Long-run costs of piecemeal reform: wage inequality and returns to education in Vietnam

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Abstract

"Shock therapy" transitions in Eastern Europe facilitated movement of skilled workers into privatized industries offering high wage premia relative to state industries. Other transitional economies (notably China and Vietnam) have been slower to relinquish control over key industries and factor markets. Some costs of this piecemeal approach are now becoming apparent. We examine the spillover of continuing capital market distortions into the market for a complementary factor, skilled labor. Using Vietnamese data we find that capital market segmentation creates a two-track market for skills, in which state sector workers earn high salaries while non-state workers face lower demand and lower compensation. Growth is reduced directly by diminished allocative efficiency and incentives to acquire education, and indirectly by higher wage inequality and rents for workers with access to state jobs.

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1. Introduction

The skill premium – the ratio of wages for skilled or relatively highly educated workers to those of workers with low skills or education – is an important and widely used indicator of progress in economic development. It provides information about the distribution of income, at least among wage earners. It also signals incentives for individuals to acquire education or skills, the accumulation of which (in the aggregate) is essential to sustained, long-run economic growth. Further, trends in the skill premium reveal, indirectly, some of the consequences of changes in production structure and employment associated with economic growth or globalization.

The idea of a single, economy-wide skill premium presumes the existence of a unified market for wage-workers. In some developing and transition economies, however, this assumption may not be justified. If the market for wage labor is segmented by policies or market failures, then equilibrium skill premia can differ among workers even if they are alike in other respects such as gender and ethnicity, and both wages and returns to skills can in principle evolve independently. In this case skill premium data can yield more information than listed above. They provide circumstantial evidence of the nature and extent of imperfections in the wage labor market. This in turn makes it possible to ask new normative questions about economic efficiency, and about the distribution of income and opportunity among workers.

In this paper we explore trends in wages and returns to education in the wage labor market of a transitional developing country, Vietnam. That country's transition to "market socialism" since about 1990 has been marked both by extensive domestic policy reforms and by a huge increase in exposure to global markets. *A priori*, each process has momentous impacts in the labor market. Our data cover almost two decades of the transition, during which time average wages

rose in real terms and average returns to education also increased. Both of these trends are widely observed in the course of economic growth and the transition to a market economy, as we discuss in more detail below. But the Vietnam data also reveal two unusual patterns.

First, the most important trends have not been linear – nor even monotonic – over the entire transition period. In particular, while average real wages rose from 1993 to 2008, most of this increase took place during the 1990s; in the 2000s there was a clear slowdown in wage growth. Likewise, skill premia rose sharply during the 1990s but leveled off and even declined somewhat in the 2000s.

Second, we find persistent differences in both levels and growth rates of wages and skill premia across some subsectors of the labor market, even after controlling for ethnicity, gender, location and other characteristics. These differences can be seen between state and non-state employers. Prior to the mid-1990s state sector wages offered no premium for education; this "wage grid" system was dismantled only after a major reform in the early 1990s. Another dimension over which we find variation is that of traded and non-traded industries. Vietnam's move from near-autarky to more or less complete integration with the global economy has been promoted by measures—notably exchange rate unification and depreciation, trade policy relaxation, and domestic commercial policy reform—which increase the domestic terms of trade between traded and non-traded industries.

If internal policy reforms, especially the relaxation of wage controls in the state sector, and external (trade and FDI policy) reforms have been so extensive, why is it that intersectoral gaps in wages and skill premium persist? We hypothesize that this is due to incomplete transition, specifically, the persistence of interventions in capital and labor markets, even as extensive

external liberalization was taking place. The government's policy of giving state firms preferential access to capital creates segmentation in the capital market, and this spills over to the market for skills because of complementarity between the two. Consequently, a program of economic policy reform that is both gradual and incomplete may impose substantial costs in the form of inefficient allocation of both capital and skilled labor. This in turn might give rise to persistent inequality of income and opportunity.

There is a large microeconomic literature devoted to estimating the determinants of wages and returns to education for individuals. We review a Vietnam-specific subset of these in the next section. But our work also connects to two areas of macroeconomic research on transition economies and on globalization.

In Eastern Europe and the former Soviet Union (EE/FSU), the collapse of communism caused deep and sustained recessions and dramatic reductions in state sector output and employment. The recovery of employment during this transition was led by private (and newly privatized) firms. Workers with skills specific to state-owned firms suffered relative wage declines (Brainerd 1998); there was positive selection of skilled and ambitious workers into private sector enterprises unconstrained by the state sector "wage grid" (Adamchik and Bedi 2000), and overall there was a rise in average returns to skills, led by growth of skill-intensive private sector firms (Flanagan 1995; Orazem and Vodopivec 1997; Adamchik and Bedi 2000; Munich et al. 2005). The evidence from EE/FSU transitions seems to support the contention that smaller, privately held firms are in general more open to new ideas and technologies. This is also the contention in recent work on China, another economy undergoing a slow and as yet highly incomplete transition (Lin 2011; World Bank/DRC 2012).

The global trend toward more open trade and capital market policies also dates from around 1990. It too has stimulated a lot of research, much of it evaluating the effects of trade policy reforms and globalization on wages and skill premia. Many studies of low-income economies undergoing trade liberalization have found that skill premia have risen rather than falling as predicted by the Heckscher-Ohlin/Stolper-Samuelson model. In Latin America and Asia, skill premia and wage inequality have increased along with integration into the global market (Wood 1997; Arbache et al. 2004; Knight and Song 2003). These trends may still be consistent with Heckscher-Ohlin in that the rise of China and India to global prominence has caused a sharp rise in the global endowment of unskilled labor. Other analyses, however, have identified Ricardian technology-based comparative advantage as playing a leading role, especially in the more dynamically growing developing and transitional economies (Feenstra and Hanson 1997; Zhu and Trefler 2005). If market-driven growth of skill-intensive industries is the main cause of rising wage inequality, then there is no cause for concern on welfare grounds. However, these studies' findings are for *average* skill premia. At least one more recent study finds (in the case of China) that the averages mask differential rates of skill premium growth within a segmented labor market (Li and Coxhead 2011).

Vietnam's transition is superficially similar to those in EE/FSU in that there was a great deal of new private sector activity and rising skill premia. By contrast with EE/FSU, however, economic growth in Vietnam remained positive throughout the transition.[1] Moreover, state enterprises, while contracting in relative terms, by no means became irrelevant or marginalized. Rather, their privileged access to capital and other resources meant that they were well placed to take advantage of opportunities created by closer global integration. In this paper we explore how such differences in transition experiences might explain the observed trends in Vietnam's

wage labor market, in particular the rise in average wages and skill premium, as well as the persistence of inter-sectional wage and skill premium gaps.

The remainder of this paper is structured as follows. In section 2 we describe the data and conduct a preliminary examination of possible reasons for observed trends and puzzles. In section 3 we sketch a simple model of wage and skill premium determination in the presence of policy interventions in both capital and labor markets. Section 4 provides an econometric exploration of trends in skill premia, taking account of the key features of the two transitions by discriminating between state and non-state sectors, and traded and non-traded industries. In section 5 we draw conclusions and consider possible implications for longer-term growth and development.

2. Wage growth and skill premia during Vietnam's twin transitions

2.1. Prior studies

The microeconomic literature on wage growth, wage inequality, and returns to education in Vietnam has become increasingly rich as data accumulate. All existing studies use data from the Vietnam Household Living Standard Surveys (VHLSS; see section 2.2 below). Most estimate variants of the well-known Mincer equation (Table 1).

