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Structural Transformation, Biased Technological Change and Employment in Vietnam

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Abstract Employment in Vietnam and elsewhere in Asia has grown more slowly than GDP over the last several decades. This means GDP per capita is rising. Vietnamese policymakers, however, are concerned that ongoing structural transformation is creating too few jobs. We use data for seven aggregated sectors and the overall Vietnamese economy to examine the roles played by structural transformation, technical change and institutional bias towards capital-intensive development to evaluate the Vietnamese development experience. We find that while some of the difference between GDP and employment growth can be attributed to capital-intensive investment by the state, the majority of the difference is because of technical change. A positive rather than pessimistic overall assessment is warranted based on the available evidence.

L'emploi au Vietnam et ailleurs en Asie a augmenté plus lentement que le PIB au cours des deux dernières décennies. Même si cela signifie que le PIB par habitant est en hausse, les décideurs vietnamiens craignent que la transformation structurelle en cours ne se traduise pas par une croissance de l'emploi assez rapide ni par suffisamment d'emplois de haute qualité. Alors qu'une partie de la différence avec la croissance du PIB peut être attribuée à l'investissement à forte intensité de capital effectué par l'Etat, la majorité de la différence se trouve être en raison de l'évolution technique lorsque l'on prend en compte de faibles élasticités de substitution, et de la main-d'œuvre qui augmente la partialité dans les changements techniques. Nous utilisons les données venant de sept secteurs agrégés et de l'économie vietnamienne dans sa totalité pour examiner les rôles joués par la transformation structurelle, le changement technique et la partialité institutionnelle envers le développement à forte intensité de capital, afin d'expliquer et d'évaluer l'expérience vietnamienne.

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Introduction

Between 2000 and 2011 GDP grew on average by 6.9 per cent per year in Vietnam, while employment increased at only 2.7 per cent per year. Two perspectives can be taken on these outcomes. On the one hand, employment has been growing faster than population, and even faster GDP growth allows for increasing per capita income. McCaig and Pavcnik (2013) argue that this is a case of successful development. On the other hand, prominent Vietnamese policymakers are concerned that employment growth has been too modest, and that slow employment generation, particularly in the modern sectors, causes slower wage growth, creation of too few high-quality jobs and serious underemployment problems, especially in rural areas. A study by Vietnam's labour ministry done with the ILO argues this case, and asserts that problems of employment generation are likely to increase in the future (MOLISA and ILO, 2010).

The authors of that report largely attribute 'slow employment growth' to inadequate structural transformation. They repeat the common though controversial argument that the Asian miracle as implemented in Vietnam is based on heavy capital investment with no technical change (for example, Kim and Lau, 1994; Krugman, 1994; Young, 1995; Collins and Bosworth, 1996). They raise the concern that development in Vietnam may have been excessively capital intensive, a characteristic particularly pronounced in investments made by state-owned and foreign-invested enterprises. High and growing minimum wages may in this line of thinking have fostered capital-intensive growth, working against Vietnam's comparative advantage as a labour-abundant, low-wage economy. The MOLISA/ILO (2010) study concludes that the investment structure and labour policies must be adjusted so that high value-added industries, and particularly private firms, can be better positioned to create more jobs.

We rely on data for seven aggregate sectors and the overall Vietnamese economy from 2000 to 2011 provided by GSO (2014) to examine the differences observed between employment and GDP growth. A decomposition framework is used to explore three hypotheses that might explain employment growth in Vietnam: (i) structural transformation; (ii) technological progress and (iii) excessively capital-intensive development. Two institutional biases that facilitate capital-intensive development are studied: (a) minimum wage policy that may distort the wage-rental ratio and (b) state as well as foreign investment that may be overly capital intensive. Our results show that only about one-third of the difference in employment and GDP growth is because of shifts from low- to higher-productivity sectors. The remaining two-thirds come from declining labour use per unit output that is also found in agriculture. Labour-augmenting technical change[1] is an important factor behind Vietnam's successful growth, and restructuring from capital-intensive state-owned enterprises is best seen as a missed opportunity, given very small changes in the state's employment share.

The next section explores further the context shaping ongoing debates on labour policy in Vietnam. The section after that reports our decomposition of employment growth, while the following section considers the impacts of biased technological change on employment. The penultimate section examines institutional biases – minimum wage policy and investment biases – that might influence employment growth. The final section concludes.

Context and Background

Three issues are examined here that relate to Vietnam's recent structural transformation and employment growth. First, Vietnam's recent economic history is explored. Next, its performance is compared with outcomes in other Asian economies. How this experience relates to literature on what is behind the Asian miracle is then considered.

Structural Transformation

For the past two decades Vietnam has experienced rapid GDP growth. Table 1 presents the sectoral composition of GDP and employment in Vietnam for 2007, as well as sectoral growth rates from 2000 to 2007 and 2007 to 2011 (GSO, 2014).[2] This division was chosen to reflect slowdowns in economic growth in Vietnam and elsewhere following the global recession (Abbott and Tarp, 2012). State intervention in reaction to the great recession may have influenced employment trends. Sectoral employment shares and sectoral employment growth rates are also reported. The table clearly reflects a case of structural transformation at work. From 2000 to 2007 GDP grew at 7.5 per cent per year. Agriculture grew at 3.7 per cent, while manufacturing grew at

Table 1: GDP and employment in Vietnam

	2007		*2000–2007*	*2007–2011*
	Trillion Dong	*Share – %*	*Growth – %/year*	
GDP	461	—	7.5	5.9
Agriculture	83	18	3.7	3.3
Manufacturing	113	25	11.2	7.0
Construction	43	9	10.4	4.7
Infrastructure services	106	23	7.1	7.4
Education & health	22	5	7.4	6.9
Energy & natural resources	38	8	6.2	4.2
Other services	57	12	6.6	6.0
	Million Persons			
Employment	45.2	—	2.6	2.7
Agriculture	23.9	53	–0.3	0.4
Manufacturing	5.7	13	6.7	5.2
Construction	2.4	5	11.8	7.7
Infrastructure services	7.4	16	3.5	5.7
Education & health	1.9	4	6.3	3.8
Energy & natural resources	0.4	1	3.1	–0.1
Other services	3.6	8	15.2	2.5

Source: GSO (2014).

