



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 experience by firms employing immigrant workers and how 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 shows that, by analyzing firm-level characteristics, firms employing immigrant workers tend to be more labor intensive, use computers or other technologies less in production, are recently established, and employ high proportions of low educated workers. Firms having job vacancies in either skilled or unskilled positions and losing production days due to slowdown and stoppage of workers will tend to employ more immigrant workers in order to fill those vacancies and smooth out its production. The impacts of job vacancies on the demand of 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 cost or fringe benefit costs, also force firms to employ more migrants in order to maintain their cost competitiveness. By using firm-level panel dataset, firms employing migrant workers in the past seem to realize the benefits from employing more migrants 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.

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1. Introduction

Over the past decade, 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 a widening of income disparities between Thailand and its neighbors—Cambodia, the Lao PDR, and especially, Myanmar. Immigration not only benefits the economy overall through higher GDP, but also benefits individual Thai firms seeking opportunities to pay lower wages and gain cost competitiveness (for example, see Bell, 1997; Borjas, 2001; Card, 2001; Kerr & Kerr, 2011). For the case of Thailand

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as a regional migrant-receiving country, different economic tools have been used, but all have provided similar results, such as the analyses done by Sussangkarn (1996), Martin (2007), and Pholphirul and Rukumnuaykit (2010).¹

Even though employing immigrants can boost GDP growth and investment, these benefits are unevenly distributed and mainly go to the owners of capital (i.e., firm owners and employers) and the immigrants themselves, while native workers are considerably jeopardized (Pholphirul & Rukumnuaykit, 2010). A number of empirical studies suggest that immigration does indeed reduce native wages and harms the employment prospects of Thai workers.² Even though these effects tend to be rather small, they could be significant for those unskilled or low-educated Thais who can be easily replaced by immigrant workers. If classification by skills and education is considered, the adverse impacts on Thai workers from immigration are much larger for young and low-skilled workers (see Lathapipat, 2010; Ottaviano & Peri, 2006, 2008 for the case of Thailand).

There has been some cost–benefit analysis of employing migrant workers in a migrant-receiving county such as Thailand. However none of them have empirically tested the roles of immigration from the perspective of labor demand, and none by analyzing firm-level data. Since Thailand is now facing a more competitive world market, the nation must change its development strategy from labor-intensive industries to more value-added types of production.

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 analyses of labor markets and employment. How well the labor market adjusts to this demand pattern is crucial to economic development as well as to the welfare of Thai laborers. It also challenges Thai employers to overcome these gaps.³

Even though it is already commonly believed among employers that immigration should help firms fill such 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. Even though the demand for immigrant workers in manufacturing may not be as obvious as it is in agriculture and the service industry, smoothing production to maintain workflows and avoid labor shortages is always a major concern.⁴

To be more specific, this paper will first analyze the challenges facing Thai manufacturing firms in seeking to hire immigrant workers. Second, given such constraints, the magnitude of migrant share can be determined by firm-level characteristics, labor shortages, job vacancies, and cost concerns.⁵ The findings of this empirical examination should help policymakers understand how the labor market will react given the substantive increase in the labor supply due to immigration. The findings can also inform labor-market policies as to how migration can best be managed. In the next section, the broader context of labor migration in Thailand will be examined. Section 2 discusses the perception of Thai firms regarding the challenges of employing foreign immigrant workers. Then, in Section 3, the role of immigration in filling job vacancies and promoting employment dynamics is explained. Section 4 discusses the findings and presents the conclusions.

2. Job vacancies and challenges of employing immigrant workers

Similar to those in other countries, Thailand's immigrant workers are made up of both skilled and unskilled workers. As of March 2010, there were 100,338 foreign professionals and skilled immigrants residing in Thailand, according to the numbers of those issued work permits. Japanese topped the list of foreign groups in Thailand with work permits with 23,060 in total, followed by skilled immigrants from the United Kingdom, China, India, the Philippines, and the United States, respectively. Nearly two-third of the work permits for foreign nationals were for senior officials and managers and nearly one fourth were for professionals. A majority of the work permits held by Japanese were for employment in business and manufacturing while 59% of those held by Filipinos were in the field of education. Thirty percent of work permits held by skilled foreign workers were in manufacturing, 16% were in education, and 16% in trade (Huguet & Chamrathirong, 2011, Table 1).