Differences in methodologies and data among these studies mean that estimates of skill premia vary considerably. Nevertheless, findings regarding *trends* are consistent across studies. First, real wages increased rapidly in Vietnam during its transition. From 1998 to 2008, real earnings doubled for men in the wage labor force, and more than doubled for women (Sakellariou and Fang 2010). Second, returns to education in Vietnam are low but have increased over time, a

trend that is broadly similar to the experiences both of China and the EE/FSU transitional economies. However skill premia have yet to reach levels comparable with international data (see Psacharopoulos and Patrinos 2004).[2]

There is also strong evidence of persistent wage differentials in several dimensions. These include gender, ethnicity, and region (Pham and Barry 2007b; Liu 2006), but also (and somewhat more surprisingly) institutions—specifically, state vs. non-state sector employment. Imbert (2010) studied the state/non-state sector wage gap, noting the rise in average earnings of state sector workers from 1993 to 2006. He finds that the rise in the state sector wage premium cannot be explained by a change in worker selection into the sector; rather, it is due to differences in returns to characteristics or sectoral differences in wage-setting. Our work confirms and extends this result.

Liberalization of the exchange rate regime, external trade and capital flows have played a major role in the transition. Oostendorp and Doan (2010) examine the labor market effects of trade liberalization and find that it lowered returns to education by 1.2-3.6%, though in their study most of this decline was due to changes in the industry distribution of employment rather than lower Mincerian returns. We explore the traded/nontraded dimension further in this paper and reach a somewhat different conclusion.

Relative to the foregoing empirical literature we make a twofold contribution. First, we use all available rounds of the VHLSS, from 1993 through 2008. This enables us to study the evolution of the Vietnamese labor market over a longer period than was previously possible. The combined data span almost two decades of extensive domestic reforms and rapid economic integration. Second, we examine skill premium trends along the two dimensions of particular

importance to the transition discussed above: state or non-state firms, and traded or non-traded industries. Because Vietnam's transition occurred in piecemeal fashion, dividing the data in this way enables us to identify the contribution of external liberalization to wage growth and rising skill premia separately from that of domestic labor market reforms, and to examine potential interactions between the two types of reform.

2.2. Data

The VHLSS[3] was carried out in 1993, 1998, and then every other year from 2002 to the present. We have access to data from 1993 to 2008. The surveys gather data on household income and expenditure and are designed to measure living conditions and poverty and inequality (Grosh and Glewwe 2000). They are intended to be representative at the national level. They include modules that generate the employment and wage data used in this paper. Early rounds of VHLSS were smaller in size (4,800 households in 1993 and 6,000 in 1998). The survey year 2002 had the largest number of households (29,533). In the most recent three rounds, the number of households surveyed has stabilized at around 9,000.

We include all individuals of working age (15-60 years) with reported wages. The hourly wage is calculated by dividing annual total wage income (salary plus cash bonuses and in-kind benefits) by the estimated number of hours worked during the year. Only the primary job is counted. Within each survey year, wages are regionally deflated to January of that year using deflators provided by the surveys. For year 2002, there are no data on experience, so we replace it with $min\{$age-17, age$-$schooling years$-17\}$.

To measure years of education, most other studies based on VHLSS data have used the survey's original schooling year variable, which ranges from 0 through 12 years. We adjust schooling

years for highest educational level (junior college means 14 years of education, a college degree 16 years, master's degree 18 years, and Ph.D. 21 years). As a result, our calculations of average years of schooling are higher than other studies. This might also lead to lower estimates of returns to schooling.

Finally, we also allocate workers into traded and non-traded industries. Appendix A describes our methods for making this division and lists industries in each category.

2.3. Descriptive statistics

We begin by characterizing the data and analyzing wage trends.[4] The first lines in Tables 2 and 3 show that real wages for all groups have risen consistently over the years.

While there was wage growth for all groups, its pace has been unequal across groups, and the trends have not been linear (see Table 3). Wage growth has been higher for those with more education, so skill premia have risen. As seen in Figure 1, in 1993 the skill premium, as measured by the ratio of the average wage for workers with different educational levels to those for workers with no schooling, hardly existed. This was the outcome of a centralized wage-fixing system, as had also been the case in EE/FSU prior to the collapse of communism. From 1993 through 2002, as the economy went through a series of domestic reforms, there was a dramatic increase in the skill premium, most especially for college-educated workers. Interestingly, however, this rise did not persist in the second reform decade. In fact, Figure 1 shows that for some levels of education, the skill premium actually declined slightly from 2002-2008.

Another interesting revelation in Table 2 is the evolution of the wage differential between state and non-state sectors. In 1993, average wages of state workers were only 90% of those in non-state (this ratio varied somewhat by education level: see Appendix Table B-1). But from 1993-2002 wages grew much faster in the state sector, with growth rates of 18% in 1993-1998 and 17% in 1998-2002, as against only 9% and 4% in the non-state sector (Table 3). As a result, state sector wages quickly caught up with and then exceeded those in non-state sectors; by 2002, state sector workers' average wage was 175% that of non-state sector workers. In 2002-2008 however, the non-state sector regained some ground; the state to non-state wage ratio declined from 1.75 in 2002 to 1.57 in 2004, then remained stable until 2008.

The rise of state sector wages and their persistent premium over those in non-state sectors stands in strong contrast to trends seen in the transitions of the EE/FSU countries. Interestingly, however, these data are similar to those from a comparable period in China, where the ratio of average state to non-state sector wages rose from 0.4 in 1988 to approximate parity (0.9) in 2001, while the coefficient of variation of wages across institutions fell from 0.46 to 0.16 (Cai, Park and Zhou 2008, Table 6.4).

2.4. Wage determinants: Mincerian analysis

While the descriptive analysis yields interesting results, when examining factors associated with wage differentials we need to control for covariates. We do this initially with Mincerian wage regressions (Mincer 1974). In Table 4a we report the regression of log hourly wage on a set of covariates that includes educational achievement, measured by reported years of schooling, along with experience, gender, and other characteristics.[5] The estimates show that in 1993, the wage premium due to education was statistically significant but very low at just 0.019 (i.e.,

1.9%). By 1998, this had jumped to 4.1%, and increased in each subsequent period until by 2008 it had reached 5.8%.[6] The contrasts between periods are notable. In 1993-2002, returns to education rose 147%, or about 16% per year. In 2002-08 they rose by just 23%, or about 4% per year. Even after these increases, however, our estimates suggest that average returns to education in Vietnam remain low by international standards (Psacharopoulos and Patrinos 2004). This is one source of concern regarding private incentives to invest in human capital.

In Table 4b we show estimates using dummy variables for different educational levels. In 1993, wage compression was such that only college graduates commanded any premium relative to unskilled workers. Even then, the difference was very small: a college degree resulted in a log wage only 27% higher than for those with no education. Returns to different education levels increased steadily from 1993 through 2008. Returns to college degrees increased the most, as already discussed. Once again, our estimates show that returns to schooling grew much faster in the 1990s compared with the 2000s.

Our data include potential selection bias problems arising from workers' decisions to enter the wage labor force, and within that, to choose state employment. To test for selection into wage labor we fit Heckman regressions to control for sample selection bias. Identification variables include the dependency ratio, a household head dummy variable, and non-wage income (non-wage income variables are not available for survey years 1993 and 1998). The results (Appendix Table B-2) reject the null hypothesis of no sample selectivity. However, there are no major differences between OLS and Heckman estimates.

In Appendix Table B-3, we control for endogenous selection into state sector jobs. Here the identification variable is a "network" dummy equal to 1 if a respondent's household has at least

one member in a state sector job. Comparing these treatment regression results in Table B-3 to the OLS results in Table 4a, we can see that without controlling for selection into state sector jobs, the estimated returns to education tend to be biased upward. However, there are no qualitative changes in the story being told.