11.2 per cent, construction at 10.4 per cent and various services at over 6.6 per cent per year. The slower GDP growth from 2007 to 2011, at 5.9 per cent per year, brought greater reductions in manufacturing (to 7.0 per cent) and construction growth (to 4.7 per cent) than for agriculture (to 3.3 per cent). From 2000 to 2007, employment in agriculture actually declined, while manufacturing employment increased at 6.7 per cent and construction at 11.8 per cent. While slower GDP growth after 2007 brought slower employment growth in manufacturing and especially construction, employment growth in lower-productivity agriculture and some service sectors increased, and hence overall employment growth held roughly constant. Thus, problematic structural transformation appears to be a smaller issue after 2007 than before. Differences in value added versus employment growth rates are noticeable for agriculture and manufacturing and in some services but not elsewhere. Infrastructure services (transportation, communications, hotels and tourism, and wholesale and retail trade) exhibit slower employment growth, whereas other services (professional and public services) have shown rapid employment growth, especially after 2007.

Figure 1 compares labour productivity across sectors in Vietnam. It shows the typically large differences in productivity levels, with manufacturing and construction yielding the highest productivity rates, while productivity in agriculture is much lower. In addition to showing sectoral differences, Figure 1 also demonstrates that productivity has been improving steadily in most sectors in Vietnam, averaging 4.2 per cent per year from 2000 to 2011. In contrast to a simplistic structural transformation story, agricultural productivity has been improving at 3.6 per cent per year. Manufacturing productivity also grew at 3.6 per cent per year. The faster growth for overall productivity reflects in part sectoral share changes towards higher-productivity activities, but may also capture capital-labour substitution or biased technical change.

Investment accounted for 34–42 per cent of Vietnam's GDP in 2000–2011, but investment efficiency is relatively low, suggested by high incremental capital-output ratios, especially after 2007 (GSO, 2014). In addition to lowering employment growth, capital-intensive development may have contributed to sluggish restructuring of the economy from rural to urban areas, from

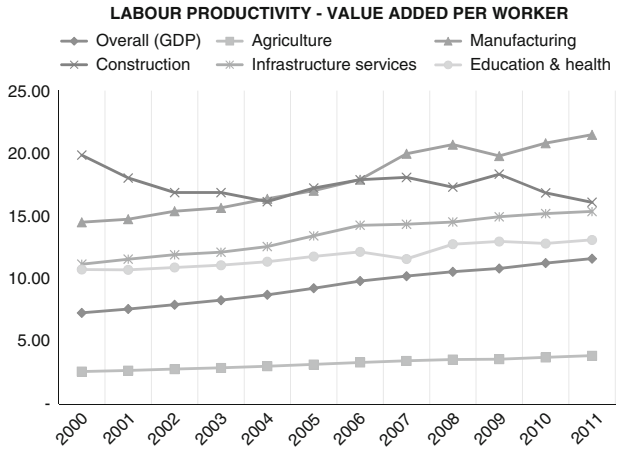

Figure 1: Sectoral labour productivity in Vietnam.
Source: GSO (2014).
Notes: Real value added per worker is measured in million dong (at 1994 prices) per year.

agriculture to manufacturing, and from public to private firms, resulting in slower than desired labour migration out of sectors where productivity is low (MOLISA and ILO, 2010).

International Comparison

While Vietnam is in some ways unique, the above trend in labour demand relative to GDP growth is found throughout East Asia. Table 2 compares several Asian countries. The elasticity of labour demand (employment) growth due to GDP growth around 2006–2008 was 0.32 in Vietnam, while it was around 0.1 in faster-growing China. Values for Thailand and South Korea are also lower than in Vietnam in recent years. Estimates very similar to those for Vietnam are found in several other East Asian countries. This measure is used by the ILO to reflect concerns similar to those voiced in Vietnam on employment generation (Kapsos, 2005), and is coupled with the concern that development may be overly capital intensive throughout Asia.

Global trends in GDP and employment growth have inspired a recent literature on 'premature deindustrialization' (Rodrik, 2015). The second step in structural transformation, following a first shift from agriculture to manufacturing, is the move from a manufacturing-based economy to greater emphasis on services, where wages are often lower. The proponents of premature deindustrialization see this happening sooner and at lower GDP per capita in East Asia and in recently developing countries than was the case for the now developed economies. While Vietnam, given its sustained manufacturing employment growth, is not at this point counted among the most problematic cases, the pessimistic perspective among its proponents reflects concerns that this may be an issue in the future.

Technical Change and the Asian Miracle

The role of technological progress during the course of Vietnam's development in the past two decades tends in our assessment to be discounted. According to MOLISA and ILO (2010), total

Table 2: Real GDP growth and employment growth in selected Asian countries, 1986–2008

Country	*1986–1990*	*1991–1995*	*1996–2000*	*2001–2005*	*2006–2008*
	Gap between real GDP growth and employment growth (%)				
China	5.7	11.0	7.5	8.6	10.5
Korea, Republic	6.4	5.6	3.4	3.4	3.5
Thailand	7.7	8.3	−0.4	3.4	3.1
Indonesia	4.6	5.5	−1.9	2.7	4.2
Philippines	2.0	−0.9	1.7	2.0	3.3
Vietnam	2.7	6.4	4.7	5.7	5.0
	Elasticity of labour demand with respect to real GDP[a]				
China	0.28	0.11	0.13	0.1	0.06
Korea, Republic	0.33	0.29	0.25	0.24	0.16
Thailand	0.25	0.04	1.58	0.33	0.25
Indonesia	0.35	0.30	2.91	0.42	0.30
Philippines	0.57	1.42	0.58	0.55	0.40
Vietnam	0.53	0.28	0.30	0.27	0.32

[a]The elasticity of labour demand with respect to real GDP is calculated as the ratio between the percentage change in employment and the percentage change in real GDP, measuring the responsiveness of employment to economic growth.
Source: Calculated using data from World Bank (2013).

factor productivity (TFP) growth only accounted for 26 per cent of GDP growth, whereas capital accumulation contributed to more than 60 per cent of GDP growth. Previous studies such as ILSSA (2008) also found low TFP growth rates.

