Jobless Industrialization

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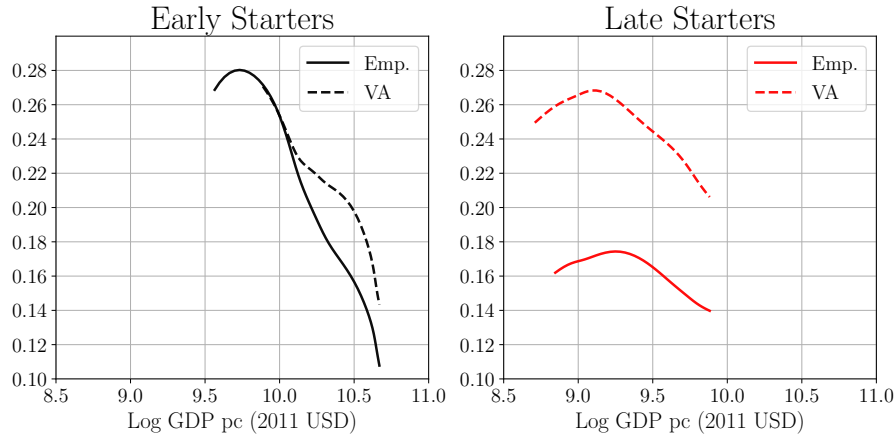
[1] The views expressed in this presentation do not necessarily reflect those of the FRB of Chicago or the Federal Reserve System.

Jobless Industrialization

All Regions

Manufacturing as a Share of the Economy's Employment and Value Added

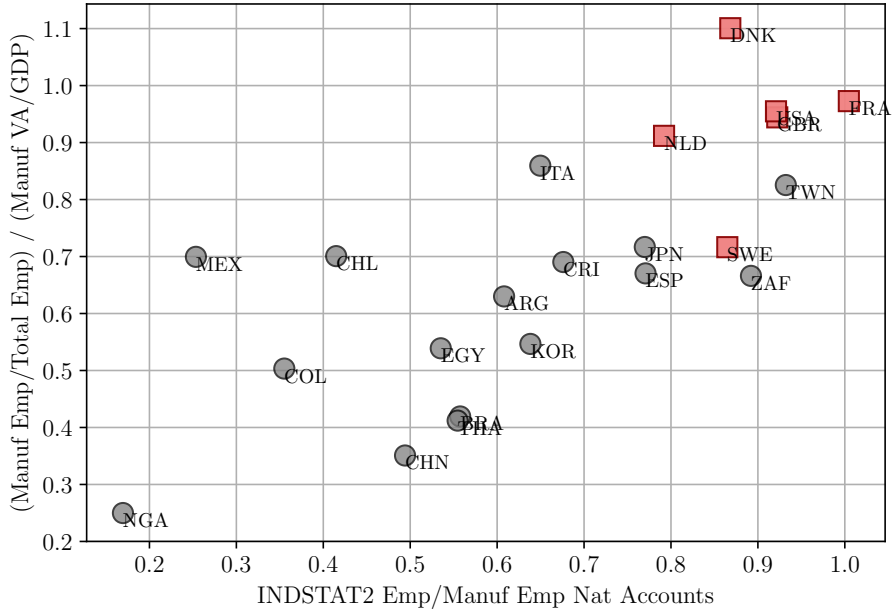


Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; MOxLAD Database. *Early Starters*: Great Britain, United States, Denmark, France, The Netherlands and Sweden. *Late Starters*: Argentina, Brazil, Chile, Colombia, Costa Rica, Egypt, Spain, Indonesia, Italy, Japan, South Korea, Mexico, Mauritius, Malaysia, Nigeria, Phillipines, Thailand, Taiwan and South Africa. Late starters are required to reach a manufacturing value added share over 20% of GDP at some point in their history to stay in sample.

Structural Change Pervasive. . . but Differs for Early and Late Starters

- Employment-generation power of manufacturing across early and late starters:
  - Early starters: shares of manufacturing in value added and employment shares go together along str. transf.
  - Late starters: industrialization in value added without much employment.
- Within manufacturing, cross-firm heterogeneity in degree of joblessness
  - Joblessness concentrated in largest, "modern", firms.
  - Late starters: Few modern

More detailed



Policy relevance

- Joblessness extends to today
- Evidence that much of Latam's productivity gap concentrated in informal (backward) sector (Eslava, 2018, Eslava et al 2023)
- And that within modern manufacturing misallocation plays an important role
- Could this be traced back to a late start of modern sectors that faced them with higher and more distortive regulations than their counterparts in early industrializing economies?
  - Does it suggest a different approach to funding social protection?

