The Developing Economies 47, no. 1 (March 2009): 81–103

IMPACTS OF TRADE LIBERALIZATION ON EMPLOYMENT IN VIETNAM: A SYSTEM GENERALIZED METHOD OF MOMENTS ESTIMATION

TRAN NHUAN KIEN[1] AND YOON HEO[2]

[1]*Faculty of Economics, Thainguyen University of Economics and Business Administration, Thainguyen City, Vietnam; and* [2]*Graduate School of International Studies, Sogang University, Seoul, Korea*

First version received August 2007; final version accepted October 2008

Using a system generalized method of moments model, the present paper investigates the impacts of trade liberalization on employment in Vietnam from 1999 to 2004. The results show that the increase in industrial output increased labor demand, whereas the increasing wage rate led to a decline in the employment level. The impact of export expansion on derived labor demand was positive and statistically significant, indicating that the higher level of exports than previously presented employment opportunities for the country's large labor surplus. As far as imports are concerned, empirical observations indicate that imports did not necessarily negatively impact Vietnam's employment level.

Keywords: Trade; Employment; Generalized method of moments; Cobb–Douglas production function; Vietnam
JEL classification: F14, F15, F16

I. INTRODUCTION

THE year 1986 marked a turning point in Vietnam's integration into the world's economy when the country's government launched the *Doi moi* policy. Since then, Vietnam has had a remarkable record of high and sustained economic growth. Vietnam's GDP achieved an average annual growth rate of 6.7% during the period from 1986 to 2005 (Table 1). The *Doi moi* policy raised per capita GDP from US$84 in 1986 to US$631 in 2005, dramatically reduced poverty and improved social welfare. The real exchange rate between Vietnamese currency, the dong, and the US dollar fell from 30.2 dong per dollar in 1986 to 14,460.8 dong per dollar in 2005, which worked in favor of Vietnamese exports relative to world markets (UNSD 2007).

We would like to express our deep gratitude to two anonymous referees for their in-depth comments and specific instructions. Any remaining errors are the responsibility of the authors.

doi: 10.1111/j.1746-1049.2009.00077.x

TABLE 1

Merchandise Trade Performance, 1986–2005

(US$ million)

Indicator	1986–90	1991–95	1996–2000	2001–5	1986–2005
Total trade	3,942.9	7,909.7	22,681.2	47,326.6	20,465.1
Trade growth rate (%)	(15.1)	(21.4)	(17.2)	(17.8)	(17.9)
Exports	1,406.2	3,431.3	10,358.0	21,797.0	9,248.1
Export growth rate (%)	(28.1)	(17.8)	(21.6)	(16.9)	(21.2)
Per capita exports (US$)	21.9	48.2	134.2	262.4	116.7
Imports	2,536.7	4,478.4	12,323.2	25,529.6	11,217.0
Import growth rate (%)	(8.2)	(24.3)	(13.9)	(18.5)	(16.1)
Trade balance	−1,130.5	−1,047.1	−1,965.2	−3,732.6	−1,968.9
Export/GDP	0.24	0.25	0.37	0.53	0.42
Import/GDP	0.44	0.33	0.44	0.62	0.51
GDP	5,788.2	13,541.4	27,713.8	41,235.8	22,069.8
GDP growth rate (%)	(4.2)	(8.2)	(7.0)	(7.5)	(6.7)
Per capita GDP (US$)	91.2	190.6	361.8	501.4	286.3

Sources: WTO (2007) and UNSD (2007).
Note: All indicators are average annual numbers during each period.

These achievements have created a favorable foundation for Vietnam to expand its international trade. Vietnam has become a member of several influential organizations, including the Asia-Pacific Economic Cooperation and the World Trade Organization (WTO). Vietnam signed Textile Trade and Trade and Cooperation Agreements with the European Union in 1992 and 1995, respectively. Vietnam became the seventh member of the Association of Southeast Asian Nations (ASEAN) in 1995 and, therefore, participated in the ASEAN Free Trade Area process. Trade liberalization proceeded with the establishment of a bilateral trade agreement with the United States in 2000; and Vietnam became an official member of the WTO in early 2007, accelerating its integration into the world's economy.

The relationship between economic integration and employment has been at the center of a lively debate among economists and policymakers over the past decade, and is also a source of concern in relation to the effects of globalization. According to neoclassical economic theory, economic integration leads to trade expansion, technological innovation, efficiency gains, and economic growth. Neoclassical theorists argue that an efficient allocation of resources, in the long run, increases welfare, positively impacts employment, and reduces absolute poverty, even though negative employment effects in specific sectors and subsequent adjustment problems may occur in the short run (Turrini 2002; Ernst 2005).

This paper centers on the following key questions. First, what are the impacts of trade liberalization on employment in Vietnam? Second, what have been the unique traits of Vietnam's structural variations and trade patterns in relation to employment over the past decade? Finally, what policy implications do these empirical results suggest? For these purposes, the present study uses a Cobb–Douglas production function with a generalized method of moment estimator (GMM) to examine the dynamic relationships between trade liberalization and employment in Vietnam during the period from 1999 to 2004. The remainder of the paper is organized as follows. Section II reviews existing evidence on the trade–employment nexus, highlighting the gap that this study fills in the published literature. Sections III and IV examine the trade liberalization process and employment situation in Vietnam, respectively. Section V provides the model's specification, estimation method, empirical results, and a discussion. The final section brings forward conclusions and suggests future work.

II. LITERATURE REVIEW

The effects of trade on employment have been analyzed comprehensively in the published literature. Baldwin (1995) surveys the impact of trade liberalization on employment in OECD countries. That study reached two conclusions; namely, that the output and employment impacts of trade liberalization have been insignificant in OECD countries, and that increased imports have negatively impacted employment in low-technology industries such as textiles, clothing, footwear, wood, furniture, food, drinks, and tobacco.

Hoekman and Winters (2005) present another excellent survey on the impacts of trade reforms on employment. They conclude that recent research indicates that trade plays a greater role in explaining labor outcomes than 1990s literature suggests. This can partly be explained by the changing nature of the globalization process, including the role of trade in intermediates and services, but also, and more importantly, by the recognition of trade as a channel for technological innovation and transfers.

Methodologies that most studies have used to investigate these relationships include the factor content approach, the growth accounting approach, and the econometric approach. The factor content approach calculates labor quantities that are embodied in a country's imports and exports in various sectors. If a country's exports have a high ratio of skilled to unskilled labor, then increased exports will reduce the demand for unskilled labor. This technique has been widely used to estimate North–South trade (see Wood 1994; Greenaway, Hine, and Wright 1999; Jenkins 2004). Using this method, Wood (1994) argues that import competition from unskilled labor–abundant countries negatively affects low-skilled labor in developed countries. Generally, however, empirical evidence of this approach shows a modest impact of trade on employment (Krugman 1995; Cortès, Jean, and Pisani-Ferry 1996; Sakurai 2004). In the case of France, Messerlin (1995) concludes that the modest and mostly positive employment effects of foreign trade between 1980 and 1992 depended upon macroeconomic factors and policies, as well as upon the structure of labor and product markets. Sakurai (2004) concludes that increased trade negatively impacts employment, but that the magnitude of these effects is not very large, in the Japanese manufacturing labor market. One of the disadvantages of this approach is that it assumes the labor market to be competitive when, in fact, the labor market is affected by several noncompetitive factors, such as state regulations and labor unions.

