The Elasticity of the Migrant Labour Supply: Evidence from Temporary Filipino Migrants

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Online appendix

This online appendix provides details on the model and the estimation equations discussed in the paper, as well as supplemental tables referenced in the main text.

A.1. The market for temporary migrant labor

Let \( m_{jt} \) represent the number of migrants that move on a temporary basis from an origin country to the destination country \( j = 1, \ldots, N \) at time \( t = 1, \ldots, T \), and let \( w_t = (w_0, w_1, \ldots, w_N)^T \) and \( c_t = (c_0, c_1, \ldots, c_N)^T \) be two vectors that gather migrants’ wages and bilateral migration costs and time \( t \). The inverse demand function for temporary migrant labour is given by:

\[
\frac{w_{jt}}{a_j y_{jt}} = \frac{m_{jt}}{c_{jt}} \quad (A.1)
\]

where \( y_{jt} \) is the real GDP in country \( j \) at time \( t \), and \( a_j \) is a time-invariant parameter that shifts the inverse labour demand in destination \( j \). The supply of migrant labour can be derived from an underlying static random utility maximisation model that describes the location-decision problem that potential migrants face, which represents the standard micro-foundation of a gravity equation for migration (Beine et al., 2016). Specifically, if the deterministic component of utility \( V_{jt} \) depends on the logarithm of the wage \( w_{jt} \) and on bilateral migration costs \( c_{jt} \), that is, \( V_{jt} = \beta \ln(w_{jt}) - c_{jt} \), then the distributional assumptions in Mcfadden (1974) on the individual-specific stochastic component \( \epsilon_{jt} \) allow to write the expected value of the labour supply \( m_{jt} \) as follows:

\[
E(m_{jt}) = w_{jt}^\beta e^{-c_{jt} - \Omega(w_t, c_t)} n_t, \quad (A.2)
\]

where \( n_t \) is the size of the population at origin, and:

\[
\Omega(w_t, c_t) = \ln \left( \sum_{k=0}^{N} w_{kt}^\beta e^{-c_{kt}} \right)
\]
represents the expected value from the choice situation that potential migrants face at time $t$ (Small and Rosen, 1981). The function $\Omega(w_t, c_t)$ in Equation (A.2), which describes the influence exerted by the attractiveness of all countries on the expected value of the migrant labour supply to destination $j$ at time $t$, varies over time but it is invariant across destinations.

### A.1.1. The elasticity of the labour supply.

We can recover the elasticity of the migrant labour supply from Equation (A.2) assuming, by the law of large numbers, that $E(m_{jt}) = m_{jt}$. We have that:

$$\frac{\partial \ln(m_{jt})}{\partial \ln(w_{jt})} = \beta(1 - p_{jt}).$$

(A.3)

The elasticity in Equation (A.3) depends on the actual migration rate $p_{jt} = m_{jt}/n_t$ between the origin and each destination at time $t$. In practice, $p_{jt}$ will be very small for any $j = 1, \ldots, N$ and any $t = 1, \ldots, T$ since only a tiny fraction of the Filipino population migrates to a single destination in a given year, so that $\beta(1 - p_{jt}) \approx \beta$, and we will be referring to $\beta$ as the labour supply elasticity, even though formally it is just an upper bound of the true elasticity.

We can rearrange the terms in Equations (A.1) and (A.2) to obtain (a logarithmic transformation of) the inverse demand function $D_j(y_{jt})$ and the inverse supply function $S_j(w_t, c_t)$ for migrant labour in destination $j$, as:

$$D_j(y_{jt}) = \ln(a_j) + \alpha \ln(y_{jt}) - \phi \ln(m_{jt}),$$

(A.4)

and:

$$S_j(w_t, c_t) = \beta^{-1} \left[ \ln(m_{jt}) + c_{jt} + \Omega(w_t, c_t) - \ln(n_t) \right].$$

(A.5)

We can observe from Equation (A.5) that $S_k(w_t, c_t) = S_j(w_t, c_t) + \beta^{-1} (c_{kt} - c_{jt})$, that is, the inverse supply functions for two destinations differ only by a term which is proportional to the difference in the bilateral migration costs.