This paper

- Build a GE model of the structure of the economy across sectors and types of firms (modern/backward) to evaluate potential of distortions in formal product and input markets to generate jobless manufacturing.
  - With occupational choice: technology operator with modern or traditional technology, salaried worker in modern firm
  - And a detailed module of modern (manufacturing) firms that incorporates a minimum wage and (potentially size-correlated) distortions to revenue, labor and capital that we directly obtain from the data
  - Counterfactuals: how much these distortions needed/enough to generate joblessness? Which of them?
  - At peak of industrialization, when services mostly traditional

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- Build a GE model of the structure of the economy across sectors and types of firms (modern/backward) to evaluate potential of distortions in formal product and input markets to generate jobless manufacturing.
- Inform the modern firm module of the model's quantification with very detailed historical microdata for Colombia going back 50 years (today: focus on 1980s, near future: 1976, peak of industrialization) Colombia
  - Data includes revenue, input use and detailed price data, for all manufacturing establishments of 10+ employees ("modern").
  - Direct data on minimum wage and payroll taxes
  - With that and structure, we back distortions in product and capital market out from revenue and capital-labor ratio wedges in data vs. distortion-free model (Eslava et al 2023 plus additional data).

Related Literature

- Structural Change: Huneeus and Rogerson (2020), Fan, Peters and Zilibotti (2020) in India
  - Premature deindustrialization: Rodrik (2016), Herrendorf et al.(2014, 2022), Fujiwara and Matsuyama (2020), McMillan and Zeufack (2021) for Africa; Sposi et al. (2021) for the role of trade.
  - Early development literature: Lewis (1979), Harris-Todaro (1970)
- Firm heterogeneity in Rich and Poor Countries: Hsieh and Klenow (2009); Bento and Restuccia (2020); Eslava, Haltiwanger and Pinzón (2019); Poshke (2018); Alfaro, Charlton and Kanczuk (2009); Missing Middle: Tybout (2000, 2014);
  - Misallocation: Hsieh and Klenow (2009), Restuccia and Rogerson (2008), Eslava et al. (2023)
- Informality and trade: Dix-Carneiro, et al. (2021)
  - Self-employment: Amodio et al. (2022)
- Micro to Macro: Buera, Kaboski, and Townsend (2021), Buera and Moll (2015), Mestieri et al (2017)

An Occupational Choice Model of Dual Development

Environment: Endowments and Preferences

Endowments

- N agents with heterogeneous ability, a.
- Each agent is endowed with one unit of time.
  - Use time to "manage" a technology (modern or traditional) or become a worker.

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Preferences

- Defined over two goods (manufactured M and non-manufactured NM).

$$U = \left(\phi_M^{\frac{1}{\rho}} C_M^{\frac{\rho-1}{\rho}} + (1-\phi_M)^{\frac{1}{\rho}} C_{NM}^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}}$$

- C_M is a nest of different varieties:
  1. Traditional vs. modern manufactures

$$C_M = \left(\phi_{M,M}^{\frac{1}{\epsilon}} C_{M,M}^{\frac{\epsilon-1}{\epsilon}} + (1-\phi_{M,T})^{\frac{1}{\epsilon}} C_{M,T}^{\frac{\epsilon-1}{\epsilon}} \right)^{\frac{\epsilon}{\epsilon-1}}$$

  2. Varieties within formal manufactures.

$$C_{M,M} = \left(\sum_{i \in N_M} d_i^{\frac{1}{\sigma}} C_{M,M,i}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

Environment: Technology and Markets

Technologies

- Two technologies can be operated: Traditional (T) and Modern (F).
  - All modern technologies are manufacturing firms, but not all manufacturing is modern.
  - Production technologies are mutually exclusive.

$$y_{M,M}(a) = a\left(k(a)^{\alpha} m(a)^{\beta} l(a)^{1-\alpha-\beta}\right)^{\gamma}$$
$$y_T(a) = a.$$

  - Price of T is numerator.
- Distortions exclusively in modern sector
  - Minimum wage payments
  - Taxes on all hired labor (τ^w); capital rents (τ^k) and revenue (τ^R). Heterogeneous across modern firms.

Occupational Choice

Agent, conditional on productivity draw, chooses occupation to maximize income.

$$\max\{a, wa, \pi(a)\}$$

a = income as self employed.
wa = income as worker.
$\pi(a)$ = profits from modern entrepreneurship. **Indifference thresholds**

1. Self employment = $a = wa$ = worker (we can pin down $\bar{a}$.)
2. Entrepreneurial profits = $\pi(a, \tau) = wa$ worker (we can pin down $\hat{a}$.)