A feature common to all these estimates is that there is conspicuous instability across decades in the parameter estimates for the state sector and traded industry dummy variables. In particular, state sector employment was associated with a significantly negative wage effect in 1993 and 1998, but a positive one in 2002 and 2008. The traded industry dummy was not statistically significant in the 1990s, but became negative and significant in the 2000s. In 2002, as Vietnam adjusted to the aftermath of the Asian financial crisis and its own set of policy reforms (see below), the wage discount for tradable sector employment was a remarkable 10-11%. But even six years later, this discount remained a significant 3-5%. By themselves, these results provide a striking contrast with the EE/FSU experience, where state employment declined and traded industries expanded rapidly as the transition progressed. They also raise questions about the trajectory of the transition as reflected in the wage labor market. Vietnam's state-owned industries have indubitably flourished, and the wage data seem to reflect that; yet so too have its trade-oriented industries. Reflecting on the estimates just presented, it seems that there may be more processes in the data than the basic Mincer model is capable of capturing. In the remainder of this paper we explore this possibility and its implications: first by means of a brief review of Vietnam's transition, second with the help of a simple theoretical model, and third by fitting nonlinear wage regressions allowing for interactions among the internal and external components of the transition process.

2.5. Vietnam's transition

In contrast with the 'shock therapy' transitions of most EE/FSU economies, Vietnam's transition has extended over many years. Table 5 illustrates some of the most significant reform measures.

In early reforms, the government liberalized product markets and trade, implemented policies to attract foreign capital, and began to "equitize" (i.e., partially privatize) some state-owned enterprises. However, high rates of import protection and other forms of preferential treatment were retained for products and services dominated by state-owned enterprises (Athukorala 2006). Private sector business enterprises were legalized from 1990, albeit under restrictive conditions. But while product markets have been liberalized over time, relaxation of state controls over factor markets has been much slower and more uneven than that in the former EE/FSU economies. As a result, access to capital through the banking system remained essentially closed to private borrowers, while state firms could obtain funds at below-market prices. By 2000, capital per worker in state firms averaged VND 147m, nearly four times greater than in the private sector (VND 40m).[7] There was a strong bias toward joint ventures with state firms in tradable industries, mainly operating at the higher end of the capital-intensity range (World Bank 1995).[8]

In the labor market, the government introduced a number of changes that affected wages and conditions for state sector workers. These changes included a wholesale reform of state sector enterprises (resulting in the loss of an estimated 1.5 million jobs), and the 1994 Labor Law, which relaxed somewhat the regulations governing state sector workers' compensation and benefits (Moock et al., 2003). These labor law reforms were thought by contemporary observers to have had little direct impact on private sector workers as "in general the private sector was not

hampered by the more rigid labor remuneration regulations" to which government agencies and state-owned enterprises were subject (World Bank 1995: 63). Despite such reforms, the state sector labor market remains tightly regulated to this day, and rationing of state-sector jobs continues to be a common practice, with non-transparent selection procedures and substantial "fees" for successful appointments widely reported.

As a result of continued state control in critical factor markets, the role of the state sector in the Vietnamese economy did not decline as in the experience of former EE/FSU economies; rather, it was strengthened in certain aspects. Early growth in tradable industries was dominated by state enterprises (some with foreign buy-in, in the form of joint ventures), largely producing import-substitutes using capital-intensive technologies. Export revenue growth in this period was dominated by agriculture (especially rice and coffee) and natural resources such as coal. As the World Bank (1995) concluded, "These privileges - in particular preferential access to land and foreign trade quotas and licenses - have played a very important role in the concentration of foreign direct investment in joint ventures with state enterprises, which is transferring to them new financial, managerial and technological resources." Undoubtedly, access of SOEs to foreign capital and joint venture partnerships in the 1990s helped raise their productivity, and along with it the returns to their workers—subject, of course, to restrictions on compensation imposed by the Labor Law.

Only later, at the start of the 2000s, were reforms adopted that encouraged private sector engagement with the global economy and promoted a more level domestic playing field between the state and private sectors. The Enterprise Laws of 2000 and 2005, in particular, consolidated the legal basis for organized private sector activity, and legalized private sector joint ventures as well as wholly foreign-owned firms. However, with capital market segmentation still in place,

private sector investment continued to be crowded out by state sector firms. The non-state tradable sector activities that grew fastest, as a consequence, were those employing technologies and factor proportions consistent with comparative advantage as defined by the vector of factor endowments *net* of those employed in the state sector. This is the decade during which assembly-driven light manufacturing became Vietnam's leading source of export earnings after coal and oil. Demand for higher-skilled labor has also grown, but mainly in non-tradable service-sector activities such as banking, finance, insurance and administration, all of which have remained the preserve either of the state (including provincial governments) or of state-owned companies.

This review suggests considerable, if circumstantial, evidence for a policy-driven form of segmentation between state and non-state labor markets. To what extent do observed trends in wages and wage premia reflect this uneven progression through a program of economic reform? What is the contribution of globalization—the very rapid opening to world markets that Vietnam underwent at the same time? We next construct a simple model to examine the consequences of a stylized sequence of piecemeal reforms for wages and skill premia. This in turn lays a foundation for empirical hypothesis tests, in section 4.

3. Theory

Assume that representative firms in state and non-state sectors produce the same output, face the output price vector p, and share the same production function $f(L,T,K)$, where L is unskilled labor, T is skilled labor, and K is capital. Under the counterfactual of complete and undistorted markets, both types of firm choose factor employment to maximize profit, given by $p*f(L,T,K) - wL - qT - rK$, where w, q and r are economy-wide unit prices for unskilled labor, skilled labor,

and capital respectively. Under the usual assumptions of concavity and linear homogeneity, this profit maximization yields factor demand functions $L_i^*(w,q,r,p)$, $T_i^*(w,q,r,p)$, and $K_i^*(w,q,r,p)$, where i indexes non-state (N) and state (S) sectors. Let w be unity by choice of unskilled labor units. Then relative labor demand $H_i = T_i/L_i$ is a declining function of the relative factor price q: $H_i^*(q,r,p)$.

An important feature of the model is the assumption of complementarity between capital and skills (Griliches 1969; Krusell et al. 2000; Duffy et al. 2004). Complementarity requires:

$$\frac{\partial H_S}{\partial r_S} < 0 \quad \text{and} \quad \frac{\partial H_N}{\partial r_N} < 0.$$

The interaction of capital-skills complementarity with policy distortions in factor markets rationalizes observed patterns of intersectoral divergence and convergence of skill premia during Vietnam's transition. Capital market interventions cause deviation from competitive equilibrium. The government sets the price and quantity of capital made available to the state sector at $\bar{r}_S$ and $\overline{K_S}$ respectively. This yields a new relative labor demand function for state firms, $H_S(q, p, \bar{r}_S, \overline{K_S})$, while that for non-state firms is still $H_N(q, r_N, p)$. Under this policy state and non-state firms no longer face the same rental rate of capital, but they still face the same relative wage. Moreover the quantity constraint on capital allocations to state firms imposes a limit on the number of skilled jobs they can create. For a given capital constraint, the maximum number of skilled workers hired in state firms is $Q(\overline{K_S})$.

Figure 2 captures the main idea. We assume a fixed total supply of skilled workers and full employment. The horizontal axis measures the total skills endowment, and the vertical axes measure relative wages in state and non-state sectors. State sector demand for skills is measured from the left by the curve H_S, and non-state demand from the right, by the curve H_N.

Without policy distortions, equilibrium is at the point where the value marginal product of skills is equal across sectors, at H*, with a common unit price q*. If there is only a capital market distortion, then in the skilled labor market both state and non-state firms still face the same relative wage q*. In the absence of capital-skills complementarity, cheaper (or more readily available) capital to the state sector leads to more hiring of skilled workers, which crowds out skills in the non-state sector. However, complementarity means that the capital quota also causes segmentation in the skilled labor market. It raises the equilibrium relative wage in the state sector to q$_S$ while lowering that in the non-state sector to q$_N$. This conjecture is consistent with the divergence observed in the data.

