSS). -
  - The highest level is the region (not recorded in survey), which is made up of provinces, which is the aggregation of districts, and then communes.
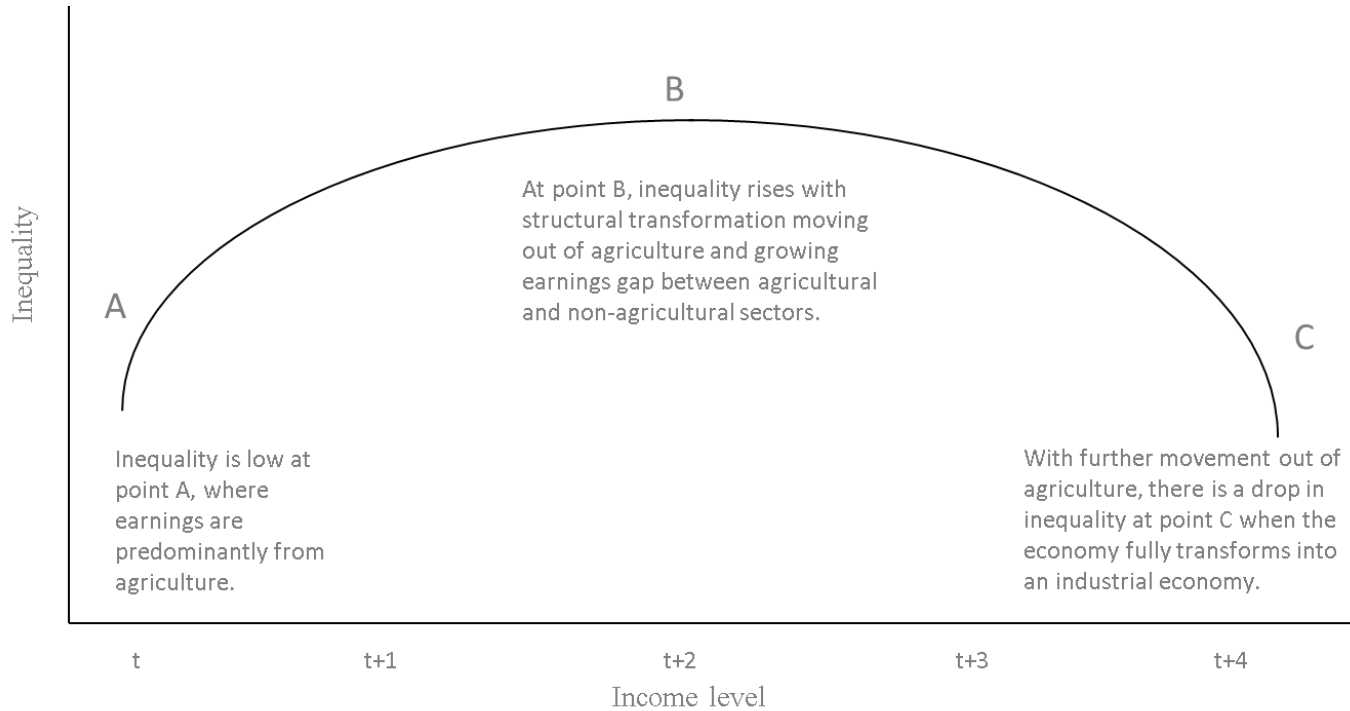
- **Unit of analysis—the household**
  - Household membership is defined on physical presence: individuals must east and live with other members for at least 6 out of past 12 months, and contribute to collective income and expenses.

Dep var: Gini	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log PCHHE	0.023***	0.048***	0.057***	0.034*	0.041	0.054	0.057***	0.063***	0.064***	0.068***	0.064***	0.076***
	(0.004)	(0.012)	(0.015)	(0.017)	(0.033)	(0.032)	(0.013)	(0.012)	(0.011)	(0.016)	(0.016)	(0.020)
Net Migration				-0.012*	-0.013	-0.013						-0.003
				(0.005)	(0.009)	(0.009)						(0.020)
Log domestic remittance						-0.019	-0.016	0.000				
						(0.013)	(0.008)	(0.008)				
Log foreign remittance									-0.009***	-0.009***	-0.006**	
									(0.002)	(0.002)	(0.002)	
Skilled agricultural worker										39.158*	34.862	49.721*
										(18.983)	(19.588)	(23.156)
Skilled manufacturing worker										38.983*	34.676	49.399*
										(18.988)	(19.596)	(23.153)
Professional										39.377*	35.073	49.911*
										(18.988)	(19.606)	(23.176)
Unskilled worker										39.203*	34.898	49.737*
										(18.989)	(19.593)	(23.168)
Year dummies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region dummies		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual and HH controls										✓	✓	✓
Constant	0.108**	-0.085	-0.131	0.041	0.033	0.055	-0.057	-0.234*	-0.194	-0.238	-0.290	-0.499**
	(0.038)	(0.120)	(0.142)	(0.168)	(0.304)	(0.307)	(0.121)	(0.111)	(0.108)	(0.157)	(0.161)	(0.186)
Number of observations	192	192	128	128	64	64	192	192	192	192	192	128
R2	0.138	0.430	0.480	0.508	0.431	0.444	0.442	0.536	0.536	0.633	0.600	0.702

