# Heterogeneous Trade Elasticity and Managerial Skills

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– Very preliminary –

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# Motivation

- **Macro puzzle**: low real exchange rate RER elasticity of aggregate exports compared to other shocks (Goldberg and Knetter, 1997, Goldberg and Campa, 2010, Hooper et al., 2000, Ruhl, 2008, Fontagné et al. 2018).

- **Possible explanation**: high performing firms are are less elastic to RER shocks, and are those that explain most of aggregate trade flows (Bernard et al., 2007; Mayer and Ottaviano, 2007, Fernandes et al., 2021).

- Heterogeneous trade elasticities that depend on firm productivity, marginal costs and quality can explain part of this macro puzzle (Berman et al., 2012, Amiti et al., 2014, Chen and Juvenal, 2016, among others).

- We investigate the role played by firms' workforce composition on the heterogeneous reaction of exporting firms to RER changes.

# Main Idea

In case of depreciation, all exporters benefit from a fall in the relative cost of production and increase their markup (i.e. pricing-to-market).

$$\Downarrow$$

Firms that devote more resources to management earn more profits ($\downarrow$ coordination costs) and have higher margins.

$$\Downarrow$$

They absorb more exchange rate shocks in their prices and have a smaller response in their export volume.

# Contribution

- **What do we do**: study the role of firm's workforce composition (namely the share of managers) in shaping firms' pricing-to-market strategy and incomplete RER pass-through.

- **Contributions**:
    - New explanation to the trade elasticity puzzle (Ruhl 2008).
    - First evidence on the role of workforce composition to pass-through.
    - Control for competing explanations: firm productivity, imported inputs, marginal costs and quality.

- **Policy contribution**: better understanding of the aggregate consequences of foreign shocks.

# Literature and contribution

- **Management practices and firm performances:** well-managed firms have larger revenues, productivity gains, superior export performances.

  Bloom and Van Reenen (2007); Bloom and Van Reenen (2011); Bloom et al. (2013); Caliendo et el. (2020); Bloom et al. (2021).

  ⇒ Link well-managed firms to heterogeneous markup and RER pass-through.

- **Pricing-to-market and firm performance:** large and high-productive firms have stronger pricing-to-market (i.e. larger export price elasticity).

  Berman et al. (2012); Chatterjee et al. (2013); Amiti et al. (2014).

  ⇒ Workforce composition (also) matters!

- **Pricing-to-market and quality:** pass-through falls with product quality.

  Auer and Chaney (2009); Chatterjee et al. (2010); Chen and Juvenal (2016); Antoniades and Zaniboni (2016); Bernini and Tomasi (2016); Auer et al. (2018).

  ⇒ Managerial intensity behind product quality.

# Preview of results

After a depreciation of the real exchange rate, managerial intensive firms increase more their export price. A 10% exchange rate depreciation leads:

- Firms with sample-average managerial intensity to raise its export price (in euro) by 0.8% → average pass-through 92% (as in Berman et al. 2012).

- Firms with higher managerial intensity (one standard deviation above the average) increase their export price by 1.2% → pass-through for managerial intensive firms is 88%.

- 3% increase in export quantity for the average firms and 2% for managerial intensive firms.

# Outline

1. Theoretical motivation.

2. Data and descriptive evidence.

3. Identification strategy.

4. Results:
   - Baseline.
   - Robustensss checks.
   - Controlling for alternative mechanisms.

5. Conclusion.

6. Next steps.

# Theoretical Motivation

Heterogeneous pricing-to-market can emerge in different classes of trade models:

1. **Linear Demand System** (Melitz and Ottaviano, 2008).
   - The price elasticity of demand increases with price faced by consumers.
   - High-performing (i.e. low-price) firms face lower demand elasticity.
   - ↑ RER (i.e. fall in production costs) ⇒ ↓ in the price faced by consumers.
   - Exporters increase their markup, and the more so high-performing firms.

2. **Imperfect Competition à la Cournot** (Atkeson and Burstein, 2008).
   - High-performance firms have larger market shares and face lower demand elasticity (i.e. approaching the elasticity across sectors).
   - ↑ RER (i.e. fall in production costs) ⇒ High-performing firms increase their market share and increase markup.