At the same time, widening income gaps between Thailand and its neighboring countries, the slowing growth of Thailand's workforce, and the improvements in roads and the infrastructure linking the region are the major drivers of cross-

¹ Sussangkarn (1996) conducted an investigation using the SAM-CGE model to gauge the impact of labor migration on growth. According to this methodology, assuming a migrant population of 750,000, immigration raised the Thai GDP by about 0.55%, or approximately USD839 million at 1995 prices. Given the slight contribution due to small number of migrants in 1996, Martin (2007) adjusted the model and found that in 2005 foreign workers were estimated to be about 5% of Thailand's total workforce. They enhanced the GDP by 1.25, which is about USD2 billion of the USD1.7 trillion of the Thai GDP in 2005. Pholphirul and Rukumnuaykit (2010) proposed another methodology by incorporating the informal sector into the labor force. This study found a net increasing trend in GDP contribution from migrants of 0.03% of the real national income (880 million baht) in 1995 to around 0.055% of the real national income (2.039 billion baht) in 2005.

² Bryant and Rukumnuaykit (2007, 2012) found that immigration appears to have caused a small reduction in wages rather than in employment. A 10% point increase of 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 Kulolkarn and Potipiti (2007), who found no significant effect of immigration on reducing the wages of Thai workers.

³ 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.

⁴ Apart from economic activity, the labor shortage problem is also crucial in non-economic (non-tradable) household activities, such as domestic work. Employing migrant to do domestic works 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.

⁵ There are a number of reasons explaining why there is no research on immigrant labor demand in Thailand. First, there is lack of firm-surveys in Thailand, especially in the context of labor employment, wage cost, and report of vacancies. Second, since a majority of immigrant workers in Thailand are still considered undocumented migrants, firms do not aggressively participate in such surveys.

Table 1
Number of skilled immigrants and foreign professionals holding work permits in Thailand (March 2010).

Occupation	Total	Japan	UK	China	India	Philippines	USA	Others
All occupations	100,338	23,060	8481	8414	8047	7052	6838	23,446
Senior officials and managers	64,586	17,681	4792	4480	6452	1271	3040	26,868
Professionals	23,920	2471	3053	2478	839	5114	3453	6512
Technicians	7099	2155	409	895	398	470	233	2539
Clerks	1439	288	125	86	63	100	53	724
Service and sales workers	1313	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

Source: Huguet and Chamrathirong (2011, Table 1.2).

Table 2
Registered migrant workers in Thailand from Cambodia, the Lao PDR, 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	1800	39,809
Seafood process.	136,973	6020	1180	129,773
Agriculture	221,703	24,085	18,035	179,583
Construction	220,236	32,465	12,635	175,136
Agric. process.	65,305	6635	3677	54,993
Meat processing	8852	442	792	7618
Recycling	13,172	2215	1360	9597
Mining, quarrying	1843	61	35	1747
Metal sales	12,556	995	2191	9370
Food sales	54,225	4483	13,074	36,668
Soil business	5879	689	322	4868
Const. materials	11,441	1003	1296	9142
Stone processing	3543	229	263	3051
Garment business	49,501	1739	6121	41,641
Plastic business	16,954	1341	2673	12,940
Paper business	2569	139	399	2031
Electronics	2595	152	342	2101
Transport	9596	2502	601	6493
Trade	42,814	4778	7565	30,471
Car repair and serv.	5631	376	1276	3979
Fuel and gas	3439	281	777	2381
Education	837	36	67	734
Household	129,790	6578	21,267	101,945
Other	238,350	12,548	13,106	212,696

Source: Department of Employment, Ministry of Labor, Thailand.

border movement of low-skilled laborers into Thailand, especially from its border countries, namely, the Lao PDR, Cambodia, and Myanmar. To manage those unskilled immigrants, the Government of Thailand has signed Memoranda of Understanding (MOUs) with those three neighboring countries for the formal recruitment of migrant workers. Under the MOUs, 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, a total of 82% of them coming from Myanmar. Those unskilled migrants have been working in a range of 3D jobs (Dirty, Dangerous, and Demeaning). Around 50% of which were in fisheries and seafood processing, 17% in agriculture, 17% in construction, 8% in domestic employment and 43% in a range of other businesses (Huguet & Chamrathirong, 2011, Table 2).