Note: *** p<0.001, ** p<0.01, * p<0.05. Robust standard errors in parentheses.

•**Rising provincial income widens income inequality, this effect is robust to alternate specifications and is statistically significant. Foreign remittances reduce inequality while widening occupation skills composition contributes to widening income inequality.**

Growth and income inequality: Kuznet's curve

B

At point B, inequality rises with structural transformation moving out of agriculture and growing earnings gap between agricultural and non-agricultural sectors.

A

C

Inequality is low at point A, where earnings are predominantly from agriculture.

With further movement out of agriculture, there is a drop in inequality at point C when the economy fully transforms into an industrial economy.

Adapted from: Paul, 2016

Inequality

t   t+1   t+2   t+3   t+4

Income level

• Empirical studies on the Kuznet's curve do not have consensus (Gallup, 2012)

• We know less about why or why not an economy fits the Kuznet's curve. Partly because we do not know who is moving where as part of the structural transformation.

• Using a dual economy framework introduced in Paul (2016) , we try to empirically explain heterogeneities in structural transformation across the income distribution.

Growth Incidence Curve (GIC)

GIC indicates the growth rate in income between two points in time at each percentile of the distribution $g(p) = \frac{\Delta y(p)}{y_0(p)} = \frac{y_1(p)}{y_0(p)} - 1$ (Ravallion and Chen, 2003); We use 20 percentiles in this paper.
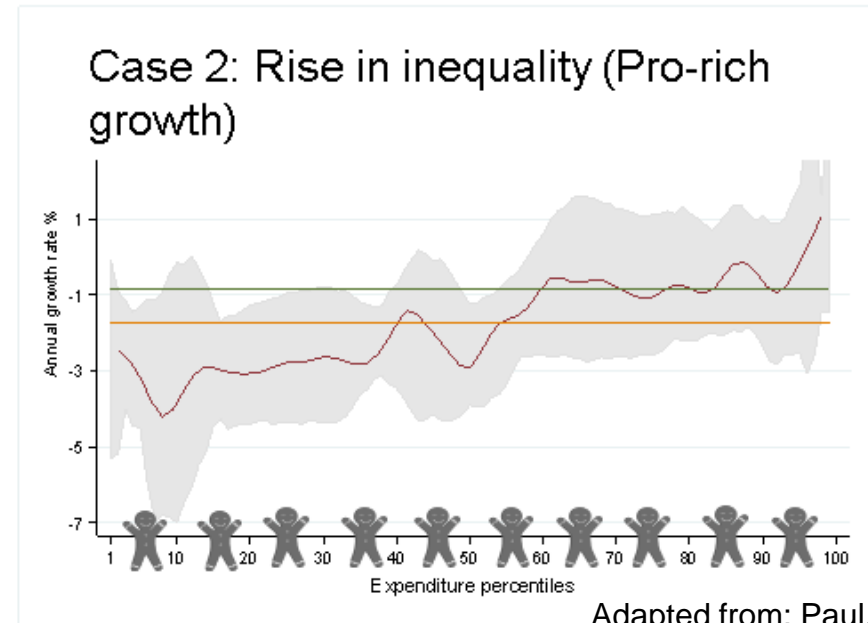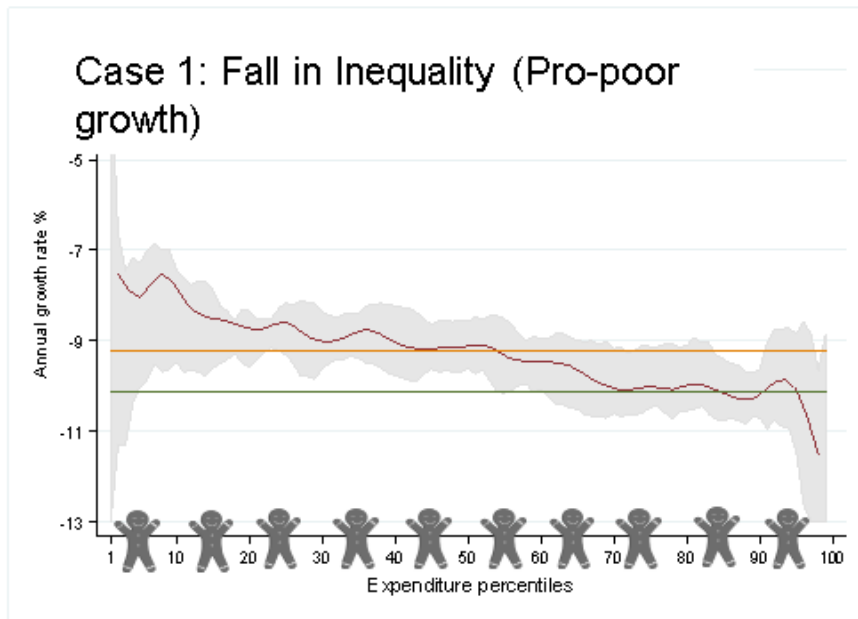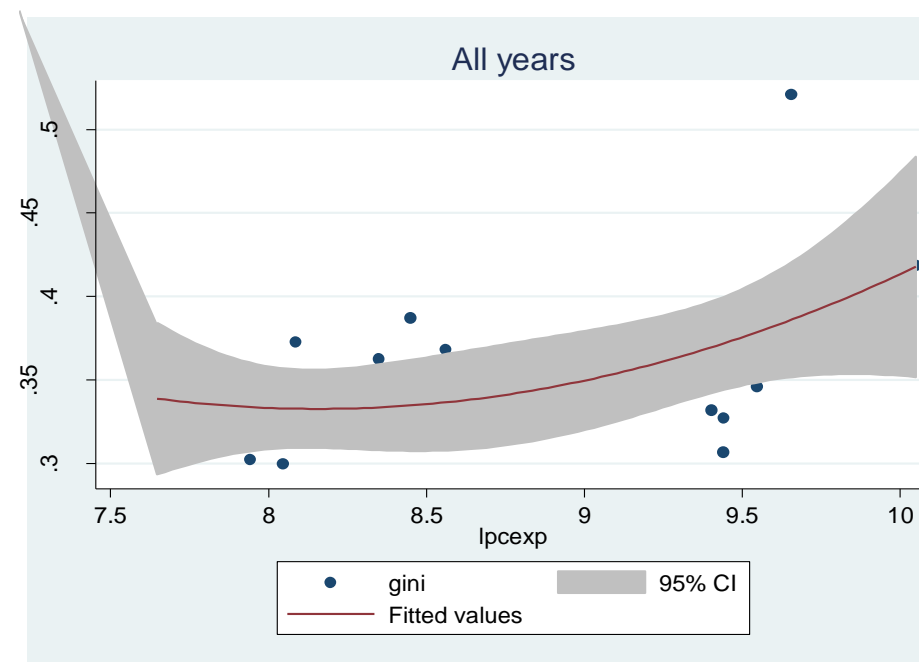

Adapted from: Paul, 2016

The GIC ignores income mobility by assuming that only post-growth income matters in social welfare.