Capital rationing in the state sector is the indirect cause of segmentation in the skills market, and generates divergent skill premia. A change in $\overline{K}_s$ directly affects the gap in skill premia through a corresponding change in Q. Moreover, other changes that affect relative labor demands in the two sectors—such as changes in output prices due to trade liberalization, or capital injections due to policy changes or foreign direct investment—also alter the gap, by displacing the relevant skilled labor demand curves in relation to each other and the hiring constraint. For example, an increase in the government's allocation of capital to the state sector will shift that sector's relative labor demand curve to the right, raising wages paid to state sector skilled workers and widening the inter-sectoral gap. On the other hand, an increase in foreign direct investment into the non-state sector will increase that sector's relative labor demand (a leftward shift of that curve in Figure 2), raising wages paid to skilled workers in non-state firms, and so narrowing the gap.

This analysis accounts for equilibrium skilled wage differences across sectors, but leaves one remaining puzzle. If limits on the hiring of skilled workers by state firms lower the cost of the

same workers to non-state firms, why do these firms not adopt more skill-intensive technologies? The answer, we surmise, lies in a macroeconomic link between the otherwise disjoint sectoral capital markets. As in China (Lin 2011), Vietnam's state-owned industries have preferential access to domestic capital at low administrative prices. Their borrowings are limited only by administrative quotas, and the capital they borrow is frequently cycled back into the economy in a variety of forms of spending and speculative activity. Seeking to maintain monetary stability, and lacking adequate sanctions over state sector activity, the monetary authorities attempt to stabilize credit growth by limiting supply to the non-state sector. This pushes private firms toward less capital-intensive processes. Capital-skills complementarity then ensures that their demand for skills is also low.

This stylized model is useful in explaining what happened to skill premia in many transition economies. In the former communist countries of Eastern Europe, transition and globalization involved a sharp reduction in the capital stocks of state firms but a dramatic increase in those of private firms. This directly reduced the relative demand for skilled labor in state firms while raising it in private firms. The net result was a relative increase in skill premia in the private sector as this sector expanded. In Vietnam, as explained earlier, transition has not been accompanied by contraction of the state sector. We take advantage of policy changes in Vietnam between two decades of reform (1990s and 2000s) to *test the hypothesis that trends in inter-sectoral skill premia gap in Vietnam were a result of incomplete transition (i.e., continued state intervention in capital and labor markets) coupled with rapid external liberalization.*

During the 1990s, the state sector expanded because of preferential treatment in the capital market. Firms either received capital directly from the government, or had easy access to subsidized loans from state banks or foreign investments. This capital market distortion, coupled

with rationing of skilled sector jobs in state firms, led to widening of the gap in skill premia between state and private sectors. As will be shown empirically below, this widening of the skill premium gap was the most pronounced among state firms in the traded sectors, because trade liberalization during this period also favored state firms more.

In the 2000s, there was a gradual leveling of the playing field between state and private sectors. Private firms started to receive more capital investments, especially in the form of foreign direct investments. This increased the private sector's relative labor demand, reducing the gap in skill premia. In the next section, we examine the empirical evidence for this hypothesis.

4. Explaining skill premia – the role of domestic and international reforms

4.1. Empirical strategy

The foregoing theoretical discussion hypothesizes that wage trend and inter-sectoral wage gap in Vietnam are a result of both domestic policies on labor and capital markets and external liberalization of trade and FDI. To measure the impacts of these simultaneous internal and external policies, simply including state sector and traded industry dummies (as in section 2.4) is likely inadequate. These policies are likely to influence wages not only through intercept shifts, but also through changes in returns to education and in returns to other workers' characteristics. Furthermore, there could be interactions between the two sets of policies.

To account for the impacts of these two coterminous sets of policies and their potential interactions, we sort wage-earners into four industry groups: state and traded (ST), non-state and traded (NST), state and non-traded (SNT), and non-state and non-traded (NSNT). Hypothesis-testing then implies an estimation strategy which allows for statistical tests of differences in

estimated coefficients across groups and years. We achieve this with "stacked regressions." That is, we interact the four group dummies with year dummies and with all explanatory variables including the constant term. We pool data for pairs of years (1993-1998, 1998-2002, and 2002-2008)[9] and calculate the change in returns to education for each group in each period. These comparisons allow us to identify the distinct effects of internal and external reforms and their interactions.

4.2. Results

The stacked regression results are shown in full form in Appendix C. Nearly all estimates differ from zero at conventional significance levels. To focus on our main story, we discuss only those results that relate to returns to education in each of the groups and time periods. These are presented in summary form in Table 6. Panel (a) of the table reports returns to education by year. It shows that in 1993, workers in state firms and non-traded industries were the only ones with any measurable skill premium. The gap in returns to education between this group and other workers persists and even widens through time; by 2008, the return to an additional year of schooling for workers in state non-traded industries (9.1%) is almost twice the next highest figure (4.7%, for workers in state traded industries). Returns to education in non-state traded industries are the slowest to rise, and by 2008 reach only 1.9%, half the rate for state workers in equivalent industries.

Interestingly, however, skill premium differences between state and non-state traded industries began to diminish in the 2000s. This is consistent with progress, albeit at a slow rate, in domestic policy reforms that removed impediments to private sector engagement in commercial activity in general, and international trade and FDI in particular.

Trends between years can be seen in Table 6, panel (b). During the early reform period, 1993-98, there were significant rises in returns to education for all groups, but especially so for workers in state firms and traded industries. These workers began with a significantly negative skill premium, so the rising premium reflects the relaxation of the command economy wage grid. But it also suggests a positive interaction between institutions and globalization. The average worker in a state firm experienced a rapid increase in returns to his or her education in the 1990s, but this increase was even higher if this worker was also in a traded industry. Thanks to the ability of state firms to attract large quantities of new investment both from the domestic economy and from abroad, state workers in traded and joint-venture industries captured a dividend from the decade of state-led globalization.

The middle period, 1998-2002, was one of slower growth as the Vietnamese economy experienced aftershocks from the Asian economic crisis. These took the form of a slowing of export demand and FDI inflows. For private sector workers, growth in the skill premium stalled during these years. State sector workers, however, suffered no such penalty, again indicating the advantages enjoyed by these industries even well into the economic transition. The tables only begin to turn during the second phase of transition, from 2002-08. In these years, non-state traded sector skill premia begin to catch up—and indeed during this later period, no other group experienced a significant rise in returns to education. These data signal a convergence in skill premia. Despite this catch-up, however, non-state traded sector workers still had substantially lower returns to education compared with workers in other groups in 2008, as already seen in Table 6, panel (a).

In summary, the empirical model estimated in this section enabled us to trace the impacts on wages of increased economic openness and domestic policies, and to unpack interactions

between the two in different eras of Vietnam's economic transition. The empirical evidence supports our hypothesis that changes in skill premium gap between state and non-state sectors were a result of both internal and external policy changes in between the two decades of reforms (1990s and 2000s). Our findings extend and to some extent unify those of prior contributions to this literature. As in Imbert (2010), we find evidence that the gap in skill premium between workers in state and private sectors increased over time. We show further that this gap ceased to increase in the 2000s as a result of deepening reform and liberalization. This is revealed only by examining the interaction between institutional and trade factors. Our analysis has also shown the net impact of trade liberalization on wage premia might be masked by interactions between institutions and trade. In this respect it complements other findings that trade liberalization reduces returns to education (Oostendorp and Doan 2010).

Despite increases over time, and with the exception of the state non-traded workforce, after two decades of globalization and liberalization returns to skills in Vietnam remain low by international standards. Our estimates, based on a generalization of the Mincer model, yield rates of return to education considerably lower than those in prior studies using earlier rounds of the same data and/or more restrictive estimation strategies.

5. Conclusions

In this paper we identify the separate wage and skill premium effects of globalization and domestic policy reforms, and of their interactions, in a transition economy, Vietnam. We do so with the aid of a data set spanning a period much longer than most existing studies of transition economies. We test the hypothesis that broad trends in the timing and sequencing of reforms strongly influence trends in wages and inter-sectoral differences in skill premia. More

specifically, the combined effects of trade and FDI liberalization with continued high levels of intervention in capital and labor markets explains the widening wage and skill premia gaps between state and non-state sector workers in the 1990s and their persistence into the 2000s.