Distortions affect these thresholds, and thus the distribution of modern employment.

Outline of the Equilibrium

- Assume price of capital r is exogenous and capital supply is perfectly elastic.
- An equilibrium is given by a wage w, and occupational choices such that:
  - Agents choose their occupation to maximize their income taking wages as given.
  - Firms maximize profits (we allow for variable markups as in HRW or EHU).
  - Labor and goods markets clear.

Quantification

Micro data module

- Annual Manufacturing Survey: R, wl, k, p, p_m, $wl(1+\tau_l)$.
- From 1982 to 1989 (for now)

Modern (manufacturing) firm problem (Eslava et al, 2023)

The firm solves

$$Max_{\{k,l\}} \left(1-\tau^R\right) D^{\frac{1}{\sigma}} d^{\frac{1}{\sigma}} y^{1-\frac{1}{\sigma}} - \left(1+\tau^l\right) wl - \left(1+\tau^K\right) rk - p_m m \tag{1}$$

$$\pi = \left(1-\tau^R\right) R \left(1-\frac{\gamma}{\mu}\right) \tag{2}$$

$$R = \left(\Delta \mu^{-\gamma} \frac{\left(1-\tau^R\right)^{\gamma}}{\left(1+\tau^k\right)^{\alpha\gamma} \left(1+\tau^l\right)^{\gamma(1-\alpha-\phi)}} \Theta\right)^{\frac{(\sigma-1)}{\sigma-\gamma(\sigma-1)}} \tag{3}$$

where $\Delta = D^{\frac{1}{\sigma-1}} d^{\frac{1}{\sigma-1}} a$ and $\Theta = \gamma^{\gamma} (\alpha r)^{\gamma\alpha} \left((1-\alpha-\phi) w\right)^{\gamma(1-\alpha-\phi)} \left(\phi p_m\right))^{\phi\gamma}$.

$$\mu^{-1} = \left(\frac{\sigma-1}{\sigma}\right)(1-s) \tag{4}$$

$$l = \frac{(1-\alpha-\phi)\, r \left(1+\tau^k\right)}{\alpha w \left(1+\tau^l\right)} k \equiv \theta k \tag{5}$$

Micro data estimation

- Estimate $\alpha, \phi, \gamma, \sigma$ through joint demand-production estimation (Eslava et al (2023)
- Obtain, for each firm, idiosyncratic components of $\Delta = \frac{1}{\sigma-1} d \frac{1}{\sigma-1} a$ from residuals of demand and production functions and obtain Δ.
- Solve for composite distortion $\frac{\left(1-\tau^R\right)^\gamma}{\left(1+\tau^k\right)^{\alpha\gamma}\left(1+\tau^l\right)^{\gamma(1-\alpha-\phi)}} = \frac{R}{(\Delta\mu^{-\gamma}\Theta)^{\frac{(\sigma-1)}{\sigma-\gamma(\sigma-1)}}}$
- Solve for $(1+\tau_k) = \frac{l}{k}(1+\tau_l)$
- Solve for $(1-\tau_r)$ from composite and individual distortions We end up with full distribution of technology, quality, revenue and factor distortions, which we then use as targets or untargeted moments in quantification.

Factor and demand elasticities

year		α	β	γ	σ_w	σ	$\gamma\left(1-\frac{1}{\sigma}\right)$
All years	**Average**	0,118	0,575	0,966	3,397	1,887	0,438
	Min	0,046	0,304	0,869	2,469	1,369	0,272
	Max	0,254	0,785	1,069	4,765	2,639	0,605
1982 - 1989	**Average**	0,106	0,555	1,009	3,039	1,640	0,371
	Min	0,015	0,243	0,922	2,007	1,128	0,105
	Max	0,210	0,770	1,190	4,669	2,495	0,635
1990 - 1999	**Average**	0,112	0,561	1,001	3,522	1,962	0,458
	Min	0,004	0,200	0,864	2,620	1,449	0,318
	Max	0,288	0,801	1,460	5,757	3,253	0,670
2000 - 2012	**Average**	0,105	0,683	0,999	3,746	2,052	0,471
	Min	0,011	0,383	0,876	2,503	1,385	0,271
	Max	0,339	0,903	1,701	7,456	4,172	0,753

