The Absorption of Immigrants and its Effects on the Thai Wage Structure

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Objectives

- To study the diffusion of low-skilled labour in different provinces, and how local industries respond to these relative supply shifts.

- This will help us understand how industries across geographical areas absorb inflows of low-skilled immigrants.
  - Mostly from the Greater Mekong Sub-region and represent around 5 percent of the 2007 labour force.

- To examine the (long-run) effects on wages – Thai and foreign wages in various education-experience groups.
Diffusion of Skills

- Use 2007 Q3 Labour Force Survey
  - Most recent coverage of (registered) immigrant workers
  - Around three quarters of immigrants are unregistered, and the census undercount could be as high as 80 percent

- Divide workers (men and women ages between 16 and 65 years) into 4 schooling groups (LP, UP, HS, CO)
  - Lower Primary: Schooling\(\leq 3\) years
  - Upper Primary: 4 years\(\leq\)Schooling\(\leq 6\) years
  - High School: 7 years\(\leq\)Schooling\(\leq 12\) years
  - College: Schooling\(> 12\) years
Diffusion of Skills

- Our (weekly) labour supply measure:
  - “total weekly hours” plus “desired additional hours”
  - Captures the extent of involuntary underemployment
  - Discard those workers not in the labour force (who reported zero weekly hours and were not seeking work)
  - For the unemployed workers, we impute their missing labour supplies using information from the rest of the sample
  - Unemployment rate using our broader measure is 2.87%
  - Conventional headline measure of unemployment is 1.81%
  - Foreign supply accounts for 0.91 percent of total supply
  - Each worker therefore has a fraction of hours employed and hours unemployed
Diffusion of Skills

- Card and Lewis (2005) decompose variation in the overall fraction of a skill group employed in a given city from the national average into 3 components:
  - Between industry (B)
  - Within industry (W)
  - Interaction term (I)

- To make statements about the relationships between skill supplies, industry structure, and unemployment we modify the CL model

- Instead, we decompose variation in the overall fraction of a skill group supplied in a given province from the national average
Diffusion of Skills

- This necessarily entails a 4th component:
  - Unemployment (U)
- Begin with the identity:

\[
\begin{align*}
  s^i(p) &= \frac{L^i(p)}{L(p)} = \frac{1}{L(p)} \sum_j N^i_j(p) + \frac{u^i(p)}{L(p)} \\
  &= \sum_j \frac{N_j(p)}{L(p)} \frac{N^i_j(p)}{N_j(p)} + s^i_u(p) \\
  &= \sum_j \lambda_j(p) \omega^i_j(p) + s^i_u(p)
\end{align*}
\]

where \(L(p)\) and \(N(p)\) are hours supplied and employed in province \(p\), schooling group and industry are indexed by \(i\) and \(j\), and \(u^i(p)\) is the hours unemployed in province \(p\)
Diffusion of Skills

- The employment share of industry $j$ indicates the size of the industry in the locality:

$$\lambda_j(p) = N_j(p) / L(p)$$

- While the share of skill group $i$ employed in industry $j$ indicates the skill intensity of the industry:

$$\omega^i_j(p) = N^i_j(p) / N_j(p)$$

- We decompose the gap between $s^i(p)$ and the national average into the 4 components:

$$s^i(p) - s^i = B(p) + W(p) + I(p) + U(p)$$
Diffusion of Skills

where

\[ B(p) = \sum_j \omega_j^i \left[ \lambda_j(p) - \lambda_j \right] \]
\[ W(p) = \sum_j \lambda_j \left[ \omega_j^i(p) - \omega_j^i \right] \]
\[ I(p) = \sum_j \left[ \lambda_j(p) - \lambda_j \right] \left[ \omega_j^i(p) - \omega_j^i \right] \]
\[ U(p) = s_u^i(p) - s_u^i \]

- And estimate the following regressions:

\[ B(p) = \alpha_B + \beta_B \left[ s^i(p) - s^i \right] + \varepsilon_B \]
\[ W(p) = \alpha_W + \beta_W \left[ s^i(p) - s^i \right] + \varepsilon_W \]
\[ I(p) = \alpha_I + \beta_I \left[ s^i(p) - s^i \right] + \varepsilon_I \]
\[ U(p) = \alpha_U + \beta_U \left[ s^i(p) - s^i \right] + \varepsilon_U \]

where the \( \beta \)'s necessarily sum to 1
Diffusion of Skills

- Under the strict Hecksher-Olin condition, variation in the shares of a skill supply across provinces is absorbed by expansion or contraction of industries that employ the skill type more intensively, that is, via the between industry component $B(p)$, and with no change in relative wages.

