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Structural Transformation, Biased Technological Change, and Labor Demand in Vietnam

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Abstract

Labor demand in Vietnam and elsewhere in Asia has grown more slowly than GDP over the last two decades. We use data for 18 aggregate sectors and the overall Vietnamese economy to examine the roles played by structural transformation, technical change and institutional bias toward capital intensive development to explain those. Decomposition of factors behind labor demand growth attributes only 30% of this difference to shifts from low productivity (agriculture) to higher productivity sectors, while the remaining 70% comes from declining labor use per unit output that is also found in agriculture. Estimation using a Leontief production function is consistent with significant labor augmenting technical progress and better explains Vietnamese outcomes. For the overall economy labor efficiency grows at 5.8 % per year, while capital efficiency grows at 2.0% per year. Rapidly rising minimum wages contribute to only a limited extent to declining labor use per unit output. Restructuring and rapid private sector growth in key sectors mean that capital intensive state investment plays a small role in explaining labor demand evolution. Hence, structural transformation only partially explains slow labor demand growth in Vietnam. While some of the difference from GDP growth may be attributed to capital intensive investment by the state, the majority of the difference is found to be due to technical change when low elasticities of substitution and labor augmenting bias in technical change are taken into account.This confirms suspicion that there may have been technical progress behind the Asian miracle.

Keywords: labor demand, structural transformation, biased technological change, minimum wage, state investment, Vietnam

I. Introduction

For the past two decades Vietnam has experienced rapid GDP growth. Over the period from 2000 to 2009, for example, Vietnam's GDP grew at 7.3% annually, which is 3.9% faster than East Asia and the Pacific, and 4.9% faster than the world (World Bank, 2011). Relative to the dynamic economic growth, employment generation seems to be much weaker. During 2000-2008, the average annual employment growth rate was only 2.2% and the elasticity of labour demand with respect to real GDP was only 0.14 (World Bank, 2011). Slow employment generation, particularly in the modern sectors, causes serious underemployment problems, particularly in the rural areas. From 2007 to 2009, the annual rural underemployment rate stayed over 6%(GSO, 2010).

The labor study by MOLISA and ILO (2010) tackled the issue of stagnant labor demand in Vietnam, and attributed slow labor demand growth largely to structural transformation. They raised the concern that development in Vietnam may have been excessively capital intensive, which is particularly pronounced in investments made by state-owned and foreign-invested enterprises. Moreover, minimum wage policies may have fostered capital intensive growth, since minimum wages may have been so high that firms were induced to substitute labor with capital. Investment accounted for 30-40% of GDP in 2000-2008, but investment efficiency is relatively low, suggested by high incremental capital-output ratios. The labor study by MOLISA and ILO suggested that the investment structure should be adjusted so that high value-added industries, and particularly private firms, should gain more attention in order to create more jobs. According to this view, economic growth in Vietnam is now due to capital accumulation much more than technological innovation. In 2007, for example, total factor productivity growth only accounted for 26% of GDP growth, whereas capital accumulation contributed to more than 60% of GDP

growth. In addition to capital intensive development lowering labor demand, slow restructuring of the economy from rural to urban areas, from agriculture to manufacturing, and from public to private firms, resulted in slower labor migration out of sectors where productivity is low.

Unlike the unanimity regarding the important role of structural transformation in explaining sluggish labor demand, the role of technological progress during the course of Vietnamese development tends to bediscounted in previous studies. Most of these studies on Vietnam, to our knowledge, found low TFP growth rates. For example, MOLISA and ILO (2010) concluded that the contribution of total factor productivity to economic growth is very limited, and that GDP growth is mainly a result of factor accumulation. Labor demand is also very insensitive to total factor productivity growth. According to ILO (2008), 1% TFP growth leads to less than a 0.5% decrease in labor use for most economic sectors.

In a more general set of studies on East Asian development, the role of technological progress during the course of economic growth is much more widely discussed, but those studies can hardly reach an agreement. Some economists (e.g., Collins et al, 1996; Kim and Lau, 1994; Krugman, 1994;Young, 1995) maintain that the East Asian miracle is mainly due to capital accumulation and that technological progress is unimportant. Others (e.g., Freeman, 1995; Krüger et al., 2000; Nelson and Pack, 1999; Pack and Page, 1994; Rodrik, 1997; World Bank, 1993) argue that technological progress, particularly labor-saving[1] technological change, fuelled the extraordinary economic growth that has constituted the "Asian miracle". Rodrik (1997) explicitly pointed out that the low TFP growth rates found in most studies are problematic, because they failed to incorporate biased technological progress in their calculations.