Bigger challenges also exist for management policies related to unskilled immigrants from bordering countries as a large number of immigrants are undocumented. This large number of undocumented migrants posed a problem for Thai policymakers as to how to manage them in such a way that could generate economic benefits and control potential costs.

The data in this section comes from the Productivity and Investment Climate Survey (PICS) data, which contains firm-level data in the manufacturing sector. Two rounds of data collection were funded by the Royal Thai Government with technical assistance from the World Bank.⁶ The first round (PICS 2004) was conducted between March 2004 and February

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 owner or plant manager incorporated by the visit of the enumerator team that 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.

Table 3
Percent of firms reporting vacancies in 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	1043

Source: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2007.

2005 and surveyed 1385 manufacturing establishments. The second round (PICS 2007) was conducted between April 2007 and November 2007 and surveyed 1043 manufacturing establishments. Four hundred twenty-six manufacturing firms participated in both surveys. The survey 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).

Even though the Thai economy as a whole has relied on huge amounts of both investments and exports, the heterogeneity of firms means that they are affected differently. For example, smaller and medium enterprises are facing labor shortages, since they lack the necessary contacts and experience to relocate production facilities abroad. According to the survey results, vacancies in all types of working skills illustrate 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 skilled production workers and unskilled workers. For skilled workers, the results can be intuitively explained. The Royal Thai Government's vision to upgrade Thailand's economy and be based more on innovation and high-technology-related production has put pressure on Thai firms to find skilled laborers. Thirty percent of firms reported a shortage of skilled labor, especially those in capital-intensive sectors, such as auto parts (49.5%), machinery and equipment (33.7%), and electronics and electrical appliances (32.3%). Skill shortages and lack of educated workers has been touted as a major or severe obstacle to Thailand's further development (World Bank, 2008).

As shown in Table 3, even though skilled laborers are always in demand by Thai manufacturers, unskilled laborers are in even greater demand (48.8%). 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% in machinery and equipment to as high as 56% in garment production. However, this result has brought a new concern. 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 shortages in both skilled and unskilled labor. The reasons for job vacancies are rather mixed, because the available workforce has poor skills and/or workers possess certain skills. There are still mismatches which create vacancies when many applicants lack the basic skills or technical skills that firms require.

Job vacancies 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. Unskilled production workers however are only 2.2 weeks as these workers were more abundant (Table 4). The World Bank (2008) also reported that shortages of both skilled and unskilled production workers among Thai manufacturers were much more prevalent in Thailand than in other countries in the region (Tables 5 and 6).

Also in PICS was a question asking firms to determine whether they would like to hire more or less than their current level of employment. Thirty percent of those firms, especially those in the garment industry, were willing to hire more workers. Only 17.8% of them wanted to hire fewer workers and 51.6% of them reported their current employment was already at the optimal level and did not want to change their current status. These data clearly reflect a labor shortage existing for Thai manufacturers.

Serious labor shortages pressure Thai firms to actively search for workers outside the region and outside Thailand. The survey results suggest that 58.2% of the workers were hired from other regions of Thailand while 39.7% of them were from the same region. Hiring workers from other regions clearly shows a pattern of internal migration, especially to 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, even though hiring foreign workers helps fill vacancies, the proportion of foreign workers is still far from that of Thai workers. The survey results show that most foreign workers, in this case, were from neighboring countries (7% of the total workforce), namely Myanmar, Cambodia, the Lao PDR, and Malaysia, while a very small portion (0.9%) were from non-neighboring countries.

Even though hiring foreign workers is still relatively less important than hiring Thais, 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

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: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2007.

Table 5
Percent 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
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: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* 0.05 statistically difference from the year 2004.

Table 6
Percent of migrants employed by firm size.