Joint distribution of plant characteristics and distortions

	Δ	a	d	R	$(1-\tau^R)$	$\frac{1}{(1+\tau^l)}$	$\frac{1}{(1+\tau^k)}$	$\frac{(1-\tau^R)}{(1+\tau^l)(1+\tau^k)}$
	1982-1989							
Δ	1,00							
a	0,15	1,00						
d	0,97	-0,08	1,00					
R	0,99	0,06	0,98	1,00				
$(1-\tau^R)$	-0,28	-0,48	-0,17	-0,14	1,00			
$\frac{1}{(1+\tau^l)}$	-0,52	-0,05	-0,51	-0,52	-0,03	1,00		
$\frac{1}{(1+\tau^k)}$	0,15	-0.09	0,18	0,18	-0,18	-0,00	1,00	
$\frac{(1-\tau^R)}{(1+\tau^l)(1+\tau^k)}$	-0,28	-0,53	-0,16	-0,14	0,93	0,08	0,14	1,00

Model Quantification: Use Micro Estimates + Calibration to Aggregate Moments

- We combine micro estimates, moments from employment surveys and censuses and calibration to match aggregate moments.
- Quantification strategy proceeds in three steps:
  1. Impose an a distribution (later: more closely fit to reach employment and earnings distribution across sectors and firm types).
  2. Parametrize distortions $\tau(a)$'s and appeal $d(a)$ to match correlations in micro data.
  3. Given shifts in production function aggregators ϕ_{MF}, $\phi_{M,M}$ and appeal level $\bar{d}$, find minimum wage $\bar{w}$ such that it is 90% of equilibrium median income.
     $\rightarrow$ This requires solving fixed point problem that conjectured $\bar{w}$ is the one in equilibrium.
  4. Search in the parameter space for ϕ_{MF} and $\phi_{M,M}$ and appeal level $\bar{d}$ to target jobless industrialization aggregate moments (VA shares, Empl. shares)

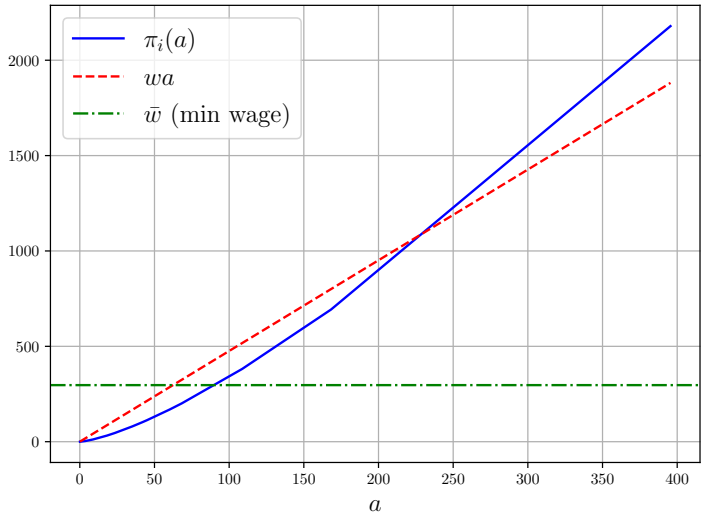
Model quantification: parameterization (1)

Parameter	Value	Target or Empirical Counterpart
	Parameters Set from Micro Data	
α	0.11	Estimates from Production Function
β	0.56	Estimates from Production Function
γ	1.01	Estimates from Production Function
σ	1.64	Estimates from Production Function
$\tau^R(a)$	0.48	Correlation estimated distortions with a
$\tau^I(a)$	0.52	Correlation estimated distortions with a
$\tau^k(a)$	-0.15	Correlation estimated distortions with a

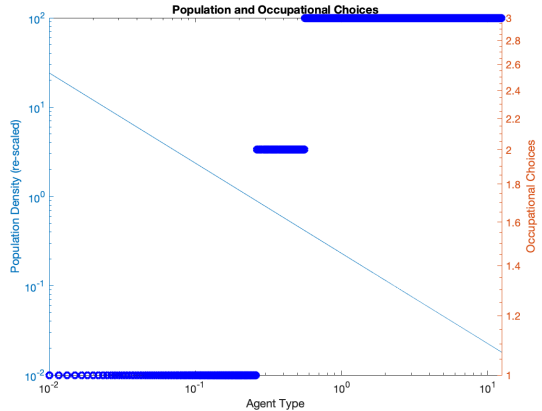
Model quantification: parameterization (2)