[1] We will use the terminology "labor-augmenting technical change", corresponding with the notion that efficiency of the labor input is increasing. "Labor-saving" is ambiguous, since an improvement in capital efficiency could reduce labor demand, but only if the elasticity of substitution exceeds one.

Policy interventions undertaken in developing countries may further accelerate the process of structural transformation and promote labor-augmenting technological change, leading to a larger gap between GDP growth and labor demand growth. Institutional biases are another factor that may slow down labor demand. Minimum wages in Vietnam have been actively adjusted over time. If increasing minimum wages drive up market wages and distort the wage-rental ratio, then we would expect lower labor demand growth. However, if the minimum wage has an unimportant effect on market wage determination, then the impact of increasing the minimum wage on labor demand would be muted. State investment is also a potential factor responsible for slow labor demand in Vietnam. If state investment in Vietnam is overly capital intensive, as many argued, then the state-owned enterprises have the tendency to substitute labor with capital, limiting employment growth in state-invested firms. Sectoral reallocation of state investment is also critical for labor demand. Sectors receiving more state investment may not require high labor intensity for production, and hence the benefit to employment due to expanding production in those sectors may not be strong enough to compensate the negative employment effectsfound in shrinking sectors.

In this study, we propose three hypotheses to explain slow labor demand in Vietnam: structural transformation, technological progress, and excessively capital intensive development. Two institutional biases that facilitate capital intensive development in Vietnam are studied: minimum wage policy that may distort the wage-rental ratio and state and foreign investment that may be overly capital intensive.

As a major result, we find that structural transformation can at most explain 30% of the difference between slow labor demand growth and rapid GDP growth. The remaining 70% rests on factors that have been less researched in previous studies on labor demand in Vietnam, as

well as in other parts of the world. We found strong evidence of biased (labor-augmenting) technological change, and strong evidence supporting the use of a Leontief production function in describing production activities in Vietnam. Under a Leontief production function, for the economy as a whole, the capital efficiency growth rate is 2% on average, and the labor efficiency growth rate is 5.8% on average during the period 2000-2008. Under this assumption, the entire economy exhibits labor-augmenting technological progress. We also find downward pressure on labor demand due to overly capital-intensive state investment, but the effect is weaker than the labor demand effect caused by restructuring non-state firms. Statistical results show that inflation, rather than the minimum wage, is the major driving force determining market wages for most sectors. The minimum wage policy seems to have larger impact on wages in state enterprises than for private firms. The correlation between the state wage and the minimum wage is stronger than that between the overall market wage and the minimum wage.

Our investigation proceeds as follows: Section II reports the decomposition of labor demand growth by sources based on data from 2000 to 2008. This analysis quantitatively identifies the contributions of structural transformation, state investment bias, biased technological change, and institutional wage bias to the gap between labor demand growth and economic growth in Vietnam. Section III considers the impacts of biased technological change on labor demand. Section IV examines the roles of the minimum wage policy and investment biases in slowing down labor demand growth. Section V summarizes and concludes.

II. Labor Demand Growth Decomposition

Labor demand growth decomposition is performed to quantitatively analyze the contributions of biased technological change, structural transformation, and institutional biases to

the sluggish labor demand for each sector and the overall Vietnamese economy. This decomposition starts with a straightforward relationship that links labor demand, labor efficiency, sectoral output shares, and economic output, shown in Equation (1):

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

where L_t is total labor demand at time *t*, which is the sum of sectoral employment L_{it} across the *i* sectors. a_{Lit} denotes the unit labor efficiency coefficient for sector *i* at time *t*, which is the ratio between labor 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 of the entire economy at time *t*. Differentiating Equation (1) with respect to time gives:

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

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

(3) $$gL_t = \frac{dL_t}{dt} \cdot \frac{1}{L_t} = \sum_i \frac{a_{Lit} S_{it} Y_t}{a_{Lt} Y_t} g a_{Lit} + \sum_i \frac{a_{Lit} S_{it} Y_t}{a_{Lt} Y_t} g S_{it} + \sum_i a_{Lit} S_{it} \frac{Y_t}{a_{Lt} Y_t} g Y_t$$

where $a_{Lt} = L_t/Y_t = \sum_i a_{Lit} S_{it}$, the overall labor-output ratio for the economy. Equation (3) can be further simplified into Equation (4):

(4) $gL_t = \sum_i \frac{a_{Lit} S_{it}}{a_{Lt}} g a_{Lit} + \sum_i \frac{a_{Lit} S_{it}}{a_{Lt}} g S_{it} + g Y_t$

Equation (4) incorporates all of the factors that contribute to slow labor demand identified earlier. Biased technical change affects labor demand by altering input efficiency.