The second approach, growth accounting, breaks down employment variations into four components associated with growth; namely, domestic demand, exports, imports, and productivity. Empirical studies have shown that labor productivity has been the main element displacing labor, and that international trade has played a modest role in employment changes in the short term (Greenaway, Hine, and Wright 1999). Examples of this approach can be found in studies by Sen (2002), Jenkins (2004), and Mekong Economics (2002). For example, Sen (2002) points out that, in the case of Bangladesh, the contribution of international trade to total employment growth has been positive, although it was less significant both in absolute and relative terms in the first half of the 1990s than in the second half of the 1980s. In contrast, employment in Kenya fell in the 1990s as a result of both import competition and export declines. Both Mekong Economics (2002) and Jenkins (2004) use this method to analyze the employment effects of trade in Vietnam. Jenkins' (2004) study reveals that the net effect of trade was around one hundred thousand new jobs annually. However, this approach's problem lies in its assumption that components of employment change are independent. However, this assumption is not true, because empirical evidence finds that labor productivity and growth in trade are correlated (Caves and Krepps 1993; Lawrence 1996).

The third approach generally uses regression models to quantify the impacts of trade on employment in the context of either a static or dynamic framework. Using a static model, Heo and Park (2008) find that import penetration in Korean manufacturing has positively impacted the job displacement rate; whereas changes in export share negatively influence the displacement rate, implying that exports contribute to job creation, although the elasticity is quite negligible in magnitude. Milner and Wright (1998) use the Cobb–Douglas production function for Mauritius' industry in a dynamic framework. Their results show that the estimated responses of employment in the exportable sectors increased in the long run in response to trade liberalization, but that employment was expected to decrease in importable sectors. Fu and Balasubramanyam (2005) also conclude that exports considerably and positively affect employment in China. Using the same method, Greenaway, Hine, and Wright (1999), in contrast, find that trade expansion in terms of both exports and imports leads to a reduction in the level of derived labor demand in the UK. This exceptional result can be explained by the trade-induced efficiencies in the use of labor in trade-oriented industries. Gaston (1998) indicates that, in Australia, exports strongly and positively affect employment, and that imports profoundly and negatively impact employment. Mouelhi (2007), using Tunisian manufacturing firms' data, shows that the impact of trade liberalization on labor demand depends on a firm's characteristics. The obtained estimates suggest that trade liberalization positively affects employment by exporting firms, but negatively affects domestically-oriented firms. This result is somewhat similar to Lee's (2007) results, which indicate that a high import penetration rate negatively affects employment by firms with fewer than 100 workers; but no such evidence exists for firms with more than 100 workers. Nevertheless, other studies have found no significant evidence of the impacts of trade on employment. Turrini (2002), for instance, asserts that trade liberalization does not significantly change employment or wages in most developing countries.

In the case of Vietnam, however, we should note that, to the best of our knowledge, few comprehensive studies have used a dynamic approach to examine trade liberalization's impacts on employment at the sectoral level. The present study expands the scope of pervious research on the subject in several ways. First, this study uses a system GMM estimator, which is more appropriate for a short panel dataset than the static or first differenced GMM estimator. Second, the present study uses the most recent sectoral dataset available. Third, this study also provides an in-depth background on trade liberalization and the employment situation in Vietnam.

III. TRADE LIBERALIZATION IN VIETNAM

Trade liberalization is a major part of Vietnam's transitional success story. The process of trade liberalization and market-oriented economic reform were initiated in Vietnam in the mid-1980s, and accelerated in the 1990s. As a result, exports per capita have increased over 30-fold over the past 20 years, from US$12.9 in 1986 to US$390.3 in 2005 (GSO 2006).

The value of Vietnam's total international trade reached US$69.4 billion in 2005, a 23-fold increase over 1986. The average annual growth rate of exports was 21.2%, or an almost 40-fold increase in terms of export value, during the period from 1986 to 2005. On the import side, the average growth rate was 16.1% during the period from 1986 to 2005, contributing to industries' inputs and to overall consumption. During this period, import value increased 16-fold, from US$2.2 billion to almost US$37 billion.

It is noteworthy to observe that the share of exports in total trade increased steadily, from 35.7% in 1986–90 to 46.2% in 2001–5. The difference between growth patterns of exports and imports affected the balance of trade. The trade deficit declined compared to total trade. From 1986 to 1990, the trade deficit accounted for nearly 29% of total trade. This gap fell to only 8% during the period from 2001 to 2005.

The total value of both exports and imports over GDP, which is an indicator of an economy's openness, reached 128% in 2005, up from 53% in 1985. This increase resulted from simultaneous in export and import growth. Exports over GDP increased fourfold (see Table 1); and the corresponding imports over GDP only doubled during the period from 1985 to 2005. This has resulted in Vietnam becoming one of the most open economies in terms of trade dependency.

With the motto of "multilateralization and diversification" in foreign policy, Vietnam has traded with most of the world's economies. In 1986, Vietnam had only 43 foreign trading partners: this increased to 100 countries by 1995, 192 by 2000, and 210 countries by 2005.

In recent years, Vietnam's export markets have experienced large shifts from Europe to Asia and the United States. The share of exports to Asian countries rose from 22.6% in 1986 to 50% in 2005; whereas that to European countries shrank from 55.6% to only 18.6% during the same period. In particular, after the normalization of US–Vietnam relations in 1995, and the Vietnam–US bilateral trade agreement came into effect in 2001, Vietnam's exports to the United States relative to its total trade increased dramatically, from 3.65% in 1995 to 7.01% in 2001, and 21.63% in 2006 (WTO 2007; U.S. Census Bureau 2007).

Therefore, Vietnam's main trading partners are now China, Japan, the United States, Singapore, and South Korea (IMF 2007). Following the fall of the Berlin Wall and the Soviet Union, Vietnam's trading partners have shifted from Eastern Europe to Asian countries, such as China and South Korea, and to the United States. Most notably, Vietnam's trade with China saw unexpected growth in the 10 years after the normalization of China–Vietnam relations in 1991. This has helped Vietnamese commodities to depend less than they did before on the EU and US markets.

To understand the advantage of Vietnam's export commodities in the world market, a revealed comparative advantage (RCA) index has been calculated.[1] Table 2 presents 17 out of 99 product categories at a two-digit HS level with a high (over 2.0) recorded RCA index between 2001 and 2005. These products cover a wide range of categories, and share 54% of Vietnam's total exports. Most of the products in Table 2 with comparative advantage are mainly either primary commodities, such as cereals and coffee, or labor-intensive manufactured products, such as footwear, apparel, and furniture.

Intra-industry trade (IIT) is an index that allows us to measure the extent of trade within an industry. The Grubel–Lloyd Index is calculated based on the two-digit HS level.[2] The results from Table 3 show that Hides and Skins (HS 41–43), Wood and

[1] $RCA_{ij} = (x_{ij}/X_{it})/(x_{wj}/X_{wt})$, where x_{ij} = exports of product j by country i, X_{it} = total exports by country i, x_{wj} = world exports of product j and X_{wt} = world total exports.

[2] $IIT_{ij} = [|X_{ij} - M_{ij}| / (X_{ij} + M_{ij})]$, where X_{ij} and M_{ij} are home country's exports of industry i to country j, and home country's imports of industry i from country j, respectively.

