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**Immigration, Job Vacancies, and Employment
Dynamics:**

Evidence from Thai Manufacturers

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Immigration, Job Vacancies, and Employment Dynamics: Evidence from Thai Manufacturers*

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Abstract

Do immigrant workers fill in job vacancies and promote employment dynamics? Using Thailand's firm-surveyed data, this paper investigates the challenges experienced by firms employing immigrant workers and how the immigrants help to fill job vacancies. Descriptive analysis shows that Thai firms do not have much difficulty employing immigrant workers, who come mostly from neighboring countries. Our regressions show that, by analyzing firm-level characteristics, firms employing immigrant workers tend to be more labor intensive, use less computers or other technologies in production, are recently established, and employ high proportions of low-educated workers. Firms that have job vacancies in either skilled or unskilled positions and are losing production days due to slowdown and stoppage of workers will tend to employ more immigrant workers in order to fill vacancies and smooth out their production. The impacts of job vacancies on the demand for immigrant workers was found to be stronger among firms located in non-border areas where immigrants tend to move away from bordering provinces to larger provinces where there are better job opportunities. Labor cost concerns, either wage or fringe benefit costs, also force firms to employ more immigrants in order to maintain their cost competitiveness. Based on firm-level panel dataset, it seems that firms employing immigrant workers in the past seem to have realized its benefits and are thus employing more immigrants today. The results pose challenges to migration management policies that aim to harmonize the demand for labor in short-term vis-a-vis long-term development.

Keywords: Immigration, Job Vacancies, Firm-Level Characteristics, Thailand

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I. Introduction

Over the decade of 2001—2010, international migration has been one of the hottest demographic issues widely discussed in Thailand. Immigration into Thailand has been increasing very rapidly mainly due to the widening income disparities between Thailand and its neighbors, which include Cambodia, the Lao People's Democratic Republic (Lao PDR), and especially, Myanmar. In the academia, a number of empirical studies attempted to explain the costs and benefits of such immigration. As a migrant-receiving country in the Southeast Asian region, the costs and benefits of immigration have already been explained and basic questions have been answered, such as has the mass immigration of unskilled people depressed the wages of the Thai workers? Does immigration of people with little education and few job skills contribute to widening income gaps? Do immigrants displace unskilled Thais from their jobs? Do they help increase the competitiveness of Thai firms in global markets?

There is already a consensus among economists and policymakers that immigration not only benefits the economy overall through higher gross domestic product (GDP) and incentives provided to firms so that they will make more investments; immigration also benefits individual Thai firms seeking opportunities to pay lower wages and gain cost competitiveness.¹ Some analysis focus on the benefits to immigrant workers who come to seek work in Thailand, and who are able to gain sufficient money for remittances back home.

Although Thailand benefits from employing immigrants in terms of GDP growth and increased investment, these benefits are unevenly distributed and mainly go to the owners of capital (i.e., firm owners and employers) and to the immigrants themselves, while native workers are considerably jeopardized (Pholphirul and Rukumnuaykit 2010). This last issue falls into the cost side of immigration. For example, a number of empirical studies suggest that immigration does indeed reduce native wages and harms the employment of Thai

workers.² Although these effects are rather small, they can be significant for Thais who are unskilled or low-educated and who are highly substitutable by immigrant workers. Nevertheless, if classification by skills and education is considered, the adverse impacts of immigration on Thai workers are much greater for young and low-skilled workers (Lathapipat 2010). At the sectoral level, immigrants reduce the wages

¹ How the macroeconomy benefits from employing immigrants was the first aspect of this phenomenon explained by Thai economists in quantifying the benefits received by the overall economy. The different economic tools used have provided similar results, such as the analyses done by Sussangkarn (1996), Martin (2007), Pholphirul and Rukumnuaykit (2010), and Pholphirul et al. (2010). Pholphirul et al. (2010) also found that, by using firm-level data, an estimated THB5,746 per person per year can be saved by a firm that employs 10% more unskilled migrants. This result is straightforward for a firm with labor-intensive production, such as in the textile industry, which can save up to THB24,144 per person per year.

² Bryant and Rukumnuaykit (2007) found that immigration appears to have caused a small reduction in wages rather than in employment. A 10-percentage point increase in migrant share is found to cause only a 0.23 percent reduction in domestic wages. A small immigration impact on native wages was also supported by Kulkolkarn and Potipiti (2007) who found no significant effect of immigration on reducing the wages of Thai workers.

of native Thai workers in agriculture, where there is a higher degree of substitution by native-migrant workers than in other sectors (Pholphirul et al. 2010).

Although the cost-benefit of employing migrant workers in Thailand has been explained in a number of previous studies, not many of them have empirically tested the roles of immigration from the perspective of demand in the labor market. Simple labor economic theory explains the role of the labor market by classifying the market into a supply side and a demand side, with the participants in the labor market classified into workers and firms. Generally speaking, workers supply labor to firms while firms demand labor from workers in exchange for wages. Holding wages constant, labor demand and labor supply interact with each other. This interaction of labor supply and demand becomes much more prominent if the immigration factor is taken into account.

As can be clearly observed in agriculture, fisheries, construction, and other services, immigrant workers are still filling both economic positions (such as farming and factory production) and non-economic activities (such as housekeeping). Therefore, vacancies could exist and vary due to business cycles, seasonality, or mismatches in the labor market. Although unemployment has never been a serious problem in Thailand, the rate of which has remained constant at 3–4 percent, the unemployment rate has always under-emphasized the true magnitude of job vacancies and workflows. For example, during harvest periods, Thai manufacturers always face serious job vacancies at certain periods of time when large numbers of native workers have to return home to aid their families in the agricultural sector. Longer durations of job vacancies can be a big impediment to the workflows, delaying production and operation, and creating huge business losses. In some other circumstances, the vacancies can be due to skill mismatches between the skills of the unemployed workers and the skills needed for the available jobs.³

Although it is commonly understood among employers that immigration should help firms fill job vacancies quickly, this argument has never been empirically and statistically tested. Therefore, it is worthwhile to examine how immigration helps to reduce vacancies and to promote employment dynamics. Nevertheless, due to the availability of firm-level survey data, this paper takes into account only the measurement of job vacancies and the need for immigrant workers only in the manufacturing sector, and not in the agricultural and services sectors. Although the demand for immigrant workers may not be as obvious as that in agriculture and services, smoothing the production to maintain workflows and avoiding labor shortages are always the concern among manufacturers. It is believed that employing immigrant workers helps stabilize the labor supply in this sector, fill in the vacancies, and prevent uncertainties in production.⁴

³ Unlike adjustments in capital and production technologies, which tend to be longer term, labor effects are likely to happen more quickly especially in the case of the labor market. For example, the negative supply shock creates labor shortages and it becomes urgent for firms to fill in the vacancies. The larger pool of unskilled workers caused by immigration helps to reduce the likelihood of a local labor shortage, especially among 3D-type jobs (dirty, dangerous, and demanding).

⁴ Apart from economic activity, the labor shortage problem is also crucial in non-economic (non-tradable) household activities, such as domestic work. Even so, employing migrant domestic workers not only helps the Thai household to alleviate this problem, but also allows Thai workers, especially women, to participate in the labor market. This partly alleviates labor shortage problems in some specific sectors.

Although the supply of immigrant workers is abundant, the decision of firms to hire immigrant workers also varies due to firm-level characteristics and production structure. For example, cost-cutting objectives should be one of the main reasons for employing cheap migrant labor. Location and relaxed regulations can also be factors that determine the number of foreign migrants employed.

To be more specific, this paper will first analyze the employment status and the challenges faced by Thai manufacturing firms in seeking to hire immigrant workers. Second, given such constraints, this paper also analyzes whether the magnitude of migrant share should be determined by firm-level characteristics, labor shortages, job vacancies, and cost concerns. The findings of this empirical work should help policymakers to understand how the labor market will react given the substantive increase in the labor supply due to immigration. The findings should also help in the formulation of labor-market policies on how to best manage migration. In the next section, the broader context of labor migration in Thailand will be examined to give the overall introduction. Section III examines and discusses the challenges of employing foreign immigrant workers as perceived by Thai firms. Section IV explains the role of immigration in filling job vacancies and promoting employment dynamics. Section V discusses the findings and presents the conclusions.

II. Job Vacancies and Challenges of Employing Immigrant Workers

As a middle-income country, Thailand has played the role of being an important host country for migration in the Southeast Asian region. Income disparities among countries have generally widened so that there is a stronger incentive among workers to migrate from a lower-income country to a higher-income country. Besides, Thailand has also served as a country of transit for asylum seekers, especially irregular migrants and victims of trafficking.

Similar to other countries, immigrant workers in Thailand consist of both the skilled and unskilled. As of March 2010, there were 100,338 foreign professionals and skilled immigrants with work permits residing in Thailand. The Japanese, with a total number of 23,060, so far, topped the list of foreign groups with work permits in Thailand. They are followed by skilled immigrants from the United Kingdom, People's Republic of China, India, the Philippines, and the United States. Nearly two-thirds of the work permits for foreign nationals were for senior officials and managers and nearly one-fourth of the permits were for professionals. The majority of the work permits held by Japanese were in business industry while 59 percent of those held by Filipinos were for education professionals. By industry, 30 percent of the work permits held by skilled foreign workers were in manufacturing, 16 percent were in education, and 16 percent in trade (Huguet and Chamrathirong 2011).

Table 1. Number of Skilled Immigrants and Foreign Professionals Holding Work Permits in Thailand (March 2010)

Occupation	Total	Japan	UK	China	India	Philippines	US	Others
All Occupation	100,338	23,060	8,481	8,414	8,047	7,052	6,838	23,446
Senior officials and managers	64,586	17,681	4,792	4,480	6,452	1,271	3,040	26,868
Professionals	23,920	2,471	3,053	2,478	839	5,114	3,453	6,512
Technicians	7,099	2,155	409	895	398	470	233	2,539
Clerks	1,439	288	125	86	63	100	53	724
Service and sales workers	1,313	186	42	160	175	42	21	687
Skilled agricultural and Fisheries workers	33	5	1	1	0	1	1	24
Craft and related trade workers	675	109	20	143	69	10	9	315
Plant and related operators	721	152	33	153	38	20	23	302
Elementary occupations	322	5	3	8	3	3	3	297
Trainees	230	8	3	8	10	21	2	178

Sources: Huguet and Chamrathirong, 2011 (Table 1.2). Information were collected from the Department of Employment, Ministry of Labour.