### A.1.2. Reduced form regressions.

We can derive the following reduced-form regression that gives us the elasticity of the scale of migration with respect to the real GDP at destination combining Equations (A.1) and (A.2) with $E(m_{jt}) = m_{jt}$:

$$\ln(m_{jt}) = \frac{\alpha \beta}{1 + \phi \beta} \ln(y_{it}) - \frac{1}{1 + \phi \beta} \left[ \Omega(w_t, c_t) + c_{jt} - \ln(n_t) \right] + \frac{\beta}{1 + \phi \beta} \ln(a_j) + \epsilon_{jt}^m.$$  

(A.6)

Similarly, the reduced-form regression that gives us the elasticity of migrants’ wages with respect to the real GDP at destination can be written as:

$$\ln(w_{jt}) = \frac{\alpha}{1 + \phi \beta} \ln(y_{it}) - \frac{\phi}{1 + \phi \beta} \left[ \Omega(w_t, c_t) + c_{jt} - \ln(n_t) \right] + \frac{1}{1 + \phi \beta} \ln(a_j) + \epsilon_{jt}^w.$$  

(A.7)

Under the assumption that the bilateral migration costs can have different levels across destinations but follow an identical time profile, then the two elasticities of interest can be identified through the estimation of the following two equations:

$$\ln(m_{jt}) = \psi_m \ln(y_{it}) + \beta_m d_j + \gamma_m d_t + \epsilon_{jt}^m,$$  

(A.8)
and:

\[
\ln(w_{jt}) = \psi_w \ln(y_{jt}) + \beta_w d_j + \gamma_j d_t + \epsilon_{jt},
\]

where \(w_{jt}\) in Equation (A.9) is either the mean or the median wage earned by the \(m_{jt}\) migrants and \(d_j\) and \(d_t\) are two vectors of destination and time dummies. Destination dummies \(d_j\) control for the dyadic time-invariant component \(c_j\) of migration costs, and for the \(\ln(a_j)\) in Equation (A.4) that influences the level of the demand for temporary migrant labour. Time dummies \(d_t\) control for the factors that exert a time-varying influence on \(\ln(m_{jt})\) and \(\ln(w_{jt})\) for any \(j = 1, \ldots, N\), such as demographic factors at origin or variations in macroeconomic conditions in all potential destinations and at origin.

It is then immediate from Equations (A.6)–(A.9) to recover an estimate of the labour supply elasticity parameter \(\beta\) in Equation (A.3) as:

\[
\hat{\beta} = \frac{\hat{\psi}_m}{\hat{\psi}_w}.
\]

### A.2. Additional specifications

**Table A.1.** Median wages

| Specification | Restricted | Restricted | Unrestricted |
|---------------|------------|------------|--------------|
| Variables     | (1)        | (2)        | (3)          |
| Log GDP       | -0.06      | 0.61**     | 0.78***      |
|               | [0.16]     | [0.23]     | [0.05]       |
| Observations  | 967        | 967        | 967          |
| Adjusted R²   | 0.72       | 0.96       | 0.98         |
| Country dummies | Yes       | Yes       | Yes          |
| Year dummies  | Yes        | Yes        | Yes          |
| Weights       | No         | Yes        | Yes          |
| H₀: (2) nested in (3)a; F-test |           | 5.73***     |              |
| (p-value)     |           | (0.00)     |              |
| H₀: \(\hat{\psi}_w^{(2)} = \hat{\psi}_w^{(3)}\); Chitest |           | 0.49        |              |
| (p-value)     |           | (0.48)     |              |

**Notes:** *** \(p < 0.01\), ** \(p < 0.05\), * \(p < 0.10\); standard errors clustered at the country level in brackets for specifications (1) and (2); specification (1) corresponds to Table 2, Panel A in McKenzie et al. (2014); observations in specifications (2) and (3) are weighted by \(m_{jt}\). a (2) and (3) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants.

**Source:** Authors’ elaboration on the replication data from McKenzie et al. (2014).
### Table A.2. Mean wages by gender