Sectoral participation by income quantile

Source: VHLSS 2002, 2006, 2010; Authors' calculations
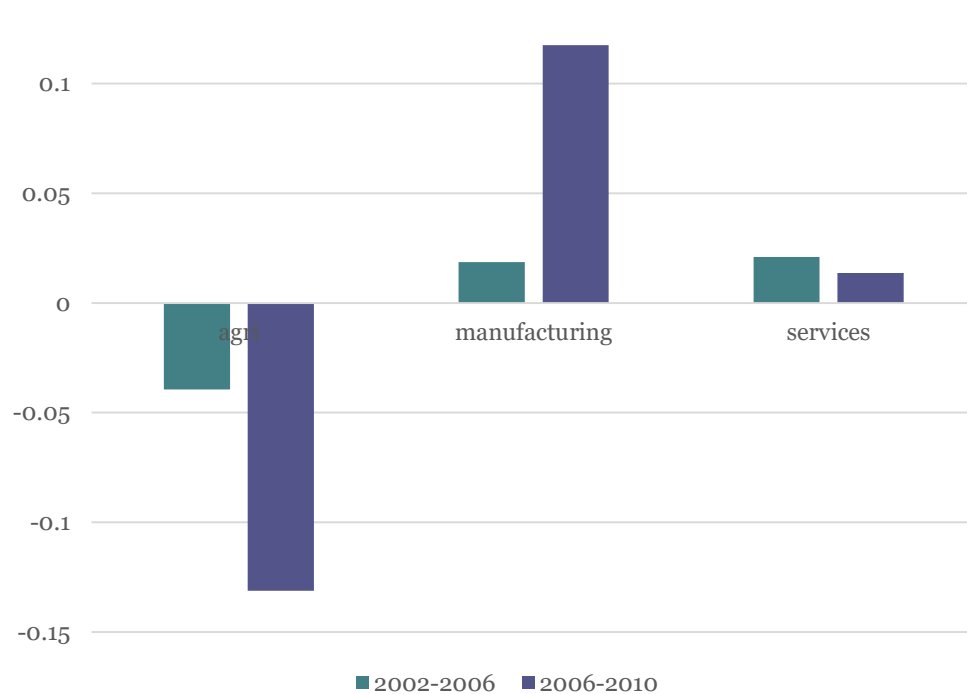
•There is evidence of structural transformation in Viet Nam, and it is accelerating. Employment is moving from agriculture to (largely) manufacturing. There is also evidence of increasing income (consumption) inequality across the years, especially steep in 2010.

RIF (Re-centred influence function)

- **Decomposition of changes in income at each quantile.**

- **Oaxaca-Blinder Decomposition:**
  - Assumes two groups with a simple linear model for each group.
  - The difference between the two groups can be decomposed into structure and composition effects.

      Drawbacks:
  - Misspecification can mislead classification into structure or composition effects.
  - Focus is only on mean.

- **Machado-Mata methodology**
  - Numerically integrate conditional quantile regressions.
  - Allows to analyse change along income distribution.

  Drawbacks:
  - Cannot decompose effects into structure and composition effects.
  - Intensive simulation.

RIF (Re-centred influence function)

- **Firpo, Fortin and Lemieux (2009) → RIF**

  - Two stage application:

  1) Divide overall change in income (consumption) growth into structure and composition effects using reweighting

  2) Estimate each of these effects: overall, structure and composition, on a set of explanatory variables to identify contribution of each of those explanatory variables on these effects.

RIF (Re-centred influence function)

- **Firpo, Fortin and Lemieux (2009) → RIF**

- Collecting the leading terms of a von Mises (1947) linear approximation of the associated functional, the rescaled influence function of the pth quantile of the distribution of y can be written as

- $RIF(y;\ q_p) = q_p + IF(y;\ q_p) = q_p + \dfrac{[p - I(y \le q_p)]}{f_y(q_p)}$

- The RIF regression for the pth quantile of the distribution of income (y):

- $RIF(y;\ q_p) = \beta_0 + \beta_1 Agri + \beta_2 MAN + X'\gamma + \varepsilon$

- where the unconditional or marginal quantile $q_p = \int E\big[RIF(y;\ q_p, F_y)\big|X\big]dF(X)$

- We consider agriculture to manufacturing to be the main channel of structural transformation.