The role of technological progress during the course of economic growth in East Asia is controversial. Some economists (for example, Kim and Lau, 1994; Krugman, 1994; Young, 1995; Collins and Bosworth, 1996) maintain that East Asian growth is mainly because of capital accumulation and that technological progress is unimportant. Others (for example, World Bank, 1993; Pack and Page, 1994; Freeman, 1995; Rodrik, 1997; Nelson and Pack, 1999; Krüger *et al*, 2000) argue that technological progress, particularly labour-saving technological change, fuelled the extraordinary economic growth that constituted the 'Asian miracle'. Moreover, Rodrik (1997) explicitly points out that the low TFP growth rates found in most studies are problematic. They fail to incorporate biased technological progress in their calculations.

Employment Growth Decomposition

We now turn to employment growth decomposition to quantitatively analyse the respective contributions of biased technological change, structural transformation and institutional biases to employment growth for each sector and for the overall Vietnamese economy. The decomposition starts with a straightforward relationship that links employment, labour efficiency, sectoral output (value added) shares and economic output:

$$L_t = \sum_i L_{it} = \sum_i a_{Lit} S_{it} Y_t \tag{1}$$

where L_t is total employment at time t, which is the sum of sectoral employment L_{it} across the i sectors. a_{Lit} denotes the unit labour efficiency coefficient for sector i at time t, which is the ratio between labour used in sector i and output in sector i. S_{it} is the proportion of output in sector i in

total output at time t, and Y_t is the output (GDP) of the entire economy at time t. Differentiating equation (1) with respect to time gives:

$$\frac{dL_t}{dt} = \sum_i S_{it} Y_t \left(\frac{da_{Lit}}{dt}\right) + \sum_i a_{Lit} Y_t \left(\frac{dS_{it}}{dt}\right) + \sum_i a_{Lit} S_{it} \left(\frac{dY_t}{dt}\right) \tag{2}$$

Defining the growth rate of variable X as $gX=(dX/dt) \cdot (1/X)$, we turn equation (2) into growth rates as follows:

$$gL_t = \sum_i \frac{a_{Lit} S_{it}}{a_{Lt}} ga_{Lit} + \sum_i \frac{a_{Lit} S_{it}}{a_{Lt}} gS_{it} + gY_t \tag{3}$$

where $a_{Lt} = L_t/Y_t = \Sigma_i a_{Lit} S_{it}$, the overall labour-output ratio for the economy.

Equation (3) incorporates the factors that may contribute to slower than desired employment growth as discussed earlier. Biased technical change affects employment by altering input efficiency. Minimum wage policy may distort input-output ratios by altering relative input prices, and therefore relative factor intensities. Thus, the first term on the right-hand side of equation (3) measures the combined contribution of two effects – capital-labour substitution and technical change – both of which are incorporated in the changes in the labour-output coefficient (a_{Lit}). Structural transformation fundamentally influences sectoral output shares, with traditional sectors shrinking and modern sectors expanding. State investment policies direct resources to flow into specific sectors, and hence may change sectoral output shares, S_{it}, as well. The employment effects of both structural transformation and state investment policies are summarized in the changes in sectoral output shares, gS_{it}. Therefore, the second term in equation (3) measures the contribution of structural transformation and state investment bias to sectoral employment. If labour-output coefficients, a_{Lit}, and output shares, S_{it}, remain constant, one would observe the same growth rates for output and employment ($gL_t=gY_t$). The first two terms in equation (3) are weighted by relative sectoral labour efficiency and sectoral output.

To implement our decomposition we assembled annual data from the GSO website (2014) over the years 2000–2011 for both employment a (L_{it}) and sectoral output. The data were originally disaggregated at an 18-sector level. Since structural transformation mainly focuses on shifts between aggregate sectors, such as agriculture, manufacturing and services, we aggregated the data into seven sectors, mainly eliminating details in the service sectors. Among the seven economic sectors, there is an aggregate traditional sector (agriculture), a manufacturing sector, an energy and natural resources sector, and four service sectors (including construction). The row titled 'GDP' represents the overall economy.

The results of our employment growth decomposition analysis are presented in Table 3. Growth rates for sectoral output shares (gSi), sectoral employment, gLi, and labour productivity (labour – output ratios), gaLi, are reported for 2000–2007 and 2007–2011. The columns labelled 'BiasTech' are the contributions to labour employment growth because of improved labour productivity, and hence the components of the first term of equation (3). These may be because of technical progress or minimum wage bias. The column labelled 'StrCh' is the contribution because of sectoral share changes, and hence the components of the second term of equation (3). These may be because of structural transformation or investment bias. Further analysis is required to disentangle the contributions to employment growth from each potential explanation.

Table 3: Employment growth decomposition

	2000–2007 (%)						*2007–2011 (%)*					
Sectors	*gSi*	*gLi*	*gaLi*	***Bias Tech***	***StrCh***	*gY*	*gSi*	*gLi*	*gaLi*	***Bias Tech***	***StrCh***	*gY*
Agriculture	−3.7	−0.3	−4.1	−2.39	−2.20	—	−2.6	0.4	−2.8	−1.42	−1.34	—
Manufacturing	3.8	6.7	−4.6	−0.50	0.41	—	1.1	5.2	−1.8	−0.24	0.15	—
Construction	3.0	11.8	1.3	0.05	0.11	—	−1.1	7.7	2.9	0.17	−0.07	—
Infrastructure services	−0.4	3.5	−3.6	−0.57	−0.06	—	1.5	5.7	−1.7	−0.30	0.26	—
Education & health	−0.1	6.3	−1.1	−0.04	0.00	—	1.0	3.8	−3.1	−0.13	0.04	—
Energy & natural resources	−1.2	3.1	−3.1	−0.03	−0.01	—	−1.7	−0.1	−4.3	−0.04	−0.02	—
Other services	−0.8	15.2	8.6	0.45	−0.04	—	0.1	2.5	−3.5	−0.27	0.01	—
GDP (overall economy)	0.0	**2.63**	−4.8	**−3.01**	**−1.78**	**7.5**	0.0	**2.7**	−3.2	**−2.24**	**−0.96**	**5.90**

Source: Authors' calculations from data in GSO (2014).