# Employees	Skilled migrants	Unskilled migrants	# observations
2004			
Small firms (less than 50)	0.04	0.17	367
Medium firms (50–200)	0.53	0.38	493
Large firms (greater than 200)	0.34	0.33	510
2007			
Small firms (less than 50)	0.39 [*]	4.00 [*]	377
Medium firms (50–200)	0.74	3.50 [*]	372
Large firms (greater than 200)	1.84 [*]	5.32 [*]	294

Source: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* 0.05 statistically different from the year 2004.

vacancies than do firms in non-border provinces. Firms in border provinces reported that around 11.6 of their newly hired workers in 2006 were migrants, which is far higher than what firms in non-border provinces had reported. Even though newly hired workers cannot be distinguished by skill types, the result still shows the importance of immigration workers to Thai manufacturers, especially to those operating in border provinces.

Hiring foreign workers not only helps reduce the local labor shortage and promote continuity of production, but also enhances competitiveness due to the lower cost of employing cheap laborers from neighboring countries. However, survey results show that the majority of Thai manufacturers hired foreign workers due to shortages 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 hiring immigrants in order to lower wage costs. Other reasons were not specified in the dataset. This result clearly supports the hypothesis mentioned above that immigration is important to Thai firms for filling in job vacancies and smoothing workflows.

Nonetheless, 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 asks what firms believe about labor regulations concerning 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 many as 61.1% of Thai firms reported no problems with procedures when hiring foreign workers. Slightly less than 68.9% reported no problems when hiring Thai workers. Nonetheless, 15.2% of Thai manufacturers believed that hiring procedures of foreign workers was a major problem. On average, Thai firms reported having to spend 2 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 survey results show that even though hiring Thai workers was believed to be easier than hiring foreign workers, the percent points between the two results are not very different.

These results indicate that the firms’ perceptions regarding employing immigrant workers in Thailand seemed not to be a major problem. By analyzing channels of new recruits, Thai firms reported that, within the previous 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 came 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, in particular, for immigrant workers for which manufacturers can use their social networks for recommendations to fill in job vacancies.

In conclusion, mismatches between the skill requirements of jobs and the skill levels of workers, wage and recruitment activities by firms, and the shortage of local workers as well as other factors explain the variations of labor shortages and vacancy rates across firms. In Thailand, job vacancies for unskilled workers were found to be more prominent 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.

3. Determinations of immigrant worker employment

Besides the magnitude of job vacancies discussed above, the decision by firms to hire immigrant workers would be expected to vary across firms according to their characteristics, such as type of industry, location, production technology, firm size, firm age, and labor costs. To discover the missing link in the demand for immigrant workers, this section aims to analyze how such factors determine the number of immigrants, classified as skilled and unskilled, who are employed.⁸

Survey results on employment status show that firms reported a substantial increase in the employment of unskilled immigrants, from 0.31% in 2004 to 4.19% in 2007. There was clearly a sharp increase in employment of unskilled migrants during the period of 2004–2007 in labor-intensive sectors. Significant increases occurred mainly in the food processing industry (from 0.67% to 12.1%), the garment industry (from 0.07% to 7.65%), the textile industry (from 0.15% to 3.78%), the rubber and plastic industry (from 0.46% to 2.72%), and in furniture and wood production (from 0.84% to 4.73%). On the other hand, the share of skilled migrants increased slightly from 0.33% in 2004 to 0.92% in 2007. The most significant increases were seen in the food processing industry (from 0.05% to 1.46%), the garment industry (from 0.05% to 2.12%), and electronics and electrical appliance production (from 0.3% to 1.15%).⁹

There is evidence showing that Thai firms decided to employ more immigrants, especially unskilled immigrants, in labor-intensive sectors during 2004–2007. The largest migrant registration campaign took place in 2004 from an effort to obtain more precise estimates of the number of irregular immigrants in Thailand.¹⁰ The main reason comes due to the MOUs signed

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 report a positive relationship by indicating that larger firms and foreign-owned firms tend to spend more days dealing with hiring procedures.

⁸ 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 persons involved in production process that management considers to be unskilled.

⁹ We understand that this figure, especially for the year 2004, is likely to be biased downward since firms may not report the true numbers of employed migrants and probably reported only documented ones.

¹⁰ The Ministry of the Interior was assigned to be responsible for registering migrants from Myanmar, Laos, 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 Labor 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 (Rukunnuaykit, 2008).