# Theoretical Motivation

- Extend Melitz and Ottaviano (2008) – MO – to rationalize the channels through which managerial intensity affects firms' pricing-to-market.

- Continuum of firms $i$ producing output $q$ by a linear production function of unskilled labor $l$:
$$q_i = \theta_i l_i \tag{1}$$

- $\theta_i$ is the productivity of unskilled workers in production, and depends on marginal costs $c_i$ (as in MO) and managerial intensity of the workforce $\lambda_i$:
$$\theta_i = f(\lambda_i, c_i) = \frac{\lambda_i}{c_i} \tag{2}$$

- Managers contribute to firm productivity by reducing coordination costs and increasing firm efficiency through a better organization of the production process across inputs (Bao et al. 2022).

# Theoretical Motivation

- With quasi-linear quadratic utility function, the inverse demand for each variety exported to country $j$ is:

$$p_j/\epsilon_j = \alpha - \gamma q_j - \beta Q_j \qquad (3)$$

- where:
  - $\epsilon_j$ is the nominal exchange rate between the home and foreign country $j$.
  - $q_j$ is the individual consumption of a variety.
  - $Q_j$ is total consumption in country $j$.

# Theoretical Motivation

- The optimal export quantity $q_{ij}$ and price $p_{ij}$ set by a firm $i$ after profit maximization are determined by:

$$q_{ij}(c_i, \lambda_i) = \frac{Lw\tau_j}{2\epsilon_j\gamma}\left[\theta^* - \theta_i\right] \qquad p_{ij}(c_i, \lambda_i) = \frac{\tau_j w}{2}\left[\theta^* + \theta_i\right]$$

- Where $\theta^* = \frac{c_i^*}{\lambda_i^*} = \frac{e_j(\alpha - \beta Q_j)}{w_j \tau_j}$ is the firm efficiency threshold for which operating export profits in market $j$ are zero, $\tau_j$ are trade variable costs faced by firms when exporting to country $j$ and $w$ is the wage in home country.

- $e_j = \epsilon_j w_j / w$ is the Real Exchange Rate between home and destination $j$. With $w_j$ the wage in country $j$, and $\epsilon_j$ the nominal exchange rate.

# Theoretical Motivation

- When all exporters in the home country benefit from a fall in the relative cost of production (i.e. $\uparrow e_j = \epsilon_j w_j / w$), the price faced by consumer at destination falls and exporters react by increasing their markup $\rightarrow$ Pricing-to-market and incomplete pass-through.

- The elasticity of export prices to real exchange rate is positive and increases with firm managerial intensity:

$$\eta_{p_j(\lambda_i)} = \frac{dp_j(\lambda_i)}{de_j} \frac{e_j}{p_j(\lambda_i)} = \frac{\frac{\lambda_i}{c_i}}{\frac{\lambda_i}{c_i} + \theta^*} \tag{4}$$

- The elasticity of export quantity to real exchange rate depreciation decreases with managerial intensity:

$$\eta_{q_j(\lambda_i)} = \frac{dq_j(\lambda_i)}{de_j} \frac{e_j}{q_j(\lambda_i)} = \frac{\theta^*}{\frac{\lambda_i}{c_i} - \theta^*} \tag{5}$$

# Theoretical Motivation

**Testable implications:**

1. Firms with higher managerial intensity have larger export price elasticity to real exchange rate variations.

2. The elasticity of export prices to real exchange rate also increases with firm efficiency measured by the inverse of marginal costs $(1/c_i)$.

3. For a given level of marginal cost $c_i$, the elasticity of export quantity to real exchange rate decreases with managerial intensity of the firm $\lambda_i$.