In a low-income country where both capital and skills are scarce, our results point to significant development implications of the transition strategy. In such a country there is a potentially large growth dividend associated with further relaxation of special treatment for state-owned enterprises. As a group, these industries absorb a large share of Vietnam's investment capital and its skilled labor, yet they are highly inefficient and their activities contribute relatively little to overall income growth.[10] In the presence of persistent capital market segmentation, state sector activity has *both* depressed returns to skills in non-state sectors *and* crowded out more skill-intensive forms of private sector growth. Vietnam's transition "from plan to market" has been less disruptive than in Eastern Europe, yet our results suggest that even faster growth would have been possible had domestic reforms extended sooner and more deeply into factor markets.

The incomplete transition also has negative consequences on equality of income and opportunity. We have found that the return to education is substantially higher for workers with coveted state-sector jobs.[11] We find also that family connections are very strong predictors of employment in state firms (Appendix Table B-3); thus, such connections indirectly raise returns to education. The rationing of state sector jobs on non-meritocratic criteria—an inevitable consequence of capital market segmentation—is undoubtedly a contributing factor both to inequality of opportunity and to corruption, both of which have corrosive effects on economic development. A promising area for further research is to investigate in greater detail the process of selection into state-sector employment, and the effects of this on incentives to invest in education, wage inequality, and the distribution of household income.

Table 1: Studies on wage distribution and estimates of returns to schooling in Vietnam

Paper	VHLSS years used	Methodology	Results
Gallup 2002	1993, 1998	OLS Mincerian	Returns to one year of schooling: 1.9% in 1993, 3.5% in 1998
Liu 2005	1993, 1998	OLS Mincerian; estimate separately for male and female, and for workers in government, SOE, or private sector; decomposing gender wage gap into within- and between-sector differences	Returns to one year of schooling range from 3.3% to 7.5%; lower for females and in private sector; gender wage gap has decreased from 1993 to 1998
Doan & Gibson 2010	1998 through 2008	Heckman method to correct for selection into wage employment	Returns to one year of schooling: 3.8% in 1998, increasing to 10% in 2008
Liu 2006	1993, 1998	Hay's two-stage method (generalization of Heckman) to correct for selection into wage employment; Katz and Murphy (1992) framework to identify supply and demand factors.	Returns to one additional year of schooling ranges from 3% to 6%; shift in demand in favor of more educated workers drives changes in wage structure
Pham & Reilly 2007a	1993, 1998, 2002	Mean and quantile regression separately for male and female; Oaxaca decomposition of gender wage gap into treatment and endowment effects at mean and at quantiles of conditional wage distribution	Gender wage gap halved between 1993 and 2002
Pham & Reilly 2007b	2002	Oaxaca decomposition of ethnic wage gap into treatment and endowment effects at mean and at quantiles of conditional wage distribution	Ethnic wage gap is largely attributable to differentials in returns to endowments
Oostendorp & Doan 2010	1998, 2002, 2004, 2006	Endogenous employment choice for sample selection; workers divided into three groups: non-traded, import-substituting, and export-oriented industries; diff-in-diff to study impact of trade liberalization on returns to education.	Returns to education: 3-5% at 6 years of education; 6-12% at 12 years; 7-17% at 15 years; trade liberalization reduces returns to education by 1.2 - 3.6%.
Sakellariou and Fang 2010	1998 through 2008	Oaxaca-Blinder decomposition of contribution of changes in education and other explanatory variables to changes in wages at quantiles of the unconditional wage distribution, for men and women separately	For men: wage growth underpinned by both increases in endowment of productive characteristics and changes in wage structure; for women: it was mostly the latter
Imbert 2010	1993 through 2006	Exploit the panel data (1993-1998 and 2002-2006) and modify the Oaxaca decomposition method to decompose public-private sector wage gap into: constant earnings diff. between public and private workers, diff. in returns to productive skills, selection into public sector	Public-private sector wage gap did not decline but increased over time; changes in the returns to skills are the driving factor

Table 2: Mean hourly wages (thousand VND)

	1993	1998	2002	2004	2006	2008
All	1.83	2.90	3.83	4.54	4.56	7.34
Gini coefficient	0.38	0.35	0.42	0.36	0.35	0.39
State	1.71	3.23	5.49	5.64	5.61	9.34
Non-state	1.89	2.73	3.14	3.60	3.65	5.84
State/non-state ratio	0.90	1.18	1.75	1.57	1.54	1.60
t-stat for state - non-state difference	2.08	5.95	25.24	21.70	21.75	20.28
No schooling	1.76	2.53	2.54	3.07	3.13	4.80
Primary school	1.99	2.68	3.03	3.50	3.53	5.39
Middle school	1.74	2.68	3.72	3.92	3.89	5.60
High school	1.75	3.20	4.70	5.42	4.99	7.82
College degree and higher	2.03	5.36	7.37	8.08	8.42	14.74
t-stat for primary against others	2.32	4.57	10.59	12.37	12.16	10.64
t-stat for middle school against others	1.34	3.48	3.24	7.24	8.02	9.89
t-stat for high school against others	0.88	2.54	8.82	9.32	5.97	3.74
t-stat for college against others	1.25	17.7	28.00	27.74	32.60	32.18

NOTE: all wages deflated to January 1998 prices.
Source: Authors' calculation using VLSS and VHLSS data

Table 3: Average annual growth in real wages (% change)

	1993-1998	1998-2002	2002-2008	1993-2008
All	12	8	15	20
State	18	17	12	30
Non-state	9	4	14	14
No degree	9	0	15	12
Primary school degree	7	3	13	11
Middle school degree	11	10	8	15
High school degree	17	12	11	23
College degree and higher	33	9	17	42

Source: author's calculation using VLSS and VHLSS data

Table 4a: Determinants of Wage (OLS), using years of education

	1993		1998		2002		2008	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Years of education	**0.019**	0.004	**0.041**	0.004	**0.047**	0.002	**0.058**	0.003
Years of experience	**0.017**	0.005	**0.023**	0.003	**0.022**	0.002	**0.037**	0.003
Experience squared	**0.000**	0.000	**0.000**	0.000	**0.000**	0.000	**-0.001**	0.000
Ethnic minority dummy	-0.036	0.058	-0.004	0.046	**-0.130**	0.029	**-0.084**	0.034
Male dummy	**0.310**	0.027	**0.183**	0.020	**0.185**	0.009	**0.202**	0.014
Red River Delta	**-0.283**	0.043	**-0.444**	0.047	**-0.361**	0.019	**-0.294**	0.023
North East	**-0.306**	0.065	**-0.347**	0.058	**-0.428**	0.029	**-0.159**	0.037
North West	0.181	0.167	**-0.198**	0.060	**-0.636**	0.122	**-0.256**	0.074
North Central Coast	**-0.252**	0.060	**-0.424**	0.057	**-0.338**	0.027	**-0.362**	0.039
South Central Coast	**-0.182**	0.051	**-0.120**	0.040	**-0.147**	0.022	**-0.115**	0.033
Central Highland	-0.014	0.087	*-0.150*	0.086	**-0.921**	0.047	**0.137**	0.066
South East	**0.190**	0.047	0.045	0.038	-0.028	0.021	**0.081**	0.030
Mekong River Delta	**0.133**	0.040	**-0.078**	0.034	-0.028	0.019	-0.040	0.025
Tradable industry dummy	0.015	0.033	-0.025	0.027	**-0.110**	0.012	**-0.051**	0.016
Public sector dummy	**-0.164**	0.039	**-0.134**	0.031	**0.216**	0.015	**0.116**	0.020
Constant	-0.003	0.054	**0.428**	0.045	**0.584**	0.025	**1.218**	0.033
N	2608		3590		21451		7019	
Adjusted R-squared	0.10		0.17		0.31		0.32	