From 2000 to 2007 employment growth is shown to be 4.8 per cent per year less than GDP growth, with reductions in labour use (gaLi) contributing 3.01 per cent and sectoral share changes 1.78 per cent. Hence, biased technological change and/or institutional wage bias are responsible for 63 per cent of the difference between GDP and employment growth, and structural transformation and/or state investment bias are responsible for the remaining 37 per cent. From 2007 to 2011, the difference between GDP and employment growth was 3.2 per cent, with labour productivity improvement contributing 2.24 per cent (70 per cent of this difference) and structural shifts adding 0.96 per cent (30 per cent of the difference). These results suggest that structural transformation explains at most about one-third of the growth rate differential.

The key sectors determining slower employment growth are agriculture, manufacturing, infrastructure services and construction. Because of its size and low labour productivity, changes in the traditional agricultural sector are the greatest factor in these calculations. Agriculture's sectoral output share fell at 3.7 per cent per year from 2000 to 2007, and labour productivity improved at 4.1 per cent per year, resulting in employment growth rate reductions of 2.2 and 2.4 per cent, respectively. From 2007 to 2011 these contributions were 1.34 and 1.42 per cent, once again with labour productivity improvements being a slightly greater factor than the declining share of agricultural output. For manufacturing, in each period increases in employment due to expanding sector shares are more than offset by improved labour productivity. That improvement was much faster, at 4.6 per cent per year in the earlier period than at 1.8 per cent in the latter period. For infrastructure services there is a mixed sectoral share story but productivity improvements during each period, with output share increases compensating for productivity improvement only in 2007–2011. Construction is the one sector for which labour productivity declined, at 1.3 per cent per year from 2000 to 2007 and 2.9 per cent per year from 2007 to 2011. Its output share increase in 2000–2007 (3.0 per cent) increased employment, but its output share decline from 2007 to 2011 (1.1 per cent) partially offsets the increasing demand for labour in this sector. Energy and natural resources take a large share of investment and output, mostly by state-owned enterprises, and that share is also shrinking. At the same time, the very small employment share for this sector makes its contribution to employment growth minimal. Other services, including professional and various public services, show declining sector shares from 2000 to 2007, and improving labour productivity after 2007.

Technological Change and Employment

One issue in interpreting the above employment and growth decomposition is to identify whether increasing labour productivity is because of capital-labour substitution or due to technical change. Moreover, technical change can be labour augmenting if productivity of labour grows faster than productivity of capital. While previous studies generally assumed Hicks-neutral technological change, critics of these studies point out that ignoring biased technological change may lead to underestimation of TFP growth (for example, Rodrik, 1997).

Estimation of substitution elasticities and of changing factor productivity (biased technical progress) is challenging because of the nature of the data used to estimate production functions. Figure 2 shows labour and capital productivity from 2001 to 2011 for the overall Vietnamese economy. It also shows real private wages, real interest rates and thus the wage-rental ratio over that same period. While rising wages and steadily rising labour productivity are evident, fluctuating real interest rates led to an erratic wage-rental ratio that rose significantly at the beginning of this period and is confused by negative real interest rates at the time of the global recession. While capital productivity was stagnant until 2008, it fell dramatically during and after the great recession, even as the wage-rental ratio moved back to its pre-recession levels. If these volatile relative factor prices are driving factor substitution, it is not evident in this data. More likely, long-run expectations of rising real wages may have helped the Vietnam transition to more efficient, albeit capital-intensive technologies. Assuming constant technical progress better fits this medium-term data, not only for the overall economy, but for most disaggregated sectors as well.

Econometric estimation of production functions using this type of data often leads to estimated elasticities of substitution not significantly different from zero and significantly different from one. Disentangling the elasticity of substitution estimate from biased technical progress requires an identifying assumption, typically a choice of functional form. We examine three alternatives in the set of CES models – Cobb-Douglas, Leontief and a general CES specification. In addition, it has been recognized that investment and growth may be determined simultaneously, introducing an identification problem (Levinsohn and Petrin, 2003). Estimation of factor demand equations, one of several approaches used to address these problems, may address that concern at least for labour demand. Estimation of disaggregated sectoral factor demands also reduces the likelihood of simultaneity in capital demand equations.

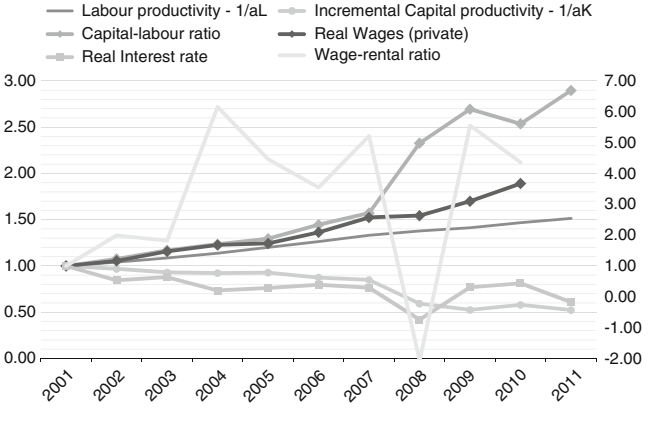

Figure 2: Factor prices, substitution and technical change in Vietnam.
Sources: GSO (2011, 2014); IMF (2013).
Notes: All variables are expressed as indices normalized to equal 1 in 2001.

Previous studies often used an accounting approach to calculate TFP growth under a Cobb-Douglas production function to avoid these same problems, and to identify TFP growth. In that approach, actual input cost shares are employed to measure the parameters of the production function. The broad results based on an accounting approach often seem reasonable, but they may hide potential weaknesses associated with the assumptions of the Cobb-Douglas production function. That production function is believed to be robust if similar results can be obtained from both accounting and econometric approaches. Results from econometric estimation can also test whether elasticities of substitution are indeed one, but must separately identify technical progress and factor substitutions because of changes in the wage-rental ratio.

To circumvent potential problems associated with biased technological change and the validity of the production functional forms assumed, the analyst can estimate productivity growth rates in factor demand equations, allowing both Hicks-neutral and factor-augmenting technological change, derived from Cobb-Douglas, CES and Leontief production functions, and using both accounting and econometric approaches. In our case, we use sectoral data from GSO (2009, 2010) to estimate productivity growth rates for 18 aggregated sectors and for the overall economy from 2000 to 2008. Detailed derivations and results are available in Abbott *et al* (2011). In this article, we report key results in Table 4 and discuss the lessons learned.