Table: OLS Regressions

Dep: lpchhexp	2002	2006	2010	Pooled
Sector-Agriculture	-0.187***	-0.175***	-0.039	-0.117***
	(0.014)	(0.018)	(0.021)	(0.011)
Sector-Manufacturing	-0.102***	-0.131***	-0.096***	-0.111***
	(0.017)	(0.021)	(0.023)	(0.013)
Skilled agricutlure occupation	0.165***	0.24***	0.125***	0.134***
	(0.019)	(0.029)	(0.019)	(0.013)
Skilled manufacturing occupation	0.098***	0.082***	0.185***	0.127***
	(0.018)	(0.022)	(0.021)	(0.013)
Professional	0.234***	0.266***	0.391***	0.32***
	(0.02)	(0.023)	(0.024)	(0.014)
Log land size	-0.022***	-0.025***	-0.027***	-0.026***
	(0.001)	(0.002)	(0.002)	(0.001)
HHSize	0.017***	0.011	-0.012*	0.009**
	(0.004)	(0.006)	(0.006)	(0.003)
Married (Yes=1)	0.041*	0.034	0.048	0.035**
	(0.016)	(0.021)	(0.025)	(0.013)
Secondary ed. (Yes=1)	0.118***	0.197***	0.215***	0.177***
	(0.01)	(0.014)	(0.014)	(0.008)
Higher ed. (Yes=1)	0.315***	0.428***	0.433***	0.402***
	(0.014)	(0.018)	(0.019)	(0.011)
Ethnicity	0.201***	0.251***	0.455***	0.292***
	(0.014)	(0.02)	(0.019)	(0.01)
No. of children	-0.143***	-0.153***	-0.157***	-0.151***
	(0.005)	(0.007)	(0.008)	(0.004)
More than one adult male (Yes=1)	0.027	0.006	0.051	0.031
	(0.022)	(0.03)	(0.033)	(0.018)
More than one adult female (Yes=1)	-0.143***	-0.249***	-0.08	-0.146***
	(0.037)	(0.057)	(0.046)	(0.03)
Region-Red River Delta	-0.179***	-0.141***	0.302***	-0.03**
	(0.014)	(0.018)	(0.025)	(0.011)
Region-North East	-0.115***	-0.143***	0.053**	-0.051***
	(0.015)	(0.019)	(0.019)	(0.011)
Region-North West	-0.149***	-0.121***	-0.038	-0.1***
	(0.025)	(0.03)	(0.022)	(0.015)
Region-North Central Coast	-0.292***	-0.349***	-0.059**	-0.233***
	(0.015)	(0.02)	(0.02)	(0.011)
Region-Central Highlands	-0.157***	-0.116***	-0.052*	-0.104***
	(0.015)	(0.02)	(0.022)	(0.011)
Region-South Central	-0.096***	-0.01	0.19***	0.043**
	(0.019)	(0.025)	(0.023)	(0.014)
Region-South East	0.247***	0.3***	0.321***	0.291***
	(0.019)	(0.022)	(0.025)	(0.013)
Year 2006				0.456***
				(0.007)
Year 2010				1.408***
				(0.008)
Constant	8.261***	8.779***	9.167***	8.095***
	(0.045)	(0.068)	(0.056)	(0.035)
R-Squared	0.427	0.498	0.518	0.736
Observations	19,648	7,984	8,127	35,759

•Employment in agriculture and manufacturing reduce per capita household income (expenditure) by about 11%-12% on average compared to employment in the service sector.

•However, households with skilled agricultural and manufacturing workers, on average, experienced 12%-13% high per capita income.

•There is also some evidence to suggest that land holding adversely affects per capita household income, but this result is likely to be driven by non-agricultural high-wage employment.
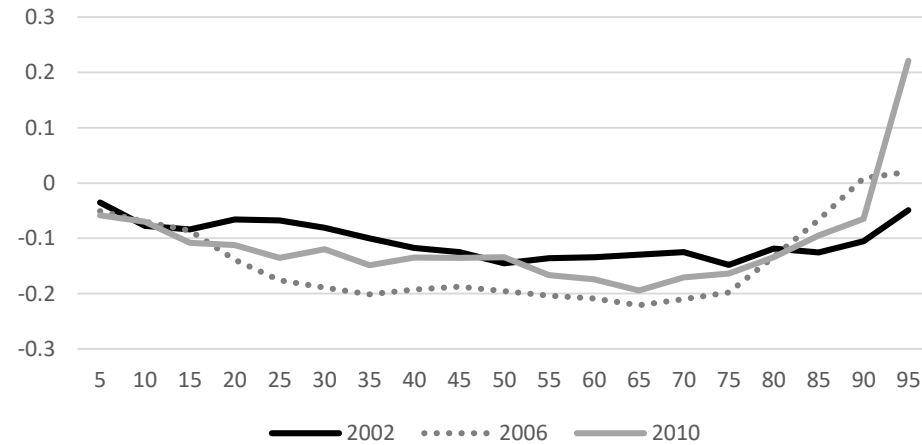
•There is also strong evidence to suggest households in the South East had higher per capita income than the rest of the region, the magnitude is also statistically large.

Unconditional Quantile Regression (RIF) Coefficients

RIF-Coefficients of Agri
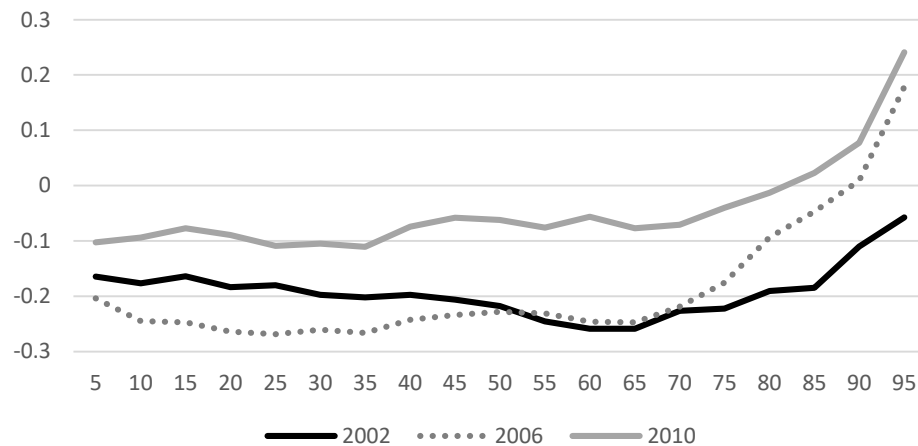
RIF-coefficients for Manufacturing

- Returns to agriculture and manufacturing negative across the income distribution for 2002.