At the same time, widening income gaps between Thailand and its neighboring countries, the slowing growth of Thailand's workforce, and improvements in roads and infrastructure linking the region are the major drivers of cross-border movement of low-skilled laborers into Thailand, especially from its border countries, namely, Lao PDR, Cambodia, and Myanmar. To manage these unskilled immigrants, the Government of Thailand has signed memorandums of understanding (MOUs) with these three neighboring countries for the formal recruitment of migrant workers. The MOUs indicated that there were around 1.3 million migrants from these three neighboring countries who held work permits for low-skilled employment at the end of 2009. Of these migrants, 82 percent were from Myanmar. These unskilled migrants have been working in a range of so-called 3D jobs (dirty, dangerous, and demeaning) in which around 50 percent were in fishery and seafood processing, 17 percent were in agriculture, 17 percent in construction, 8 percent in domestic employment, and 43 percent in other businesses.

The bigger challenge of managing the entry of these unskilled immigrants from the three bordering countries is the documentation of a large number of them who chose to be documented. There were as

many as 1.44 million of these migrants, including their family members, who were unregistered. This high figure of undocumented migrants, therefore, puts challenges to Thai policymakers on how to manage them in such a way as to generate economic benefits.

Table 2. Registered Migrants Workers in Thailand from Cambodia, Lao People's Democratic Republic, and Myanmar (December 2010)

Sector	Total	Cambodia	Lao PDR	Myanmar
Total	1,314,382	124,761	110,854	1,078,767
Fishing	56,578	14,969	1,800	39,809
Seafood processing	136,973	6,020	1,180	129,773
Agriculture	221,703	24,085	18,035	179,583
Construction	220,236	32,465	12,635	175,136
Agric. process,	65,305	6,635	3,677	54,993
Meat processing	8,852	442	792	7,618
Recycling	13,172	2,215	1,360	9,597
Mining, quarrying	1,843	61	35	1,747
Metal sales	12,556	995	2,191	9,370
Food sales	54,225	4,483	13,074	36,668
Soil business	5,879	689	322	4,868
Const. materials	11,441	1,003	1,296	9,142
Stone processing	3,543	229	263	3,051
Garment business	49,501	1,739	6,121	41,641
Plastic business	16,954	1,341	2,673	12,940
Paper business	2,569	139	399	2,031
Electronics	2,595	152	342	2,101
Transport	9,596	2,502	601	6,493

Trade	42,814	4,778	7,565	30,471
Car repair & services	5,631	376	1,276	3,979
Fuel and gas	3,439	281	777	2,381
Education	837	36	67	734
Households	129,790	6,578	21,267	101,945
Others	238,350	12,548	13,106	212,696

Lao PDR = Lao People's Democratic Republic.

Sources: Huguet and Chamrathirong (2011), Table 1.2. Information were collected from the Department of Employment, Ministry of Labour.

Studying immigration topics can be varied, depending on the different approaches in the labor market, ranging from labor demand to labor supply, as well as policy frameworks to understand and facilitate the market. Since Thailand is now facing a more competitive world market, it must change its development strategy by shifting from labor-intensive to more value-added types of production. Manpower requirements are also changing. Industries can no longer rely on cheap, unskilled labor. What is needed is a more skilled and better-educated work force. Under the current circumstances, it is expected that there would be a shortage of skilled and semi-skilled labor. Simultaneously, the demand for unskilled labor remains high due to the need to maintain cost competitiveness, especially in global markets. A significant demand for both highly skilled and semi- to low-skilled workers creates supply-demand gaps in the Thai labor market. Job vacancies play an important role in any analysis of labor markets and employment. How well the labor market adjusts to this demand pattern is crucial to economic development and to the welfare of Thai laborers. It is also a big challenge for Thai employers to overcome these supply-demand gaps.⁵

The data in this section come from the Productivity and Investment Climate Survey (PICS), which contains firm-level data on the manufacturing sector. The collection of data was funded by the Royal Thai Government with technical assistance from the World Bank. Data collection was conducted in two rounds⁶. The first round (PICS 2004) was conducted between March 2004 and February 2005, and surveyed 1,385 manufacturing establishments. The second round (PICS 2007) was conducted between

⁵ In some empirical studies by Abraham (1983) and Abraham and Katz (1986), job vacancies have been used to distinguish frictional or structural employment from the "deficient-demand" structure.

⁶ The Productivity and Investment Climate Survey (PICS) was carried out by the Foundation for Thailand Productivity Institute (FTPI) under the supervision of the Ministry of Industry, with technical assistance from the World Bank on survey design and implementation by aiming to improve productivity and competitiveness of firms operating in Thailand. Parts of the questionnaire were filled out by firm owners or plant managers incorporated by a visiting team of enumerators who went through the questionnaire. Technical Advisory Committees were composed of representatives from the World Bank, the Ministry of Industry, the National Economic and Social Development Board, the Bank of Thailand, the National Statistics Office, and other agencies.

April 2007 and November 2007, and surveyed 1,043 manufacturing establishments. Some 426 manufacturing firms participated in both surveys. The surveys covered six regions of Thailand (North, Central, Bangkok and vicinity, East, Upper and Lower Northeast, and South) and nine industries based on ISIC classifications (food processing, textiles, garments, automobile components, electronic components, electrical appliances, rubber and plastics, furniture and wood, and machinery and equipment).

Although the Thai economy as a whole has relied on huge amounts of investments and exports, firms are rather heterogeneous. For example, smaller and medium enterprises usually face labor shortages, since they lack the necessary contacts and experience to relocate their production facilities abroad. According to the survey results, vacancies in all types of skilled works are a serious problem among Thai manufacturers. Using PICS-2007 to ask whether the firms had any vacancies for both skilled and unskilled production workers in their establishments in the previous year (2006), it was found that Thai manufacturers faced serious shortages of both unskilled and skilled production workers. For skilled workers, the results can be obviously explained. The Royal Thai Government's vision to upgrade Thailand's economy to a more innovative, high -technology production had put pressure on Thai firms to find skilled laborers. Of the firms, 29.3 percent reported a shortage of skilled labor, especially those firms in capital-intensive sectors, such as auto parts (49.5%), machinery and equipment (33.7%), and electronics and electrical appliances (32.3%). Skills shortages and lack of educated workers were perceived as major obstacles to Thailand's further development (World Bank 2008).

As shown in Table 3, although skilled labor is always in demand by Thai manufacturers, they have reported an even higher shortage of unskilled labor (48.8%). This result has brought a new concern. Although Thai industries, particularly firms in capital-intensive sectors, have reported shortages of skilled production workers, unskilled workers are in strong demand by all sectors, regardless of the type of production, ranging from a minimum of 38.6 percent in machinery and equipment to as high as 56 percent in garments. At the unskilled worker level, shortages create a serious problem, especially for labor-intensive industries, such as food processing and garments, where many vacancies result from too few applicants. Some sectors, such as auto parts, electronics and electrical appliances, and garments, also face serious shortage in both skilled and unskilled labor. The reasons for job vacancies are rather mixed, because the available workforce has poor skills and/or workers have certain other skills. There are still mismatches between jobs and skills, which create vacancies when many applicants lack the basic skills or technical skills that the firms require.

As generally explained by economic theory, job vacancies always create invisible costs for firms, as firms have to spend extra time and effort to find and recruit employees to fill the vacancies. Survey results show that, on average, Thai firms took around 5.2 weeks to find skilled production workers, but only 2.2 weeks to find unskilled production workers as these workers were more abundant (Table 4). The World Bank (2008) also reported that shortages of both skilled and unskilled production workers among manufacturers were much more prevalent in Thailand than in other countries in the region.

Table 3. Percentages of Firms Reporting Vacancies, 2007

Industry	Skilled Labor	Unskilled Labor	Number of Observation
Food Processing	22.2	43.5	108
Textile	22.6	55.6	133
Garment	32.7	56.0	159
Auto Parts	49.5	47.7	109
Electronics and Electrical Appliances	32.3	47.3	93
Rubber and Plastics	23.3	46.9	258
Furniture and Wood Products	28.0	50.0	100
Machinery and Equipment	33.7	38.6	83
Total	29.3	48.8	1,043

Source: Computed from PICS Data 2007

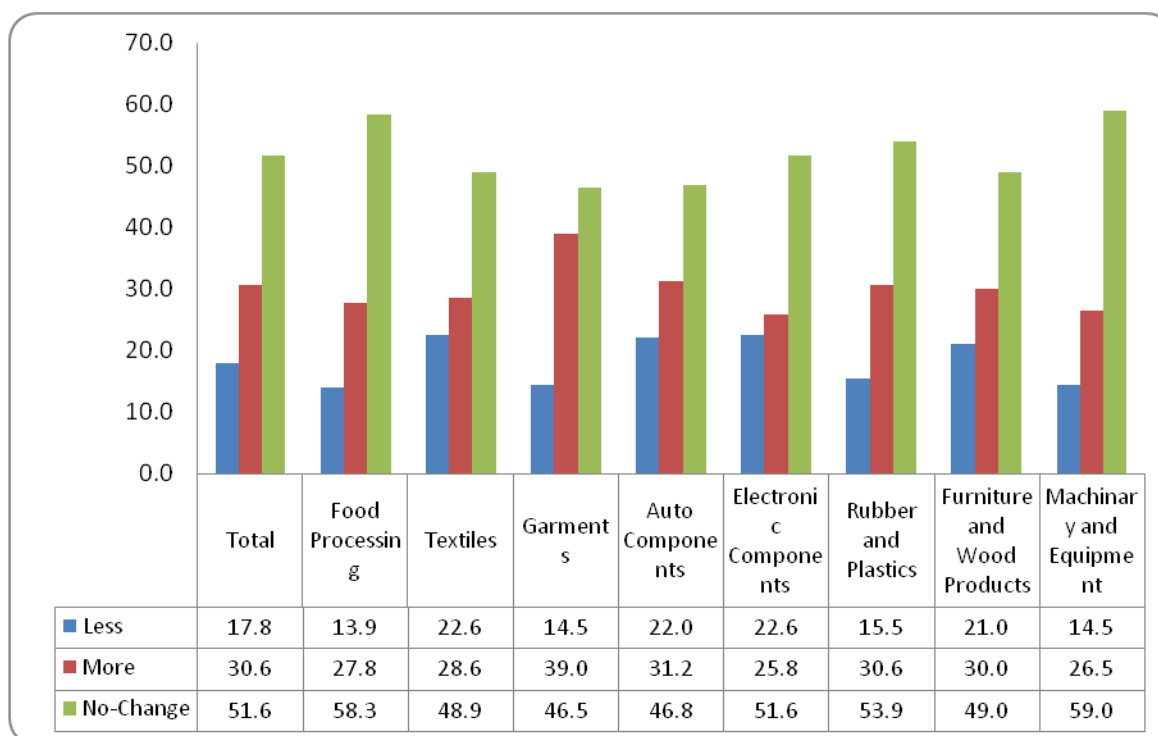
Table 4. Number of Weeks to Fill Job Vacancies by Region and Industry