Accounting approaches based on the Cobb-Douglas production function are clearly the most common in the literature, and their application to the Vietnamese data leads to reasonable though somewhat low estimates of Hicks-neutral technical change, similar to results found for other Asian countries and by ILSSA (2008) for Vietnam. The econometric estimation of a Cobb-Douglas production function gives vastly different results for parameters that should equal costs

Table 4: Estimated sectoral elasticities of substitution and technical progress

Sector	*Elasticities of substitution*		*Technical progress (% per year for labour efficiency improvement)*				
	CES estimates		*Cobb-douglas*		*CES estimates*		
	Neutral	*Biased*	*Accounting*	*Estimated*	*Neutral*	*Biased*	*Leontief*
Agriculture	–0.38	0.13*	5.4	7.6	82.0	7.0	5.7*
	(–0.86)	(3.34)	—	(1.2)	—	—	(16.5)
Manufacturing	1.52*	0.87*	3.4	4.6	2.0	5.2	6.0*
	(24.9)	(2.35)	—	(1.5)	—	—	(22.8)
Construction	0.28	0.69*	4.3	4.0	5.3	10.1	5.8*
	(1.41)	(10.70)	—	(1.9)	—	—	(3.6)
Infrastructure services	0.4*	0.24	9.1	18.0	1.4	15.7	12.9*
Education & health	1.04*	0.71*	7.5	7.6	0.7	28.0	9.0*
Energy & natural resources	0.77*	0.86*	–0.7	–0.4	–0.2	–2.7	0.6
GDP (overall economy)	1.54*	0.36*	4.1	2.8	4.5	10.4	5.8*
	(2.31)	(5.04)	—	(1.7)	—	—	(27.6)

Source: Abbot *et al* (2011).

Notes: Estimates assuming Cobb-Douglas and CES production functions yield Hicks-neutral technical change. Biased technical change estimates using CES and Leontief production functions yield separate labour and capital efficiency improvements. Only labour results are presented here. For infrastructure services, education and health, and energy and natural resources, estimates reported are averages over several more disaggregated subsectors. *T*-statistics are reported in parentheses below estimates where applicable. Where averages are reported, for the accounting estimates, and for technical progress in the CES cases where measures are derived, *t*-statistics cannot be easily estimated and thus are not reported. Statistical significance (at 1 per cent) is indicted by * where *t*-statistics can be computed and for the averages when there are consistent results across all subsectors.

shares, and in several cases these parameters are negative unless constrained at zero. The estimates of technical progress are only somewhat different from accounting results. None of these specifications predict factor use well over the sample period.

The assumption of a unitary elasticity of substitution must be relaxed to examine biased technical change. Our attempts to apply a general CES production function provide evidence of quite low elasticities of substitution, but results are not robust and some sectoral parameters are found in implausible ranges – reflecting the data concerns noted above. Moreover, estimated elasticities of substitution are much smaller when biased technical progress is taken into account, as significant labour-augmenting technical progress is then found and better explains output and employment. Estimation using a Leontief production function, hence constraining the elasticity of substitution to equal zero, provides the most robust results. Estimates of TFP growth are not unreasonably large, but larger than found using the more standard approaches. For the overall economy labour efficiency is found to grow at 5 per cent per year, while capital efficiency grows at 1 per cent per year.[3]

In sum, comparisons of the predictive ability of alternative production functions and thus derived conditional employment demand specifications confirm the robustness of the Leontief production function results, given data constraints. These results are consistent with significant labour-augmenting technical progress and better explain recent economic performance in Vietnam. Hence, the most convincing interpretation of the labour demand growth decomposition is based on the Leontief results that suggest that increasing labour productivity is because of biased technical progress, not capital-labour substitution.

Institutional Biases and Employment

In Vietnam there are two policies that may have biased development towards a capital-intensive path: minimum wage policy and state investment policy. In this section, we investigate to what extent these two policies induce capital-intensive production, and how they in turn affect employment in various key economic sectors.

Minimum Wage Policy

If minimum wage policy is not an important determinant of market wages, which rather follow inflation and productivity trends, then the role of the minimum wage in employment over the medium run is minimal. The literature on the magnitude and direction of these effects in Vietnam and elsewhere is conflicting and unresolved (Cuong, 2010). There is also controversy over what data is appropriate, with some emphasizing the use of only micro data. But both Cuong (2010) and Sakellariou and Fang (2014), who look mostly at distributional implications over the longer term, lack sufficient variation in cross-sectional or panel household data (the VHLSS survey) to identify significant effects directly attributable to minimum wages. These studies also note that the minimum wage is not always respected, not only by informal firms but also by some formal firms. A long-run effect noted by McCaig and Pavcnik (2013) is that firms may be reluctant to register as formal enterprises because of minimum wage laws. Yet this effect is muted if formal firms are paying only a small share of workers at or below the minimum wage.

Here we focus on whether minimum wages distort capital-labour ratios. We first explore whether the minimum wage is seen as an important factor in setting overall market wages. Then we consider to what extent the minimum wage would affect labour-output coefficients and employment, using the conditional employment demand functions discussed in the section

'Technological change and employment'. If elasticities of substitution are near zero (our earlier result), even if minimum wages do drive overall wages, the effect on labour intensity and thus employment is small.

Ideally, we would also compare minimum wages to wages of unskilled workers. Unfortunately, available data does not allow such distinctions. If the minimum wage is binding, it is most likely for only a small number of low-skill workers in a firm who represent only a fraction of the workforce. The question we can address is whether available evidence supports the claim that minimum wages influence the overall wage structure, and hence average wages.

Figure 3 compares wages for state-owned enterprises, foreign-invested enterprises and the private (formal) sector to the minimum wage from 2001 to 2011. Two observations are apparent. First, the minimum wage is much lower than actual average wages for any of these firm types. After 2007 there were separate minimum wages for private firms and for foreign-invested firms. Average wages for private formal firms were subsequently nearly four times the minimum wage applicable to those firms, and wages in foreign-invested firms were nearly three times higher than the much higher minimum wage required of those firms. While wages for informal firms and traditional labour markets are lower, the minimum wage is seldom enforced in those cases.