Notes: Dependent variable = log(hourly wage)
Bold means statistically significant at 5% of 1%; Italic means statistically significant at 10%
OLS regressions with robust and clustering-adjusted standard errors

Table 4b: Determinants of Wage (OLS), using educational degrees

	1993		1998		2002		2008	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Middle school degree	0.004	0.035	**0.074**	0.028	**0.127**	0.014	**0.101**	0.019
High school degree	0.066	0.045	**0.216**	0.035	**0.287**	0.017	**0.304**	0.023
College degree and above	**0.272**	0.064	**0.575**	0.054	**0.635**	0.023	**0.792**	0.032
Years of experience	**0.017**	0.005	**0.021**	0.003	**0.023**	0.002	**0.034**	0.003
Experience squared	**0.000**	0.000	**0.000**	0.000	**-0.001**	0.000	**-0.001**	0.000
Ethnic minority dummy	-0.083	0.056	-0.060	0.056	**-0.190**	0.029	**-0.131**	0.034
Male dummy	**0.313**	0.027	**0.190**	0.021	**0.197**	0.009	**0.222**	0.014
Red River Delta	**-0.266**	0.043	**-0.412**	0.048	**-0.342**	0.019	**-0.237**	0.023
North East	**-0.287**	0.065	**-0.308**	0.060	**-0.406**	0.030	**-0.106**	0.036
North West	0.217	0.170	**-0.187**	0.066	**-0.604**	0.125	**-0.206**	0.070
North Central Coast	**-0.232**	0.059	**-0.406**	0.059	**-0.321**	0.027	**-0.316**	0.039
South Central Coast	**-0.185**	0.052	**-0.121**	0.040	**-0.134**	0.023	**-0.080**	0.033
Central Highland	-0.037	0.088	**-0.167**	0.086	**-0.930**	0.048	**0.151**	0.067
South East	**0.168**	0.047	0.034	0.040	**-0.043**	0.021	**0.076**	0.029
Mekong River Delta	**0.099**	0.040	**-0.131**	0.035	**-0.076**	0.019	**-0.080**	0.025
Tradable industry dummy	0.017	0.033	-0.014	0.028	**-0.109**	0.012	**-0.043**	0.016
Public sector dummy	**-0.143**	0.039	**-0.124**	0.032	**0.201**	0.015	**0.109**	0.020
Constant	**0.122**	0.046	**0.673**	0.037	**0.833**	0.020	**1.549**	0.027
N	2608		3590		21451		7010	
Adjusted R-squared	0.10		0.18		0.31		0.34	

Notes: Dependent variable = log(hourly wage). Bold means statistically significant at 5% of 1%; Italic means statistically significant at 10%. OLS regressions with robust and clustering-adjusted standard errors

Table 5: Major reform measures

Year	Domestic market liberalization	Trade and international integration
1986	Doi moi – "renovation" of the command economy: introduction of markets	
1988-89		Introduction of import tariffs, unified exchange rate
1990-91	Recognition of private enterprises (constitutional amendment); Law on Private Enterprises, Law on Companies	1991 Law on Import & Export Duties (preferential tariffs)
1994	Law on Promotion of Domestic Investment (rules on approval process); Labor Code (relaxation of wage grid)	US diplomatic relations restored
1995	Law on State Enterprises (regulation and reform)	Join ASEAN, apply to join WTO
2000	Enterprise Law (significant domestic market liberalization)	2000 US bilateral trade agreement ("WTO lite" – implemented 2002); mid-2000s – various bilateral/multilateral PTAs/FTAs; 29 new Trade Laws
2006	Unified Investment Law – further domestic liberalization and more relaxation of foreign investment controls	WTO accession agreed
2007		WTO accession

Table 6: Returns to an additional year of schooling by institution, industry, and year

(a) Annual values	1993	1998	2002	2008
State*Traded	**-0.029**	**0.021**	**0.051**	**0.047**
Non-state*Traded	-0.008	**0.013**	**0.005**	**0.019**
State*Non-traded	**0.044**	**0.073**	**0.082**	**0.091**
Non-state*Non-traded	0.002	**0.038**	**0.035**	**0.040**

(b) Changes between years	1993-98	1998-2002	2002-08
State*Traded	**0.050**	**0.036**	-0.004
Non-state*Traded	**0.029**	-0.004	**0.013**
State*Non-traded	**0.020**	**0.015**	0.009
Non-state*Non-traded	**0.036**	0.002	0.006

Source: summarized from estimates shown in full in Appendix C. Dependent variable is log of hourly wage. Figures in bold are statistically significant at $p \leq 0.05$.
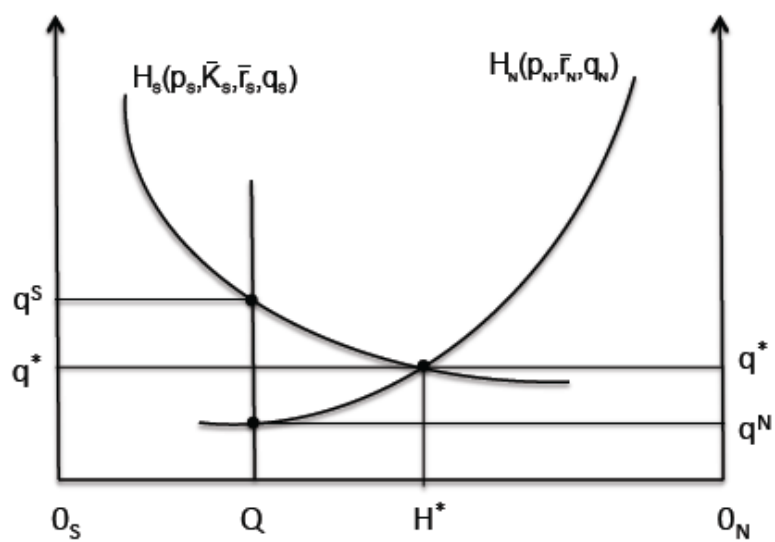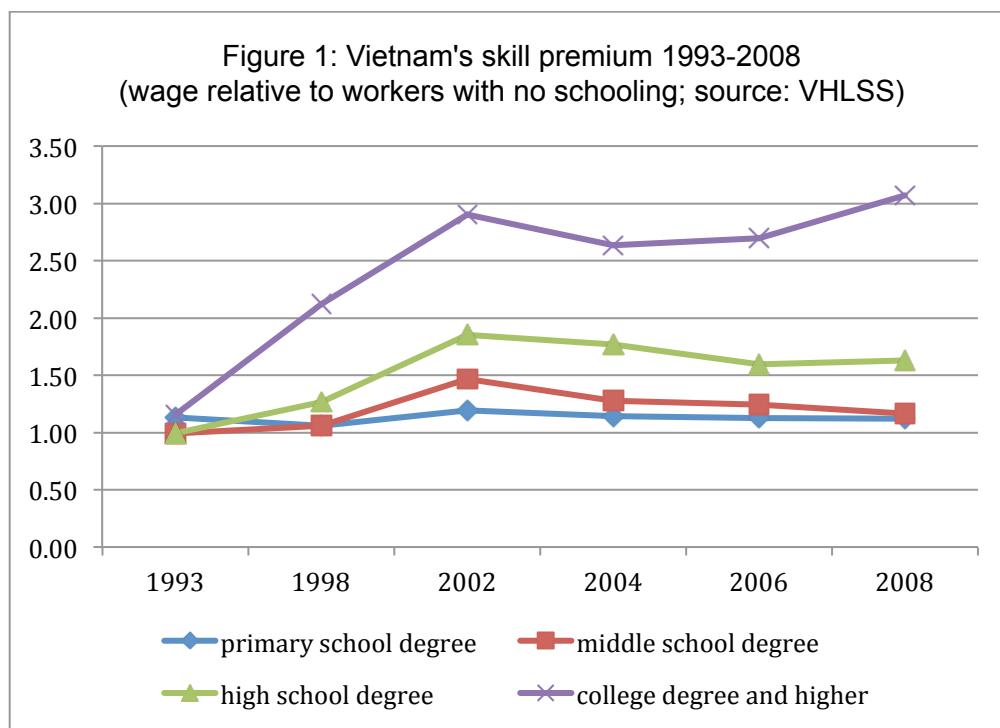
Figure 1: Vietnam's skill premium 1993-2008
(wage relative to workers with no schooling; source: VHLSS)

Figure 2: The intersectoral market for skilled labor

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Appendix A: Classification of tradable and non-tradable industries

This definition is based on an examination of the UN COMTRADE data set. If an industry does not show up in COMTRADE, it's considered non-tradable. All agricultural, mining, and manufacturing (except recycling) industries are in COMTRADE. Most utility and service industries are not, except 40 (electricity, gas, and water), 74 (other business activities), 92 (disposable collection and public sanitation), and 99 (foreign organization activities). In the following list, non-tradable industries include industries numbered 37 –73, 75 – 91, and 93 – 98. The rest are tradable.