# Empirical Motivation
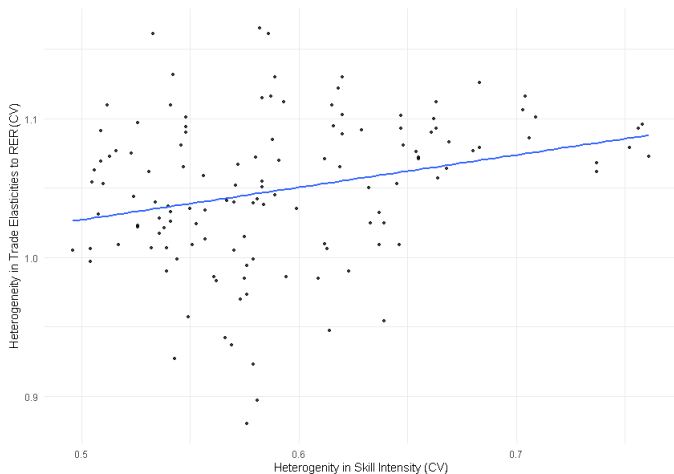
Note: CV firms' export growth in $jt$ normalized by % change in RER (vertical axis).
CV firms skilled share in $jt$ (horizontal axis).

# Data

1. **French Customs Data:** values (in euro) and quantities (volume in tons) exported by the firm at the product level (8-digit Combined Nomenclature), which we translate into 6-digit Harmonized System (HS6), and destination country over the period 1995-2008.

2. **Déclaration Annuelle des Données Sociales (DADS):** matched employer-employee information collected by the INSEE. It contains information on the employment at the level of the firm, and the occupation category of its workers (4-digit of the PCS classification).

3. **Macroeconomic variables:** GDP and real exchange rate are computed from the Penn World tables and the IMF's International Financial Statistics.

# Data

We build our main proxy for the managerial intensity of firms based on the PCS 2-digit occupation of workers:

1. Sales managers: "*37, Cadres administratifs et commerciaux d'entreprise*".

2. Engineers and business technical executives: "*38, Ingénieurs et cadres techniques d'entreprise*"

3. We rely on the share of firm's managers (1 and 2) in the total workforce in the initial year 1995.

4. As a robustness check we use sales managers only.

# In-sample statistics

| Variable | | Obs | Mean | Median | Std. Dev |
|---|---|---|---|---|---|
| # employees | | 194,457 | 144.3 | 38 | 757.7 |
| Managers ratio (37+38) | | | | | |
| | Managers share | 194,457 | 12% | 7.8% | 14.4% |
| | Managers share$_{95}$ | 155,698 | 9.2% | 5.8% | 11.6% |
| Managers ratio (37) | | | | | |
| | Managers share | 194,457 | 5.2% | 2.2% | 9.3% |
| | Managers share$_{95}$ | 155,698 | 4.1% | 1.6% | 7.9% |

Note: the sample includes only firms with at least one non-Eurozone transaction.

# Empirical strategy

**Firms' pricing-to-market depending on their managerial intensity:**

$$\ln UV_{ipct} = \alpha_1 \ln RER_{ct} + \alpha_2 \ln M_{i,95} \times \ln RER_{ct} + \alpha_3 Rank_{ipct} + \theta_{ipc} + \mu_t + \nu_{ipct}$$

- subscript $i$, $p$, $c$ and $t$ stand respectively for firms, product, destination, year.
- $UV_{ipct}$ is the firm-product-destination export unit values.
- $M_{i,95}$ is the firm's managerial intensity in the initial year (normalized).
- $RER_{ct}$ is the real exchange rate $\epsilon_j P_j / P$ (so $\uparrow RER_{ct}$ means depreciation).
- $Rank_{ipct}$ is the rank of each product exported by a firm to each destination market in total firm's exports towards each destination.
- $\theta_{ipc}$ firm-product-destination fixed effects.
- $\mu_t$ year fixed effects.

# RER and the export price of firms

| Dep var: | Ln(export price) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $RER_{ct}$ (ln) | 0.032 | 0.038 | 0.084*** |
| | (0.024) | (0.024) | (0.022) |
| $RER_{ct}$ (ln) $\times M_{i,95}$ | 0.038*** | 0.037*** | 0.033*** |
| | (0.011) | (0.011) | (0.011) |
| $Rank_{ipt}$ | | -0.004*** | -0.003*** |
| | | (0.000) | (0.000) |
| $RER_{ct}$ (ln) $\times Rank_{ipt}$ | | | -0.005*** |
| | | | (0.001) |
| | *Quantification* | | |
| | Price elasticity to 10% RER ↑ for firms: | | |
| with avg $M_{i,95}$ | - | - | 0.8 |
| with one s.d. $M_{i,95}$ above avg | 0.4 | 0.4 | 1.2 |
| Firm-Product-Destination FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| $R^2$ | 0.897 | 0.897 | 0.897 |
| Adj. $R^2$ | 0.867 | 0.867 | 0.867 |
| Observations | 2408291 | 2408291 | 2408291 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. *** , **, * denotes statistically significance at the 1%, 5% and 10% level, respectively.