	Skilled Workers	Unskilled Workers
Thailand	5.2	2.2
Regions		
Bangkok and vicinity	5.2	2.0
Central	4.4	2.0
East	7.0	2.7
North	3.6	2.6
Northeast	5.5	1.7
South	5.5	3.2
Industry		
Food Processing	4.1	2.6
Textiles	5.1	2.3
Garments	5.1	2.2
Auto Components	5.9	1.9
Electronic Components	4.1	1.8
Rubber and Plastics	5.5	2.2
Furniture and Wood Products	4.9	2.1
Machinery and Equipment	5.2	2.2
Food Processing	4.1	2.6

Source: Computed from PICS Data, 2007

There was also a question asking firms to determine whether they would like to hire more or less than their current level of employment. Of the firms, 30.6 percent, especially those in the garments industry, were willing to hire more workers. Only 17.8 percent of them wanted to hire fewer workers and 51.6 percent of them reported that their current employment was already at the optimal level and did not want to change their status. These data clearly confirm a labor shortage existing among Thai manufacturers in all types of production intensities (Figure 1).

Figure 1. Percentage of Firms Wanting to Hire More, Less, or Zero Number of Workers



Source: Computed from PICS Data, 2007

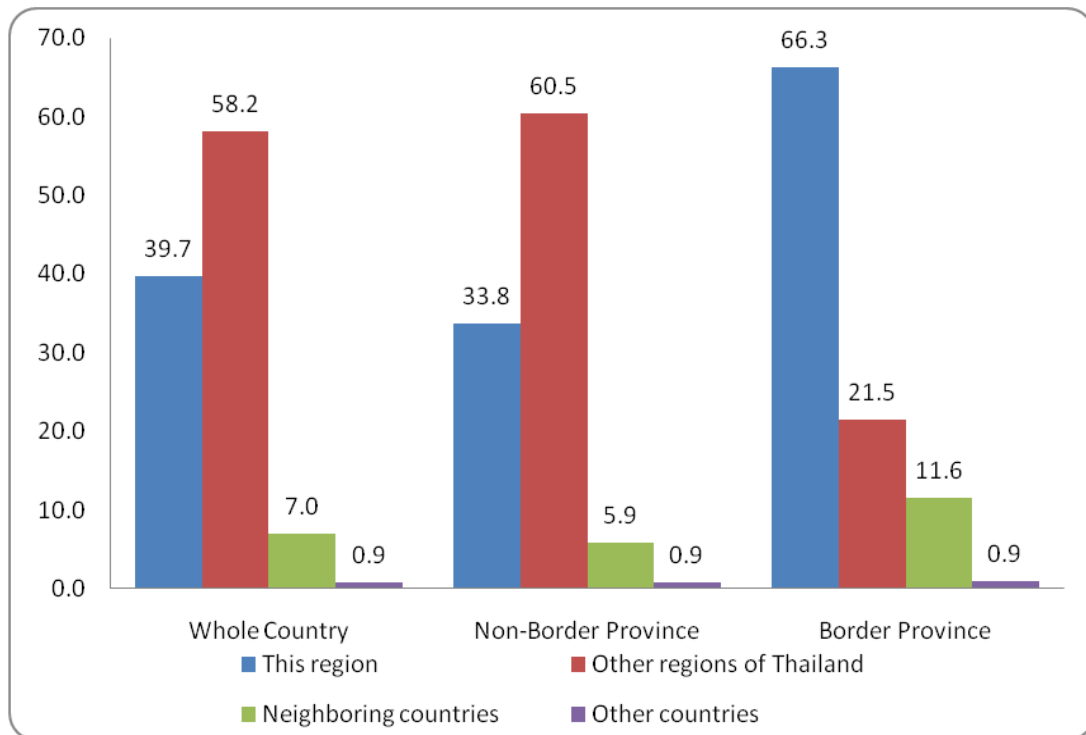
Serious labor shortages pressure Thai firms to actively search for workers outside the region and outside Thailand. Survey results suggest that 58.2 percent of the workers were hired from other regions of Thailand while 39.7 percent were from the same region where the firm is located. Hiring workers from other regions clearly shows a pattern of internal migration, especially for firms located in non-border provinces such as Bangkok and its vicinity, the Central Region, and the Eastern region (Seaboard area) in which a large number of plants and factories are located.

For outsource employment, although hiring foreign workers helps fill vacancies, the ratio is still far from that of Thai workers. Survey results show that most foreign workers, in this case, were from neighboring

countries (7%), namely Myanmar, Cambodia, Lao PDR, and Malaysia, while a very small portion (0.9%) were from non-neighboring countries.

Although foreign workers are still relatively much less employed than hiring Thai workers, classifying firms by their location also gave an interesting finding. Firms located in border provinces seem to rely more on immigrant workers to fill in job vacancies than firms in non-border provinces. Firms in border provinces reported that 11.6 percent of their newly hired workers in 2006 were migrants, which is far higher than what firms in non-border provinces had reported. Although newly hired workers cannot be distinguished by skill types, the result still shows the importance of immigrant workers to Thai manufacturers, especially to those operating in border provinces (Figure 2).

Figure 2. Percentage of Workforce Classified by Border/Non-Border Location



Source: Computed from PICS Data 2007

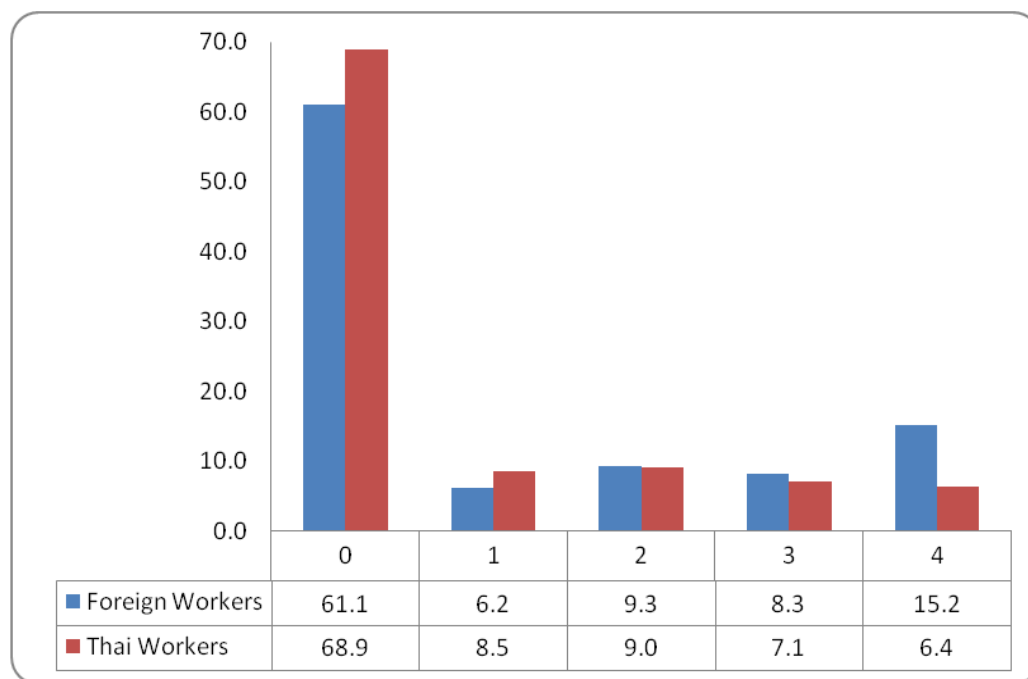
Thai firms hire foreign workers not only to reduce local labor shortage and promote continuity of production, but also to enhance their competitiveness by lowering labor cost through employment of cheap labor from neighboring countries. However, survey results showed that the majority of Thai manufacturers hired foreign workers due to shortage of native labor rather than for lower wage costs. Among 928 firms answering this question in the survey, 765 of them reported shortages of labor as the main reason for hiring immigrant workers. Only 46 of them reported seeking lower wage costs. Any other

reasons were not specified in the dataset. This result clearly supports the hypothesis mentioned before that immigration is important to Thai firms for filling in job vacancies and smoothing workflows.

Nonetheless, as shown in Figure 3, shortages of particular laborers can also be felt because of various structural and behavioral factors associated with hiring difficulties. To address this issue, one question in the survey asked what the firms think about the labor regulations on hiring procedures on a scale from 0 to 4, with “0” representing the belief that hiring procedures were “not the problem” and “4” being the belief that hiring procedures were a “major obstacle.” As much as 61.1 percent of Thai firms reported no problems with procedures when hiring foreign workers. Slightly less than 68.9 percent of them reported no problems when hiring Thai workers. Nonetheless, 15.2 percent of Thai manufacturers believed that the hiring procedures were a major problem. On average, Thai firms reported having to spend two days to deal with immigration procedures. More days (4-5 days) were spent by firms located in border provinces than by those located in other provinces.⁷ As the survey results show, although hiring Thai workers was believed to be easier than hiring foreign workers, the percentage points between the two results are not very different.

⁷ We have already computed the correlation between firm size and foreign-owned firms with the number of days spent on hiring procedures at the Immigration Office. The computations indicate that larger firms and foreign-owned firms tend to spend more days dealing with hiring procedures.