- We formally test the hypothesis to see if $\beta_B = 1$.

- Focus on the two schooling groups with less than a high school education.
Diffusion of Skills

Excess Fraction of Lower Primary Labour

Excess Fraction of Upper Primary Labour
Diffusion of Skills

- Much flatter slopes for the between industry absorption of lower and upper primary labour
- Limited evidence of HO-style absorption of excess supplies of these two skill groups
- Industries in low-skilled labour-abundant provinces are more intensive in their use of this type of labour
- Substantial portions of excess supplies of lower and upper primary labour are associated with higher unemployment rates
  - 7.2% of excess fraction of lower primary labour absorbed by unemployment, and 6.3% for upper primary labour
## Diffusion of Skills

### Table 2.1: Absorption of Excess Lower Primary and Upper Primary Workers

<table>
<thead>
<tr>
<th></th>
<th>Agribusiness</th>
<th>Manufacturing</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between</td>
<td>Within</td>
<td>Interaction</td>
</tr>
<tr>
<td>Excess Fraction of Lower Primary Labour</td>
<td>0.098***</td>
<td>0.696***</td>
<td>0.134**</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.090)</td>
<td>(0.065)</td>
</tr>
<tr>
<td>Observations</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.302</td>
<td>0.730</td>
<td>0.119</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses. All regressions are weighted by the provincial size of the particular skill group supply.
## Diffusion of Skills

Table 2.3: Absorption of Excess Lower Primary Thai and Immigrant Workers

<table>
<thead>
<tr>
<th></th>
<th>Agribusiness</th>
<th>Manufacturing</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between Industry</td>
<td>Within Industry</td>
<td>Interaction</td>
</tr>
<tr>
<td>Excess Fraction of Lower Primary</td>
<td>0.018**</td>
<td>0.740***</td>
<td>0.241***</td>
</tr>
<tr>
<td>Immigrant Labour</td>
<td>(0.008)</td>
<td>(0.042)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>Observations</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.312</td>
<td>0.554</td>
<td>0.116</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses. All regressions are weighted by the provincial size of the particular skill group supply.
## Diffusion of Skills

### Table 2.4: Absorption of Excess Upper Primary Thai and Immigrant Workers

<table>
<thead>
<tr>
<th></th>
<th>Agribusiness</th>
<th>Manufacturing</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between Industry</td>
<td>Within Industry</td>
<td>Interaction</td>
</tr>
<tr>
<td>Excess Fraction of Upper Primary Immigrant Labour</td>
<td>0.004*** (0.001)</td>
<td>0.914*** (0.010)</td>
<td>0.091*** (0.003)</td>
</tr>
<tr>
<td>Observations</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.398</td>
<td>0.995</td>
<td>0.927</td>
</tr>
</tbody>
</table>

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Robust standard errors in parentheses. All regressions are weighted by the provincial size of the particular skill group supply.

### Table 2.4 Continued

<table>
<thead>
<tr>
<th></th>
<th>Agribusiness</th>
<th>Manufacturing</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between Industry</td>
<td>Within Industry</td>
<td>Interaction</td>
</tr>
<tr>
<td>Excess Fraction of Upper Primary Thai Labour</td>
<td>0.302*** (0.059)</td>
<td>0.763*** (0.061)</td>
<td>-0.128 (0.092)</td>
</tr>
<tr>
<td>Observations</td>
<td>46</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.45</td>
<td>0.767</td>
<td>0.101</td>
</tr>
</tbody>
</table>