Parameter	Value	Target or Empirical Counterpart
	Parameters Set Exogenously from the Model	
ρ	0.05	Exogenously fixed to Buera and Kaboski (2009)
ϵ	1.1	Exogenously fixed
	Calibrated Parameters to Match Moments	
ϕ_M	0.29	Manu. VA Share, Target: 24%
ϕ_{MF}	0.01	Emp. Sh. Manuf:. Target: 13%
$\bar{w}$	0.30	Min. Wage, Target: 90% Median income=0.30.
D	4.7	VA Share Formal Manuf. Model: 74%, Target 66%

Results: Occupational Choice (preliminary, version without materials and variable markups)



Results: Occupational Choices and Population Density in Calibrated Model (preliminary, no materials or variable μ)



Note on occupational choice coding: 1 corresponds to self-employed, 2 to workers in the modern sector, 3 to modern entrepreneur.

Results: targeted and aggregate (preliminary, version without materials and variable markups)

	Quantitative Analysis					
		Counterfactual Exercises				
	Baseline	Only Min. Wage	All τ's only	Only τ^l	Only τ^r	No Distortions
Targeted Outcomes for Baseline						
Total Value Added Manuf. Share	25%	26%	25%	26%	25%	26%
Employment Sh.in Formal Manuf.	16%	34%	26%	83%	29%	88%
Untargeted Economywide Outcomes						
Median Income	0.34	2.8	0.32	2.9	0.33	3.44
Income perc. 99/perc. 1	7416	7750	7881	16542	9165	19441
Income perc. 99/perc. 50	220	254	250	567	278	565

Results: micro untargeted moments (preliminary, version without materials and variable markups)

	Quantitative Analysis					
		Counterfactual Exercises				
	Baseline	Only Min. Wage	All τ's only	Only τ^l	Only τ^r	No Distortions
Untargeted Modern Sector Outcomes:						
Wage (per efficiency unit)	1.1	3.3	1.03	9.6	1.08	11
Share Modern Entrepreneurs	41.5%	17.1%	42.9%	31.8%	42%	29%
Share Modern Workers	9.9%	34.5%	15%	58%	16.6%	63%
$\frac{\text{Wage Bill Sh. Below Median Modern}}{\text{Value Added Sh. Below Median Modern}}$	4.9	5.31	5.35	3.10	4.82	2.7
$\frac{\text{Wage Bill Sh. Above Median Modern}}{\text{Value Added Sh. Above Median Modern}}$	0.79	0.99	0.80	0.87	0.82	0.9

PRELIMINARY discussion

- Proportional labor distortions have little bite to generate jobless modern (formal) sectors, unless combined with high minimum wage
- The extent and heterogeneity of Colombian jobless industrialization at (close to) the peak of industrialization requires a combination of the different distortions in the model, including minimum wage, size-correlated labor and revenue
  - In particular, though combination of fixed and proportional labor-intensive distortions generates large joblessness, additional revenue distortions needed. Only replacing removing proportional distortions (SS contributions as fraction of wage) has little bite, and could be negative if funding replaced with corporate income taxation.

Next Steps

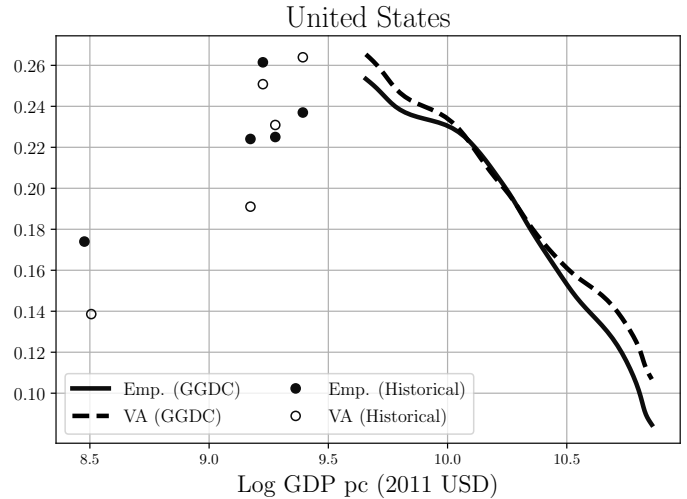
- Quantification:
  - Data to 1976
  - Materials and variable markups
  - Closer modelling of a and d distributions to data
- Model:
  - Modern firms in services (data from services' surveys but only recently).
  - Dynamic decisions: invest in a (education) and invest in d (innovation)
  - Technology vs. distortions? Other countries in Latam have lower labor distortions (both min. wage and payroll taxes)
  - Personnal taxes to evaluate if could replace payroll or corporate taxes?
  - Structural change

Thank you!