The second observation is that changes in minimum wages often lag rather than lead wages paid by the various firm types. Once set, minimum wages have often not been changed for more than a year. From 2000 to 2011 the minimum wage was changed eight times, so that sometimes the lag has been as long as 2 years. As seen in Figure 3, private wages have been steadily increasing in both nominal and real terms, as both inflation and economic growth have fuelled pressure for higher wages. For state-owned enterprises minimum wages have changed more frequently since 2007, but have remained flat in real terms, as have the levels of real state wages. In private (formal and informal) and foreign-invested firms, however, real wages have increased rapidly in periods when real minimum wages remained constant or fell.

To measure the link between minimum wages and actual nominal wages, we estimated wage determination models. They included the real minimum wage and the CPI as independent

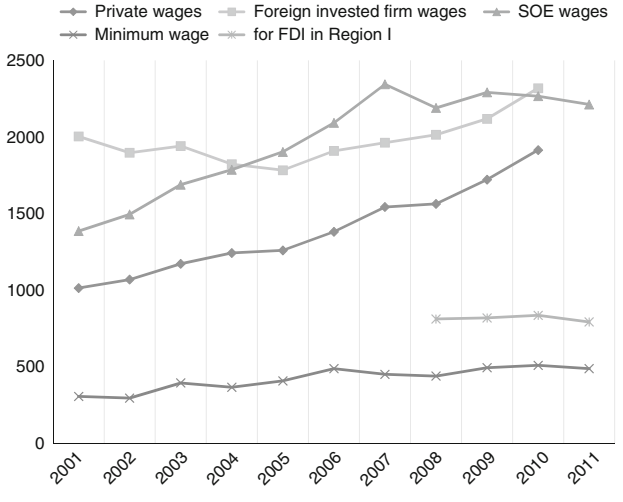

Figure 3: Real wages and the minimum wage in Vietnam.
Sources: GSO (2011, 2014); Wikipedia (2013); IMF (2013).
Notes: Real wages are monthly average income per employee per month in thousand dong (at 2005 prices).

variables to explain variation in the nominal market wage. The goal of this regression is to determine the importance of the real minimum wage and/or inflation in determining the overall pattern and level of nominal market wages. We estimated this relationship separately for each firm type and for each aggregated sector. Private (formal sector) wage data as well as wages for foreign-invested firms came from the Enterprise survey (GSO, 2011). The GSO website (GSO, 2014) reports wage data for state-owned enterprises, from which more current data is available. CPI values are from IMF (2013) and minimum wage data based on the Labour Law by the National Assembly of Vietnam that are accessible online (Wikipedia, 2013).

Estimation results summarized in Table 5 indicate that for most sectors inflation is a significantly more important factor than the minimum wage in driving market wages. All of the elasticities with respect to the real minimum wage are small and are statistically significant in only three of 12 cases. We also tried constraining the elasticity on inflation to one, that is, neutral inflation pass-through for all the sectors. Then only five cases have a significant (but low) correlation between the real market wage and the real minimum wage. For the original model (Table 5), two of the three sectoral cases where a significant relationship was found were for state-owned enterprises. The other case was private invested agricultural firms. For the economy overall, coefficients are insignificant for private and foreign-invested firms, while that for state-owned firms is only significant at the 5 per cent level. On the other hand, inflation is a highly significant factor determining nominal wages, at the 0.1 per cent level in 11 of 12 sectoral cases and also overall (independent of ownership). Hence, this evidence suggests minimum wages have had little influence on the evolution of market wages in Vietnam. If it had a small effect, it was on state-owned firms and not private or foreign-invested firms. Moreover, since some sectoral coefficients on inflation differ from one, there appears to be some degree of non-neutrality in inflation pass-through.

The second factor in the link between minimum wages and employment is the extent to which higher wages would induce factor substitution towards more capital-intensive techniques. Our estimates of elasticities of substitution yielded quite low, statistically insignificant values. Had minimum wages significantly increased market wages, then their effect on employment would

Table 5: Estimated coefficients on the real minimum wage and CPI in sectoral nominal wage determination models

Sector	*Firm ownership*					
	State		*Private*		*Foreign*	
	real min wage	*CPI*	*real min wage*	*CPI*	*real min wage*	*CPI*
Agriculture	1.02*	1.99***	2.01*	−0.35	0.41	1.10***
	−3.17	−8.91	−2.89	(−0.72)	−1.53	−7.84
Manufacturing	0.34	1.43***	0.16	1.46***	0.3	0.89***
	−2.25	−8.14	−1.02	−8.26	−2.25	−11.05
Construction	0.46*	1.27***	0.43	1.50***	−0.064	1.54***
	−2.61	−9.11	−1.42	−6.3	(−0.14)	−7.56
Infrastructure services	0.21	2.13***	0.037	1.72***	0.03	1.05***
	−1.36	−16.94	−0.36	−20.6	−0.25	−18.88
Overall – All sectors	0.59*	1.61***	0.28	1.60***	0.3	0.95***
	−2.89	−9.39	−1.59	−10.8	−1.73	−11.71

Source: Wu (2012).
Notes: Numbers in parentheses are *t* statistics. * represents $P<0.05$, ** represents $P<0.01$ and *** represents $P<0.001$. Dependent variable is the nominal sectoral wage.

have been muted by these small elasticities. The combination of minimum wages exerting little influence on overall market wages plus these very limited effects of wages on factor demand patterns suggests that the recent evolution of minimum wages did not contribute in any significant way to more capital-intensive development. Thus, the improved labour productivity term in equation (3) should be attributed to biased technical progress, not to this institutional bias.

State Investment

According to MOLISA and ILO (2010), investment in state-owned firms tends to be overly capital intensive, and they could absorb more labour if that investment were less so, or if more investment went to the private sector. In order to evaluate the role of state investment in recent employment trends, two issues must be addressed. One is the extent to which state-owned enterprises are more capital intensive than other firms. The second is the extent to which there has been restructuring, resulting in either a smaller state sector or state enterprises concentrated in capital-intensive sectors. This analysis is limited by the data available. The GSO (2014) website reports output, investment and employment by either firm ownership type or sector. It does not provide tables that address both these dimensions at once. This limits both capital intensity and restructuring information.