01	Agriculture and relating services (including livestock raising)
02	Sylviculture and relating services
05	Catching and raising seaproducts, and relating services
10	Coal mining
11	Oil and gas drilling and related services
12	Uranium and Thorium mining
13	Metal mining
14	Mining for rocks, stone, sand, salt, fertilizer...
15	Food and beverage production
16	Tobacco production
17	Textile
18	Fur processing and fur products (excluding garments)
19	Leather tanning and leather products including wallets, seats, suitcases
20	Wood, bamboo, rattan processing and production of wood, bamboo and rattan products
21	Paper and paper products
22	Printing and publishing (books, magazines, newspapers, and
23	Coke, crude oil, uranium processing
24	Chemicals and chemical products
25	Plastic and Rubber production and products
26	Other non-metal mineral products production
27	Metal production and processing
28	Metal products (except machines and equipment)
29	Other equipment and machinery not specified elsewhere
30	Office and computer equipment production
31	Other electronic, electric equipment not specified elsewhere
32	Radio, TV, broadcasting and other communication equipment
33	Medical and laboratory equipment, precision instruments, and meters (clocks)
34	Motor vehicles and spare parts
35	Other means of transportation (boats, railroad, airplane)
36	Furniture production and other productions not specified elsewhere
37	Recycling, reprocessing
40	Electricity, gas, water steam, hot water production and distribution
41	Water exploitation, purification, and distribution
45	Construction
50	Vehicle sales, maintenance and repair; retail sale of gas
51	Wholesale and agent sales (excluding motor vehicles and motorbikes)
52	Retail sales (excluding motor vehicles and motorbikes);repairs of family appliances
55	Hotel and restaurant (including big and small restaurants, cafe, beverage and drink stands,...)
60	Road, railroad and pipeline transport
61	Water transport

62	Airline transport
63	Services in transport; tourist services
64	Post and telecommunications
65	Financial intermediary (excluding insurance and social welfare)
66	Insurance and pensions (excluding social insurance)
67	Assistance in finance (including social insurance)
70	Science and technology activities
71	Activities relating real-estate
72	Rental of machines and equipment; rental of furnitures and household goods
73	Computer-related activities
74	Other business activities (accounting, tax and other consulting, architecture, advertising, protection, housecleaning, photography, packaging, etc.
75	Government administration and national defense; promulgated social ensurance
80	Education and training
85	Health and social relief (hospitals, health centers, veterinary care, social relief,...)
90	Cultural and sport activities (broadcasting, television, cinema, recreation and entertainment, press, library, museum, sport,...)
91	Communist party, mass organizations, professional associations
92	Disposal collection, public sanitation improvement, and similar activities
93	Other service activities (laundry, hairdressing, funerals,…)
95	Housework services provided at client's home
99	Activities of foreign organizations

Appendix B: Supplementary data and estimation

In 1993, average wages for state sector workers were lower than those of their private sector counterparts for all education levels except college degrees (Table B-1). Within the state sector in 1993, average returns to college education were somewhat higher than returns to lower education levels. Surprisingly, this was not true for the non-state sector.

Table B-1: Average hourly wage by educational level and institution, 1993

	State	Nonstate	State/nonstate Wage Ratio
Primary school	1.85	2.02	0.92
Middle school	1.54	1.88	0.82
High school	1.63	2.01	0.81
College & above	2.04	1.90	1.07
Wage ratio (base = no degree)			
Primary school	0.98	1.16	
Middle school	0.82	1.07	
High school	0.86	1.15	
College & above	1.08	1.09	

Wages are in thousand VND, January 1993 price, deflated regionally and monthly

Table B-2: Determinants of Wages - Heckman Estimation Results

	1993		1998		2002		2008	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Wage equation								
Dependent variable = log hourly wage								
Years of education	0.011	0.007	**0.039**	0.005	**0.037**	0.002	**0.057**	0.003
Years of experience	**0.016**	0.005	**0.023**	0.003	**0.023**	0.002	**0.037**	0.003
Experience squared	**0.000**	0.000	**0.000**	0.000	**-0.001**	0.000	**-0.001**	0.000
Male dummy	**0.390**	0.070	**0.314**	0.026	**0.219**	0.012	**0.244**	0.021
Ethnic minority dummy	-0.114	0.081	**-0.137**	0.055	**-0.387**	0.036	**-0.146**	0.040
Urban dummy	**0.226**	0.107	**0.403**	0.038	**0.292**	0.017	**0.194**	0.035
Public sector dummy	**-0.121**	0.039	**-0.100**	0.031	**0.243**	0.015	**0.138**	0.019
Tradable industry dummy	0.027	0.033	-0.007	0.027	**-0.106**	0.012	**-0.033**	0.018
Constant	-0.606	0.441	**-0.608**	0.105	**0.254**	0.046	**0.815**	0.090
Selection equation								
Dependent variable = wage job dummy								
Years of education	**0.027**	0.004	**0.025**	0.005	**0.028**	0.002	**0.050**	0.005
Male dummy	**0.327**	0.028	**0.345**	0.023	**0.384**	0.011	**0.372**	0.021
Ethnic minority dummy	**-0.278**	0.046	**-0.302**	0.069	**-0.364**	0.028	**-0.574**	0.047
Urban dummy	**0.539**	0.029	**0.578**	0.036	**0.457**	0.017	**0.369**	0.041
Dependency ratio	-0.033	0.019	**0.049**	0.020	**0.091**	0.011	**0.139**	0.019
Log (non-wage income)	-		-		**-0.173**	0.000	**-0.126**	0.000
Household head dummy	0.042	0.033	**0.067**	0.028	**0.053**	0.014	0.038	0.024
Age	**-0.004**	0.001	**-0.003**	0.001	**-0.001**	0.001	0.000	0.001
Constant	**-1.176**	0.058	**-1.268**	0.064	**-0.974**	0.034	**-1.249**	0.075
N	12985		16689		81462		25530	
Rho	0.508	0.277	0.729	0.044	0.206	0.037	0.327	0.088
Sigma	0.747	0.101	0.744	0.032	0.679	0.008	0.597	0.012
Lambda	0.379	0.258	0.542	0.055	0.140	0.026	0.195	0.051
Chi2 for Wald test: rho=0	2.25		95.62		29.18		3.03	

Notes: Bold means significant at $p \leq 0.05$; italic means significant at $p \leq 0.10$. All regressions have robust and clustering-adjusted standard errors