Additional Slides

Manufacturing Employment and Value Added Shares. United States (1869–2018)

Back to shares = f(time)



Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; Kuztnets (1966), Mitchell (2007).

Rodrik (2006) Premature De-industrialization

Back to Macro Facts Econometric Model

	Employment	Nominal Value Added	Real Value Added
Log pop.	0.029	0.053	-0.133
	(0.066)	(0.082)	(0.097)
Log pop. sq.	0.002	-0.002	0.006
	(0.004)	(0.005)	(0.005)
Log GDP pc	0.400***	0.267**	0.206*
	(0.120)	(0.107)	(0.120)
Log GDP pc sq.	-0.021***	-0.013**	-0.008
	(0.007)	(0.006)	(0.007)
1960s	-0.017	0.003	0.009
	(0.013)	(0.016)	(0.016)
1970s	-0.033*	-0.004	0.017
	(0.018)	(0.022)	(0.021)
1980s	-0.052**	-0.011	0.014
	(0.023)	(0.028)	(0.026)
1990s	-0.073**	-0.028	0.009
	(0.027)	(0.033)	(0.032)
2000s	-0.103***	-0.058	-0.008
	(0.032)	(0.037)	(0.037)
2010+	-0.127***	-0.087**	-0.035
	(0.036)	(0.042)	(0.040)
Country FE	YES	YES	YES
Obs.	2,269	2,269	2,269
Adjusted R^2	0.41	0.27	0.37

Rodrik's Econometric Model

Back to Macro Facts Back to Rodrik (2006)

- Following Rodrik (2006), we estimate the following econometric model

$$\begin{aligned}\text{Man. share}_{it} = \beta_0 + \beta_1 \log \text{pop}_{it} + \beta_2 (\log \text{pop}_{it})^2 + \beta_3 \log \text{GDP pc}_{it} \\ + \beta_4 (\log \text{GDP pc}_{it})^2 + \sum_i \gamma_i D_i + \sum_T \phi_T \text{PER}_T + \epsilon_{it}.\end{aligned}$$

- For Man. Share, we use employment, nominal and real value added shares as independent variables.
- i stands for country, t for year, T for decade. D_i are country fixed-effects.
- Rodrik's emphasis is on the significance of $\sum_T \phi_T \text{PER}_T$, which suggest a de-industrializion beyond what one would expect through the hump-shaped explained via income.

Regions: Employment Regions: Value Added (Nominal) Regions: Value Added (Real)

Employment. Regional Estimates

Back to Macro Facts Back to Econometric Model

	All	USA + Europe	Latin America	Asia	Africa
Log pop.	0.041	1.183	0.118*	0.190	0.098*
	(0.063)	(0.823)	(0.054)	(0.191)	(0.055)
Log pop. sq.	0.001	-0.045	-0.001	-0.012	-0.003
	(0.004)	(0.030)	(0.003)	(0.008)	(0.003)
Log GDP pc	0.395***	0.944**	0.872***	0.843***	0.063
	(0.117)	(0.299)	(0.252)	(0.156)	(0.059)
Log GDP pc sq.	-0.020***	-0.049**	-0.048***	-0.043***	-0.003
	(0.007)	(0.016)	(0.014)	(0.008)	(0.004)
1960s	0.002	0.017	-0.029***	-0.012	0.035
	(0.016)	(0.027)	(0.009)	(0.017)	(0.021)
1970s	-0.014	-0.011	-0.053**	-0.018	0.030*
	(0.020)	(0.029)	(0.018)	(0.023)	(0.015)
1980s	-0.032	-0.050	-0.085***	-0.030	0.024
	(0.025)	(0.034)	(0.027)	(0.035)	(0.016)
1990s	-0.053*	-0.079*	-0.104**	-0.058	0.018
	(0.029)	(0.039)	(0.036)	(0.058)	(0.016)
2000s	-0.082**	-0.104*	-0.138**	-0.082	0.008
	(0.033)	(0.047)	(0.043)	(0.072)	(0.009)
2010+	-0.106***	-0.138**	-0.153***	-0.096	0.000
	(0.037)	(0.049)	(0.045)	(0.079)	(.)
Country FE	YES	YES	YES	YES	YES
Obs.	2476	552	603	598	723
Adjusted R^2	0.39	0.72	0.57	0.48	0.18