TABLE 2

Products with High Recorded RCA Index in Vietnam, 2001–5

HS Code	Product Classification	2001	2002	2003	2004	2005	2005 Trade Volume (US$ million)
64	Footwear, gaiters and the like, parts thereof	21.75	22.81	22.33	24.22	21.81	4,898.1
46	Manufacturers of planting material, basketwork etc.	24.40	23.26	22.41	25.08	21.16	129.2
9	Coffee, tea, mate and spices	21.54	18.07	18.31	19.12	17.26	1,090.8
3	Fish, crustaceans, mollusks, aquatic invertebrates n.e.s	11.85	11.95	11.27	11.06	10.49	2,000.2
65	Headgear and parts thereof	4.32	7.38	7.64	9.60	9.38	138.4
10	Cereals	4.55	3.24	3.01	1.86	6.85	982.8
62	Articles of apparel, accessories, not knit or crochet	5.23	6.01	6.90	7.21	6.40	3,107.8
16	Meat, fish and seafood preparations n.e.s	6.19	7.14	6.60	6.50	5.81	493.8
42	Articles of leather, animal gut, harness, travel goods	5.34	5.83	5.40	5.48	5.06	594.3
94	Furniture, lighting, signs, prefabricated buildings	2.64	3.01	3.45	4.37	4.94	2,031.8
14	Vegetable planting materials, vegetable products n.e.s	8.32	6.09	8.71	11.44	4.13	5.5
61	Articles of apparel, accessories, knit or crochet	1.63	3.49	5.16	4.67	4.13	1,712.7
69	Ceramic products	3.52	3.24	3.17	3.36	3.19	318.2
8	Edible fruit, nuts, peel of citrus fruit, melons	2.92	3.22	3.02	3.26	3.07	495.9
50	Silk	2.69	2.47	2.11	2.23	2.76	28.9
63	Other made textile articles, sets, clothing, etc.	3.18	2.78	2.70	3.18	2.61	290.5
11	Milling products, malt, starches, insulin, wheat gluten	1.32	1.45	2.56	2.42	2.57	70.9
Total				17 product categories			18,390

Source: Authors' calculation based on ITC database (2007).
Note: n.e.s = not elsewhere specified.

TABLE 3

Vietnam's Intra-Industry Trade Index with the World, 2000–2005

HS Code	Product Classification	2000	2002	2004	2005	2005 Trade Share (%)
41–43	Hides and skins	0.860	0.940	0.965	0.939	2.05
44–46	Wood and wood products	0.532	0.683	0.854	0.867	1.17
50–63	Textiles and textile articles	0.903	0.882	0.793	0.823	13.84
71	Pearls, precious stones, metals, coins etc.	0.761	0.890	0.948	0.789	0.54
25–27	Mineral products	0.580	0.602	0.658	0.758	19.86
16–24	Prepared foodstuffs	0.695	0.847	0.864	0.746	2.94
68–70	Articles of stone, plaster, cement, asbestos	0.690	0.743	0.671	0.718	0.96
84–85	Machinery and mechanical appliances	0.449	0.419	0.484	0.598	14.53
39–40	Plastics and rubber	0.456	0.633	0.595	0.560	4.63
90–92	Instruments: measuring, musical	0.457	0.466	0.477	0.526	1.06
98–99	Other	0.191	0.497	0.287	0.431	0.76
01–05	Live animals	0.285	0.239	0.316	0.369	3.80
06–14	Vegetable products	0.282	0.378	0.357	0.329	4.99
47–49	Wood pulp products	0.260	0.218	0.270	0.310	1.12
86–89	Transportation equipment	0.095	0.230	0.261	0.304	3.65
93	Arms and ammunition	0.027	0.672	0.268	0.268	0.00
94–96	Miscellaneous	0.420	0.337	0.259	0.249	3.87
72–83	Base metals and articles thereof	0.192	0.178	0.218	0.238	6.89
97	Works of art	0.040	0.100	0.216	0.216	0.01
15	Animal or vegetable fats	0.512	0.276	0.322	0.200	0.19
28–38	Chemical products	0.162	0.187	0.155	0.190	5.12
64–67	Footwear and headgear	0.145	0.117	0.106	0.100	7.87

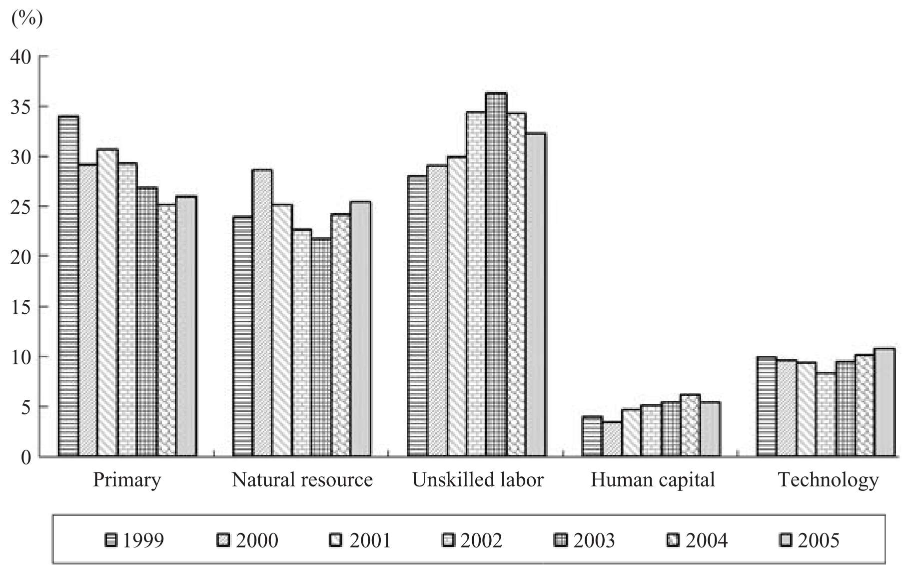
Source: Authors' calculation based on ITC database (2007).

Wood Products (HS 44–46), and Textiles and Textile Articles (HS 50–63) recorded the first, second, and third highest IIT, respectively. On the other hand, Footwear and Headgear (HS 64–67) and Chemical Products (HS 28–38) have smallest IIT index. It is notable to see that almost 62% of Vietnam's total trade has an IIT index above 0.5.

To understand variations in the factor content of Vietnam's exports, we calculate the factor intensity of Vietnam's exports based on the three-digit SITC level of aggregation according to their dominant factor inputs (see Appendix 2). This method aggregates export commodities into five groups: primary, natural-resource-intensive, unskilled-labor-intensive, technology-intensive, and human-capital-intensive products.

Figure 1 shows the composition of Vietnam's exports by commodity group from 1999 to 2005. Overall, a noticeable shift away from primary toward other products is evident. The table clearly indicates that unskilled-labor-intensive products' share of exports increased from 28.1% to 32.3% of total exports between 1999 and 2005, whereas primary exports declined from 34.2% to 26% during the same period. The

Fig. 1. Factor Intensity of Vietnam's Merchandise Exports, 1999–2005



Source: Authors' calculation from COMTRADE (2007), based on Leamer (1984) and Hiloopen and Marrewijk (2007).

remarkable increase in exports of unskilled-labor-intensive products suggests that it might impact derived labor demand in the country, where the labor force is mainly unskilled.

Moreover, an analysis of the factor intensity of exports determines that Vietnam's human-capital-intensive products occupy a remarkably small share of its exports. This reflects a shortage of skilled labor, especially in the human capital category. Lewis (2002) indicates that this shortage of skilled technical and managerial labor seriously constrains economic growth.

This preliminary assessment of Vietnam's export structure reveals that the country's rapid export expansion during the period from 1999 to 2004 should have significantly impacted employment because exports were heavily concentrated in primary and unskilled-labor-intensive products. However, further analysis is needed to reach a firm conclusion regarding the true impacts of trade on employment in Vietnam.