Figure 3. Percentage of Firms' Beliefs about Hiring Procedures, on a Scale of 0 to 4



Source: Computed from PICS Data, 2007

These results indicate that the firms perceive the employment of immigrant workers in Thailand to be not a major problem. By analyzing channels of new recruits, Thai firms reported that, within the past three years, the majority of their new recruits were from factory door postings (45.8%), followed by recommendations of other workers (38.3%). A very small proportion was from headhunters and/or newspaper advertisements. A relatively high percentage was from recommendations of other workers, which clearly indicates strong social/labor networks in which workers help each other to find jobs. This is true particularly in the case of immigrant workers, for which Thai manufacturers can use their social networks for recommendations to fill in job vacancies.

Firms also reported relatively weak investigations by the Immigration Office. More than 95 percent of the firms reported that there were no visits by government officers from the Immigration Office, while about 43 percent reported 1–2 official visits in the past year (2006).

In conclusion, this section presented some evidence of the magnitudes of job vacancies occurring among Thai manufacturing firms. Mismatches between skill requirements and available jobs, and the skills level of workers, the wage and recruitment activities of firms, the shortage of local workers, as well as other factors explain the variations of labor shortages and the vacancy rates across firms. In Thailand, job vacancies for unskilled workers were found to be greater than those for skilled workers. This leads Thai

manufacturers to fill in vacant jobs by hiring workers outside the region or from neighboring countries. Therefore, the immigration of foreign workers plays an important role in reducing the shortage. As the majority of immigrant workers from neighboring countries are relatively unskilled, employing immigrant workers not only helps to fill in job vacancies, but also helps manufacturers, especially those in labor-intensive production, save on wage expenditures to maintain cost competitiveness.

III. Determinations of Immigrant Worker Employment

Aside from the magnitude of job vacancies explained earlier, the decision of firms to hire immigrant workers also varies depending on firm-level characteristics, such as type of industry, location, production technology used, firm size, firm age, and labor cost. To find out the missing link to the demand for immigrant workers, this section analyzes how such factors determine the number of immigrants, classified as skilled and unskilled, that are employed.⁸

Observing the employment status in the survey results, the firms reported a substantial increase in the employment of unskilled immigrants from 0.31 percent in 2004 to 4.19 percent in 2007. There was clearly a sharp increase in the hiring of unskilled migrants during 2004-2007 among labor-intensive firms. Significant increases were mainly in the food processing industry (from 0.67 % to 12.1 %), the garments industry (from 0.07 % to 7.65 %), the textile industry (from 0.15 % to 3.78 %), rubber and plastics industry (from 0.46% to 2.72%), and furniture and wood products (from 0.84 % to 4.73 %). On the other hand, shares of skilled immigrants increased slightly from 0.33 percent in 2004 to 0.92 percent in 2007. The significant increase came mainly from the food processing industry (from 0.05% to 1.46%), garments (from 0.05% to 2.12%), and electronics and electrical appliances (from 0.3% to 1.15%).⁹

There is evidence that Thai firms, especially those in the labor-intensive sector, have employed more unskilled immigrants during 2004-2007. The largest migrant registration campaign took place in 2004 in an effort to obtain more precise estimates of the number of irregular immigrants in Thailand.¹⁰ In addition, the MOUs signed between Thailand and neighboring countries (Lao PDR in October 2002, Cambodia in May 2003, and Myanmar in June 2003) helped to facilitate the employment of immigrants by the recruitment process to fill the vacancies requested by registered employers.¹¹ Moreover, in 2005,

⁸ As defined by the PICS manual, skilled and unskilled classification here is rather subjective. Skilled production workers are technicians involved directly in the production process or at a supervisory level and whom management considers to be skilled. Unskilled production workers, on the other hand, are those involved in the production process that management considers to be unskilled.

⁹ This figure, especially for 2004, may actually be lower since firms may not have reported the true number of employed migrants and probably reported only the documented ones.

¹⁰ The Ministry of the Interior was responsible for registering migrants from Myanmar, Lao PDR, and Cambodia who had been working in Thailand for at least one year. Since there was no fee involved in the process, it was an incentive to the 1,284,920 migrants who became registered. The Ministry of Labour was responsible for registering employers who wished to employ migrants, to register migrants, and to obtain work permits. As a result, 248,746 employers registered (Rukumnuaykit 2008).

¹¹ From late 2005, Thailand requested 51,105 workers from Lao PDR and 17,470 from Cambodia. However, Lao PDR and Cambodia were able to provide only 3,418 and 570 workers, representing lower targets for the fresh new

the government of Thailand allowed registered migrants to stay in Thailand for another year. As a result, in 2006, the Ministry of Labour issued work permits to 705,293 migrant workers and approved a quota of 1,226,106 migrants. In December 2006, the Cabinet decided to allow migrants whose work permits would expire in 2007 to stay and work in Thailand for another year. As a result, work permits were issued to 535,732 migrant workers in June 2007. The percentage of employed immigrants as reported by the PICS survey did not represent the actual number of immigrants working in Thailand, but rather, the number was lower. However, the number did show an increasing trend for Thai firms to employ more immigrants. Immigrants were concentrated in Bangkok and its vicinity where the income level is relatively higher than in other regions. Otherwise, unskilled migrants are relatively more concentrated in the northern and the southern regions that are close to Myanmar.

Classified by firm size, larger firms tend to employ skilled immigrant workers. In 2007, large-sized firms employed 1.84 percent of immigrants, followed by medium-sized firms (0.74%) and small-sized firms (0.39%). However, employment of unskilled workers is found to be almost unvaried among firms regardless of size (4% for small-sized firms, 3.5% for medium-sized firms, and 5.32% for large-sized firms.¹² Nevertheless, the percentage of firms employing immigrant workers was found to have statistically increased between 2004 and 2007 regardless of firm's size.

Table 5. Percentage of Migrants Employed in Each Industry

Industry	Skilled Migrants	Unskilled Migrants	#Observation
2004			
Food Processing	0.05	0.67	175
Textile	0.30	0.15	186
Garment	0.05	0.07	167
Auto Parts	1.14	0.10	144
Electronics and Electrical Appliances	0.30	0.16	235
Rubber and Plastics	0.56	0.46	234
Furniture and Wood Products	0.03	0.84	125
Machinery and Equipment	0.09	0.01	100
2007			
Food Processing	1.46*	12.10*	108
Textile	1.13	3.78*	133

recruitment under the MOU. From 2006 to August 2007, the demand for the admission of foreign workers increased to 60,890 for Lao PDR and 36,733 for Cambodia. As of 2007, there were 14,150 workers recruited from these two countries. However, the implementation of the MOU and national verification of Myanmar's citizens in Thailand requires intensive cooperation from the government of Myanmar (Rukumnuaykit 2008).

¹² Thailand's definition of firm size is based on the number of employees and fixed asset or paid up capital labeled in ministerial regulations. Classified by the number of employees, firms with less than 50 employees, 50-200 employees, and greater than 200 employees are classified as "small-sized firms", "medium-sized firms, and "large-sized firms," respectively.

Garment	2.12*	7.65*	159
Auto Parts	0.77	0.50	109
Electronics and Electrical Appliances	1.15*	1.05	93
Rubber and Plastics	0.18	2.72*	258
Furniture and Wood Products	0.28	4.73*	100
Machinery and Equipment	0.64	0.26*	83

Source: Computed from PICS Data (2004 and 2007)

Note: * 0.05 statistical difference from the year 2004

Table 6. Percentage of Migrants Employed By Firm Size

<i># Employees</i>	Skilled Migrants	Unskilled Migrants	# Observations
<i>2004</i>			
Small Firms (<i>Less than 50</i>)	0.04	0.17	367
Medium Firms (<i>50-200</i>)	0.53	0.38	493
Large Firms (<i>Greater than 200</i>)	0.34	0.33	510
<i>2007</i>			
Small Firms (<i>Less than 50</i>)	0.39*	4.00*	377
Medium Firms (<i>50-200</i>)	0.74	3.50*	372
Large Firms (<i>Greater than 200</i>)	1.84*	5.32*	294

Source: Computed from PICS Data (2004 and 2007)

Note: * 0.05 statistical differences from the year 2004

Nonetheless, using only the average figures from data tabulation does not give a reliable description of the labor dynamics of employing migrant workers when there are large variations among firms due to various factors such as their location, the type of industry to which they belong, the intensity of their production, the kind of technology they use, and others. Using simple econometrics should make the results more convincing and reliable for the controlling effects of these factors. To our estimations, there are three sets of independent variables. First, we create the following list of control variables in measuring firm-level characteristics, such as firm age, firm size, capacity utilization, factor intensity, R&D investment, use of computer in production, and education quality of their workers. In theory, some

variables are predicted to have a negative sign in determining the behavior of a firm in employing migrant workers. For example, firms investing in R&D and using more computers in production are less likely to employ unskilled immigrant workers as their productions rely more on technology rather than cheap labor. Estimated coefficients of some other control variables to migration employment, for example, firm size, firm age, and education quality of workers, can however be doubtful.

Second, to quantify existing vacancies and the need to facilitate workflows force Thai firms to employ more immigrant workers, we use report of job vacancies and a number of day losses due to worker slowdown and worker stoppage as another set of independent variables. To avoid endogeneity issues and selection biases, we use lag period of those independent variables on job vacancies, days of worker slowdown and stoppage, and remuneration cost. A firm reporting, for example, job vacancies in 2006 should affect its decision to employ migrant workers in 2007 but not the other way around. Estimated coefficients of job vacancies and work delay are predicted to have some positive signs of employing migrants. As stated earlier, a labor shortage causing unpredicted losses due to stoppages force firms to look for additional workers to fill in those vacancies. This should be especially true for firms engaged in labor-intensive production where workers are seriously needed. The slowdown and/or stoppage by workers are industrial actions in which employees perform their duties but seek to reduce productivity or efficiency in the performance of their duties. Although there are a number of financial and non-financial costs occurring due to labor slowdown—for example loss of production, productivity loss, costs of recruiting new workers, and others—the number of day losses should be the simplest way to be used for analysis.