Minimum wage policy may distort input-output ratios by altering relative input prices, so relative factor intensities, as well. Thus, these two effects are both incorporated in the changes in the labor-output coefficient (a_{Lit}). The first term on the right hand side of Equation (4) therefore measures the contribution of biased technological change and institutional wage bias to sectoral labor demand. 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 change sectoral output shares, S_{it}, as well. The labor demand 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 (4) measures the contribution of structural transformation and state investment bias to sectoral labor demand. If labor-output coefficients, a_{Lit}, and output shares, S_{it}, remain constant, then we will observe the same growth rates for output and employment($gL_t = gY_t$). The first two terms in Equation (4) are weighted by relative sectoral labor efficiency and sectoral output.Technological progress, structural transformation and relevant policies associated with sectors that feature low labor efficiency (i.e., high labor-output coefficients) and large output shares would generate relatively larger impacts on total labor demand trends.

We assembled annual data over the years 2000-2008 for Vietnam. Both labor demand data (L_{it}) and sectoral output data are from the GSO Statistical Yearbook (2010). They 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 eighteen economic sectors into nine sectors, mainly eliminating some details in the service sectors. Among the nine economic sectors, there is an aggregate traditional sector, a manufacturing sector, an energy and natural resources sector, and six service sectors. We also

added a sector titled “GDP”, representing the entire economy. The sum of contributions from each of the nine sectors will be in the tenth row.

The results of labor demand growth decomposition analysis are presented inTable 1[2]. The entire economy has an average of 2.2% annual labor demand growth over the time period from 2000 to 2008, as shown in the first column for Sector 10, 5.4% lower than GDP growth. Biased technical change and institutional wage bias slow down labor demand by 3.5%, as shown in the fifth column for Sector 10, while structural transformation plus state investment bias slow down labor demand by another 1.5%, as shown in the seventh column for Sector 10. Therefore, for the entire economy, biased technological change and institutional wage bias are responsible for 70% of the difference between economic output growth and labor demand growth, and structural transformation and state investment bias are responsible for the other 30%. These results suggest that there are other factors beyond structural transformation important in explaining stagnant labor demand.

The traditional agricultural sector experienced a 3.5% decline in output sharesper year. The economy became less reliant on agriculture, forestry and fishing, and more dependent on manufacturing and service sectors. Even though the traditional sector is usually characterized by low labor productivity, the agricultural sector in Vietnam witnessed a 4.3% increase in labor productivity during 2000-2008. This labor efficiency improvement further reduced labor use in this traditional sector. The energy and natural resource sector is another shrinking sector in the economy, contributing only slightly to the overall negative impact due to structural transformation and state investment bias. It is worth noting that the energy and natural resource

[2] Due to lack of data, we cannot perform the labor demand growth decomposition analysis by firm type. Thus, the results do not reflect differences across sectors by ownership. We will explore the role of state owned enterprises using very strong assumption in section IV, however.

sector is a heavily state invested sector. Different from many other sectors, the energy and natural resource sector had a decrease in labor productivity over the years, but very low employment per unit of output. The manufacturing sector along with most service sectors became more important in the economy, suggested by increases in labor and output shares. Even though structural transformation and state investment bias generate positive impacts on labor demand in those sectors, biased (labor-augmenting) technical change and the institutional wage bias slow down labor demand growth in the manufacturing and the majority of the service sectors.

We now focus on one specificsource of slow labor demand, biased technological change. The results will then be used to sort between the contribution of technological progress and the contribution of institutional wage bias to stagnant labor demand.