For this purpose, we calculate the total labor embodied in trade flows by computing the direct labor requirement per US$1 million of export and import substitution.[3] To

[3] This method is developed from Jenkins (2004), who does not take into account the indirect labor input via inputs of intermediate goods by deriving it from the input–output tables. Direct labor input is calculated by first computing the employment coefficient at the industry level (employment per US$1 million of output). This coefficient is then weighted by each industry's share in total exports and total imports.

TABLE 4

Employment Coefficient of Exports and Imports

Year	Total		Agriculture		Mining and Quarrying		Manufacturing	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
1999	608.75	291.73	2,520.62	2,971.72	38.38	1,117.42	417.45	215.07
2000	747.83	256.41	2,802.92	2,791.18	21.80	873.44	409.84	179.29
2001	541.53	261.33	2,455.64	2,949.21	28.17	665.96	406.42	180.71
2002	563.84	271.93	2,421.48	2,724.08	31.93	665.38	469.69	197.98
2003	562.99	241.79	2,144.72	2,633.69	30.37	550.78	452.84	173.77
2004	469.28	226.02	2,307.87	2,550.94	31.73	439.03	402.81	154.25

Source: Authors' calculation based on data from the GSO (2006) and WTO (2007) at the two-digit ISIC level.

quantify the direct impacts of trade, we first calculate employment coefficients at a sectoral level by dividing each sector's total employment by its real total output. These coefficients are then weighted by each sector's (agriculture, manufacturing, and mining and quarrying) share in total exports and imports.

These results show that the structure of Vietnam' exports is highly labor intensive, compared to that of imports (Table 4). Employment per US$1 million of exports in 1999 was approximately 609 people, which was about twice as high as that of imports in 1999. Overall, the employment coefficient for exports is especially high in the agricultural and manufacturing sectors, and is exceedingly low in the mining and quarrying sector. In the manufacturing sector, employment per US$1 million in exports in 1999 was approximately double the level of that in imports. In 2004, for example, every US$1 million increase in exports created 403 new jobs in the manufacturing sector; whereas only 154 jobs would have been replaced by every US$1 million in imports. With reference to the mining and quarrying sector, there are substantial differences between the employment coefficients of exports and imports: each US$1 million increase in exports, mostly from the extraction of crude oil and gas, created only 32 new jobs, but 665 jobs would be displaced by the same value of imports, in 2002. This reflects the fact that the export sectors in mining and quarrying are relatively capital intensive over the import sectors. However, because the share of mining and quarrying imports in total imports is very small, that sector's negative effects of imports on employment are insignificant. In the agricultural sector, the employment coefficients of exports and imports are nearly equal: for instance, in 2004, an increase of US$1 million in exports would have created approximately 2,308 new jobs; whereas 2,551 jobs would have been eliminated by the same amount of imports. During this period, it is important to note that the employment exports and imports coefficients declined gradually. This can partly be explained by the enhanced labor productivity that stemmed from either innovation in agriculture or the sector's increased capital intensity over time.

IV. EMPLOYMENT SITUATION IN VIETNAM

Vietnam is a predominantly agricultural country, where over 70% of the population reside in rural areas and are actively involved in agricultural production. The country's employment structure, however, has varied considerably over the past decade. The agricultural sector's share of total employment fell significantly, from 73% to 58.8% between 1992 and 2004. In fact, agricultural labor has adjusted to engage in the industrial, construction, and service sectors.

As summarized in Table 5, Vietnam's employment increased by 9.8 million between 1990 and 2004, which implies an average annual growth rate of 2.47%. Employment growth varied across sectors. The agricultural sector experienced the smallest average growth rate, only 0.4%, between 1992 and 2004. Employment in the industrial and construction sector increased from 13.4% to 17.4% of total employment during the 1992–2004 period. In particular, the service sector has played a pivotal role in absorbing a substantial number of workers in the country. Over 5.6 million laborers work in the service sector, which accounts for 57% of total

TABLE 5

Total Employment by Sector, 1992–2004 (Thousands of persons)

Sector	1992	1995	2000	2002	2004	1992–2004†
Agriculture, forestry, and fisheries	23,208	24,765	24,481	24,456	24,431	1,223
Percentage change (%)	(–)	(6.71)	(–1.15)	(–0.10)	(–0.10)	(5.27)
Industry and construction	4,275	4,494	4,930	6,085	7,217	2,942
Percentage change (%)	(–)	(5.12)	(9.70)	(23.43)	(18.60)	(68.82)
Industry‡	3,450	3,395	3,889	4,558	5,294	1,844
Percentage change (%)	(–)	(–1.59)	(14.55)	(17.20)	(16.15)	(53.45)
Services	4,336	5,341	8,199	8,967	9,939	5,603
Percentage change (%)	(–)	(23.18)	(53.51)	(9.37)	(10.84)	(129.22)
Trade§	1,735	2,290	3,897	4,281	4,767	3,032
Percentage change (%)	(–)	(31.99)	(70.17)	(9.85)	(11.35)	(174.76)
Total	31,819	34,600	37,610	39,508	41,587	9,768
Percentage change (%)	(–)	(8.74)	(8.70)	(5.05)	(5.26)	(30.70)

Source: IMF (various issues).
† Total employment change during the period.
‡ Subsector of Industry and Construction.
§ Subsector of Services.

new jobs. Exceptionally, the trade-related sector has become the most attractive destination for the country's employees. Over three million jobs have been created in this sector, with the most significant change occurring during the period from 1992 to 2004.

This trend reflects a common development pattern of labor forces, in which they gradually depart from the agricultural sector to the industrial or service sector, where they can enjoy higher and more consistent wages. These structural changes, however, reveal that the movement of employment within the country was slower than the sectoral output changes, reflecting smaller improvements in the efficiency of agricultural productivity and income than in other sectors, especially in the industrial sector (CIEM 2004).

V. TRADE–EMPLOYMENT NEXUS

Using the Cobb–Douglas production function and GMM estimation, this section investigates the impacts of Vietnam's trade liberalization on employment in industrial sectors. The section starts with the model's specification, and then presents the estimation method. The final part of this section presents the empirical results and discussion.

A. *Model Specification*

The Cobb–Douglas production function shows physical output as a function of labor and capital inputs, that is:

$$Q_{it} = A^{\gamma} K_{it}^{\alpha} N_{it}^{\beta}, \tag{1}$$

where i denotes industry, t denotes time, Q represents real output, A represents total factor productivity, K represents capital stock, N represents units of labor utilized, α and β denote factor share coefficients, and γ allows for growth in efficiency in the production process.

Assuming that firms are profit-maximizing, the marginal productivity of labor equals the wage (w) and the marginal productivity of capital equals its user cost (c). Solving this system simultaneously to eliminate capital from the expression for firms' output yields the following equation:

$$Q_{it} = A^{\gamma} \left(\frac{\alpha N_{it}}{\beta} * \frac{w_i}{c} \right)^{\alpha} N_{it}^{\beta}. \tag{2}$$

Taking logarithms to linearize and rearrange the above equation provides the derivation of the firms' and, therefore, the industry's derived demand for labor as:

$$\ln N_{it} = \phi_0 + \phi_1 \ln \left(\frac{w_i}{c} \right) + \phi_2 \ln Q_{it} + \varepsilon_{it}, \tag{3}$$

where $\phi_0 = -\frac{(\gamma \ln A + \alpha \ln \alpha - \alpha \ln \beta)}{(\alpha + \beta)}$, $\phi_1 = -\frac{\alpha}{(\alpha + \beta)}$, $\phi_2 = \frac{1}{(\alpha + \beta)}$, and ε_{it} is a disturbance term.