Figure 4 presents both labour and capital productivity by firm ownership. It is apparent that private domestic firms use much less capital and much more labour per unit output (value added) than either foreign-invested or state-owned firms. As of 2011, capital and labour intensities of state-owned and foreign-invested firms were similar. Labour productivity in state-owned firms at that time was six times higher than in domestic private firms, while capital productivity was less than one half that for private firms. Both state-owned and foreign-invested enterprises clearly chose more capital-intensive techniques than did domestic private firms.

These factor intensities suggest that investments by state-owned enterprises go counter to Vietnam's comparative advantage as a labour-abundant, low-wage country. This reflects that these firms have had access to better, more capital-intensive international technologies than do strictly private firms, especially as state-owned enterprises have in the past partnered with foreign firms. Allocation of savings by a socialist government that favours state-owned enterprises has therefore acted as an implicit capital subsidy.

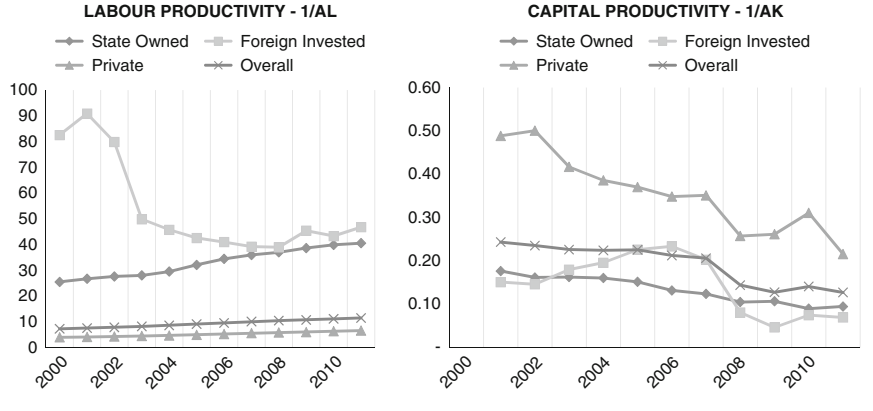

Figure 4: Labour and capital productivity by firm ownership.
Source: GSO (2014).
Notes: Real value added per worker is measured in million dong (at 1994 prices) per year. Capital productivity is value added per year in million dong per million dong invested.

Factor intensities have changed over time because of both shifts in sectoral emphasis and technical change. Foreign-invested firms were in 2001 much less labour intensive than even state-owned firms. Since then they have invested in more labour-intensive sectors, and thus employment intensity has increased. Capital intensity for foreign-invested firms initially decreased as employment intensity increased, but there was a significant decline in capital productivity for all ownership types after 2007. While labour productivity has been steadily increasing for all firm types over the entire period for state-owned and private firms, capital productivity was declining, corresponding with labour-capital substitution or biased technical change. The fall in capital productivity after 2007 was not matched by any change in the trend for labour productivity. If there is an effect on employment trends due to capital-intensive development, it appears to be found for all firm types, and the changing role of foreign-invested firms is the most dramatic change.

Table 6 presents GDP, investment and employment by firm ownership in 2000, 2007 and 2011 to show the extent of restructuring by state-owned enterprises as well as the emergence of foreign-invested firms. These data suggest very little restructuring, but reflect a state sector being slowly overtaken by more dynamic private and foreign firms. The state share of GDP fell from 41 per cent in 2000 to 39 per cent in 2007 and 37 per cent in 2011. The decline in its share of investment was much larger, from 59 per cent in 2000 to 40 per cent in 2011. Investment declines greater than output declines reflect increasingly capital-intensive production and sectoral shifts, as well as declining capital productivity, for all types of firms. The employment share of state-owned enterprises changed very little over this period, at 3 per cent in both 2000 and 2011.

Table 6: Investment, output and employment by firm ownership

	Overall	*Enterprises by firm ownership*		
		State owned (SOE)	*Foreign invested (FDI)*	*Private*
2000				
GDP	274	112	30	133
		41%	11%	48%
Investment	115	68	21	26
		59%	18%	23%
Employment	37.1	4.4	0.4	32.4
		12%	1%	87%
2007				
GDP	461	180	61	220
		39%	13%	48%
Investment	309	132	85	93
		43%	27%	30%
Employment	45.2	5.0	1.6	38.7
		11%	3%	86%
2011				
GDP	584	213	80	291
		37%	14%	50%
Investment	363	145	95	122
		40%	26%	34%
Employment	50.4	5.3	1.7	43.4
		10%	3%	86%

Source: GSO (2014).
Notes: GDP and investment are in trillion dong. Employment is in million persons. Shares are reported in per cent below each variable.

With this small change in employment shares, state enterprises play a very limited role in our employment growth decomposition. Had there been much more restructuring, the differences in capital and labour intensity would have mattered more. Possibly more notable are the changes for foreign-invested firms. Their investment share increased from 18 per cent in 2000 to 26 per cent in 2011 following the surge in foreign investment around WTO accession in 2008. The investment share of private domestic firms increased faster than for either state or foreign firms, from 23 per cent in 2000 to 34 per cent in 2011. The employment share of foreign firms jumped from 1 per cent in 2000 to 3 per cent in 2007 and 2011. Their output share increased somewhat from 11 per cent in 2000 to 14 per cent in 2011. The small share changes are all because of the dynamic growth of private firms that makes changes in state and foreign firms *relatively* smaller.

Sector composition matters to capital intensity and to the scope for restructuring. State-owned enterprises have been heavily involved in capital-intensive mining, natural resources and energy sectors, although they operate in many other, potentially more labour-intensive sectors as well. Foreign firms have also exhibited some significant sectoral shifts since 2000. Revised investment and enterprise laws in the mid-2000s, as part of pre-WTO accession changes, allowed wholly owned foreign-invested firms that are no longer required to partner with SOEs to alter their sectoral composition. This led to an increase in the share of foreign firms in manufacturing. Consequently, the state's share in manufacturing declined.

Older data are available by sector and firm ownership for investment (but not output) (GSO, 2009), allowing us some idea of what sectoral shifts have been occurring as shown in Table 7.[3] This table shows the large decline in the overall investment share of state-owned enterprises, but not dramatic changes in the sectoral composition of that investment allocation. The agriculture share dropped the most while construction increased, and there is a decline in the share of the energy and natural resource sectors matched by an increase for foreign firms, similar to that for manufacturing. This does not provide a consistent story about SOE movements into or out of capital-intensive sectors, as some expanding sectors were capital intensive while others are labour intensive. Moreover, movement of investment out of agriculture has only limited structural transformation effects, as it was for processing and distribution firms, not primary production where most low-wage employment is found.