# Robustness tests

Previous results are robust to:

1. **Strategic complementary in prices:** firms increase their price in response to an increase in the price of competitors (Amiti et al. 2019). ▸ More

2. **Sample selection:** to reduce the endogeneity concern, the measure of managerial intensity is obtained for the initial year of the sample (1995). Alternative measures of skilled managerial intensity based on the first year in which the firm appears in the estimating sample. ▸ More

3. **Alternative definition of managers:** PCS category 37 only. ▸ More

4. **The role of managers' quality:** is it rather the quality of the managers in the firm that matters? ▸ More

# Alternative explanations

**Our results are robust to alternative explanations of heterogeneous pricing-to-market behavior of firms.**

1. Firm productivity (value added per worker excluding managers).
   ⇒ High-productive firms have stronger pricing-to-market (Berman et al. 2012).

2. Output quality (demand shifter as in Khandelwal et al. 2013).
   ⇒ Pass-through falls with product quality (Amiti et al. 2014).

3. Import RER shock.
   ⇒ Managerial intensive firms may have different composition of imported input and being exposed differetly to import weighted firm level RER.

# Alternative explanations

| Dep var: | Ln(export price) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $RER_{ct}$ | 0.033 | 0.085*** | 0.037 | 0.090*** | 0.035 | 0.087*** |
| | (0.024) | (0.022) | (0.024) | (0.022) | (0.024) | (0.022) |
| $RER_{ct} \times M_{i,95}$ | 0.048*** | 0.043*** | 0.050*** | 0.044*** | 0.051*** | 0.046*** |
| | (0.014) | (0.014) | (0.012) | (0.012) | (0.012) | (0.012) |
| $RER_{ct} \times Prod._{i,95}$ | 0.004 | 0.004 | | | | |
| | (0.011) | (0.011) | | | | |
| $RER_{ct} \times Quality_{i,95}$ | | | 0.014*** | 0.014*** | | |
| | | | (0.002) | (0.002) | | |
| $RER_{ct} \times ImpRER_{i,95}$ | | | | | -0.284*** | -0.295*** |
| | | | | | (0.064) | (0.064) |
| $Rank_{ipct}$ | | -0.003*** | | -0.003*** | | -0.003*** |
| | | (0.000) | | (0.000) | | (0.000) |
| $RER_{ct}$ (ln) $\times Rank_{ipct}$ | | -0.005*** | | -0.005*** | | -0.005*** |
| | | (0.001) | | (0.001) | | (0.001) |
| Firm-Prod-Dest FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.896 | 0.896 | 0.865 | 0.896 | 0.896 | 0.897 |
| $R^2$ Adj. | 0.866 | 0.867 | 0.865 | 0.866 | 0.867 | 0.867 |
| Observations | 2313539 | 2313539 | 2353919 | 2353919 | 2402755 | 2402755 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. $***$, $**$, $*$ denotes statistically significance at the 1%, 5% and 10% level, respectively.