In addition, we assume that the labor coefficient of average domestic production is different from those of export-oriented-goods production and import-substitution-goods production. Regarding exports, when domestic production is export oriented, increased export intensity may create more job opportunities because export-oriented goods are labor intensive in Vietnam (see Table 4; Fu and Balasubramanyam 2005). In terms of imports, when domestic production depends on the importation of raw materials and capital goods, intensified import penetration may also stimulate labor demand. More specifically, because the output and the wage rate are already controlled in the estimation, only the additional changes in labor demand triggered by import penetration, excluding its impact on labor adjustment through the channels of output and/or wage variations, will be captured by the coefficient of the import penetration variable (M). Therefore, the labor demand is hypothesized to be dependent on the ratios of exports and imports. The ultimate model is as follows:

$$\ln N_{it} = \phi_0 + \phi_1 \ln\left(\frac{w_i}{c}\right) + \phi_2 \ln Q_{it} + \phi_3 \ln M_{it} + \phi_4 \ln X_{it} + \mu_0 T + \varepsilon_{it}, \quad (4)$$

where T is the time trend, X is the export intensity index (measured by export–output ratio), and M is the import penetration index (measured by import–output ratio).[4]

Many economic relationships are dynamic, and one of the advantages of panel data is that they allow researchers to understand the dynamics of adjustment (Baltagi 2001). Therefore, a substantial number of studies have dealt with dynamic effects; for example, Holtz-Eakin (1988) use a dynamic wage equation, and Arellano and Bond (1991) and Greenaway, Hine, and Wright (1999) apply a dynamic employment model. These dynamic relationships are characterized by the presence of lagged employment among regressors. To take adjustment processes into account, time lags are also introduced for the independent variables, using a distributed lag structure. This form is called an autoregressive distributed lag model. Because of data availability, the model includes a one-year lag of both dependent and independent variables for empirical estimation.

$$\ln N_{it} = \lambda_i + \mu_0 T + \phi_0 \ln N_{i,t-1} + \sum_{j=0}^{1} \phi_{1j} \ln\left(\frac{w_{i,t-j}}{c_{t-j}}\right) + \sum_{j=0}^{1} \phi_{2j} \ln Q_{i,t-j}$$
$$+ \sum_{j=0}^{1} \phi_{3j} \ln M_{i,t-j} + \sum_{j=0}^{1} \phi_{4j} \ln X_{i,t-j} + \eta_t + \varepsilon_{it}, \quad (5)$$

where λ_i represents industry-specific effects and η_t represents time-specific effects.

[4] Theoretically, it would have been preferable to use the share of imports in domestic demand (= imports/ [production + import – exports]); however, there are problems with measuring domestic demand in some industries, which give rise to inconsistencies such as negative domestic demand (Jenkins 2004).

Following Greenaway, Hine, and Wright (1999) and Milner and Wright (1998), variation in users' cost of capital (c) is captured by time dummies in the estimation by assuming perfect capital markets; thus it varies only over time.

To eliminate the industry specific effects and to ensure that the two-year lag of level variables is not correlated with error terms, the employment equation (5) is differenced and a dynamic employment equation is implemented as follows:

$$\Delta\ln N_{it} = \mu_0 + \phi_0 \Delta\ln N_{i,t-1} + \sum_{j=0}^{1} \phi_{1j} \Delta\ln\left(\frac{w_{i,t-j}}{c_{t-j}}\right) + \sum_{j=0}^{1} \phi_{2j} \Delta\ln Q_{i,t-j}$$
$$+ \sum_{j=0}^{1} \phi_{3j} \Delta\ln M_{i,t-j} + \sum_{j=0}^{1} \phi_{4j} \Delta\ln X_{i,t-j} + \Delta\eta_t + \Delta\varepsilon_{it}, \tag{6}$$

where Δ indicates differences in variables' transformation; for example, $\Delta\ln N_{it} = \ln N_{it} - \ln N_{i,t-1}$. Unlike industry-specific effects, time-specific effects are not eliminated by the difference transformation of variables.

However, the differenced equation (6) creates another problem (i.e., endogeneity) because it is clear that $\Delta\ln N_{i,t-1}$ and $\Delta\varepsilon_{i,t-1}$ are correlated. Therefore, it would be inappropriate to estimate equation (6) using the OLS technique. To deal with this problem, an instrumental variables (IV) approach will be used for $\Delta\ln N_{i,t-1}$. Two approaches, which use IV, can be applied to estimate equation (6); namely, Anderson's and Hsiao's (1982) IV estimator, and Arellano's and Bond's (1991) GMM estimator.

B. *Estimation Method and Data*

The introduction of a lag dependent variable as one of the explanatory variables makes OLS, fixed effects, random effects, and feasible generalized least squares (FGLS) techniques yield biased and inconsistent estimates (Nickell 1981; Sevestre and Trognon 1985; Baltagi 2001; Harris and Mátyás 2004). To deal with this problem, the most favored approaches to date that give unbiased and consistent results are IV and GMM. However, the GMM estimator is used in the present study for two reasons.[5] First, if heteroskedasticity is present, the GMM estimator is more efficient than the simple IV estimator; whereas if heteroskedasticity is not present, the GMM estimator is no worse asymptotically than the IV estimator (Baum, Schaffer, and Stillman 2003). Second, the use of the IV method leads to consistent, but not necessarily efficient, estimates of the model's parameters because it does not use all available moment conditions and it does not take into account the differenced structure on the residual disturbances (Baltagi 2001).

[5] Besides the GMM estimator, we also use other methods to test the basic model, such as OLS, fixed effects, random effects, between effects, and a feasible generalized least square, which do not include the lagged endogenous or exogenous variables. The results are reported in Appendix Table 1.

The GMM estimators, which include first-differenced GMM (DIF-GMM), developed by Arellano and Bond (1991), and system GMM (SYS-GMM) developed by Blundell and Bond (1998), are becoming increasingly popular for estimating dynamic panel data sets. As pointed out by Blundell and Bond (1998) and Bond *et al.* (2001), however, the DIF-GMM estimator has been found to have poor finite sample properties, in terms of bias and imprecision, when lagged levels of the series are only weakly correlated with subsequent first-differences. They also show that DIF-GMM might be subject to a large downward finite-sample bias, particularly when the number of time periods available is small. Therefore, the SYS-GMM estimator is more appropriate than the DIF-GMM for our model, and will be used as the main method for estimating the employment equation.

Arellano and Bond (1991) recommend two specification tests to address the GMM estimator's consistency; namely, a second-order serial correlation test for the first-differenced residual m_2 statistics and a Sargan/Hansen test for the overidentifying restrictions' validity. First, an Arellano–Bond test for autocorrelation should be used to confirm that the estimated results will not have autocorrelation. Because Δv_{it} is mathematically related to Δv_{it-1} via the share of v_{it-1} in Δv_{it}, negative first-order serial correlation is expected in differences, so evidence of it is uninformative. Therefore, to check for first-order serial correlation in levels, we look for second-order correlation (AR(2)) in differences, with the idea that this will detect correlation between the v_{it-1} in Δv_{it} and the v_{it-2} in Δv_{it-2} (Roodman 2006). If the reported Arellano–Bond statistic is greater than the critical level of 0.1, then we can conclude that our model has no autocorrelation. Second, the Sargan test for validity of the instruments should also be reported. The purpose of this test is to ensure that the instruments are exogenous. The null hypothesis is that IV are uncorrelated with the residuals. If the Sargan statistic exceeds the χ^2 critical value, we can reject the model (Hansen 2005).