| Specification | Restricted | Restricted | Unrestricted |
|---------------|------------|------------|--------------|
| **Variables** |            |            |              |
| **Panel A: Male sample** |            |            |              |
| Log GDP | -0.03   | 0.46***  | 0.33***   |
| (0.12) | [0.13] | [0.09] |           |
| H0: (2) nested in (3)*; F-test | 8.47*** | (0.00) |           |
| (p-value) |            |            |              |
| H0: $\psi_{w}(2) = \psi_{w}(3)$; Chi² test | 0.64 | (0.42) | |
| (p-value) |            |            |              |
| Observations | 930     | 930       | 930         |
| Adjusted R² | 0.67     | 0.92      | 0.96        |
| **Panel B: Female sample** |            |            |              |
| Log GDP | 0.04    | 0.46***  | 0.34***   |
| (0.21) | [0.16] | [0.05] |           |
| H0: (2) nested in (3)*; F-test | 4.89*** | (0.00) |           |
| (p-value) |            |            |              |
| H0: $\psi_{w}(2) = \psi_{w}(3)$; Chi² test | 0.46 | (0.50) | |
| (p-value) |            |            |              |
| Observations | 901     | 901       | 901         |
| Adjusted R² | 0.75     | 0.98      | 0.98        |
| Country dummies | Yes     | Yes       | Yes         |
| Year dummies | Yes     | Yes       | Yes         |
| Weights | No       | Yes       | Yes         |

**Notes:** *** p < 0.01, ** p < 0.05, * p < 0.10; standard errors clustered at the country level in brackets for specifications (1) and (2); specification (1) corresponds to Table 2, Panels B and C in McKenzie et al. (2014); observations in specifications (2) and (3) are weighted by the gender-specific number of migrants $m_{jt}$; * (2) and (3) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants.

**Source:** Authors’ elaboration on the replication data from McKenzie et al. (2014).
| Specification | Restricted | Restricted | Unrestricted |
|---------------|------------|------------|--------------|
| **Panel A: Male sample** | | | |
| Log GDP | -0.02 | 0.45** | 0.19* |
| (p-value) | [0.15] | [0.18] | [0.10] |
| H₀: (2) nested in (3)⁶; F-test | | | 8.93*** |
| (p-value) | (0.00) | | |
| H₀: ψ⁽²⁾ᵵ₀ = ψ⁽³⁾ᵵ₀; Chi² test | | | 1.66 |
| (p-value) | | | (0.20) |
| Observations | 930 | 930 | 930 |
| Adjusted R² | 0.65 | 0.89 | 0.95 |
| **Panel B: Female sample** | | | |
| Log GDP | -0.05 | 0.51*** | 0.35*** |
| (p-value) | [0.23] | [0.18] | [0.06] |
| H₀: (2) nested in (3)⁶; F-test | | | 4.29*** |
| (p-value) | (0.00) | | |
| H₀: ψ⁽²⁾ᵵ₀ = ψ⁽³⁾ᵵ₀; Chi² test | | | 0.58 |
| (p-value) | | | (0.45) |
| Observations | 901 | 901 | 901 |
| Adjusted R² | 0.74 | 0.97 | 0.98 |
| Country dummies | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes |
| Weights | No | Yes | Yes |

**Notes:** *** p < 0.01, ** p < 0.05, * p < 0.10; standard errors clustered at the country level in brackets for specifications (1) and (2); specification (1) corresponds to Table 2, Panels B and C in McKenzie et al. (2014); observations in specifications (2) and (3) are weighted by the gender-specific number of migrants mᵵₘ; ⁶ (2) and (3) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants.

**Source:** Authors’ elaboration on the replication data from McKenzie et al. (2014).
### Table A.4. Migration regression by gender

Dependent variable:

\[ \ln(m_{jt}) \]

| Specification | Restricted | Unrestricted |
|---------------|------------|--------------|
| Variables     | (1)        | (2)          |

**Panel A: Male sample**

| Variable       | Coefficient | Standard Error | F-test | p-value |
|----------------|-------------|----------------|--------|---------|
| Log GDP        | 1.15**      | 0.53           | 5.72***| 0.00    |
|                |             |                |        |         |
| \( H_0: (1) \text{ nested in } (2) \) |             |                |         |         |
| \( p \)-value  |             |                | (0.00) |         |
| \( H_0: \hat{\psi}_m^{(1)} = \hat{\psi}_m^{(2)} \) | 7.14***     |                | (0.01) |         |

| Observations   | 972         | 972           |
| Adjusted R²    | 0.82        | 0.89          |

**Panel B: Female sample**

| Variable       | Coefficient | Standard Error | F-test | p-value |
|----------------|-------------|----------------|--------|---------|
| Log GDP        | 1.98***     | 0.62           | 5.99***| 0.00    |
|                |             |                |        |         |
| \( H_0: (1) \text{ nested in } (2) \) |             |                |         |         |
| \( p \)-value  |             |                | (0.00) |         |
| \( H_0: \hat{\psi}_m^{(1)} = \hat{\psi}_m^{(2)} \) | 0.62        |                | (0.43) |         |

| Observations   | 972         | 972           |
| Adjusted R²    | 0.90        | 0.93          |
| Country dummies| Yes         | Yes           |
| Year dummies   | Yes         | Yes           |