Third, since cost concerns are still one of the major issues forcing Thai firms to rely on migrant workers, it is also worth knowing whether the preceding year's remuneration (or labor) cost should affect a firm's current decision on whether to employ immigrant workers and if so, how many they would employ. Labor costs were broken down into: (1) wage costs and (2) fringe benefit costs. In the questionnaire, fringe benefits include both social security benefits such as pension, provident fund, medical insurance, unemployment insurance, and in-kind benefits such as education, food, transport, and others. Estimated coefficients of wage cost and remuneration cost can be used to measure how the cost pressure from both wages and fringe benefits influences the firm in employing more immigrant workers. Positive sign of those estimated coefficients can be predicted. Summarized statistics and definitions of those variables are shown in Table 6.

Two estimated models were adopted here. First, we estimated binary probit regression to quantify the probability that a Thai firm will hire migrant workers given various sets of independent variables mentioned above. Second, to quantify the employment magnitude, we estimated the impacts of firm-level characteristics on the percentage of migrant shares. Since there is possibility for a firm to report “zero” from not at all employing migrant workers or some percentage of employed migrants, which cause dependent variable (migrant share) to be left-censored to zero. The Tobit model, also called a censored regression model, was designed to estimate linear relationships between migration share where there is left-censoring (also known as censoring from below). The estimated coefficients of both probit and Tobit model, classified by unskilled immigrants and skilled immigrants, of all industries are shown in Tables 7–8. Tables 9–10 show the estimated coefficients of the Tobit model for unskilled and skilled immigrants classified by industry.

For the employment of unskilled migrants, by observing firm-level characteristics, it can be seen that firms having a high percentage of computer-controlled production and engaging in R&D are likely to employ less unskilled immigrants. About 10 percent more of computer use in total production is likely to decrease the probability of employing unskilled migrants by 0.6 percent or reduce unskilled migrant share by 2.3–2.5 percent. Similarly, firms that spent on R&D last year are less likely to employ unskilled immigrants by 5 percent than firms not spending on R&D. Shares of unskilled immigrants in firms spending on R&D is also 22–24 percent lower compared to firms not spending on R&D. Negative coefficients of computer use in production and R&D investment clearly emphasize our prediction that unskilled migrants are more likely to be demanded by firms with low technology-based production. This result explains relatively high substitution between capital (technology) and unskilled migrants. The more use of capital (technology), the less demand for unskilled immigrants, especially in food processing and textile industries.¹³

Worker's education is found to be significant in the demand for unskilled immigrants. Employing 10 percent more workers whose level of education is only less than grade 6 (elementary) is likely to increase the probability of employing unskilled migrants by 0.9 percent or increase by 3.6–3.8 percent the employment share of unskilled migrants. These impacts of worker's education are found to be even significant and stronger among firms in the furniture, food processing, and textile industries.¹⁴ These estimated results confirm our understanding that demand of unskilled immigrant workers usually takes place among Thai manufacturers engaging in production type that relies relatively more on unskilled laborers, and less on computer-based or technology-based production. Although the impacts of firm size and firm age in employing unskilled migrants are found to be insignificant among firms overall, we can notice the estimated sign indicating that unskilled migrants are more likely to be demanded by younger (or newly established) and larger manufacturers. This can mean that newly established firms with a big pool of workers might prefer to maintain their price competitiveness by employing cheap unskilled immigrants to save on wage cost.

The results for the employment of skilled migrants by observing factor intensity were found to be in the opposite direction of unskilled migrants. Firms engaged in capital-intensive production will tend more to employ skilled immigrants. An additional million baht of capital-labor ratio is found to significantly increase the probability of employing skilled migrants by 4 percent or increase the skilled migrant share by 3.3–3.6 percent. This is the complementary effect between the use of machine in the production process and the requirement to employ highly skilled workers to work the machine. Nevertheless, similar to the demand for unskilled immigrants, the demand for skilled migrant workers is more likely to take place among newer but larger manufacturers. This can mean that newly established firms with a big pool of workers and capital investment may also need skilled migrants to enhance their productivity. Worker's education is also found to be significant in the demand for skilled immigrants among Thai manufacturers.

¹³ Estimated coefficients of computer use and R&D investment are found to be significant in food processing and textile industries. About 10 percent more of computer use in total production is likely to reduce unskilled migrant share by 14.7 percent in food processing and by 2.6 percent in textile. Similarly, shares of unskilled immigrants in textile firms are likely to be about 18.2 percent lower compared to those textile firms not-spending on R&D.

¹⁴ Employing 10 percent more workers who have less than 6 grades (some elementary) in education significantly increases unskilled migrant share by 6.7 percent in furniture firms, 5.2 percent in food processing firms, and 2.4 percent in textile firms.

Employing an additional 10 percent of workers who have less than 6 grades in elementary education is likely to increase the employment share of unskilled migrants by 0.8–0.9 percent.

As discussed earlier, labor shortages were found to be one of the important factors that determine the demand for both unskilled and skilled migrant workers among Thai manufacturers. Estimated results clearly confirm our prediction. A firm facing about 10 percent of unskilled vacancies (relative to total unskilled production workers) in the last period is expected to increase the probability of employing migrants workers by 0.8–0.9 percent or 2.9–3.0 percent more of unskilled immigrant shares.

The above results are also true for skilled positions. A firm facing about 10 percent of skilled vacancies (relative to total unskilled production workers) in the last period is also expected to increase the probability of employing migrant workers by 0.7–0.8 percent or 0.98–1 percent more of skilled immigrant shares. The existence of job vacancies forces firms to search for immigrant workers to fill the shortage, especially among food processing firms and textile firms for unskilled migrants, and among manufacturing and equipment firms for skilled migrants.¹⁵

By controlling the characteristics of firms, it was found that firms located in border provinces employ 7.3 percent less of unskilled migrant share and 2.7 percent less of skilled migrant share compared to firms located in non-border provinces if those firms face about 10 percent more of job vacancies (relative to total labor force). This result is a bit contradictory to our descriptive analysis explained earlier that vacancy effects on the demand for immigrant workers are stronger in non-border provinces. The higher percentage of immigrant workers employed by firms located in non-border province clearly provides evidence of internal movement among migrants themselves who chose to move into the cities where there are better job opportunities and higher income gains.

The number of days lost due to worker slowdown during the past year also forces firms to seek migrant workers. A manufacturer facing 10 days more of worker slowdown is expected to increase its probability of employing unskilled migrants by 0.6–0.7 percent or increase unskilled migrant shares by 2.1–2.3 percent especially among firms in such industries as textile, electrical appliances, and machinery and equipment. Manufacturers facing 10 days more of worker slowdown is expected to increase unskilled migrant shares in food processing (10.4%), electrical appliances (11.7%), and machinery and equipment (0.58%). A number of day losses due to worker stoppage during the past year also forces firms in auto parts industry to employ more of unskilled migrants by 20.4 percent relative to unskilled laborers.

Since it is statistically insignificant among firms to employ skilled migrants due to day losses (both losses from worker slowdown and worker stoppage), it can be intuitively explained that unskilled immigrant workers are usually needed among Thai manufacturers in order to facilitate workflows and promote employment dynamics.

¹⁵ Estimated coefficients show that a firm facing 10 percent of unskilled vacancies (relative to total unskilled production workers) in the last period is expected to have higher percent share of employing unskilled migrants by 8.4 percent in food processing, 3.3 percent in textile, and 1.6 percent in machinery and equipment. A firm facing 10 percent of skilled vacancies (relative to total unskilled production workers) in the last period is expected to have higher percent share of employing skilled migrants by 1.7 percent in manufacturing and equipment.

Besides filling in labor shortages and job vacancies, the need to maintain cost competitiveness is still another obvious factor that determines the demand for employing unskilled migrant workers. A number of empirical researches already confirm this state. For example, Pholpirul et al. (2010) found that a firm employing an additional 10 percent of unskilled immigrants could save THB5,746 per person per year on wage expenditures. Such savings are even more prominent in labor-intensive industries, such as the textile industry, which can save approximately THB24,144 per person per year. By estimating the impacts of employing migrant workers on labor cost (wage and fringe benefits), maintaining cost competitiveness is therefore a major concern among Thai manufacturers because it pressures them to seek the employment of cheap migrants. Our estimated results show that a firm with 10 percent higher of unskilled wages (relative to total labor cost) last year is expected to increase the employment share of unskilled labor by 1.6 percent. This is particularly true among labor-intensive firms, such as those in the garments industry in which higher wage cost paid to unskilled laborers also forces firms to hire more unskilled immigrants from abroad.¹⁶ Besides, the need to save on the cost of fringe benefits paid to skilled workers (social security, education, accommodation, and transportation) also forces textile firms to employ skilled immigrants.¹⁷ On the flip side, this can be considered a vulnerability of migrants, who not only receive cheaper wages compared to natives, but are also less covered by fringe benefits, especially the social security benefits.

Nonetheless, since the characteristics of the Thai manufacturers can be unobserved heterogeneity creating the potential of omitted variable bias, using panel data of the 426 firms that participated in both surveys (2004 and 2007) should help in mitigating this bias. Nevertheless, due to smaller number degree of freedom of the panel-data set, there is no identified significant effect of skilled/unskilled vacancies, worker slowdown and stoppage, and concerns of worker's wages and benefits on the employment of skilled/unskilled migrant workers in the panel firms (Table 11).

Although using panel firm-level dataset does not create significant results as we expected, it shows an interesting result, namely, that firms that employed migrant workers in 2004 are more likely to employ more of those migrants in 2007. Table 12 shows a positive relationship among those firms that employed unskilled migrants in 2004. Comparing manufacturing firms that employed and did not employ unskilled migrants in 2004, firms that employed unskilled migrants in 2004 are predicted to employ 5.3–7.6 percent more of those unskilled migrants in 2007 than firms that did not at all employ any unskilled migrants in 2004. A 10 percentage employment of unskilled migrants in 2004 is expected to increase additional 0.74 percent of unskilled migrants employed by the same firms in 2007.