- Returns to both agriculture and manufacturing improve for those in top 20 percentiles and top 10 percentiles, respectively in 2010.

- Both sectors indicate a pro-rich growth.

- Returns to manufacturing are less volatile than returns to agriculture across the years.

Generalized Oaxaca-Blinder decomposition UQR (based on RIF)

- Let $F_{y_0|t=0}$ stand for the distribution of the (potential) outcome y_0 for individuals in period 0. Write any distributional statistic (quantile) associated with this as: $\theta(F)$

- Use the counterfactual for period 1 to obtain the following aggregate decomposition

- $$\Delta^{\theta}_{Overall} = \left[\theta\left(F_{y_1|t=1}\right) - \theta\left(F_{y_0|t=1}\right)\right] + \left[\theta\left(F_{y_0|t=1}\right) - \theta\left(F_{y_0|t=0}\right)\right]$$

- The generalized Oaxaca-Blinder decomposition (Fortin, Lemieux and Firpo, 2010)

$$\Delta^{\theta}_{Overall} = E(X|t=1)(\beta^{\theta}_1 - \beta^{\theta}_C) + E(X|t=1)\beta^{\theta}_C - E(X|t=0)\beta^{\theta}_0$$

- The linear RIF-regressions of the pth quantile of the distribution of y is estimated by replacing y with the estimated value of $\widehat{RIF}(y;\ q_p)$

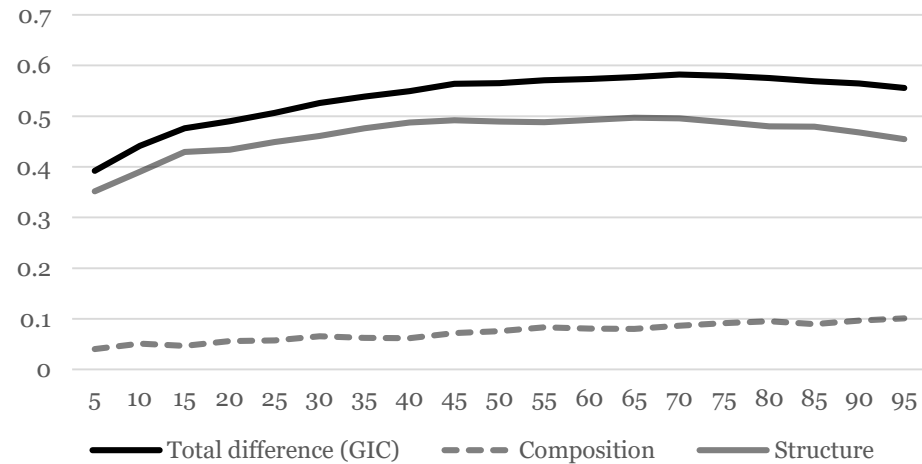- Structure Effect $= E(X|t=1)^T.(\hat{\gamma}^{q_p}_1 - \hat{\gamma}^{q_p}_C)$
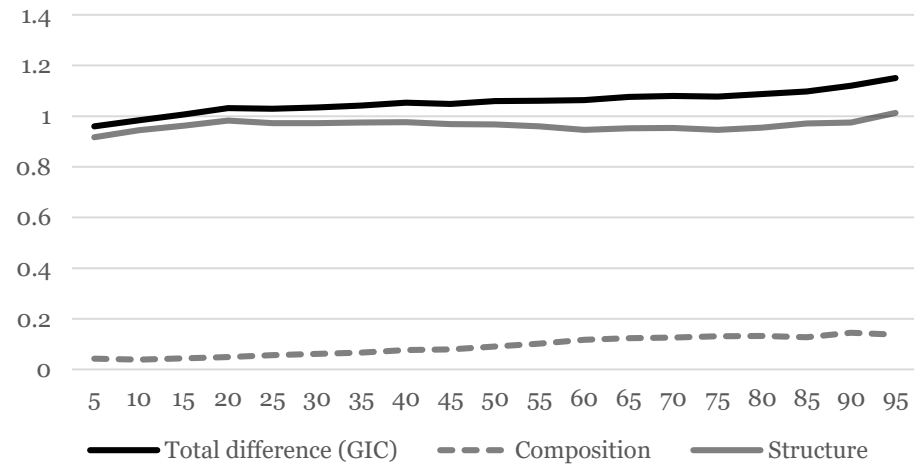- Composition Effect $= E(X|t=1)^T.\hat{\gamma}^{q_p}_C - E(X|t=0)^T.\hat{\gamma}^{q_p}_0.$