III. Technological Change and Labor Demand

Technological change can be classified into two categories: One is Hicks-neutral and the other is factor-augmenting. Technological change is Hicks-neutral if the mix of inputs in the production function is not affected, and the production function only differs by scaling of output. If all economic activities follow Hicks-neutral technological change, then we would expect equal productivity growth rates between inputs at fixed prices. Factor-augmenting technological change is featured by unequal productivity growth rates between inputs. Technological change can be labor augmenting if productivity of labor grows faster than productivity of capital, and it can be capital augmenting if productivity of capital grows faster than productivity of labor. If technological progress is believed to be Hicks neutral, total factor productivity growth rates (TFPG) would be an appropriate measure of productivity improvement. If biased technological

progress prevails, then input-specific productivity growth rates are needed. As mentioned earlier, previous studies often assume Hicks-neutral technological change and only compute TFPG. However, critics of those studies point out that lack of consideration of biased technological change may lead to underestimation of TFP growth (e.g., Rodrik, 1997).

Previous studies usually use an accounting approach to calculate TFPG under a Cobb-Douglas production function. In this approach, actual input cost shares are employed to measure the exponents in the production function, and this relationship is based on the assumption of perfect competition and constant returns to scale. The results based on an accounting approach usually seem to be reasonable, but may hide potential weaknesses associated with the assumptions of the Cobb-Douglas production function. The production function is believed to be robust if similar results can be derived from both the accounting and econometric approaches.

To circumvent potential problems associated with biased technological change and the validity of the production functional forms assumed, we estimated productivity growth rates allowing both Hicks-neutral and factor-augmenting technological change under Cobb-Douglas, CES and Leontief production functions, using both accounting and econometric approaches. We employed the root mean squared error (RMSE) method to select the best fit production function to describe production activities in Vietnam. We used sectoral data from GSO (2009, 2010) to estimate the productivity growth rates for 18 aggregated sectors and for the overall economy from 2000-2008. Detailed derivations and results can be found in Abbott et al. (2011). In this paper, we only report the key lessons learned from those results.

Accounting approaches based on the Cobb-Douglas production function are most common in the literature, and their application to Vietnamese data lead to reasonable but

somewhat low estimates of Hicks-neutral technical change. Econometric estimation of a Cobb-Douglas production functions gives vastly different results, and parameters are so unreasonable as to call into question this description of production functions. Use of Young's (1995) accounting method based (he claims) on a translog production function gives results indistinguishable from Cobb-Douglas. Assumption of a unitary elasticity of substitution must be relaxed to examine biased technical change. Our attempts to apply a CES production function provide evidence of low elasticties of substitution, but results are not robust and some sectoral parameters are found in implausible ranges. Estimation using a Leontief production function provides the most robust results, and estimates of TFP growth that are not unreasonably large, but larger than found using the more standard approaches. For the overall economy labor efficiency is found to grow at 5.8 % per year, while capital efficiency grows at 2.0% per year. Comparisons of the predictive ability of alternative production functions and derived conditional labor demand specifications confirm the robustness of the Leontief production function results. Those results are consistent with significant labor augmenting technical progress and better explain historical economic performance in Vietnam. This confirms suspicion that there may have been significant technical progress behind the Asian miracle, but one must address a labor augmenting bias in technical change to find it.

IV. Institutional Biases and Labor Demand

In Vietnam, there are two policies under focus that may be biased toward capital intensive development. They are the minimum wage policy and state investment policy. In this section, we will investigate to what extent these two policies induce capital intensive production, and how they affect labor demand in various key economic sectors.

IV.1. Minimum wage policy

If the minimum wage drives the market wage, then the affected market wage would translate into changes in labor demand. On the other hand, if minimum wage policy is not an important determinant of the market wage, then the role of the minimum wage in labor demand is trivial. In the following section, we attempt to explore if the minimum wage is an important factor in setting market wages. If minimum wage is an important driver of the market wage, then we will evaluate to what degree the minimum wage would affect the labor-output coefficient and labor demand using the estimated conditional labor demand function.

We estimated three wage determination models. The first model has the real minimum wage and the CPI as independent variables to explain the variation in the nominal market wage. The goal of this regression is to determine whether the real minimum wage or inflation is a more important determinant of nominal market wages in Vietnam. In the second model, we constrained the coefficient on CPI to be one, assuming inflation pass-through is neutral, and directly regressed the real market wage on the real minimum wage.As mentioned earlier, different types of firms may have different levels of responsiveness to changes in the minimum wage due to the wage setting mechanism. Thanks to available data on state wages, we experimented with a third model in which the real state wage is regressed on the real minimum wage to explore if there is any difference in the importance of the minimum wage in determining the market wage for state and other firms. Again, our primary data source for these analyses is

GSO (2010), complemented with CPI values from IMF (2010) and minimum wage data based on the Labor Law by the National Assembly of Vietnam that are accessible online[3].