A number of reasons can explain this relationship. First, firms that have realized the benefits of employing unskilled migrants in the past seem to further enjoy more benefits today especially when global competitiveness and labor shortages have become more serious concerns among Thai manufacturers. Second, firms that employed migrants in the past are now more familiar with the employment procedures. They have found easier ways to deal with the immigration process, registration,

¹⁶ Estimated coefficients of unskilled worker's wage show that garments firms are more likely to employ 6.5 percent more of unskilled migrant share when facing about 10 percent higher of unskilled wage relative to total labor cost spent last year.

¹⁷ Estimated coefficients of skilled worker's fringe benefits show that textile firms are more likely to employ 46.1 percent more of skilled migrant share when facing 10 percent more of unskilled fringe benefits relative to total labor cost spent last year.

and to deal with governments. And, third, migrant networks can be easily established within firms. These networks help increase the proportion of immigrant workers hired through referrals and bring more supply of migrant workers to employment channels. Also it is easier for firms to find workers to hire through the migrant network.

However, by controlling border effect, we find a difference between firms employing unskilled migrants and skilled migrants. Firms employing unskilled migrants in 2004 and located in the border provinces are 5.3 percent less likely to employ those unskilled migrants in 2007 compared to firms located in non-border provinces. In contrast to the context of skilled migrants employed, firms employing skilled migrants in 2004 and located in the border provinces are 2.3 percent more likely to employ in 2007 those skilled migrants compared to firms located in non-border provinces. These results clearly show the opposite story that, during 2004–2007, unskilled migrants are more demanded among firms located in the urban and central region, while skilled migrants are more demanded among manufacturing firms located near the border.

Since 70 percent of Thailand's GDP is currently driven by export, pressures to maintain global competitiveness force manufacturers to keep cost down. Thus, the system is prone to respond positively to the labor demand for more foreign workers. Thai manufacturers, especially those engaged in export, enjoy the benefits of employing migrant workers to fill in short-term vacancies, promote employment dynamics, and at the same time, maintain cheap labor cost. Those benefits are still prevalent on short-term. Impacts on the long-term still have to be further discussed. Employing immigrants by Thai firms, where the majority of those hired are unskilled or semi-skilled workers, is rather looked at with more skepticism and doubt because of possible negative effects over the long-term economic development, such as lower labor productivity, lower investments in R&D, lower rate of machine upgrade, lower skills training provided by business, and others.

Table 7: Definition and Mean of Independent Variables

Variables	Definition
Unskilled Vacancies	Percent of unskilled/skilled vacancies reported last year
Skilled Vacancies	Percent of skilled vacancies reported last year
Worker Slowdowns	Number of days last year indicating production disturbances due to worker slowdowns
Worker Stoppages	Number of days last year indicating production disturbances due to worker strikes and other stoppages
Unskilled Worker Wages	Amount of wage expenditure on unskilled workers as percent of total labor cost
Skilled Worker Wages	Amount of wage expenditure on skilled workers as percent of total labor cost
Unskilled Worker Benefits	Amount of expenditure on fringe benefits for unskilled workers as percent of total labor cost
Skilled Worker Benefits	Amount of expenditure on fringe benefits for skilled workers as percent of total labor cost
Computer Control	Percent of production machine controlled by computer
Firm Age	Number of years since a firm commenced operations in Thailand
Firm Size	Size of firm measured by log scale of number of persons employed
Capacity Utilization	Percent of amount of output a firm actually produced relative to the maximum amount possible
Capital-Labor Ratio	Amount of machinery and equipment rented or owned by a firm divided by total number of employees
R&D Investment	Defined to be equal to 1 if a firm spent on research and development last year and 0 otherwise
Worker Education < Grade 6	Percent of workers to total labor with less than a 6 th grade (primary) education

Computed from PICS-2004 and PICS-2007

Table 8: Definition and Mean of Independent Variables

Variables	2004	2007	Panel Data	Pooled Data (2004 and 2007)
Unskilled Vacancies	5.81	9.09	7.97	7.23
Skilled Vacancies	3.48	6.66	5.44	4.84
Worker Slowdowns	0.64	3.27	1.87	1.77
Worker Stoppages	0.21	0.33	0.04	0.26
Unskilled Worker Wages	44.33	43.35	42.99	43.91
Skilled Worker Wages	16.09	13.22	16.29	14.86
Unskilled Worker Benefits	1.60	2.50	2.08	1.99
Skilled Worker Benefits	0.53	0.83	0.73	0.66
Computer Control	19.51	10.84	16.20	15.80
Firm Age	15.44	15.29	16.93	15.38
Firm Size	4.95	4.62	4.90	4.81
Capacity Utilization	77.02	77.73	78.35	77.33
Capital-Labor Ratio	0.06	0.05	0.05	0.06
R&D Investment	0.16	0.09	0.14	0.13
Worker Education < Grade 6	11.38	12.00	13.36	11.65
Number of Observations	1,388	1,043	862	2,431

Computed from PICS-2004 and PICS-2007

Table 9: Estimation of Probability and Percent of Firms Employing Unskilled Immigrant Workers.

	Probit (Marginal Effect)				Tobit			
Unskilled Vacancies (%)	0.0009*** [0.000]	-	-	0.0008** [0.000]	0.2999** [0.120]	-	-	0.2942** [0.121]
Unskilled Vacancies x Border Province (%)	-0.0024** [0.001]	-	-	-0.0023** [0.001]	-0.7386** [0.352]	-	-	-0.7267** [0.349]
Worker Slowdowns (Number of Days)	-	0.0007*** [0.000]	-	0.0006*** [0.000]	-	0.2353*** [0.082]	-	0.2180*** [0.081]
Worker Stoppages (Number of Days)	-	-0.0001 [0.001]	-	0.0008 [0.002]	-	-0.0421 [0.385]	-	0.2395 [0.574]
Unskilled Worker Wages (% of Labor Cost)	-	-	0.0003 [0.000]	0 [0.000]	-	-	0.1607* [0.096]	0.0884 [0.105]
Unskilled Worker Benefits (% of Labor Cost)	-	-	0.0019 [0.001]	0.0015 [0.001]	-	-	0.7635 [0.547]	0.6422 [0.548]
Computer Control (%)	-0.0006** [0.000]	-0.0006** [0.000]	-0.0006** [0.000]	-0.0006** [0.000]	-0.2338** [0.097]	-0.2530** [0.099]	-0.2313** [0.097]	-0.2373** [0.098]
Firm Age (Years)	-0.0008 [0.001]	-0.0008 [0.001]	-0.0008 [0.001]	-0.0008 [0.001]	-0.3213 [0.224]	-0.3133 [0.224]	-0.2793 [0.222]	-0.3081 [0.226]
Firm Size (Log-Scale)	0.0053 [0.005]	0.0061 [0.005]	0.0044 [0.005]	0.0045 [0.005]	1.5298 [1.779]	1.8935 [1.776]	0.8103 [1.839]	0.8405 [1.868]
Capacity Utilization (Percent)	0.0003 [0.000]	0.0004 [0.000]	0.0004 [0.000]	0.0003 [0.000]	0.0788 [0.111]	0.1073 [0.112]	0.1184 [0.111]	0.0874 [0.112]
Capital-Labor Ratio (Baht)	-0.0633 [0.047]	-0.0586 [0.043]	-0.0572 [0.044]	-0.0584 [0.045]	-22.5155 [17.322]	-21.4449 [16.847]	-19.5962 [16.614]	-19.9049 [16.906]
R&D Investment = 1	-0.0515*** [0.011]	-0.0501*** [0.011]	-0.0506*** [0.011]	-0.0496*** [0.011]	-23.6841*** [7.420]	-24.1176*** [7.530]	-23.5597*** [7.471]	-22.7555*** [7.429]
Worker Education < Grade 6 (% of Labor)	0.0009*** [0.000]	0.0008*** [0.000]	0.0008*** [0.000]	0.0009*** [0.000]	0.3888*** [0.082]	0.3693*** [0.081]	0.3623*** [0.080]	0.3844*** [0.082]
Constant	-	-	-	-	-74.4777*** [13.190]	-78.4515*** [13.245]	-83.2872*** [13.464]	-77.5988*** [13.599]
Observations	2,220	2,324	2,327	2,216	2,206	2,310	2,313	2,202
Pseudo-R-square	0.108	0.102	0.099	0.115	0.059	0.055	0.055	0.061

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
 Estimated coefficients of Industry Dummy, Regional Dummy, and Time Dummy are not shown in this table.

Table 10: Estimation of Probability and Percent of Firms Employing Skilled Immigrant Workers.

	Probit (Marginal Effect)				Tobit			
Skilled Vacancies (%)	0.0007** [0.000]	-	-	0.0008** [0.000]	0.0981* [0.052]	-	-	0.1012* [0.052]
Skilled Vacancies x Border Province (%)	-0.0017* [0.001]	-	-	-0.0017* [0.001]	-0.2728* [0.146]	-	-	-0.2787* [0.148]
Worker Slowdowns (Number of Days)	-	-0.0002 [0.000]	-	-0.0002 [0.000]	-	-0.019 [0.055]	-	-0.0249 [0.055]
Worker Stoppages (Number of Days)	-	-0.0005 [0.002]	-	-0.0007 [0.002]	-	-0.0817 [0.362]	-	-0.0891 [0.302]
Skilled Worker Wages (% of Labor Cost)	-	-	-0.0002 [0.000]	-0.0002 [0.000]	-	-	-0.0346 [0.054]	-0.0288 [0.054]
Skilled Worker Benefits (% of Labor Cost)	-	-	0.0144*** [0.005]	0.0146*** [0.005]	-	-	1.2435** [0.618]	1.2550** [0.613]
Computer Control (%)	-0.0001 [0.000]	-0.0001 [0.000]	-0.0001 [0.000]	-0.0001 [0.000]	-0.0094 [0.028]	-0.014 [0.028]	-0.012 [0.028]	-0.0049 [0.029]
Firm Age (Years)	-0.0026*** [0.001]	-0.0023*** [0.001]	-0.0025*** [0.001]	-0.0025*** [0.001]	-0.3663*** [0.096]	-0.3455*** [0.096]	-0.3545*** [0.096]	-0.3619*** [0.097]
Firm Size (Log-Scale)	0.0496*** [0.005]	0.0484*** [0.005]	0.0481*** [0.005]	0.0489*** [0.005]	5.6874*** [0.752]	5.6265*** [0.746]	5.5362*** [0.743]	5.6141*** [0.754]
Capacity Utilization (Percent)	0.0008** [0.000]	0.0009*** [0.000]	0.0009** [0.000]	0.0008** [0.000]	0.0714 [0.046]	0.0869* [0.046]	0.0825* [0.046]	0.0626 [0.047]
Capital-Labor Ratio (Baht)	0.0428* [0.024]	0.0399* [0.024]	0.0394 [0.024]	0.0405* [0.024]	3.6222 [3.371]	3.3199 [3.419]	3.4538 [3.406]	3.6287 [3.381]
R&D Investment = 1	-0.0078 [0.014]	-0.0096 [0.014]	-0.0138 [0.014]	-0.012 [0.014]	-0.5271 [2.061]	-0.8633 [2.077]	-1.438 [2.104]	-1.1249 [2.104]
Worker Education < Grade 6 (% of Labor)	0.0003 [0.000]	0.0004 [0.000]	0.0003 [0.000]	0.0003 [0.000]	0.0934** [0.038]	0.0885** [0.038]	0.0848** [0.038]	0.0920** [0.038]
Constant	-	-	-	-	-66.4246*** [6.528]	-67.3447*** [6.533]	-66.2003*** [6.506]	-65.7854*** [6.566]
Observations	2,250	2,324	2,327	2,246	2,234	2,307	2,310	2,230
Pseudo-R-square	0.176	0.171	0.175	0.184	0.067	0.064	0.065	0.068