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Robust standard errors in parentheses. All regressions are weighted by the provincial size of the particular skill group supply.
Diffusion of Skills

- Tables 2.3 and 2.4 further disaggregate lower and upper primary workers into Thai and Foreign portions
- Most striking result is the much lower between industry absorption of immigrant relative to Thai excess supplies
  - For lower primary groups – 1.8% of excess foreign supply is associated with shifting industry structure, while the corresponding number for Thais is 21.6%
  - For upper primary groups – $\hat{\beta}_B = 0.4\%$ for immigrants, and for Thais $\hat{\beta}_B = 30.2\%$
- A closer look into the contribution of selected industries reveals that sector-specific estimates of $\beta_B$’s are all zeroes for immigrant labour
Diffusion of Skills

- Comparing the absorption contribution of agribusiness sector reveals that
  - While the entire immigrant excess supplies are absorbed through the within industry component, the exact opposite is observed for similarly-educated Thai labour
  - Evidence of HO-style absorption of Thai excess supplies in this industry
  - Evidence that employers regard foreign workers as temporary

- Excess supplies of immigrants are essentially uncorrelated with their rates of unemployment
  - Since the sample contains only registered workers, this observation is not at all surprising
Effects on Wages

- The small role of shifting industry structure in the absorption of immigrant excess supplies indicates that unemployment rates and/or the wage structure must adjust.

- In addition to language barriers and other factors, we have established evidence that immigrants and natives are imperfect substitutes in production due to their temporary worker status.


- Due to data availability, we evaluate variations in wages and employment across geographical areas rather than through time as in OP.
Effects on Wages

- We also make the implicit assumption that industries across provinces adjust their physical capital to accommodate differences in relative skill supplies.
- Our model can thus be considered a long-run model.
- We begin by defining a general production function:

\[ Y_p = F(K_p, N_p) \]

- Following OP, the labour CES aggregate, \( N \), is defined as:

\[
N_p = \left[ \theta_{Lp} N_{Lp}^{\sigma_{HL}^{-1}} + \theta_{Hp} N_{Hp}^{\sigma_{HL}^{-1}} \right]^{\sigma_{HL} \sigma_{HL}^{-1}}
\]

where \( N_L \) and \( N_H \) are aggregate measures of low- and high-education labour, \( \sigma_{HL} \) is the elasticity of substitution parameter, and the \( \theta \)'s are the relative efficiency parameters.
Effects on Wages

- The broad education groups are CES aggregates of the 4 detailed education groups defined earlier:

\[
N_{Lp} = \left[ \theta_{Lp} N_{Lp} \sigma_{LL}^{-1} + \theta_{Up} N_{Up} \sigma_{LL}^{-1} \right] \sigma_{LL}^{-1} \quad N_{Hp} = \left[ \theta_{Hsp} N_{Hsp} \sigma_{HH}^{-1} + \theta_{Cop} N_{Cop} \sigma_{HH}^{-1} \right] \sigma_{HH}^{-1}
\]

- The detailed education group – denoted by \( k \) – further nests workers in 3 potential experience groups:

\[
N_{kp} = \left[ \sum_j \theta_{kj} N_{kjp} \sigma_{Exp}^{-1} \right] \sigma_{Exp}^{-1}
\]

Group \( j=1 \): Experience \( \leq 14 \) years
Group \( j=2 \): 15 years \( \leq \) Experience \( \leq 29 \) years
Group \( j=3 \): Schooling \( \geq 30 \) years
Effects on Wages

- The $N_{kj}$’s are CES aggregates of foreign and domestic workers within the same $kj$ skill groups

$$N_{kjp} = \left[ \theta_{Dkj} D_{kjp}^{\frac{\sigma_{IMMI} - 1}{\sigma_{IMMI}}} + \theta_{Fkj} F_{kjp}^{\frac{\sigma_{IMMI} - 1}{\sigma_{IMMI}}} \right]^{\frac{\sigma_{IMMI}}{\sigma_{IMMI} - 1}}$$