Notes: *** \( p < 0.01 \), ** \( p < 0.05 \), * \( p < 0.10 \); standard errors clustered at the country level in brackets for specification (1); specification (1) corresponds to Table 2, Panels B and C in McKenzie et al. (2014); \( ^a \) (1) and (2) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants. Source: Authors’ elaboration on the replication data from McKenzie et al. (2014).
Table A.5: Mean wages, omitting Japan

| Specification | Restricted | Restricted | Unrestricted |
|---------------|------------|------------|--------------|
| **Variables** |            |            |              |
| log GDP       | -0.07      | 0.58***    | 0.50***      |
|               | [0.14]     | [0.15]     | [0.07]       |
| Observations  | 949        | 949        | 949          |
| Adjusted R²   | 0.73       | 0.90       | 0.94         |
| Country dummies | Yes    | Yes     | Yes          |
| Year dummies  | Yes        | Yes       | Yes          |
| Weights       | No         | Yes       | Yes          |
| H₀: (2) nested in (3)a; F-test | | | 6.99*** |
| (p-value)     |            |            | (0.00)       |
| H₀: $ψ_2(2) = ψ_3(3)$; Chi² test | | | 0.19 |
| (p-value)     |            |            | (0.67)       |

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; standard errors clustered at the country level in brackets for specifications (1) and (2); observations in specifications (2) and (3) are weighted by $m_{jt}$; a (2) and (3) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants.

Source: Authors’ elaboration on the replication data from McKenzie et al. (2014).

Table A.6: Median wages, omitting Japan

| Specification | Restricted | Restricted | Unrestricted |
|---------------|------------|------------|--------------|
| **Variables** |            |            |              |
| log GDP       | -0.09      | 0.79***    | 0.68***      |
|               | [0.16]     | [0.18]     | [0.08]       |
| Observations  | 949        | 949        | 949          |
| Adjusted R²   | 0.70       | 0.89       | 0.94         |
| Country dummies | Yes    | Yes     | Yes          |
| Year dummies  | Yes        | Yes       | Yes          |
| Weights       | No         | Yes       | Yes          |
| H₀: (2) nested in (3)a; F-test | | | 9.03*** |
| (p-value)     |            |            | (0.00)       |
| H₀: $ψ_2(2) = ψ_3(3)$; Chi² test | | | 0.25 |
| (p-value)     |            |            | (0.62)       |

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; standard errors clustered at the country level in brackets for specifications (1) and (2); observations in specifications (2) and (3) are weighted by $m_{jt}$; a (2) and (3) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants.

Source: Authors’ elaboration on the replication data from McKenzie et al. (2014).
Notes

1. We let $w_0$ denote the wage in the origin country at time $t$, and we normalise the cost of staying $c_0$ to zero.
2. We thus assume that $c_j$ follows an independent and identically distributed Extreme Value Type-1 distribution.
3. Formally, we assume that $c_j = c_j + f_t$ for all $j \in D$; this assumption implies that the difference between $S_j(w, c_j)$ and $S_j(w, c_k)$, with $j, k \in D$, is time-invariant.

References

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Table A.7. Migration regression omitting Japan

| Specification | Restricted | Unrestricted |
|---------------|------------|--------------|
| Variables     | (1)        | (2)          |
| log GDP       | 1.34***    | 3.45***      |
| Observations  | 954        | 954          |
| Adjusted R²   | 0.85       | 0.89         |
| Country dummies | Yes   | Yes          |
| Year dummies  | Yes        | Yes          |
| $H_0$: (1) nested in (2) $^a$, F-test | 4.77*** | (0.00) |
| ($p$-value)    |            |              |
| $H_0^$: $\psi_m^{(1)} = \psi_m^{(2)}$, Chi² test | 5.97** | (0.02) |

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$; standard errors clustered at the country level in brackets for specification (1); $^a$ (1) and (2) refer to the specification in the table. The restricted version of the estimation equation assumes that all destination countries are equally substitutable for potential migrants. The unrestricted version allows for different patterns of substitution across destinations for potential migrants. Source: Authors’ elaboration on the replication data from McKenzie et al. (2014).