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
Estimated coefficients of Industry Dummy, Regional Dummy, and Time Dummy are not shown in this table.

Table 11: Estimation of Percent of Firms Employing Unskilled Immigrant Workers by Industry

Industry	Food Processing	Textile	Garment	Auto Parts	Electrical Appliances	Rubber& Plastic	Furniture	Machinery& Equipment
Unskilled Vacancies (%)	0.8435** [0.385]	0.3333** [0.151]	-0.6857 [0.531]	0.2671 [0.183]	-5.4683 [5.619]	0.1439 [0.141]	0.0933 [0.739]	0.1606* [0.084]
Unskilled Vacancies x Border Province (%)	-5.5033** [2.364]	-0.9111 [0.577]	3.2027 [2.785]	0.0393 [0.522]	-2,259.97 [0.000]	0.3083 [0.385]	-2.4887 [2.117]	-5.5335 [0.000]
Worker Slowdowns (Number of Days)	-0.1803 [1.511]	1.0373*** [0.343]	-0.197 [2.185]	-12.2665 [0.000]	1.1695* [0.598]	-0.3451 [0.382]	-4.1146 [6.619]	0.0583*** [0.020]
Worker Stoppages (Number of Days)	-75.5015 [0.000]	-63.9932 [0.000]	75.0646 [0.000]	2.0359* [1.215]	-3.8035 [5.576]	-138.5015 [0.000]	-9.6334 [0.000]	-2.209 [0.000]
Unskilled Worker Wages (% of Labor Cost)	0.338 [0.381]	0.0255 [0.133]	0.6520* [0.394]	-0.11 [0.156]	0.2197 [0.448]	-0.1649 [0.147]	0.1846 [0.428]	0.0485 [0.069]
Unskilled Worker Benefits (% of Labor Cost)	1.8995 [3.445]	0.335 [0.308]	-1.3735 [5.433]	-1.4667 [2.119]	3.648 [3.019]	1.3318 [1.010]	-1.1766 [4.723]	-0.8306 [0.918]
Computer Control (%)	-1.4715* [0.821]	-0.2564** [0.123]	-0.7186 [0.643]	0.0691 [0.098]	-0.0418 [0.322]	-0.0213 [0.102]	-0.2273 [0.682]	-0.098 [0.101]
Firm Age (Years)	-1.4952** [0.750]	-0.2654 [0.254]	-0.9 [1.030]	0.5528 [0.336]	-1.9785 [2.200]	0.202 [0.284]	-1.3114 [1.154]	0.0626 [0.149]
Firm Size (Log-Scale)	-8.8709* [5.217]	3.8941 [2.610]	-4.9647 [7.860]	-1.3362 [2.386]	4.1126 [8.851]	0.6392 [2.771]	15.3707* [9.171]	0.6461 [1.815]
Capacity Utilization (Percent)	-0.0015 [0.301]	0.0923 [0.170]	-0.0386 [0.460]	-0.1116 [0.145]	0.7591 [0.729]	0.1553 [0.145]	-0.2096 [0.417]	0.1136 [0.092]
Capital-Labor Ratio (Baht)	-224.9509* [131.088]	-12.9964 [18.732]	-96.8757 [410.560]	20.6889 [15.731]	17.6235 [68.664]	-33.9019 [42.046]	-116.8925 [468.895]	-13.9619 [39.314]
R&D Investment = 1	10.8037 [16.386]	-18.1689* [10.649]	-424.2475 [0.000]	-1.1566 [7.885]	-210.9804 [0.000]	-13.854 [12.115]	-294.21 [0.000]	-16.9465 [0.000]
Worker Education < Grade 6 (% of Labor)	0.5225** [0.245]	0.2440** [0.103]	0.2128 [0.290]	-0.994 [0.743]	0.6549 [1.017]	0.1885 [0.121]	0.6725** [0.286]	-0.1172 [0.144]
Constant	-34.5083 [36.632]	-60.3584*** [17.884]	-66.6314 [46.926]	-20.4382 [16.246]	-144.9293* [77.836]	-57.3759*** [16.907]	-121.3048** [54.265]	-22.1645 [13.720]
Observations	257	289	284	233	315	466	199	159
Pseudo-R-square	0.111	0.127	0.114	0.123	0.193	0.035	0.125	0.406

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
Estimated coefficients of Regional Dummy and Time Dummy are not shown in this table.

Table 12: Estimation of Percent of Firms Employing Skilled Immigrant Workers by Industry

Industry	Food Processing	Textile	Garment	Auto Parts	Electrical Appliances	Rubber& Plastic	Furniture	Machinery& Equipment
Unskilled Vacancies (%)	0.684 [0.428]	-0.0709 [0.216]	-0.1454 [0.282]	0.126 [0.145]	0.061 [0.040]	0.0982 [0.133]	0.021 [0.046]	0.1762*** [0.067]
Skilled Vacancies x Border Province (%)	-41.2703 [0.000]	-0.3918 [1.384]	0.534 [0.897]	-0.4381 [0.331]	-0.0864 [0.086]	-60.9737 [0.000]	-1.2436 [0.000]	-0.2829 [0.369]
Worker Slowdowns (Number of Days)	-0.2658 [0.892]	-1.2927 [1.799]	0.5526 [0.854]	-0.0063 [0.156]	0.0112 [0.065]	-0.0297 [0.206]	-9.6605 [0.000]	-1.4271 [0.948]
Worker Stoppages (Number of Days)	-25.4919 [0.000]	-19.7507 [0.000]	-119.5999 [0.000]	-8.994 [25.051]	0.4404 [0.682]	2.1881 [2.935]	-0.5084 [0.000]	-6.4271 [0.000]
Unskilled Worker Wages (% of Labor Cost)	-0.5106 [0.558]	-0.0786 [0.171]	-0.3757 [0.292]	-0.0549 [0.096]	0.04 [0.046]	0.1988 [0.187]	-0.0371 [0.053]	-0.0982 [0.117]
Unskilled Worker Benefits (% of Labor Cost)	-2.1937 [7.355]	4.6104* [2.604]	2.9596 [2.881]	1.0232 [0.874]	0.7733 [0.786]	1.2245 [2.581]	1.133 [0.922]	0.6004 [0.738]
Computer Control (%)	-0.5056 [0.367]	-0.0463 [0.082]	-0.0357 [0.214]	0.1433*** [0.045]	-0.0133 [0.020]	-0.0809 [0.108]	-0.1232 [0.105]	-0.0204 [0.051]
Firm Age (Years)	-0.5046 [0.491]	-0.5889** [0.257]	-1.4197** [0.667]	-0.1588 [0.161]	-0.0099 [0.093]	-0.5049 [0.341]	0.1028 [0.081]	-0.4848* [0.272]
Firm Size (Log-Scale)	7.8836** [3.680]	7.8196*** [2.613]	7.4104** [3.514]	4.4945*** [1.459]	2.1138*** [0.545]	6.0627** [2.822]	1.6546 [1.024]	2.7602* [1.645]
Capacity Utilization (Percent)	0.0016 [0.216]	0.1729 [0.159]	0.0679 [0.271]	-0.0235 [0.084]	0.0104 [0.036]	0.0171 [0.146]	0.0198 [0.038]	0.1099 [0.083]
Capital-Labor Ratio (Baht)	-243.7827 [194.580]	3.079 [5.341]	242.5262** [121.138]	10.5773 [9.098]	4.9747 [4.212]	2.986 [13.624]	-17.2399 [38.913]	24.0486 [24.035]
R&D Investment = 1	-6.3897 [9.983]	6.5008 [5.543]	7.6288 [11.178]	2.0883 [4.158]	-2.354 [1.435]	-0.7139 [9.983]	-1.3372 [1.703]	0.5906 [4.325]
Worker Education < Grade 6 (% of Labor)	0.2864* [0.146]	0.2346** [0.113]	0.1671 [0.140]	-0.0572 [0.123]	-0.157 [0.103]	-0.0244 [0.152]	-0.078 [0.068]	-0.6927* [0.374]
Constant	-61.8512** [29.618]	-75.6917*** [19.184]	-76.9071** [30.648]	-39.5397*** [9.804]	-19.4016*** [4.091]	-63.9328*** [18.301]	-13.8238* [7.942]	-24.2206** [10.352]
Observations	267	292	291	240	312	458	208	162
Pseudo-R-square	0.111	0.127	0.114	0.123	0.193	0.035	0.125	0.406

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
Estimated coefficients of Regional Dummy and Time Dummy are not shown in this table.