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 6th grade (primary) education

Source: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

between Thailand and neighboring countries (the Lao PDR in October 2002, Cambodia in May 2003, and Myanmar in June 2003) that helped to facilitate the employment of immigrants by the recruitment process to fill vacancies requested by registered employers.¹¹ Moreover, in 2005, the Thai government allowed registered migrants to stay in Thailand for another year. 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 percent of immigrants employed as reported by the PICS survey did not represent the actual number of immigrants working in Thailand but was biased downward. However, the number did show an increasing trend for Thai firms to employ more immigrants.

Classified by firm size, larger firms tend to employ skilled immigrant workers. In 2007, large-sized firms employ about 1.84%, followed by medium-sized firms (0.74%) and small-sized firms (0.39%). However, employment of unskilled workers is found to be unvaried among firm size 4% for small-sized firms, 3.5% for medium-sized firms, and 5.32% for large-sized firms¹² Nevertheless, the percentage of firms employing immigrant workers is found to have statistically increased between the years of 2004–2007 for all firm sizes.

Nonetheless, using only average figures from data tabulation should not be convincing when there are large variations among firms in terms of their location, industry, production intensity, usage of technology, etc. Using simple econometrics should make the results more convincing and reliable for the controlling effects of those factors. Thus the dependent variables *share of skilled migrants* and *share of unskilled migrants* which comprise percentages of skilled/unskilled migrants employed by a firm to total population of skilled workers were created.

There are, however, three sets of independent variables. First, adapted from the [World Bank \(2008\)](#), we create list of control variables in measuring firm-level characteristics, which are (1) firm age, (2) firm size, (3) capacity utilization, (4) factor intensity, (5) R&D Investment, (6) computer control in production, and (7) education quality of their workers. Definitions of this list of control variables are given in [Table 7](#). From economic theories, some variables are predicted to have a negative effect in determining whether a firm will employ unskilled migrants. For example, firms investing in R&D investment, using a higher percent of computer control in production, and having relatively highly skilled employees should be less likely to employ unskilled immigrant workers as their production processes rely more on technology-based rather than cheap labor. However for some other control variables, the effect is ambiguous, for example, the size of the firm and firm age.

The second set of independent variables is focused on the impacts of job vacancies and the number of losses due to worker slowdown and worker stoppage. To avoid endogeneity issues and selection biases, a lag period of independent variables on job vacancies and days of worker slowdown and stoppage in the previous year is used. For example, a firm reporting, for example, job vacancies in the year 2006 should affect its migrant's employment decision in the year 2007 but not the other way round. Estimated coefficients of job vacancies and work delays in the previous year are predicted to have some positive signs with regard to employing migrants in this year. Labor shortages in a previous period, which cause unpredicted financial losses due to stoppages, could be expected to force firms to look for additional workers to fill in those vacancies. This should be especially true for firms engaging in labor-intensive production where workers are desperately needed.

¹¹ From late 2005, Thailand requested 51,105 workers from Laos and 17,470 from Cambodia. However, the Lao PDR and Cambodia were able to provide only 3418 and 570 workers, respectively, representing lower targets for the fresh new recruitment under the MOU. From 2006 to August 2007, the demand for the admission of foreign workers increased to 60,890 for the 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 employing less than 50 employees, 50–200 employees, and greater than 200 employees are classified "small-sized firms," "medium-sized firms," and "large-sized firms," respectively.

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	1388	1043	862	2431

Source: Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

The third set of independent variables involves cost concerns that force Thai firms to rely on cheap migrant workers. In this case, a labor cost variable is created and broken down into: (1) wage costs, and (2) fringe benefit costs. Fringe benefits include both social security benefits such as pension, provident fund, medical insurance, and unemployment insurance, as well as in-kind benefits such as education, food and transport. Due to cost pressure on hiring labor, estimated coefficients of wage cost and remuneration cost can be used to determine whether a firm hires more immigrant workers. Summarized statistics and definitions of these variables are shown in Tables 7–8 below.