Table B-3: Determinants of Wages - Treatment Estimation Results

	1993		1998		2002		2008	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Wage equation								
(dependent variable = log hourly wage)								
Years of education	0.002	0.004	**0.027**	0.003	**0.031**	0.002	**0.048**	0.002
Years of experience	**0.017**	0.004	**0.023**	0.003	**0.022**	0.001	**0.036**	0.003
Experience squared	**0.000**	0.000	**0.000**	0.000	**-0.001**	0.000	**-0.001**	0.000
Male dummy	**0.298**	0.027	**0.175**	0.020	**0.186**	0.010	**0.194**	0.014
Ethnicity minority dummy	-0.032	0.056	-0.013	0.043	**-0.363**	0.016	**-0.072**	0.027
Urban dummy	**0.069**	0.029	**0.182**	0.021	**0.242**	0.011	**0.142**	0.015
Traded industry dummy	0.026	0.031	-0.012	0.021	**-0.107**	0.010	**-0.031**	0.015
State sector dummy	**-0.091**	0.046	-0.022	0.032	**0.325**	0.015	**0.191**	0.022
Constant	0.053	0.050	**0.335**	0.035	**0.373**	0.018	**0.657**	0.027
Treatment equation								
(dependent variable = state sector dummy)								
Years of education	**0.141**	0.012	**0.135**	0.010	**0.138**	0.005	**0.130**	0.007
Male dummy	**-0.244**	0.077	-0.061	0.069	**-0.116**	0.031	0.043	0.049
Ethnic minority dummy	**0.399**	0.176	**0.328**	0.146	**0.514**	0.056	**0.616**	0.096
Urban dummy	-0.122	0.080	**-0.405**	0.073	**-0.216**	0.033	**-0.143**	0.051
Network dummy	**1.537**	0.054	**1.756**	0.052	**1.854**	0.024	**1.762**	0.038
Constant	**-0.996**	0.120	**-0.856**	0.109	**-1.105**	0.053	**-1.153**	0.085
N	2608		3590		21451		7019	
Rho	-0.051		-0.189		-0.165		-0.112	
Sigma	0.670		0.580		0.670		0.575	
Lambda	-0.034		**-0.109**		**-0.110**		**-0.064**	

Notes: Bold means significant at $p \leq 0.05$; italic means significant at $p \leq 0.10$. All regressions have robust and clustering-adjusted standard errors
Network dummy: value = 1 if the household has at least one other member working for the state

Appendix C: Determinants of log wage: generalized model

Table C-1: OLS regression with full interaction, 1993 and 1998

	Coeff.	SE	t-statistic	p-value
State*trade*1998	0.357	0.084	4.26	0.000
State*trade*1993	0.284	0.141	2.01	0.044
Nonstate*trade*1998	0.435	0.041	10.61	0.000
Nonstate*trade*1993	0.096	0.054	1.79	0.073
State*nontrade*1998	-0.066	0.138	-0.48	0.630
State*nontrade*1993	-0.191	0.157	-1.22	0.224
Nonstate*nontrade*1998	0.233	0.117	1.99	0.047
Nonstate*nontrade*1993	-0.129	0.150	-0.86	0.389
State*trade*1998*educ_yrs	0.021	0.009	2.23	0.026
State*trade*1993*educ_yrs	-0.029	0.014	-2.16	0.030
Nonstate*trade*1998*educ_yrs	0.013	0.005	2.39	0.017
Nonstate*trade*1993*educ_yrs	-0.008	0.006	-1.33	0.185
State*nontrade*1998*educ_yrs	0.073	0.007	10.85	0.000
State*nontrade*1993*educ_yrs	0.044	0.009	5.07	0.000
Nonstate*nontrade*1998*educ_yrs	0.038	0.008	4.89	0.000
Nonstate*nontrade*1993*educ_yrs	0.002	0.010	0.19	0.852
N	6198			
Adjusted R^2	0.60			

i) Dependent variable = log(hourly wage)

ii) Other explanatory variables (gender, ethnicity, urban dummy, industry dummies, and experience) included but not reported; constant term suppressed

Table C-2: OLS regression with full interaction, 1998 and 2002

	Coeff.	SE	t-statistic	p-value
State*trade*2002	0.304	0.059	5.12	0.000
State*trade*1998	0.430	0.092	4.66	0.000
Nonstate*trade*2002	0.445	0.028	15.68	0.000
Nonstate*trade*1998	0.461	0.048	9.59	0.000
State*nontrade*2002	-0.097	0.058	-1.65	0.098
State*nontrade*1998	-0.197	0.099	-1.99	0.047
Nonstate*nontrade*2002	0.316	0.033	9.49	0.000
Nonstate*nontrade*1998	0.261	0.078	3.33	0.001
State*trade*2002*educ_yrs	0.056	0.005	11.34	0.000
State*trade*1998*educ_yrs	0.017	0.010	1.71	0.088
Nonstate*trade*2002*educ_yrs	0.013	0.003	4.59	0.000
Nonstate*trade*1998*educ_yrs	0.014	0.006	2.36	0.018
State*nontrade*2002*educ_yrs	0.079	0.004	19.67	0.000
State*nontrade*1998*educ_yrs	0.065	0.007	9.49	0.000
Nonstate*nontrade*2002*educ_yrs	0.036	0.003	10.47	0.000
Nonstate*nontrade*1998*educ_yrs	0.035	0.008	4.22	0.000
N	25041			
Adjusted R^2	0.73			

i) Dependent variable = log(hourly wage)

ii) Other explanatory variables (gender, ethnicity, urban dummy, industry dummies, and experience) included but not reported; constant term suppressed

Notes

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[1] In EE/FSU, the simple average contraction of per capita GDP after 1989 was 46%, and it took anything from 3-10 years to recover pre-transition levels. Neither China nor Vietnam experienced a recession following their adoption of market economy policies (source of basic data: World Development Indicators Online).

[2] The exception is a study by Doan and Gibson (2010). Using OLS and Heckman estimators, they find that the rate of return to one additional year of schooling in Vietnam rose from about 3% in 1993 to about 10% in 2008, a level comparable to returns to schooling in other developing countries.

[3] In its first two rounds this was known as the Vietnam Living Standards Survey (VLSS).

[4] In the very first years of the transition the VHLSS data show an appreciable increase in the share of the labor force in wage employment, from 26% in 1993 to 40.9% in 1998. Subsequently, however, the ratio remained very stable at around 41%, with the exception of a brief dip to 36% in 2002, following the Asian crisis.

[5] In this and all subsequent regressions, we examine robustness with respect to industry. The results are not substantive altered by inclusion of industry fixed effects among the covariates.

[6] For example, Cai et al. (2008) estimate returns at about 10%/yr in China. Our estimate is also substantially lower than those obtained in other studies using the same Vietnamese data: Doan and Gibson (2010) estimate that annual returns to schooling rose to over 9% per year by 2008.

[7] Authors' calculations from the Enterprise Survey 2000.

[8] In its report, the World Bank (1995:35) noted that "the vast majority of FDI has financed joint ventures with [State-owned enterprises], whose capital contribution to the joint venture has usually consisted of land use rights. Several reasons have contributed to this trend: the relatively small size of most private enterprises, their concentration on few industrial subsectors, their more limited connections with decision makers, and-most important-their limited access to land."

[9] Use of this subset of survey years sharpens the focus on 'early' versus 'late' reform periods. However, the results are not sensitive to the use of data form intervening surveys (2004, 2006).

[10] Vietnam's Central Institute for Economic Management has estimated a state-sector ICOR of 17.5 as opposed to a private sector ICOR of 4.6 (cited in Asia Times: "Vietnam changes course", April 12 2011, http://www.atimes.com/atimes/Southeast_Asia/MD12Ae01.html).

[11] From the regression results in Table B-3, we can calculate the total effect of education on wages taking into account the treatment effect of education (treatment here refers to the fact that education increases a worker's chance of obtaining a state-sector job, which gives him/her a wage premium). That is, $\partial W/\partial E = \alpha + \beta*\gamma$, where W = wages, E = years of schooling, so $\partial W/\partial E$ = the marginal effect of education on wages, α = the education coefficient in the main wage equation, β = education coefficient in the treatment equation, and γ = the coefficient on state-sector dummy in the main wage equation. Inclusion of the treatment effect can increase the returns to education by more than 100% for the year 2002 and 50% for the year 2008.