Table 13: Estimation of Percentage of Firms Employing Skilled/Unskilled Immigrant Workers using Firm-Panel

	Skilled Migrants				Unskilled Migrants			
Skilled/Unskilled Vacancies (%)	-0.0078 [0.020]	-	-	-0.0077 [0.020]	0.0165 [0.026]	-	-	0.0184 [0.027]
Skilled/Unskilled Vacancies x Border Province (%)	0.0039 [0.040]	-	-	0.0035 [0.040]	0.0045 [0.079]	-	-	0.0031 [0.079]
Worker Slowdowns (Number of Days)	-	-0.007 [0.026]	-	-0.0065 [0.027]	-	0.0188 [0.036]	-	0.0125 [0.037]
Worker Stoppages (Number of Days)	-	0.1619 [0.362]	-	0.1703 [0.375]	-	0.3436 [0.509]	-	0.408 [0.517]
Skilled/Unskilled Worker Wages (% of Labor Cost)	-	-	-0.0042 [0.020]	-0.0053 [0.021]	-	-	0.0037 [0.020]	0.0082 [0.023]
Skilled/Unskilled Worker Benefits (% of Labor Cost)	-	-	0.2454 [0.259]	0.2525 [0.270]	-	-	-0.0034 [0.098]	0.0078 [0.100]
Computer Control (%)	-0.0064 [0.014]	-0.0064 [0.014]	-0.006 [0.013]	-0.0072 [0.015]	-0.0214 [0.020]	-0.0232 [0.019]	-0.0199 [0.019]	-0.0252 [0.020]
Firm Age (Years)	-0.1314** [0.063]	-0.1299** [0.061]	-0.1269** [0.061]	-0.1297** [0.063]	0.1121 [0.088]	0.0903 [0.086]	0.0898 [0.086]	0.1135 [0.089]
Firm Size (Log-Scale)	-0.5649 [0.775]	-0.4786 [0.732]	-0.5835 [0.747]	-0.6818 [0.788]	0.0599 [1.151]	-0.0845 [1.054]	-0.1142 [1.069]	-0.0036 [1.165]
Capacity Utilization (Percent)	-0.0107 [0.020]	-0.0104 [0.019]	-0.0106 [0.019]	-0.0122 [0.021]	-0.0131 [0.027]	-0.0004 [0.026]	0.0001 [0.026]	-0.0119 [0.028]
Capital-Labor Ratio (Baht)	-2.6146 [3.086]	-2.3594 [2.934]	-2.7003 [2.972]	-3.0916 [3.158]	1.8638 [4.289]	2.5135 [4.128]	2.4317 [4.139]	1.9097 [4.324]
R&D Investment = 1	-0.7604 [0.800]	-0.7109 [0.776]	-0.7871 [0.778]	-0.8358 [0.812]	-1.0734 [1.112]	-1.2381 [1.082]	-1.1924 [1.085]	-1.1616 [1.127]
Worker Education < Grade 6 (% of Labor)	0.016 [0.013]	0.0143 [0.012]	0.0151 [0.012]	0.0164 [0.013]	-0.0384** [0.018]	-0.0363** [0.017]	-0.0357** [0.017]	-0.0387** [0.018]
Constant	8.0633 [6.833]	6.5043 [5.416]	7.9634 [6.609]	7.7251 [5.755]	-3.1776 [6.876]	-5.6939 [9.318]	-2.4527 [7.653]	-3.3499 [6.969]
Observations	799	822	822	798	787	822	822	786
Adjusted R-square	0.032	0.03	0.032	0.035	0.258	0.244	0.242	0.261

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
Estimated coefficients of Regional Dummy and Industry Dummy are not shown in this table.

Table 14: Estimation of Impact from Employing Skilled/Unskilled Immigrant Workers in 2004 using Firm-Panel

	Skilled Migrants				Unskilled Migrants			
Skilled/Unskilled Migrants Employed in 2004 = 1	0.1093 [0.558]	-0.6601 [0.662]	-	-	5.2995*** [1.172]	7.5880*** [1.509]	-	-
Skilled/Unskilled Migrants Employed in 2004 = 1 x Border Provinces	-	2.3303** [1.083]	-	-	-	-5.3387** [2.227]	-	-
Skilled/Unskilled Migrants Employed in 2004 (%)	-	-	-0.0044 [0.040]	-0.0311 [0.044]	-	-	0.0741** [0.032]	0.0613 [0.056]
Skilled/Unskilled Migrants Employed in 2004 x Border Province (%)	-	-	-	0.1367 [0.098]	-	-	-	0.0189 [0.068]
Computer Control (%)	0.0146** [0.007]	0.0143* [0.007]	0.0148** [0.007]	0.0147** [0.007]	-0.0132 [0.015]	-0.0133 [0.015]	-0.0099 [0.014]	-0.0098 [0.014]
Firm Age (Years)	-0.0379* [0.020]	-0.0377* [0.020]	-0.0365* [0.020]	-0.0360* [0.020]	-0.0269 [0.040]	-0.0244 [0.039]	-0.0014 [0.038]	-0.0017 [0.038]
Firm Size (Log-Scale)	0.19 [0.170]	0.206 [0.170]	0.1972 [0.171]	0.2095 [0.171]	0.2114 [0.340]	0.2139 [0.339]	0.1276 [0.322]	0.1246 [0.323]
Capacity Utilization (Percent)	0.0003 [0.010]	-0.0002 [0.010]	-0.0001 [0.010]	-0.0005 [0.010]	0.0063 [0.020]	0.0052 [0.020]	0.0014 [0.019]	0.0015 [0.019]
Capital-Labor Ratio (Baht)	-0.9824 [1.637]	-0.8972 [1.634]	-0.9789 [1.646]	-0.9945 [1.645]	-0.7152 [3.242]	-1.0408 [3.236]	-0.595 [3.069]	-0.5744 [3.071]
R&D Investment = 1	0.0381 [0.511]	0.0196 [0.510]	0.0096 [0.517]	-0.0015 [0.517]	-1.7100* [1.015]	-1.6764* [1.012]	-1.5858* [0.959]	-1.5758 [0.960]
Worker Education < Grade 6 (% of Labor)	0.0200** [0.008]	0.0209*** [0.008]	0.0203** [0.008]	0.0207*** [0.008]	0.0532*** [0.016]	0.0529*** [0.016]	0.0345** [0.015]	0.0345** [0.015]
Constant	-0.5708 [1.226]	-0.598 [1.223]	-0.5555 [1.233]	-0.6034 [1.233]	-0.4652 [2.445]	-0.6219 [2.438]	-0.2297 [2.326]	-0.2221 [2.327]
Observations	823	823	817	817	823	823	817	817
Adjusted R-squared	0.065	0.071	0.067	0.069	0.121	0.127	0.088	0.088

Standard errors are in brackets. Significant at 10%; ** significant at 5%; *** significant at 1%.
Estimated coefficients of Regional Dummy and Industry Dummy are not shown in this table.

IV. Conclusion

This paper describes the importance of employing migrant workers to help smooth work flows. This is particularly true in sectors and industries with labor-intensive production, where incomplete information in the labor market can cause uncertainty about output production and can result in market failures. From the firm's perspective, employing migrants helps to stabilize the labor supply in these sectors, to fill vacancies, and to prevent uncertainties about production.

Do immigrant workers fill job vacancies and promote employment dynamics? Using Thailand's firm-survey data, this paper investigates the challenges of immigrant worker employment across various types of firms and how such employment can help to fill job vacancies. Descriptive analysis shows that Thai firms do not have much difficulty in employing immigrant workers, who mostly come from neighboring countries. Our regressions show, by analyzing firm-level characteristics, that the firms employing immigrant workers tend to be more labor intensive, use less computer or technology in production, are newly established, and employ a high proportion of low-educated workers. Firms facing job vacancies in either skilled or unskilled positions and losing production days due to slowdowns and stoppages of workers tend to employ more immigrant workers in order to fill those vacancies and smooth production. Impacts of job vacancies on the demand for immigrant workers are found to be stronger among firms located in non-border areas, where immigrants tend to move because of better job opportunities. Labor cost concerns, either wage costs or fringe benefit costs, also force firms to employ more migrants in order to maintain the cost competitiveness of their products. Such benefits seem also to encourage the employment of more migrants in the future. This paper, by using panel a firm-level dataset, also investigates the positive relationship of firms employing migrants in the past and the likelihood that they will employ migrant workers in the present, especially unskilled ones.

Since job vacancies need to be filled urgently, a policy promoting temporary immigration recruitment could help. Many argue that temporary recruitment provides more flexibility in the labor market and are not a serious threat to social cohesion. Temporary migration allows Thailand to meet labor needs more flexibly across business cycles. For migrants themselves, a temporary program would provide low-income migrants better access to the external labor market and maximize the return to their countries of origin. Temporary migrants usually remit more, retain closer links to their homes, and transfer freshly acquired skills from Thailand.

At the bilateral level, Thailand and the three migrant-sending countries should better coordinate and align migration policies with their national development objectives. Bilateral agreements provide a number of benefits, including flexibility to address policy objectives and issues as prioritized by the respective two countries that align with national development plans. This collaboration should aim to increase public awareness of migration benefits, foster regularization of immigration processes, and promote formal transfer mechanisms for remittances. Offering more flexible entry regimes and more promising long-term opportunities in attracting skilled

immigrants should also be taken into consideration. Both tax and non-tax incentives, including the launching of a temporary program to employ foreign workers, can be attractive measures. Under this strategy, the government should project both labor demand and supply for both the short and long terms by skill categories and geographical areas, and prepare a list of skill shortages.

Even so, achieving short-term goals on employing migrants does not guarantee that longer-term objectives will be secured. A middle-income country like Thailand has a somewhat larger inflow of unskilled workers that can be used effectively, but fewer foreign skilled workers. The results pose challenges to migration management policy, which aims to harmonize labor demand vis-à-vis long-term development toward better living standards. While moving toward an innovation-driven economy is among the top priorities of long-term development goals announced by the Thai authorities, implementing cost-saving strategies by employing cheap migrants tends to divert the country from productivity-enhanced activities. Promoting R&D investment within Thai firms, securing intellectual property rights, and increasing the value added to goods and services should be an immediate response. This can be achieved by promoting capital and innovative-intensive production technologies, adopting technology into labor-intensive production, such as agriculture, agro-business and farming products, and textiles and garments. Without question, value-added goods and services will confer more competitive advantage and sustained global competitiveness than relying on cheap labor costs from immigrant workers.

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