To estimate the empirical model based on equation (6), the paper uses a data set that includes 26 industries, corresponding approximately to a two-digit ISIC level of aggregation, during the 1999–2004 period. Data on exports, imports, industrial outputs, and employment were obtained from the General Statistics Office of Vietnam (GSO various issues). Data on wages were obtained from the Ministry of Labor, Invalids and Social Affairs (MOLISA various issues).

C. *Estimation Results and Discussion*

The employment equations for the full sample from 1999 to 2004, estimated using different estimation methods, are reported in Table 6. In SYS-GMM, we treat all the regressors as endogenous variables.[6]

[6] To test for endogeneity of the regressors, the Durbin–Wu–Hausman test is performed. Results from the Durbin–Wu–Hausman test show that the hypothesis on the exogeneity of the regressors is rejected at the 99.9% significance level. Additionally, to test the robustness of the SYS-GMM model,

TABLE 6

Estimation of Employment Equations with OLS, Fixed Effects, and System Generalized Method of Moments (GMM)

Independent Variables	OLS	Fixed Effects	System GMM	
			Model 1	Model 2
$\Delta\ln N_{t-1}$	–0.095 (–0.90)	–0.403*** (–3.61)	–0.165 (–0.89)	–0.182 (–0.86)
$\Delta\ln(W/C)_t$	–0.034 (–0.38)	0.075 (0.81)	–0.486*** (–3.84)	–0.356** (–2.61)
$\Delta\ln(W/C)_{t-1}$	–0.025 (–0.31)	0.148* (1.81)	–0.052 (–0.36)	–0.079 (–0.67)
$\Delta\ln Q_t$	0.265*** (3.06)	0.263** (2.59)	0.656** (2.67)	0.416** (2.80)
$\Delta\ln Q_{t-1}$	0.213** (2.72)	0.366*** (4.49)	0.319* (1.80)	0.116 (0.47)
$\Delta\ln EXTEN_t$	–0.010 (–0.25)	0.095* (1.73)		0.110* (1.78)
$\Delta\ln EXTEN_{t-1}$	–0.031 (–1.01)	0.045 (1.18)		–0.081 (–1.41)
$\Delta\ln IMPEN_t$	0.012 (0.47)	0.046 (1.51)		0.016 (0.24)
$\Delta\ln IMPEN_{t-1}$	–0.041* (–1.76)	–0.004 (–0.16)		0.015 (0.22)
AR(2) test			0.537	0.679
Sargan test			0.222	0.261
Number of observations	102	102	108	102
R^2	0.39	0.23		

Notes: 1. t-ratios are in parentheses.
2. The dependent variable is $\Delta\ln N_t$.
3. Coefficients on time dummies are not reported.

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Despite the biases and inconsistency in the OLS and fixed effects estimations, their results are still useful for verifying the estimation results of SYS-GMM. As demonstrated by Nickell (1981), the fixed effects estimator yields a downward bias; whereas the OLS estimator produces an upward bias (Hsiao 1986). The results are consistent with these arguments, as expected. Compared with the SYS-GMM estimator's coefficient (–0.182) as the benchmark, the OLS estimator's coefficient has an upward bias of –0.095, and the fixed effects estimator's coefficient has a downward bias of –0.403. Therefore, this study uses the dynamic panel data estimation of SYS-GMM to determine the impacts of trade liberalization on Vietnam's employment level.

In model 1 of SYS-GMM, we estimated the employment equation with a base specification. In this model, employment is a function of only real output and the

as suggested by Roodman (2008), we choose certain available lags as instruments and examine the behavior of the estimated coefficients of interest. The result is robust against the change in the choice of instruments. The results for these tests are reported in Appendix Table 3.

wage rate. A Sargan test has been performed to verify the instruments' validity. This test, which tests the null hypothesis of no correlation between the instruments and the residual, has a two-tailed p-value of 0.222. Using the conventional criteria, the instruments used in the SYS-GMM estimator are valid. We also test for autocorrelation with the null hypothesis that the residuals are not second-order correlated. The Arellano–Bond test for autocorrelation has a critical value of 0.1. Model 1 has an Arellano-Bond test result of 0.537, which implies that autocorrelation is not present.

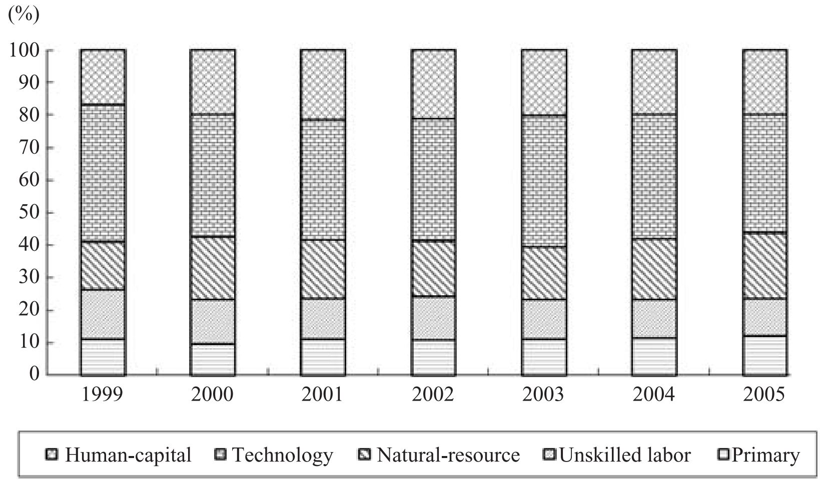
The result of our base specification shows that an increase in output positively impacts labor demand; whereas a rise in the wage rate decreases the employment level. The lagged dependent variable's estimated coefficient is negative and statistically insignificant, indicating that fast growth in one year might reduce the growth potential for the succeeding year. This result is also consistent with a study on China by Fu and Balasubramanyam (2004). Model 2 gives the results for the introduction of two new explanatory variables; namely, export intensity and import penetration. Again, the Sargan test for instrumental validity is satisfied and the Arellano–Bond test for the existence of second-order correlation cannot reject the null hypothesis that the residuals have no second-order correlation. The introduction of export intensity and import penetration as independent variables into the regression equation did not change the signs of the estimated coefficients of industrial output or wage rate, reflecting the consistency of the output and wage rate effects. An increase in industrial output will be followed by increasing labor demand; whereas an increase in the wage rate will lead to a decline in the employment level, with statistical significance at conventional levels.

The results show that the estimated coefficient of exports is positive and statistically significant, indicating that rising export intensity increases labor demand. This can be attributed to the fact that Vietnam's exports are more labor-intensive than imports. A 1% increase in export intensity would expand employment by 0.11%. The export intensity elasticity of labor demand is lower than that of domestic production. This implies that the increased export share in one sector additionally contributes to job creation in the same sector, holding the output level constant.

This result has an important implication for Vietnam's labor market. It implies that exports have generated new jobs for Vietnam's abundant labor force, thus reducing its unemployment level. Hence, an increase in export volume will bring about employment opportunities for Vietnam's abundant labor force.