Unconditional Quantile Regression (RIF) Coefficients
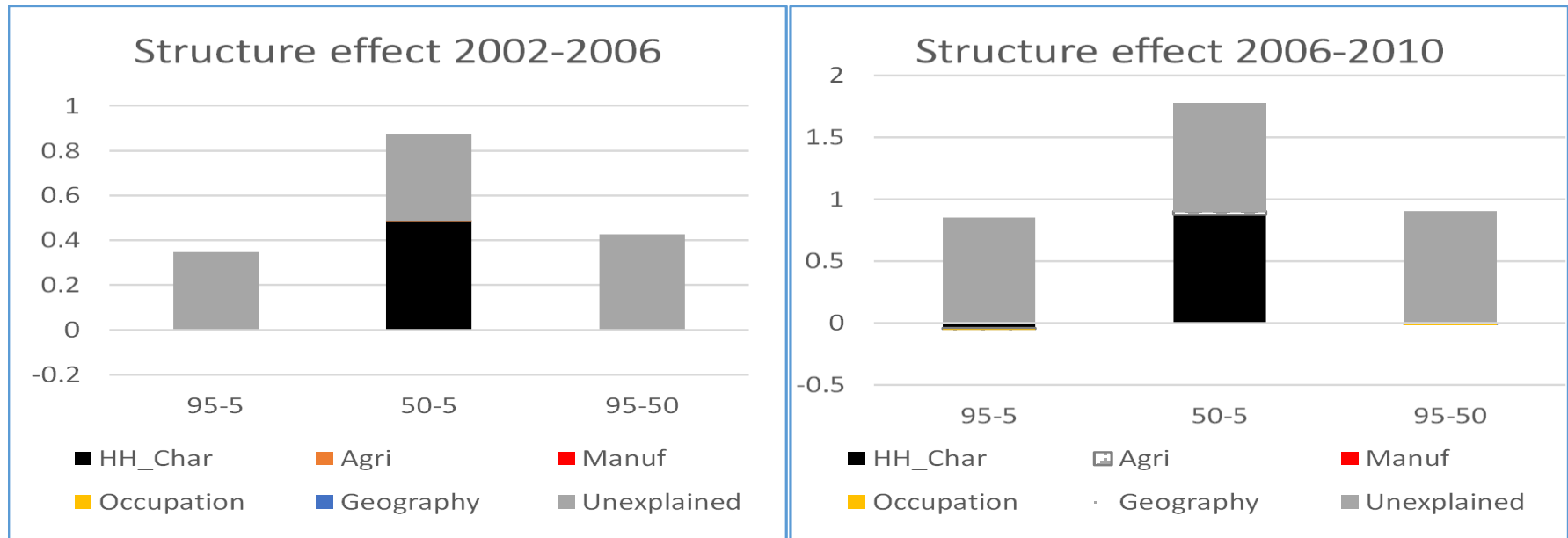

Total Decompostion: 2002-2006

Total decomposition: 2006-10

•Much of the variance in growth is explained by structural factors across both time periods.

Unconditional Quantile Regression (RIF) Coefficients

Appendix I: Decomposition of structure effect.

Source: Authors' calculations based on VHLSS 2002, 2006 and 2010

• We do not find that structural transformation explains the structural effects. Structural transformation contributes less than 1% in explaining structural effects, but contributes more significantly in explaining composition effects (not presented here for brevity).

• Residual, which measures the unexplained part of the structure effect is responsible for much of the effect in both periods.

Concluding Remarks

- **Returns to agriculture and manufacturing**
    - Returns to agriculture and manufacturing are positive for the rich (top 10 to 20th percentile).
    - Returns to agriculture and manufacturing are negative for the others, however, the rate is narrowing.
    - Growth in Viet Nam currently exhibits pro-rich growth.

- **Decomposition effects**
    - Growth in Viet Nam can mostly be explained by structural effects.
    - For the bottom half of the income distribution , structural effects are influenced partly through household characteristics—including ethnicity.
    - Structural transformation does not sufficiently explain structural effects and thus income inequality.