Value Added (Nominal). Regional Results

Back to Macro Facts Back to Econometric Model

	All	USA + Europe	Latin America	Asia	Africa
Log pop.	0.076	0.576	0.086	0.448**	0.281**
	(0.092)	(0.557)	(0.111)	(0.156)	(0.106)
Log pop. sq.	-0.003	-0.023	-0.005	-0.022***	-0.014**
	(0.005)	(0.020)	(0.007)	(0.007)	(0.005)
Log GDP pc	0.321*	-1.418***	0.346	0.808***	-0.016
	(0.127)	(0.348)	(0.408)	(0.188)	(0.074)
Log GDP pc sq.	-0.016**	0.066***	-0.017	-0.042**	-0.000
	(0.007)	(0.017)	(0.023)	(0.010)	(0.005)
1960s	0.005	0.017	-0.004	0.002	0.002
	(0.012)	(0.014)	(0.017)	(0.018)	(0.035)
1970s	0.007	-0.019	-0.012	0.012	0.026
	(0.022)	(0.016)	(0.027)	(0.033)	(0.028)
1980s	-0.002	-0.034	-0.009	0.003	0.031
	(0.028)	(0.023)	(0.042)	(0.036)	(0.021)
1990s	-0.020	-0.046	-0.018	-0.012	0.022
	(0.032)	(0.029)	(0.059)	(0.046)	(0.019)
2000s	-0.051	-0.073	-0.046	-0.025	0.008
	(0.037)	(0.040)	(0.065)	(0.051)	(0.011)
2010+	-0.083*	-0.105**	-0.080	-0.041	0.000
	(0.042)	(0.043)	(0.070)	(0.053)	(.)
Country FE	YES	YES	YES	YES	YES
Obs.	2381	422	555	652	752
Adjusted R^2	0.31	0.85	0.28	0.57	0.36

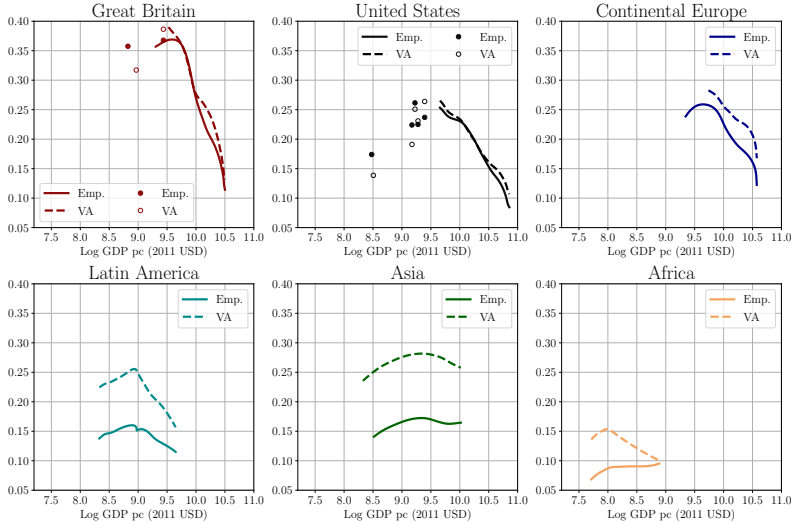
Value Added (Real). Regional Results

Back to Macro Facts Back to Econometric Model

	All	USA + Europe	Latin America	Asia	Africa
Log pop.	-0.096	-2.863	0.185***	0.029	0.027
	(0.097)	(1.547)	(0.039)	(0.205)	(0.048)
Log pop. sq.	0.005	0.108	-0.002	-0.006	-0.000
	(0.005)	(0.059)	(0.003)	(0.010)	(0.003)
Log GDP pc	0.263**	0.678	-0.178	0.692***	0.071
	(0.128)	(0.383)	(0.120)	(0.139)	(0.069)
Log GDP pc sq.	-0.011	-0.026	0.008	-0.033***	-0.004
	(0.007)	(0.020)	(0.006)	(0.009)	(0.005)
1960s	-0.017	-0.043	-0.013	0.010	0.037
	(0.023)	(0.047)	(0.007)	(0.019)	(0.027)
1970s	-0.013	-0.032	-0.022**	0.022	0.044*
	(0.027)	(0.048)	(0.008)	(0.033)	(0.024)
1980s	-0.019	-0.047	-0.060***	0.025	0.039*
	(0.031)	(0.052)	(0.009)	(0.039)	(0.018)
1990s	-0.026	-0.053	-0.089***	0.031	0.035**
	(0.035)	(0.059)	(0.012)	(0.046)	(0.011)
2000s	-0.046	-0.053	-0.112***	0.031	0.015*
	(0.040)	(0.076)	(0.018)	(0.048)	(0.007)
2010+	-0.075*	-0.053	-0.138***	0.020	0.000
	(0.043)	(0.076)	(0.017)	(0.051)	(.)
Country FE	YES	YES	YES	YES	YES
Obs.	2556	562	613	654	727
Adjusted R^2	0.29	0.30	0.56	0.79	0.20