# Controlling for all channels

| Dep var: | Ln(export price) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $RER_{ct}$ (ln) | 0.085*** | 0.090*** | 0.096*** |
| | (0.022) | (0.022) | (0.022) |
| $RER_{ct}$ (ln) $\times$ $M_{i,95}$ | 0.043*** | 0.039*** | 0.034** |
| | (0.014) | (0.013) | (0.013) |
| $RER_{ct}$ (ln) $\times$ $Productivity_{i,95}$ | 0.004 | 0.006 | 0.007 |
| | (0.011) | (0.011) | (0.011) |
| $RER_{ct}$ (ln) $\times$ $impRER_{i,95}$ | | -0.031*** | -0.030*** |
| | | (0.008) | (0.009) |
| $impRER_{i,95}$ (ln) | | -0.005 | -0.004 |
| | | (0.003) | (0.003) |
| $RER_{ct}$ (ln) $\times$ $Quality_{i,95}$ | | | 0.014*** |
| | | | (0.002) |
| $Rank_{ipct}$ | -0.003*** | -0.003*** | -0.003*** |
| | (0.000) | (0.000) | (0.000) |
| $RER_{ct}$ (ln) $\times$ $Rank_{ipct}$ | -0.005*** | -0.005*** | -0.005*** |
| | (0.001) | (0.001) | (0.001) |
| Firm-Product-Destination FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| $R^2$ | 0.896 | 0.896 | 0.895 |
| $R^2$ Adj. | 0.867 | 0.867 | 0.865 |
| Observations | 2313539 | 2308540 | 2258523 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. \*\*\*, \*\*, \* denotes statistically significance at the 1%, 5% and 10% level, respectively.

# RER and the export volume of firms

**The simple framework also predicts that:**

1. The elasticity of export quantity to real exchange rate depreciation decreases with managerial intensity of the firm.

# RER and the export quantity of firms

| Dep var: | Ln(export volume) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $RER_{ct}$ (ln) | 0.290*** | 0.348*** | 0.324*** | 0.240*** |
| | (0.046) | (0.048) | (0.053) | (0.051) |
| $RER_{ct}$ (ln) $\times M_{i,95}$ | | -0.095*** | -0.120*** | -0.114*** |
| | | (0.020) | (0.023) | (0.023) |
| $GDP_{ct}$ | | | 1.311*** | 1.328*** |
| | | | (0.093) | (0.093) |
| $P_{ct}$ (ln) | | | 0.020 | 0.021 |
| | | | (0.018) | (0.018) |
| $Rank_{ipct}$ | | | -0.057*** | -0.059*** |
| | | | (0.002) | (0.002) |
| $RER_{ct}$ (ln) $\times Rank_{ipct}$ | | | | 0.008** |
| | | | | (0.004) |
| | *Quantification* | | | |
| | Volume elasticity to 10% RER ↑ for firms: | | | |
| with avg $M_{i,95}$ (ln) | 2.9 | 3.5 | 3.2 | 2.4 |
| with one s.d. $M_{i,95}$ (ln) above avg | — | 2.5 | 2.0 | 1.3 |
| Firm-Product-Destination FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| $R^2$ | 0.850 | 0.850 | 0.866 | 0.866 |
| Adj. $R^2$ | 0.808 | 0.808 | 0.827 | 0.828 |
| Observations | 2408291 | 2408291 | 2408291 | 2408291 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. $***$, $**$, $*$ denotes statistically significance at the 1%, 5% and 10% level, respectively.

# Conclusion

**A new and unexplored mechanism through which firm performance affects the heterogeneous reaction of exporters to RER changes:**

- Managerial intensive firms react to a depreciation of the real exchange rate by increasing more their export prices (pricing-to-market).

- A 10% depreciation of the real exchange rate makes firms with sample-average managerial intensity charging 0.8% higher export price.

- A 10% exchange rate depreciation leads firms with higher managerial intensity (one standard deviation above the average) increase their export price by 1.2%.

# Next Steps

- Dig more into the quantity *vs* quality of manager.

- Addressing the issue of multiproduct firms (i.e. restrict the sample to firms exporting only one product into a destination).

- Extensive margin and aggregation.

- Use STEM classification for definition of managers.

Thanks for your attention!