- Equating the value of marginal productivity of a generic domestic worker to the wage rate, it can be shown that:

$$\ln(w_{Dbkjp}) = \ln\zeta_p + \frac{1}{\sigma_{HL}} \ln(N_p) + \ln \theta_{bp} - \left( \frac{1}{\sigma_{HL}} - \frac{1}{\sigma_{bb}} \right) \ln(N_{bp}) + \ln \theta_{kp} - \left( \frac{1}{\sigma_{bb}} - \frac{1}{\sigma_{EXP}} \right) \ln(N_{kp}) + \ln \theta_{kj} - \left( \frac{1}{\sigma_{EXP}} - \frac{1}{\sigma_{IMMI}} \right) \ln(N_{kjp}) + \ln \theta_{Dkj} - \frac{1}{\sigma_{IMMI}} \ln(D_{kjp})$$
Effects on Wages

- The same wage equation for foreign workers (changing the notation from $D$ to $F$)

Estimation of Elasticity of Substitution Parameters

- Here we only show the estimation of $\sigma_{IMMI}$:
- Taking the difference between the previous equation for $F$ and $D$:

$$\ln \left( \frac{w_{Fb kj p}}{w_{Db kj p}} \right) = \ln \left( \frac{\theta_{Fkj}}{\theta_{Dkj}} \right) - \frac{1}{\sigma_{IMMI}} \ln \left( \frac{F_{kj p}}{D_{kj p}} \right)$$

- The above expression can be estimated by running the following regression with detailed education-by-experience fixed effects:
Effects on Wages

\[ \ln \left( \frac{w_{Fbkjp}}{w_{Dbkjp}} \right) = I_{kj} - \frac{1}{\sigma_{IMMI}} \ln \left( \frac{F_{kjp}}{D_{kjp}} \right) + u_{bkj} \]

- The efficiency parameters, \( \theta \)'s, (normalised to sum to 1) can be estimated as follows:

\[ \hat{\theta}_{Fkj} = \frac{\exp(\hat{I}_{kj})}{1 + \exp(\hat{I}_{kj})} \text{ and } \hat{\theta}_{Dkj} = \frac{1}{1 + \exp(\hat{I}_{kj})} \]

- The estimated \( \sigma_{IMMI} \), \( \theta_{Fkj} \) and \( \theta_{Dkj} \) are then used to construct the aggregate labour input \( N_{kj} \) using the expression:

\[ \hat{N}_{kjp} = \left[ \hat{\theta}_{Dkj} \frac{\hat{\sigma}_{IMMI}^{-1}}{\hat{\sigma}_{IMMI}^{-1}} + \hat{\theta}_{Fkj} \frac{\hat{\sigma}_{IMMI}^{-1}}{\hat{\sigma}_{IMMI}^{-1}} \right] + \frac{\hat{\sigma}_{IMMI}}{\hat{\sigma}_{IMMI}^{-1}} \]

Note that the \( D_{kjp} \) and \( F_{kjp} \) are observed in the sample.
Effects on Wages

Table 3.1: Regression Estimates of the Elasticity of Substitution Parameters

<table>
<thead>
<tr>
<th></th>
<th>$\sigma_{IMMI}$</th>
<th>$\sigma_{EXP}$</th>
<th>$\sigma_{LL}$</th>
<th>$\sigma_{HH}$</th>
<th>$\sigma_{HL}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>-0.016</td>
<td>-0.037</td>
<td>-0.006</td>
<td>-0.061</td>
<td>-0.101*</td>
</tr>
<tr>
<td>(2)</td>
<td>(0.021)</td>
<td>(0.028)</td>
<td>(0.037)</td>
<td>(0.073)</td>
<td>(0.055)</td>
</tr>
</tbody>
</table>

Inverse Elasticity Estimate

| Elasticity of Substitution | $\hat{\sigma}_{IMMI} = 60.85$ | $\hat{\sigma}_{EXP} = 26.77$ | $\hat{\sigma}_{LL} = 162.51$ | $\hat{\sigma}_{HH} = 16.50$ | $\hat{\sigma}_{HL} = 9.90$ |

Fixed Effects:

- **Education×Experience**: Yes, Yes, No, No, No
- **Education×Province**: No, Yes, No, No, No
- **Province**: No, Yes, Yes, Yes, Yes
- **Observations**: 111, 880, 75, 76, 75
- **R-Squared**: 0.117, 0.959, 0.053, 0.440, 0.588

*** p<0.01, ** p<0.05, * p<0.1
Note: Robust standard errors in parentheses.
Effects on Wages

- The relative magnitudes of the estimates do make sense

- Using these estimates together with data on wages and supplies of each skill group, we can simulate the effects on Thai wages of any immigrant supply shocks using the following expression:

\[
\frac{\Delta w_{Dbkjp}}{w_{Dbkjp}} = \frac{1}{\hat{\sigma}_{HH}} \sum_{c \in B} \sum_{q \in E} \sum_{i=1}^{3} \frac{w_{Fcqip}F_{cqip}}{\bar{w}_p N_p} \frac{\Delta F_{cqip}}{F_{cqip}} - \left( \frac{1}{\hat{\sigma}_{HH}} - \frac{1}{\hat{\sigma}_{bb}} \right) \sum_{q \in b} \sum_{i=1}^{3} \frac{w_{Fbqip}F_{bqip}}{\bar{w}_{bp} N_{bp}} \frac{\Delta F_{bqip}}{F_{bqip}} \\
- \left( \frac{1}{\hat{\sigma}_{bb}} - \frac{1}{\hat{\sigma}_{EXP}} \right) \sum_{i=1}^{3} \frac{w_{Fbkip}F_{bkip}}{\bar{w}_{kp} N_{kp}} \frac{\Delta F_{bkip}}{F_{bkip}} - \left( \frac{1}{\hat{\sigma}_{EXP}} - \frac{1}{\hat{\sigma}_{IMMI}} \right) \sum_{q \in b} \sum_{i=1}^{3} \frac{w_{Fbqip}F_{bqip}}{\bar{w}_{bp} N_{bp}} \frac{\Delta F_{bqip}}{F_{bqip}}
\]

- The effects on foreign wages is simulated by

\[
\frac{\Delta w_{Fbkjp}}{w_{Fbkjp}} = \frac{\Delta w_{Dbkjp}}{w_{Dbkjp}} - \frac{1}{\sigma_{IMMI}} \frac{\Delta F_{bkjp}}{F_{bkjp}}
\]
Effects on Wages

- Simulated doubling of foreign labour force across all skill groups yields the following wage responses

<table>
<thead>
<tr>
<th>Schooling</th>
<th>Experience (Years)</th>
<th>Foreign Wage Change %</th>
<th>Thai Wage Change %</th>
<th>Foreign Wage Change %</th>
<th>Thai Wage Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Primary</td>
<td>0-14</td>
<td>-2.13</td>
<td>-0.49</td>
<td>-1.94</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>15-29</td>
<td>-1.77</td>
<td>-0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 plus</td>
<td>-1.02</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Primary</td>
<td>0-14</td>
<td>-2.49</td>
<td>-0.85</td>
<td>-2.45</td>
<td>-0.79</td>
</tr>
<tr>
<td></td>
<td>15-29</td>
<td>-2.42</td>
<td>-0.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 plus</td>
<td>-2.40</td>
<td>-0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>0-14</td>
<td>-1.09</td>
<td>0.55</td>
<td>-1.09</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>15-29</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>30 plus</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>College</td>
<td>0-14</td>
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<tr>
<td></td>
<td>30 plus</td>
<td></td>
<td></td>
<td>0.57</td>
<td></td>
</tr>
</tbody>
</table>

Note: The percentage of Immigrant to total hours supplied prior to simulated shocks in the top 5 provinces is 9.69%
Effects on Wages

- Even a small degree of imperfect substitutability between native and foreign workers can cause substantial differences in wage responses.
- Immigration adversely affect wages of foreign workers much more than those of low-skilled Thais.
- Inflows of low-skilled immigrants found to raise the productivity of high-skilled natives.
- Younger workers are found to suffer greater wage losses than older workers since most immigrants are from the younger groups.