- **Geographical heterogeneity**
    - Evidence of some heterogeneity in both sectoral participation and income inequality across regions and provinces.
    - Geospatial heterogeneities are likely to be highly correlated with ethnic composition of minorities in highly agrarian rural areas (McCaig, Benjamin and Brandt, 2015)

Policy Implications and future work

- While there is some evidence in the literature that growth has trickle-down effects on Viet Nam as a whole, there is also evidence that inequality is increasing as a result of the rising incomes.

- While labour productivity in agriculture is improving, returns to agriculture are only positive for the rich. This may partly be due to improvements in technology that yield better productivity at the expense of human employment.

- The government may therefore need to devise targeted policies that aim to improve the skills and returns to skills for the lower income quantiles and perhaps develop non-farm based activities for non-coastal areas.

- There is some similarities in the growth between Viet Nam and China and therefore, it may be important to address regional (and ethnic) differences for a more inclusive growth.

- As part of future work, we hope to include more time periods and also look at the regional and ethnic dimensions in explaining differences in growth through structural transformation in Viet Nam.

Picture Courtesy:
BBC/Getty Images

Thank you !

Descriptive statistics

	2002	2006	2010
Observations	19,648	7,984	8,127
HHSize	4.506	4.294	3.975
	(1.729)	(1.631)	(1.520)
Log Land	6.174	6.304	5.864
	(3.884)	(3.741)	(3.945)
Ethnicity	2.036	2.22	2.371
	(3.724)	(4.270)	(4.343)
Age of Head	44.542	46.646	45.559
	(12.054)	(11.629)	(12.173)
Gender of Head (Male=1)	0.8	0.789	0.79
	(0.400)	(0.408)	(0.407)
Married (Yes=1)	0.863	0.859	0.86
	(0.344)	(0.348)	(0.347)
Secondary ed (Yes=1)	0.42	0.427	0.419
	(0.494)	(0.495)	(0.493)
Higher ed (Yes=1)	0.208	0.227	0.245
	(0.406)	(0.419)	(0.430)
Years of schooling of head	6.963	7.212	7.341
	(3.547)	(3.556)	(3.615)
No. of children	1.896	1.573	1.365
	(1.330)	(1.231)	(1.123)
Male adults	1.259	1.317	1.263
	(0.731)	(0.756)	(0.710)
Female adults	1.351	1.403	1.348
	(0.679)	(0.699)	(0.671)
lpchhexp	7.949	8.463	9.495
	(0.595)	(0.636)	(0.689)

	2002	2006	2010
Observations	19,648	7,984	8,127
Agriculture	0.605	0.566	0.434
	(0.489)	(0.496)	(0.496)
Manufacturing	0.154	0.173	0.29
	(0.361)	(0.378)	(0.454)
Wholesale, Retail, Transport	0.151	0.157	0.162
	(0.358)	(0.364)	(0.368)
Other Services	0.089	0.105	0.114
	(0.285)	(0.306)	(0.318)
Leaders	0.021	0.03	0.022
	(0.144)	(0.170)	(0.146)
Professionals	0.084	0.097	0.194
	(0.277)	(0.297)	(0.395)
Skilled agri worker	0.05	0.042	0.107
	(0.217)	(0.201)	(0.309)
Unskilled agri worker	0.546	0.518	0.397
	(0.498)	(0.500)	(0.489)
Skilled manufacturing worker	0.112	0.126	0.184
	(0.315)	(0.332)	(0.388)
Unskilled other	0.184	0.183	0.096
	(0.387)	(0.387)	(0.295)

Descriptive statistics

	2002	2006	2010
Observations	19,648	7,984	8,127
Region-Red River Delta	0.22	0.205	0.18
	(0.414)	(0.403)	(0.384)
Region-North East	0.158	0.151	0.167
	(0.365)	(0.358)	(0.373)
Region-North West	0.037	0.052	0.076
	(0.190)	(0.222)	(0.264)
Region-North Central Coast	0.115	0.112	0.109
	(0.319)	(0.315)	(0.312)
Region-Central Highlands	0.093	0.095	0.071
	(0.290)	(0.293)	(0.257)
Region-South Central	0.059	0.068	0.09
	(0.236)	(0.252)	(0.287)
Region-South East	0.115	0.121	0.109
	(0.319)	(0.326)	(0.311)
Region-Mekong River Delta	0.202	0.196	0.199
	(0.402)	(0.397)	(0.399)