Estimation results are summarized in Table 2. The results indicate that for most sectors, inflation is a more important factor than the minimum wage in driving the market wage, evidenced by positive and relatively large correlation between the nominal market wage and inflation for most sectors, as shown in the second column. All of the elasticities with respect to the real minimum wage are small and less than unity, as shown in the first column. In the case of inflation constrained to one, i.e., neutral inflation pass-through for all the sectors, similar patterns appear (see column 3 of Table 2). Only five sectors have a significant (but low) correlation between the real market wage and the real minimum wage. For the economy as a whole, the real minimum wage is a significant variable in explaining the real market wage, but the elasticity is only 0.35, similar to the unconstrained result above. As shown in the last column, the real state wage is more closely correlated with the real minimum wage relative to wages in other types of firms, which is consistent with the fact that state-owned enterprises are more tightly bound by the minimum wage policy. The minimum wage is important for most state sectors, and the coefficients are largely above 0.5. For the economy as a whole, we would expect that a 1% increase in the real minimum wage would lead to 0.5% increase in the real state wage.

Minimum wages may affect labor demand by influencing market wages. The more sensitive the market wage is in response to the minimum wage, the larger the impact on labor demand would be. To quantitatively evaluate the impact of changes in the minimum wage on labor demand, we first used the estimates from a direct regression of real minimum wage on real

[3]The minimum wage data are summarized on a Wikipedia webpage: http://translate.google.com/translate?js=y&prev=_t&hl=zh-CN&ie=UTF-8&layout=1&eotf=1&u=http://vi.wikipedia.org/wiki/L%25C6%25B0%25C6%25A1ng_t%25E1%25BB%2591i_thi%25E1%25BB%2583u_t%25E1%25BA%25A1i_Vi%25E1%25BB%2587t_Nam&sl=vi&tl=en

market wage to obtain predicted changes in the real market wage. Then, we adopted the estimates from the derived conditional labor demand equation based on the CES production function to assess the changes in labor-output coefficients. From the magnitude of the changes in the labor-output coefficient, we can assess the contribution of institutional wage bias to labor demand based on the labor demand growth decomposition analysis. It is worth noting that we only performed this analysis for three major sectors, namely, agriculture, manufacturing and infrastructure services, which account for the vast majority of changes in labor demand partially attributable to institutional wage bias in the labor demand growth decomposition. Also, since the estimated coefficients on real wage tend to be bigger in the second model than the estimates from other two models, the minimum wage effect we assess here would be an upward bound.

Table 3reports the percentage changes in the labor-output coefficients due to institutional wage bias in the agriculture, manufacturing and infrastructure service sectors, compared with total percentage changes in labor-output coefficients in those sectors. As can be seen, the changes in labor-output coefficients due to institutional wage bias are not large for any of the three sectors. Since the effect on labor demand is proportional to the effect on the labor-output coefficient in the labor demand growth decomposition analysis, we can infer that the effect of minimum wages on labor demand is also small, and may account for less than one-third of the total percentage change, i.e., a 1% decrease in labor demand growth. The pass-through of the minimum wage is muted by the low correlation between the minimum wage and the market wage, in conjunction with the low correlation between the real market wage and labor-output coefficients (i.e., low elasticity of substitution) in the CES-based conditional labor demand functions. The overall outcome is small effects of institutional wage bias on slowing down labor

demand, at least in the short run. Biased technological change appears to be more important in explaining stagnant labor demand.

IV.2. Role of state investment

According to MOLISA and ILO (2010), investment in state-owned firms tends to be overly capital intensive, and they could absorb more labor if that investment were less capital intensive. In this section we will explore if state investment is more capital intensive than other firm types, and how that investment bias would affect the structure of the economy. In order to evaluate the role of state investment, we first calculated labor-output coefficients for state and non-state firms, and for the overall sector in 2003. We then examined how the sectoral shares of output evolved for state and non-state firms to assess the role of state investment on labor demand growth.Due to lack of data on output and value added by firm type, we combined the GSO data with estimated sectoral output shares by ownership for 35 sectors in 2003 based on the Enterprise Survey and other assumptions in Boys (2008).Since the output share data are necessary to compute the initial capital stock and output levels by firm type, we chose 2003 as the base year to start this analysis. We performed these analyses for the major sectors, including the agricultural[4], manufacturing, construction, and infrastructure service sectors.