As far as import penetration is concerned, it is interesting to note that its estimated coefficient is positive but statistically insignificant. This implies that imports do not necessarily negatively impact the country's employment level. The insignificant coefficient of import penetration implies that holding output constant, an increase in import penetration does not influence the employment level. In fact, as we can see in Figure 2, Vietnam's industrial production depends strongly on imports of inputs,

Fig. 2. Factor Intensity of Vietnam's Merchandise Imports, 1999–2005



Source: Authors' calculation from COMTRADE (2007), based on Leamer (1984) and Hinloopen and Marrewijk (2008).

capital, and technologies. Vietnam's imports of human-capital-intensive and technology-intensive products accounted for approximately 60% of its total imports during the 1999–2005 period. Another roughly 18% of natural-resource-intensive products are mainly refined petroleum products (about 14%), which can actually generate job opportunities for local employees. This import structure is totally opposite to that of exports (see Figure 1); primary and unskilled-labor-intensive products account for approximately 60% of total exports.

Exports and imports thus are highly complementary in that both can stimulate job creation in Vietnam. Overall, our results show that trade liberalization positively impacts employment in Vietnam. Specifically, exports have emerged as an important source of job creation; whereas increasing imports have not destroyed jobs in Vietnam's economy.

VI. CONCLUSION

Trade liberalization is one of the main driving forces to foster economic growth and development in Vietnam. Changes in economic structure in favor of increasing exports' share of manufactured products could be a favorable signal for this process. Besides this, trade liberalization can impact various other issues, including, increasing employment and reducing poverty. This paper aimed to empirically test a model of the labor market's response to trade liberalization.

A dynamic labor demand equation was built, which incorporated both imports and exports. The study used system GMM as the main technique to estimate the reaction of exports and imports to trade. The results show that, as expected, an increase in industrial output is followed by increased labor demand; whereas an increase in the wage rate reduces the employment level with statistical significance at conventional levels. The estimated coefficient of exports is positive and statistically significant, indicating that rising export intensity increases derived labor demand. Regarding imports, the estimated coefficient is positive but statistically insignificant. This implies that imports do not necessarily negatively impact employment in the country. Therefore, integration into the international market has generated new jobs for workers, particularly in some manufacturing subsectors, such as the textile, garment, and footwear industries. A high rate of export growth in labor-intensive industries has mitigated the country's labor surplus.

Notwithstanding the above evidence, further research in this area should seek to address several concerns. First, the available data set covers only a short period of time. Second, this study concentrates on the impacts of trade liberalization on employment only in industrial sectors. Third, the employment effects of trade often follow changes in the relative wages of skilled and unskilled workers.

REFERENCES

Anderson, Todd W., and Cheng Hsiao. 1982. "Formulation and Estimation of Dynamic Models Using Panel Data." *Journal of Econometrics* 18, no. 1: 47–82.

Arellano, Manuel, and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58, no. 2: 277–97.

Baldwin, Robert E. 1995. "The Effect of Trade and Foreign Direct Investment on Employment and Relative Wages." NBER Working Paper no. 5037. Cambridge, Mass.: National Bureau of Economic Research.

Baltagi, Badi H. 2001. *Econometric Analysis of Panel Data*. 2nd ed. Chichester: John Wiley and Sons.

Baum, Christopher F.; Mark E. Schaffer; and Steven Stillman. 2003. "Instrumental Variables and GMM: Estimation and Testing." Boston College Working Paper no. 545. Chestnut Hill, Mass.: Boston College.

Blundell, Richard, and Stephen Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87, no. 1: 115–43.

Bond, Stephen R.; Anke Hoeffler; and Jonathan Temple. 2001. "GMM Estimation of Empirical Growth Models." CEPR Discussion Paper no. 3048. London: Center for Economic Policy Research.

Caves, Richard E., and Matthew B. Krepps. 1993. "Fat: The Displacement of Non-production Workers from U.S. Manufacturing Industries." *Brookings Papers on Economic Activity: Macroeconomics 1993*, no. 2: 227–88.

Central Institute for Economic Management (CIEM). 2004. *Globalization, Employment and Poverty Reduction: Country Study of Vietnam*. Hanoi: CIEM.

COMTRADE. 2007. *United Nations Commodity Trade Statistics Database*. New York: United Nations. http://comtrade.un.org/db/default.aspx (accessed June 22, 2007).

Cortès, Olivier; Sébastien Jean; and Jean Pisani-Ferry. 1996. "Trade with Emerging Countries: The French Case." CEPII Working Paper no. 1996–04. Paris: Centre d'Etudes Prospectives et d'Informations Internationals.

Ernst, Christoph. 2005. "Trade Liberalisation, Exports Orientation and Employment in Argentina, Brazil and Mexico." ILO Employment Strategy Papers 2005/15. Geneva: International Labour Organization.

Fu, Xiaolan, and V. N. Balasubramanyam. 2004. "Exports, FDI, Growth of Small Rural Enterprises and Employment in China." ESRC Centre for Business Research Working Paper no. 286. Cambridge: University of Cambridge.

———. 2005. "Exports, Foreign Direct Investment and Employment: The Case of China." *World Economy* 28, no. 4: 607–25.

Gaston, Noel. 1998. "The Impact of International Trade and Protection on Australian Manufacturing Employment." *Australian Economic Papers* 37, no. 2: 119–36.

General Statistical Office (GSO). Various issues. *Annual Statistic Book*. Hanoi: Statistical Publishing House.

———. 2006. *The Vietnamese International Merchandise Trade for Twenty Years Renovation 1986–2005*. Hanoi: Statistical Publishing House.

Greenaway, David; Robert C. Hine; and Peter Wright. 1999. "An Empirical Assessment of the Impact of Trade on Employment in the United Kingdom." *European Journal of Political Economy* 15, no. 3: 485–500.

Hansen, Bruce E. 2005. "Econometrics." http://www.ssc.wisc.edu/~bhansen/econometrics/Econometrics2005.pdf.

Harris, Mark N., and László Mátyás. 2004. "A Comparative Analysis of Different IV and GMM Estimators of Dynamic Panel Data Models." *International Statistical Review* 72, no. 3: 397–408.

Heo, Yoon, and Miri Park. 2008. "Import Competition and Job Displacement: A Case Study of Korean Manufacturing Industries." *Social Science Journal* 45, no. 1: 182–93.

Hinloopen, Jeroen, and Charles van Marrewijk. 2008. "Empirical Relevance of the Hillman Condition for Revealed Comparative Advantage: 10 Stylized Facts." *Applied Economics* 40, no. 18: 2313–28.

Hoekman, Bernard, and L. Alan Winters. 2005. "Trade and Employment: Stylized Facts and Research Findings." World Bank Policy Research Working Paper no. 3676. Washington, D.C.: World Bank.

Holtz-Eakin, Douglas. 1988. "Testing for Individual Effects in Autoregressive Models." *Journal of Econometrics* 39, no. 3: 297–307.

Hsiao, Cheng. 1986. *Analysis of Panel Data*. Cambridge: Cambridge University Press.

International Monetary Fund (IMF). Various issues. *Vietnam: Statistical Appendix*. Washington, D.C.: IMF.

———. 2007. *Direction of Trade Statistics CD-ROM*. Washington, D.C.: IMF.

International Trade Center (ITC). 2007. *Trade Competitiveness Map: Analyse Country and Product Competitiveness with Trade Flows*. Geneva: ITC. http://www.intracen.org/menus/countries.htm (accessed June 20, 2007).

Jenkins, Rhys. 2004. "Vietnam in the Global Economy: Trade, Employment and Poverty." *Journal of International Development* 16, no. 1: 13–28.