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# Managerial intensity in the initial year

| Dep var: | Ln(export price) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $RER_{ct}$ (ln) | 0.038* | 0.045** | 0.086*** |
| | (0.023) | (0.022) | (0.021) |
| $RER_{ct}$ (ln) $\times M_{i,tmin}$ | 0.047*** | 0.045*** | 0.043*** |
| | (0.011) | (0.011) | (0.011) |
| $Rank_{ipt}$ | | -0.005*** | -0.003*** |
| | | (0.000) | (0.000) |
| $RER_{ct}$ (ln) $\times Rank_{ipt}$ | | | -0.004*** |
| | | | (0.001) |
| Firm-Product-Destination FE | Yes | Yes | Yes |
| Product-Year FE | Yes | Yes | Yes |
| $R^2$ | 0.899 | 0.899 | 0.899 |
| Adj. $R^2$ | 0.869 | 0.869 | 0.869 |
| Observations | 2786566 | 2786566 | 2786566 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. ***, **, * denotes statistically significance at the 1%, 5% and 10% level, respectively.

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# Controlling for the price of competitors

| Dep var: | Ln(export price) | | |
|----------|:----:|:----:|:----:|
| | (1) | (2) | (3) |
| $RER_{ct}$ (ln) | 0.072*** | 0.037 | 0.088*** |
| | (0.024) | (0.027) | (0.025) |
| $Price_{-ipct}$ (ln) | 0.020*** | 0.020*** | 0.019*** |
| | (0.002) | (0.002) | (0.002) |
| $RER_{ct}$ (ln) $\times M_{i,95}$ | | 0.056*** | 0.052*** |
| | | (0.013) | (0.013) |
| $Rank_{ipt}$ | | | -0.003*** |
| | | | (0.000) |
| $RER_{ct} \times Rank_{ipt}$ | | | -0.004*** |
| | | | (0.001) |
| Firm-Product-Destination FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| $R^2$ | 0.892 | 0.892 | 0.893 |
| $R^2$ Adj. | 0.861 | 0.861 | 0.861 |
| Observations | 2176238 | 2176238 | 2176238 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. * * *, **, * denotes statistically significance at the 1%, 5% and 10% level, respectively.

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## Alternative definition of managers

| Dep var: | | Ln(export price) | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $RER_{ct}$ (ln) | 0.057*** | 0.062*** | 0.107*** |
| | (0.022) | (0.022) | (0.020) |
| $RER_{ct}$ (ln) $\times$ $M_{i,95}$ | 0.047*** | 0.046*** | 0.038*** |
| | (0.014) | (0.014) | (0.014) |
| $Rank_{ipt}$ | | -0.004*** | -0.003*** |
| | | (0.000) | (0.000) |
| $RER_{ct}$ (ln) $\times$ $Rank_{ipt}$ | | | -0.005*** |
| | | | (0.001) |
| Firm-Product-Destination FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| $R^2$ | 0.897 | 0.897 | 0.897 |
| $R^2$ Adj. | 0.867 | 0.867 | 0.867 |
| Observations | 2408291 | 2408291 | 2408291 |

Note: Managerial intensity proxy normalized around the average. Core product has rank equal to zero. Robust standard errors clustered by country-destination. ∗∗∗, ∗∗, ∗ denotes statistically significance at the 1%, 5% and 10% level, respectively.

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# The role of managers quality

Quality of managers:

- Estimate mincerian equation (covariates: firm FE, sector FE, occupation FE, worker obsevables).
- Residual of mincerian is proxy for the intrinsic quality of the worker.

| Dep var: | Ln(export price) | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $RER_{ct}$ (ln) | 0.065*** | 0.062*** | 0.067*** | 0.108*** |
| | (0.021) | (0.020) | (0.020) | (0.019) |
| $RER_{ct}$ (ln) $\times$ Manag. Quality$_{i,95}$ | | 0.012* | 0.010 | 0.001 |
| | | (0.007) | (0.007) | (0.008) |
| $Rank_{ipct}$ | | | -0.004*** | -0.003*** |
| | | | (0.000) | (0.000) |
| $RER_{ct}$ (ln) $\times$ $Rank_{ipct}$ | | | | -0.004*** |
| | | | | (0.001) |
| Observations | 2408291 | 2085483 | 2085483 | 2085483 |
| $R^2$ | 0.897 | 0.889 | 0.889 | 0.889 |
| $R^2$ Adj. | 0.867 | 0.859 | 0.859 | 0.859 |

Note: Robust standard errors clustered by country-destination. ***, **, * denotes statistically significance at the 1%, 5% and 10% level, respectively.

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