The first analysis involves labor-output ratios for state firms, non-state firms and for the sector overall. Table 4presents the results. The labor-output coefficients in state sectors are clearly lower than those in non-state sectors, indicating less labor use per unit of output in the state sectors. The sharpest contrast between state and non-state firms is in the agriculture sector, where labor-output coefficient is only 0.010 in state firms and is 0.507 in non-state firms.

[4] It is worth noting that results on the agricultural sector should be viewed with caution. State-owned enterprises in the agricultural sector are mainly concentrated in food processing, marketing and distribution, but have very limited involvement in primary production, which is the major employment hub in the agricultural sector.

However, it is worth noting that the output shares are based on the Enterprise Survey, in which only formal sectors are included. The formal sector is only a subset of each sector, and state firms may be overrepresented in this subset relative to non-state firms. Therefore, the labor-output coefficients for the state sector we derived serve as lower bounds for this statistic.

We subsequently evaluated the impact of state investment bias on labor demand growth for those key sectors. As concluded in the previous section, the Leontief function best represents production activities in Vietnam, particularly for predicting the output.Therefore, we assumed a Leontief production function to compute output levels in state-owned enterprises for the period 2004-2008. We foundin Abbott et al. (2011) that technology in state-owned enterprises tends to be static. Thus, we fix the labor-output ratio at the 2003 level for the state-owned enterprises, and compute the output for the following years. With output by state enterprise available, we can then compute sectoral output produced by non-state enterprises by subtracting state output from total output. The estimated output and labor-output ratios by ownership permit us to recalculate the second term in the labor demand decomposition equation [Equation(4)] by firm type to evaluate to what extent state investment bias affects labor demand growth.

Table 5shows the results of the labor demand impact of state investment bias. The negative values in the first column indicate that the state share has been falling for all those sectors on average during the period 2003-2008. In fact, for most years during the time period, those modern sectors witnessed decreasing state output, not just declining shares, as private firms rapidly expanded. The booming sectors, such as manufacturing, construction, and infrastructure services, have mainly expandeddue toincreased investment by both domestic private and foreign-invested firms. The last column in Table 5shows that state investment bias has a small negative impact on labor demand for all of these key sectors. State output shares are decreasing, but the

magnitude of the impacts are small relative to the impacts generated by non-state investments, mainly because of low labor requirements in production, evidenced by relatively low labor-output coefficients. For the manufacturing sector, declining state investment lowers labor demand by 0.02% annually from 2003 to 2008. By contrast, non-state firms increase employment by 0.98% annually during the same time period. The overall employment in the manufacturing sector increases by 0.51% per year due to structural transformation and state investment bias. In the construction sector, even though employment decreases by 0.15% per year due to the reduction in state investment in the construction sector, private and foreign-invested firms expand employment by 0.37% every year. The overall impact on labor demand due to changes in output shares is very small. The role of state investment on labor demand in infrastructure services is similarly small. State investment bias causes 0.09% decrease in labor demand. The decline in employment is replenished by expanding private and foreign-invested firms. The non-state sectors generate a 1.46% increase in employment in the infrastructure service sector. The overall infrastructure service sector experiences a 0.18% increase in labor demand due to the output restructuring.

These results suggest that restructuring into the private and foreign-invested firms, which are relatively less capital intensive, is an important factor driving labor demand growth. If state firms were expanding in output shares, then the labor demand growth rate in those modern sectors would be lower due to relatively low labor requirement in state enterprises. The declining importance of state production in those key modern sectors weakens the impact of an overly capital-intensive production strategy pursued by state firms on slowing down labor demand growth for the entire economy. But it may be the case that the restructuring could occur more

rapidly, making the gap between GDP and labor demand growth smaller as private firms expand more rapidly.

V. Conclusions

Labor demand in Vietnam has grown much more slowly than GDP over the last two decades. Since 2000 until 2008 GDP has grown on average 7.6% per year while employment grew at only 2.2%per year. While that difference reflects improvements in labor productivity, it also raises concerns that economic development is not creating enough new jobs. Structural transformation has moved labor from lower productivity traditional sectors, especially agriculture, to higher productivity modern sectors including manufacturing and services. The Vietnamese labor ministry in its recent assessment of the labor 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 18 aggregate sectors and the overall Vietnamese economy from 2000 to 2008 provided by GSO (2009, 2010) to examine the roles played by structural transformation, technical progress and institutional bias toward capital intensive development to explain the difference observed between labor demand growth and GDP growth. Decomposition of the factors behind labor demand growth attribute only 30% of this difference to shifts from low productivity sectors to higher productivity sectors, while the remaining 70% comes from declining labor use per unit output that is also found in agriculture. That simple decomposition cannot separate technical progress from effects of higher wage-rental ratios driving choice of capital intensive techniques. Nor can it distinguish between sectoral composition changes due to structural transformation versus choices toward capital intensive sectors made by state owned