Two estimation models were adopted here. First, binary probit regression was used to quantify the probability that a Thai firm will hire migrant workers given various sets of the independent variables mentioned above. Second, 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) to quantify employment magnitude on the percent of migrant shares. The tobit model is chosen since it is likely the case that firms reporting “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 estimated coefficients of both the probit and tobit model, classified by unskilled immigrants and skilled immigrants, for all industries are shown below in Tables 9 and 10, respectively. Tables 11 and 12 show the estimated coefficients of the tobit model for unskilled and skilled immigrants classified by industry.

For the employment of unskilled migrants, as observed from firm-level characteristics, it can be seen that firms having a high percentage of computer-controlled production and engaging in R&D investment are likely to employ fewer unskilled immigrants. About 10% more of computers used in total production are likely to decrease the probability of employing unskilled migrants by 0.6% or reduce by about 2.3–2.5% the share of unskilled migrants. Similarly, firms spending on R&D last year are less likely to employ unskilled immigrants by 5% than firms not spending on R&D. Shares of unskilled immigrants are also about 22–24% lower compared to those firms that did not spend on R&D. Negative coefficients of computer-used in production and R&D investment clearly confirm our prediction that unskilled migrants are more likely to be demanded by firms with low technology-based production. This result explains the relatively high substitution between capital (technology) and unskilled migrants. The more capital (technology) is used, the less the demand for unskilled immigrants, especially in the food processing and textile industry (Table 9).¹³

Not only technology-used in the production process, skill of workers employed within firms but also another determination on whether or not firms will be engaging on employing migrants. Estimation shows that worker education is found to be significant in the demand for unskilled immigrants. Estimates suggest a 10% increase in the proportion of workers who have less than 6 grade of education (some elementary) would raise the probability of a firm employing unskilled migrants by 0.9% or increase about 3.6–3.8% of the unskilled migrant share. These impacts of worker's education are found to be significant and even stronger among firms operating in furniture, food processing, and textiles.¹⁴ These estimated results confirm our understanding that the demand for unskilled immigrant workers usually occurs among Thai manufacturers engaging in production types that rely relatively more on unskilled laborers, but less on computer-based or technology-based production. Even though the impacts of firm size and firm age in employing unskilled migrants are found

¹³ Estimated coefficients of computer control and R&D investment are found to be significant in food processing and textile industry. About 10% more of computer used in total production are likely to reduce unskilled migrant share by 14.7% in food processing and by 2.6% 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 About 10% more employed workers who had less than a 6th grade education significantly increased the unskilled migrant share by about 6.7% in furniture firms, 5.2% in processing firms, and 2.4 percent in textile firms.

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 × 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 (%)	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 (million 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	2220	2324	2327	2216	2206	2310	2313	2202
Pseudo-R-square	0.108	0.102	0.099	0.115	0.059	0.055	0.055	0.061

Standard errors are in brackets.

Estimated coefficients of Industry Dummy, Regional Dummy, and Time Dummy are not shown in this table.

Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

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 × 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 (%)	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 (million 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	2250	2324	2327	2246	2234	2307	2310	2230
Pseudo-R-square	0.176	0.171	0.175	0.184	0.067	0.064	0.065	0.068

Standard errors are in brackets.

Estimated coefficients of Industry Dummy, Regional Dummy, and Time Dummy are not shown in this table.

Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Table 11
 Estimation of percent of firms employing unskilled immigrant workers by industry.

Industry	Food processing	Textile	Garment	Auto parts	Electrical appliances	Rubber and plastic	Furniture	Machinery and 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 × border province (%)	-5.5033** [2.364]	-0.9111 [0.577]	3.2027 [2.785]	0.0393 [0.522]	-2259.97 [5.576]	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 (%)	-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.

Estimated coefficients of Regional Dummy and Time Dummy are not shown in this table.

Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Table 12
Estimation of percent of firms employing skilled immigrant workers by industry.

Industry	Food processing	Textile	Garment	Auto parts	Electrical appliances	Rubber and plastic	Furniture	Machinery and 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 × 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 (%)	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.

Estimated coefficients of Regional Dummy and Time Dummy are not shown in this table.

Author's calculations computed from Productivity and Investment Climate Survey (PICS) Data 2004 and 2007.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

to be insignificant among firms overall, it can be seen from the estimates that unskilled migrants are more likely to be in demand among 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 wage costs.