These results suggest that restructuring and investment allocation into the private firms, which are relatively less capital intensive, could be an important factor driving future employment growth. If state firms had been expanding in output shares, then the employment growth rates in

Table 7: Sectoral investment shares by firm ownership

Sector	*Firm ownership (%)*					
	State owned (SOE)		*Foreign invested (FDI)*		*Private*	
	2000	*2007*	*2000*	*2007*	*2000*	*2007*
Agriculture	4.6	2	3.4	2.4	4.8	4
Manufacturing	4.8	3.2	6.8	9.3	3.1	3.4
Construction	1.4	1.8	0.5	0.3	0.5	1.3
Infrastructure services	12.7	8.7	0.9	2	1	5.4
Education & health	9.3	6.9	0.6	0.5	0.6	0.9
Energy & natural resources	16.2	9.3	1	8.2	0.5	1.8
Other services	10.1	8	4.8	2.1	12.3	12.6
GDP (overall economy)	59.1	39.9	18	24.8	22.9	29.5

Source: GSO (2009).

those modern sectors would be lower because of relatively low labour requirements in state enterprises. This story is probably more relevant to the 1990s than to the 2000s, however. The slowly declining importance of state production in key modern sectors weakens the impact of an overly capital-intensive production strategy pursued by state firms on slowing down employment growth for the entire economy. The low state employment share, stagnant output share and limited restructuring mean these sectoral ownership effects are a small part of our employment growth decomposition. At the same time, it may be the case that restructuring could occur more rapidly in the future, making the gap between GDP and employment growth smaller as private firms expand more rapidly.

Conclusions

Employment in Vietnam has grown more slowly than GDP over the last two decades. While this difference reflects improvements in labour productivity and rising GDP per capita – signs of successful development – it has also raised concerns among Vietnamese policymakers that economic development is not creating enough new jobs. Structural transformation has moved labour from lower-productivity traditional sectors, especially agriculture, to higher-productivity modern sectors including manufacturing and services. The Vietnamese labour ministry in its assessment of the labour situation in Vietnam (MOLISA and ILO, 2010) believes this restructuring is not moving sufficiently rapidly, has involved too little innovation, and exhibits an overly capital-intensive development strategy.

We used data for seven aggregate sectors and the overall Vietnamese economy from 2000 to 2007, and then to 2011, provided by GSO (2014), to examine the roles played by structural transformation, technical progress and institutional bias towards capital-intensive development to explain the differences observed between employment and GDP growth. This decomposition attributes only about one-third of the employment-growth difference to shifts from low-productivity to higher-productivity sectors. The remaining two-thirds came from declining labour use per unit output that is also found in agriculture. Further analysis attempted to separate technical progress and structural transformation from institutional biases towards capital-intensive development.

Data on capital- and labour-output ratios reveal steadily improving labour productivity, but erratic and inconsistent factor price trends. Estimated elasticities of substitution are generally significantly less than one, and not significantly greater than zero, regardless of specification. Estimation using a Leontief production function shows that TFP growth is not unreasonably large, and larger than found using the more standard approaches relied on in MOLISA and ILO (2010). For the overall economy, our results suggest that labour efficiency grew at 4.2 per cent per year, while capital efficiency grew at 1 per cent per year. These results are consistent with significant labour-augmenting technical progress and better explain historical economic performance in Vietnam. This is highly consistent with the Rodrik (1997) conjecture that there may have been significant technical progress behind the Asian miracle, and that the analyst must address a labour-augmenting bias in technical change to find it.

Our results also suggested that rising minimum wages only contribute to a very limited extent to more capital-intensive development. We looked at both of the two key links between the minimum wage and labour intensity – the effect of minimum wages on overall wages and the effect of wages on technical choices. Real market wages have been rising for private formal and foreign firms as real minimum wages held constant since 2007. We found that non-neutral inflation pass-through better explains nominal wage evolution than do minimum wages.

Therefore, the differential between GDP and employment growth because of falling labour-output ratios is mostly because of technical progress. Undoubtedly, long-run expectations on relative wages have played a role in sectoral and technical choices made in Vietnam. Yet, over the short run institutional biases in wage setting are only a limited factor.

Investment by state-owned enterprises appears to be much more capital intensive than for private firms. While substantial investment in SOEs has persisted, low capital productivity since 2007, low labour output ratios and much more rapid growth of private firms mean that this factor has only played a limited role in recent Vietnamese employment trends. This is best viewed as a missed opportunity. Since there was little restructuring, there is little evident impact on employment. More rapid restructuring and greater investment allocations to private firms and less to SOEs would likely lead to greater demand for labour.

Structural transformation only partially explains the employment growth seen in Vietnam. While some of the difference from GDP growth may, as just noted, be attributed to capital-intensive investment by the state, a significant share of the employment-growth difference is because of technical change when low elasticities of substitution and labour-augmenting bias in technical change are taken into account. In sum, there is little reason to be pessimistic about the performance of the Vietnamese economy. Focus in the coming years should be on consolidating the distinct progress made rather than on promoting policy shifts based on inadequate interpretation of the available evidence.

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Notes

1. We will use the terminology ‘labour-augmenting technical change’, corresponding with the notion that efficiency of the labour input is increasing. ‘Labour-saving’ is ambiguous, since an improvement in capital efficiency could reduce labour demand, but only if the elasticity of substitution exceeds one.
2. Though no distinction is indicated on the GSO (2014) website, data for employment clearly include informal labour given the large reported size of the agricultural sector, and the numbers reported for manufacturing, construction and infrastructure services relative to numbers from the Enterprise survey (GSO, 2011) that looks only at formal firms. When we look at wage data from that survey later, that information is for formal firms, and will be so noted.
3. Detailed sector data provided by GSO (2009) are not entirely consistent with the aggregate data on its website, with the largest differences in deflated capital allocations. Hence, the aggregate data shows slower labour productivity growth and declining capital productivity. Gross output rather than value added was also used in these estimations, and thus productivity differences may also reflect differences in intermediate input efficiency.

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