Krugman, Paul. 1995. "Growing World Trade: Causes and Consequences." *Brookings Papers on Economic Activity 1995*, no. 1: 327–77.

Lawrence, Robert Z. 1996. *Single World, Divided Nations? International Trade and OECD Labor Markets*. Washington, D.C.: Brookings Institution Press.

Leamer, Edward E. 1984. *Sources of International Comparative Advantage: Theory and Evidence*. Cambridge, Mass.: MIT Press.

Lee, Siwook. 2007. "Trade Policy and Productivity: Micro-evidence from Korean Manufacturing." In *The Korean Economy in the Era of Globalization: Issues and Policy Implications*, ed. MoonJoong Tcha. Seoul: Korea Development Institute.

Lewis, Jeffrey D. 2002. "Promoting Growth and Employment in South Africa." *South African Journal of Economics* 70, no. 4: 338–58.

Mekong Economics. 2002. *A Study of Trade, Foreign Direct Investment and Labour in Vietnam*. An Input to the DFID, ESCOR Funded Project on Globalisation, Production and Poverty: Macro, Meso, and Micro Level Studies. Hanoi: Mekong Economics.

Messerlin, Patrick A. 1995. "The Impact of Trade and Capital Movements on Labour Evidence of the French Case." *OECD Economic Studies* 24: 89–124.

Milner, Chris, and Peter Wright. 1998. "Modelling Labour Market Adjustment to Trade Liberalization in an Industrializing Economy." *Economic Journal* 108, no. 447: 509–28.

Ministry of Labor-Invalids and Social Affairs (MOLISA). Various issues. *Statistical Data of Labor-Employment in Vietnam*. Hanoi: MOLISA.

Mouelhi, Rim Ben Ayed. 2007. "Impact of Trade Liberalization on Firm's Labour Demand by Skill: The Case of Tunisian Manufacturing." *Labour Economics* 14, no. 3: 539–63.

Nickell, Stephen. 1981. "Biases in Dynamic Models with Fixed Effects." *Econometrica* 49, no. 6: 1417–26.

Roodman, David. 2006. "How to Do Xtabond2: An Introduction to 'Difference' and 'System' GMM in Stata." CGD Working Paper no. 103. Washington, D.C.: Center for Global Development.

———. 2008. "A Note on the Theme of Too Many Instruments." *Oxford Bulletin of Economics and Statistics*, Forthcoming.

Sakurai, Kojiro. 2004. "How Does Trade Affect the Labor Market? Evidence from Japanese Manufacturing." *Japan and the World Economy* 16, no. 2: 139–61.

Sen, Kunal. 2002. "Globalisation and Employment in Bangladesh and Kenya." Globalisation, Production and Poverty Discussion Paper no. 7. Norwich: School of Development Studies, University of East Anglia.

Sevestre, Patrick, and Alain Trognon. 1985. "A Note on Autoregressive Error Component Models." *Journal of Econometrics* 28, no. 2: 231–45.

Turrini, Alessandro. 2002. *International Trade and Labor Market Performance: Major Findings and Open Questions*. Study Series no. 20. New York; Geneva: United Nation.

U.S. Census Bureau. 2007. *Foreign Trade Statistics*. Washington, D.C.: U.S. Census Bureau. http://www.census.gov/foreign-trade (accessed May 19, 2007).

United Nations Statistics Division (UNSD). 2007. *National Accounts Main Aggregates Database*. New York: United Nations. http://unstats.un.org/unsd/snaama/selectionbasicFast.asp (accessed June 16, 2007).

Wood, Adrian. 1994. *North-South Trade, Employment and Inequality*. New York: Oxford University Press.

World Trade Organization (WTO). 2007. *WTO Statistics Database*. Geneva: WTO. http://stat.wto.org/ (accessed May 12, 2007).

APPENDIX TABLE 1

Employment Equation's Estimation with Different Methods

Independent Variables	OLS		Fixed Effects		Random Effects		Between Effects		FGLS	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
ln *Outputs*	0.859	0.043***	0.335	0.058***	0.494	0.067***	0.887	0.104***	0.854	0.024***
ln *WACO*	–2.319	0.086***	–0.257	0.084***	–0.556	0.103***	–2.408	0.204***	–2.333	0.064***
ln *EXTEN*	0.061	0.036*	–0.001	0.029	0.009	0.036	0.061	0.085	0.096	0.021***
ln *IMPEN*	–0.141	0.025***	–0.037	0.020*	–0.017	0.025	–0.125	0.070*	–0.134	0.018***
Yeas Effects	Yes		Yes		Yes		Yes		Yes	
Constant	4.490	0.574***	6.869	0.740***	5.503	0.873***	5.747	1.429***	4.687	0.367***
Observations	155		155		155		155		155	
R^2	0.89		0.60		0.74		0.50		—	

Notes: 1. Dependent variable: ln *Employment*.
2. *WACO* = wage rate, *EXTEN* = export intensity, *IMPEN* = import penetration.
*** and * represent statistical significance at the 1% and 10% level, respectively.

APPENDIX TABLE 2

Factor Content Classification

Sector	Standard International Trade Classification Code
Primary products	001–098; 111–122; 211–292; 322; 323; 335; 341; 351; 411; 423; 424; 431; 941
Natural resource intensive products	333; 334; 524; 611; 612; 613; 633; 634; 635; 661; 662; 663; 667; 671; 681; 682; 683; 684; 685; 686; 687; 688; 689
Unskilled labor intensive products	651–659; 664; 665; 666; 793; 812; 821; 831; 842; 843; 844; 845; 846; 847; 848; 851; 894; 895
Human capital intensive products	531–533; 551–554; 621–628; 641; 642; 672–679; 691–699; 761–763; 781–786; 791; 885; 892; 896; 897; 898; 899
Technology intensive products	511–523; 541; 562; 572; 582; 583; 584; 585; 591; 592; 598; 711–759; 764; 771–778; 792; 871–884; 893; 951

Source: Based on Hinloopen and Marrewijk (2008) and Leamer (1984).

APPENDIX TABLE 3

Robustness Test†

Independent Variables	System Generalized Method of Moments	
	Coefficient	t-statistic
$\Delta\ln N_{t-1}$	–0.149**	–2.36
$\Delta\ln(W/C)_t$	–0.551***	–4.58
$\Delta\ln(W/C)_{t-1}$	0.063	0.42
$\Delta\ln Q_t$	0.260*	1.71
$\Delta\ln Q_{t-1}$	0.570**	2.57
$\Delta\ln EXTEN_t$	0.170**	2.10
$\Delta\ln EXTEN_{t-1}$	–0.095	–1.02
$\Delta\ln IMPEN_t$	0.057	0.89
$\Delta\ln IMPEN_{t-1}$	0.068	1.08
AR(2) test	0.383	
Sargan test	0.930	
Number of observations	102	
Durbin–Wu–Hausman χ^2 test (p-value)‡	40.788 (0.000)***	

Notes: 1. The dependent variable is $\Delta\ln N_t$.
2. Coefficients on time dummies are not reported.

† For the robustness test for the choice of instruments, we observe no significant changes across this current estimation or in Table 6 of the estimated coefficients of interest. It is reaffirming the pattern that increasing export intensity stimulates labor demand while import penetration does not.

‡ Durbin–Wu–Hausman test for endogeneity is performed via instrumental variables. The null hypothesis states that an OLS estimator of the same equation would yield consistent estimates. The rejection of the null hypothesis means that the endogenous regressors have meaningful effects on coefficients, and instrumental variables techniques are required.

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.