The results for the employment of skilled migrants by observing factor intensity were found to be in the opposite direction of that for unskilled migrants. Firms engaging in capital-intensive production will be more likely to need and employ skilled immigrants. An additional million baht of capital–labor ratio is found to significantly increase the probability of employing skilled migrants by about 4% or increase the skilled migrant share by 3.3–3.6%. This is the complementary effect between the use of machines in production process and the requirement to employ highly skilled workers to work with the machines. Nevertheless, similar to the demand for unskilled immigrants, 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 might also need skilled migrants to enhance their productivity. Worker education is also found to be significant to the demand of skilled immigrants among Thai manufacturers. Estimates suggest a 10% increase in the proportion of workers who have less than 6 grade of education (some elementary) would raise the probability of a firm employing unskilled migrants by 0.9%.

As discussed earlier, labor shortages were found to be one of the important factors determining the demand for both unskilled and skilled migrant workers among Thai manufacturers. Estimated results clearly confirm our prediction. A firm facing about 10% of unskilled vacancies (relative to total unskilled production workers) in the previous year can be expected to increase the probability of its employing migrant workers by 0.8–0.9% or about 2.9–3% of the share of unskilled immigrants.

The above results are also true for skilled positions. A firm facing about 10% of skilled vacancies (relative to total unskilled production workers) in the previous year is also expected to increase the probability of its employing migrant workers by 0.7–0.8% or about 0.98–1% of the share of skilled immigrants. The existence of job vacancies forces firms to search for immigrant workers to fill them, especially in food processing firms and textiles firms for unskilled migrants and in manufacturing and equipment firms for skilled migrants.¹⁵

By controlling for the characteristics of firms, we can see that firms located in border provinces were found to employ about 7.3% fewer unskilled migrants and 2.7% fewer skilled migrants compared to firms located in non-border provinces if those firms faced about 10% more of job vacancies (relative to the total labor force). This result supports to some extent the descriptive analysis offered earlier, namely, that the effect of job vacancies on demand for immigrant workers is stronger in non-border provinces. The higher percentage of immigrant workers employed by firms located in non-border provinces clearly provides evidences of internal movement among migrants themselves, who chose to move into the cities where there are better job opportunities and higher incomes.

The number of days lost due to worker slowdowns during the past year also forces firms to seek migrant workers. A manufacturer facing about 10 days more of worker slowdown can be expected to increase the probability of its employ unskilled migrants by about 0.6–0.7% or increase unskilled migrant shares by 2.1–2.3%, especially among textile, electrical appliance, and machinery and equipment firms. Manufacturers facing 10 days more of worker slowdown can be expected to increase the proportion of unskilled migrants shares by 10.4%, 11.7%, and 0.58% in food processing, electrical appliance, and machinery and equipment firms, respectively. A number of day losses due to worker stoppage during the past year also forced firms in auto part industry to employ 20.4% more unskilled migrants relative to unskilled laborers.

Besides filling in labor shortages and job vacancies, the need to maintain cost competitiveness is yet another obvious factor determining demand for unskilled migrant workers. Much empirical research has already confirmed this factor. For example, Pholphirul and Rukumnuaykit (2010) found that a firm employing an additional 10% of unskilled immigrants could save approximately 5746 baht 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 24,144 baht per person per year. Estimating the impacts of employing migrant workers from the perspective of labor costs (wage and fringe benefits) shows that maintaining cost competitiveness is therefore a major concern among Thai manufacturers by pressuring them to seek the employment of cheap migrants. Our results show that a firm that pays 10% more in unskilled wages (relative to total labor cost) in the previous year can be expected to employ 1.6% more unskilled labor. This is particularly true in the labor-intensive sector, such as the garment industry, in which higher wages paid to unskilled laborers forces firms to hire more unskilled immigrants from abroad.¹⁶ Besides, in order to avoid paying for the fringe benefits (social security, education, accommodation, and transportation) textile firms tend to employ skilled immigrants.¹⁷ On the flip side, this illustrates the vulnerabilities of migrants, who not only receive lower wages compared to native workers but who do not receive the fringe benefits to which native workers are entitled, especially social security benefits.