(and possibly foreign invested) enterprises. We attempted to sort between these competing factors by investigating estimation of TFP growth by sector and by examining institutional biases that might lead to more capital intensive development.

We estimated technical progress using several production function specifications following both accounting and econometric approaches. Comparisons of the predictive ability of alternative production function specifications indicate the robustness of the Leontief production function results.Estimation using a Leontief production function shows that TFP growth is not unreasonably large but larger than found using the more standard approaches. For the overall economy labor efficiency is found to grow at 5.8 % per year, while capital efficiency grows at 2.0% per year.Those results are consistent with significant labor augmenting technical progress and better explain historical economic performance in Vietnam. This confirms suspicion that there may have been significant technical progress behind the Asian miracle, but one must address a labor augmenting bias in technical change to find it.

Rapidly rising minimum wages were found to contribute to a limited extent to more capital intensive development when we looked at the two key links between the minimum wage and labor intensity – the effect of minimum wages on overall wages and the effect of wages on technical choices. We found that inflation better explained wage evolution than did minimum wages. The 3.5% differential between GDP and labor demand growth due to falling labor output ratios is mostly due to technical progress.Institutional wages driving capital intensive technical choices explains at most about one-third of that difference. Undoubtedly, low wages have played a role in sectoral and technical choices made in Vietnam, but 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. Strong assumptions lead us to find declining roles played by state-owned enterprises in the manufacturing, construction, and infrastructure service sectors. The overall output expansion in those sectors was brought by increasing production levels of private and foreign-invested enterprises. The impact of overly capital intensive state investments on slowing down labor demand is weakened by the declining role of state enterprises in production. If restructuring occurred faster, however, enabling private firms to expand more rapidly, the differential might narrow faster, as well. Changes in output shares in non-state sectors generate more significant labor demand impacts than do investments in state-owned enterprises.

Structural transformation only partially explains slow labor demand growth in Vietnam. While some of the difference from GDP growth may be attributed to capital intensive investment by the state or by rising minimum wages, a significant share of the difference is found to be due to technical change when low elasticities of substitution and labor augmenting bias in technical change are taken into account.

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Table 1. Labor demand growth decomposition by sector, 2000- 2008

Activity	*Labor demand growth rate (%)* gL_i	Relative unit labor use a_{Li}/a_L	GDP share S_i	Growth rate of unit labor use (%) ga_{Li}	*Biased technical change and institutional wage bias (%)*	Growth rate of GDP shares gS_i	*Structural transformation and state investment bias (%)*	*GDP growth rate (%) gY*
Agriculture, forestry and fishing	*-0.44*	2.91	0.20	-4.27	*-2.48*	-3.46	*-2.01*	
Energy and natural resources	*8.27*	0.14	0.08	3.62	*0.04*	-2.65	*-0.03*	
Manufacturing	*7.18*	0.54	0.22	-3.90	*-0.47*	3.79	*0.46*	
Construction	*10.42*	0.52	0.09	1.33	*0.06*	1.79	*0.08*	
Infrastructure services	*3.18*	0.68	0.24	-4.66	*-0.75*	0.55	*0.09*	
Professional services	*14.37*	0.12	0.07	9.04	*0.07*	-1.96	*-0.02*	
Education and health	*4.86*	1.31	0.03	-1.16	*-0.04*	-1.27	*-0.05*	
Public services	*11.31*	0.37	0.05	3.85	*0.07*	0.16	*0.00*	
Other services	*7.23*	0.74	0.03	1.05	*0.02*	-1.11	*-0.02*	
GDP	***2.22***	1.00	1.00	-5.07	***-3.48***	0.00	***-1.50***	*7.57*

Table 2. Estimation of wage determination equations[1, 2]

Activity	Dependent variables:			
	nominal wage		real wage	real state wage
	real minwage α_i	CPI β_i	real min wage δ_i	real min wage η_i
Agriculture and forestry	0.0963	1.679***	0.376***	0.472**
	(1.36)	(11.99)	(6.39)	(3.79)
Fishing	0.286**	0.906***	0.198***	0.488***
	(3.88)	(6.23)	(7.94)	(7.01)
Mining and quarrying	0.504	0.149	0.0551	0.638***
	(2.04)	(0.31)	(0.62)	(6.09)
Manufacturing	0.262*	0.814**	0.130**	0.392***
	(2.68)	(4.21)	(4.88)	(10.75)
Electricity, gas and water supply	0.132	0.371	-0.211	0.278**
	(0.79)	(1.13)	(-3.55)	(4.29)
Construction	-0.0433	1.220**	0.0181	0.361***
	(-0.26)	(3.78)	(0.28)	(6.86)
Wholesale and retail trade; repair of motor vehicles, motor cycles and personal and household goods	-0.103	2.002	0.330	0.532***
	(-0.22)	(2.16)	(1.90)	(10.53)
Hotels, restaurant	0.206	1.887***	0.585***	0.616***
	(1.94)	(9.01)	(7.39)	(6.49)
Transport, storage and communications	0.596**	1.106**	0.603***	0.416***
	(5.46)	(5.14)	(17.14)	(5.63)
Financial intermediation	-0.414	0.938*	-0.487	0.783***
	(-3.17)	(3.65)	(-11.32)	(6.89)
Scientific activities and technology	0.440	0.820	0.311**	0.797***
	(2.28)	(2.16)	(5.25)	(7.51)
Real estate, renting and business activities	-0.485	0.298	-0.863	0.321
	(-4.46)	(1.39)	(-16.88)	(2.21)
Public administration and defense; compulsory social security	-0.0442	0.704**	-0.228	0.626***
	(-0.53)	(4.30)	(-8.24)	(9.35)
Education and training	0.452**	0.218	0.0358	0.637***
	(5.76)	(1.41)	(0.79)	(12.71)
Health and social work	0.229	0.680*	0.0330	0.649***
	(1.95)	(2.94)	(0.82)	(11.99)
Recreational, cultural and sporting activities	0.407*	0.483	0.118*	0.621***
	(3.61)	(2.17)	(3.04)	(8.92)
Activities of Party and of membership organizations	-0.682	1.216*	-0.622	0.501***
	(-3.88)	(3.51)	(-9.15)	(12.43)
Community, social and personal service activities and private household with employed persons	-0.0760	0.707*	-0.259	0.210*
	(-0.74)	(3.49)	(-8.75)	(2.81)
GDP	0.320**	1.148***	0.347***	0.492***
	(5.59)	(10.16)	(13.39)	(9.86)

Notes: [1] Numbers in parentheses are t statistics

[2] * represents p<0.05, ** represents p<0.01, and *** represents p<0.001.

Table 3. The impact of institutional wage bias on labor-output coefficients, 2000-2008

Activity	Percentage change in:	
	Unit labor use due to institutional wage bias (%)	Overall unit labor use (%)
Agriculture, forestry and fishing	-1.05	-4.27
Manufacturing	-0.11	-3.90
Infrastructure services	-1.37	-4.66

Table 4.Labor-output coefficients in 2003 by firm type

Activity	Labor-output coefficient for:		
	State	Non-state	Overall
Agriculture	0.010	0.507	0.345
Manufacturing	0.035	0.076	0.064
Construction	0.037	0.083	0.059
Infrastructure services	0.010	0.162	0.083
GDP	0.030	0.190	0.122

Table 5. Impact of state investment bias on labor demand from 2003 to 2008[1]

Activity	Growth rate of output shares gS_i	relative unit labor use a_{Li}/a_L	GDP share S_i	Impact on labor demand (%)
Manufacturing				
Overall	3.65	0.59	0.24	0.51
State	-12.49	0.04	0.04	-0.02
Non-state	7.83	0.64	0.19	0.98
Construction				
Overall	0.55	0.61	0.09	0.03
State	-12.44	0.39	0.03	-0.15
Non-state	8.71	0.72	0.06	0.37
Infrastructure services				
Overall	1.03	0.75	0.24	0.18
State	-9.81	0.10	0.09	-0.09
Non-state	8.51	1.13	0.15	1.46

Note:[1]The values for the overall sectors in this Table are not exactly the same as those in Table 1, because different time periods are considered. In Table 1, the time period is 2000-2008, and the time period for this Table is 2003-2008.