¹⁵ Estimated coefficients show that a firm facing 10 percent of unskilled vacancies (relative to total unskilled production workers) in the previous period can be expected to have a higher proportion of employing unskilled migrants—by 8.4% in food processing, 3.3% in textiles, and 1.6% in machinery and equipment. A firm facing 10% of skilled worker vacancies (relative to total unskilled production workers) in the previous period can be expected to have a higher likelihood of employing skilled migrants by 1.7% in manufacturing and equipment.

¹⁶ Estimated coefficients of unskilled workers' wages show that garment firms are more likely to employ 6.5% more unskilled migrants when they pay about 10% higher wages for unskilled workers relative to the total labor costs incurred the previous year.

¹⁷ Estimated coefficients of skilled worker's fringe benefits show that textile firms are more likely to employ 46.1% more of skilled migrant share when they pay about 10% more for unskilled fringe benefits relative to total labor costs incurred the previous year.

Table 13
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 × 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 × 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 (%)	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.

Estimated coefficients of Regional Dummy and Industry Dummy are not shown in this table.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Since the characteristics of the Thai manufacturers may include unobserved heterogeneity, creating the potential for omitted variable bias, using panel data of 426 firms that participated in both surveys (2004 and 2007) should help mitigate the risk. However, there are not any significant effects from skilled/unskilled vacancies, worker slowdowns and stoppages, and concerns over workers' wages and benefits on the employment of skilled/unskilled migrant workers from estimating fixed-effect panel firms.

Even though using a panel firm-level dataset by estimating its fixed-effect does not generate significant results as might be expected, it does show the interesting result that firms that employed migrant workers in 2004 were more likely to employ more of those migrants in 2007. Table 13 show a positive relationship among those firms that employed unskilled migrants in 2004. Comparing manufacturing firms that employed unskilled migrants in 2004 and those that did not, firms that did employ unskilled migrants in 2004 were more likely to employ about 5.3–7.6% more of those unskilled migrants in 2007 than firms employing no unskilled migrants in 2004. A 10 percentage employment rate of unskilled migrants in 2004 could be expected to increase an additional 0.74% of those unskilled migrants employed by the same firms in 2007.

Intuitively, a number of reasons can explain this relationship. First, the fact that firms realized the benefits of employing unskilled migrants in the past seem to continue to enjoy such benefits today, especially in light of global competitiveness and labor shortages becoming more serious concerns among Thai manufacturers. Second, firms that employed migrants in the past would presumably be more familiar with the necessary employment procedures. Such firms had most likely found easier ways of dealing with immigrant-hiring process, registration, and dealing with governments. And, third, migrant networks can easily be established within firms. Such networks help increase the proportion of immigrant workers hired through referrals and bring more migrant workers into employment channels. This migrant network is also easier from having strong demand from firms.

However, by controlling for the border effect, a difference can be seen between firms employing unskilled migrants and those employing skilled migrants. Firms employing unskilled migrants in 2004 and located in border provinces were 5.3% less likely to employ unskilled migrants 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 border provinces were 2.3% more likely to employ more skilled migrants compared to firms located in non-border provinces. These results clearly represent the opposite of what might be expected, namely, that during the period of 2004–2007, unskilled migrants were more in demand among firms located in urban areas and the Central Region, while skilled migrants were more in demand among manufacturing firms located near the border.

Since 70% of Thailand's GDP is currently driven by exports, pressures to maintain global competitiveness force manufacturers to keep costs down. Thus, the system is prone to responding positively to adding more foreign works to the workforce. Thai manufacturers, especially among exporting firms, enjoy the benefits from employing immigrant workers to fill in short-term vacancies and promote employment dynamics while, at the same time, keeping labor costs down. Such benefits exist also in the short term. Long-term impacts remain to be discussed further. Thai firms' continuing to employ immigrant workers, most of whom are unskilled to semi-skilled, could be a rather dubious enterprise as it could possibly jeopardize long-term economic development through lower labor productivity and lower incentives for R&D investment.

4. 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 job vacancies in the labor market can cause uncertainty about output production. 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. However, there are not any significant effects from skilled/unskilled vacancies, worker slowdowns and stoppages, and concerns over workers' wages and benefits on the employment of skilled/unskilled migrant workers from estimating fixed-effect panel firms.

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 is 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 could 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-a-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 could 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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