Macro Fact 1: Jobless Industrialization–Additional Countries

Back to Macro Facts



Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; MOxLAD Database. Regional aggregations are expressed as simple averages. *Europe*: Denmark, Spain, France, G. Britain, Italy, The Netherlands and Sweden. *Latin America*: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico and Peru. *Asia*: China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Thailand and Taiwan. *Africa*: Botswana, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Senegal, South Africa, Tanzania and Zimbabwe.

We Incorporate Historical Firm-Level Micro Data (Long-Time Series)

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- Long Time-Series of Firm Micro Data: Generally Unavailable.
- Colombian data: unparalleled in scope and detail in most of developing countries.

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- Other countries: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; MOxLAD Database; Local Data Sources

We Model and Quantify Structural Change with Firm Heterogeneity

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- Interpret evidence through a model with self-selection in formality in a dual economy.
- Modern (manufacturing) faces binding labor costs associated to formality relative to traditional (self-employment).
- Leverage unparalleled establishment-level data covering 7 decades to estimate market-power and distortions in labor, capital, and product markets.

Factor and demand elasticities by sector (pooling years)

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Sector	$1-\alpha$	α	γ	σ_w	σ	$\gamma\left(\frac{1}{1-\sigma}\right)$
311	0,646	0,354	1,052	8,110	4,073	0,794
313	0,674	0,326	1,042	5,531	4,303	0,799
321	0,546	0,454	0,885	4,776	4,036	0,666
322	0,594	0,406	0,679	6,287	4,019	0,510
323	0,539	0,461	0,946	5,268	4,081	0,714
324	0,640	0,360	0,865	5,975	3,957	0,647
331	0,758	0,242	0,887	4,785	3,828	0,655
332	0,580	0,420	0,884	3,616	4,003	0,663
341	0,588	0,412	0,961	2,570	4,058	0,724
342	0,775	0,225	1,053	2,012	4,057	0,794
351	0,657	0,343	1,127	8,042	4,162	0,857
352	0,563	0,437	0,979	6,171	4,174	0,744
355	0,736	0,264	0,975	4,028	4,176	0,741
356	0,703	0,297	1,050	3,467	4,022	0,789
362	0,685	0,315	1,092	3,745	4,031	0,821
369	0,603	0,397	1,019	6,880	4,078	0,770
371	0,685	0,315	1,249	4,856	4,155	0,949
381	0,659	0,341	0,946	1,912	3,955	0,707
382	0,709	0,291	0,959	3,401	4,011	0,720
383	0,688	0,312	1,056	4,447	4,051	0,795
384	0,748	0,252	1,132	7,526	3,990	0,848
385	0,640	0,360	1,002	4,260	3,901	0,745
390	0,741	0,259	0,971	2,009	4,004	0,729
Average	0,659	0,341	0,992	4,768	4,049	0,747
Min	0,539	0,225	0,679	1,912	3,828	0,510
Max	0,775	0,461	1,249	8,110	4,303	0,949

Occupational Choice: Frictionless

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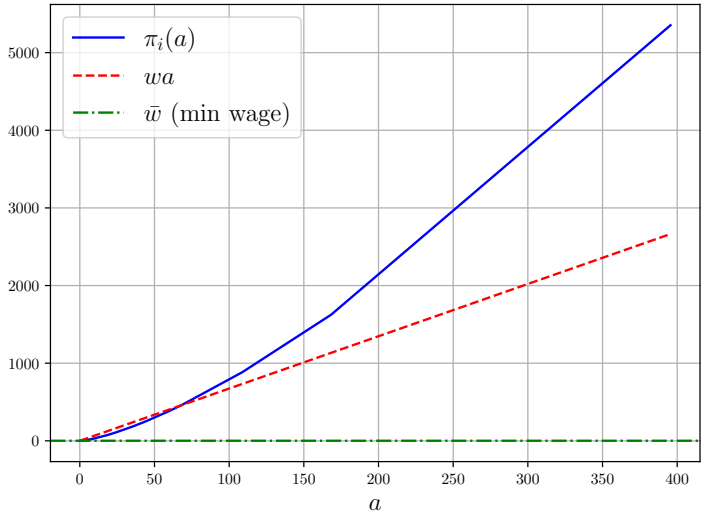
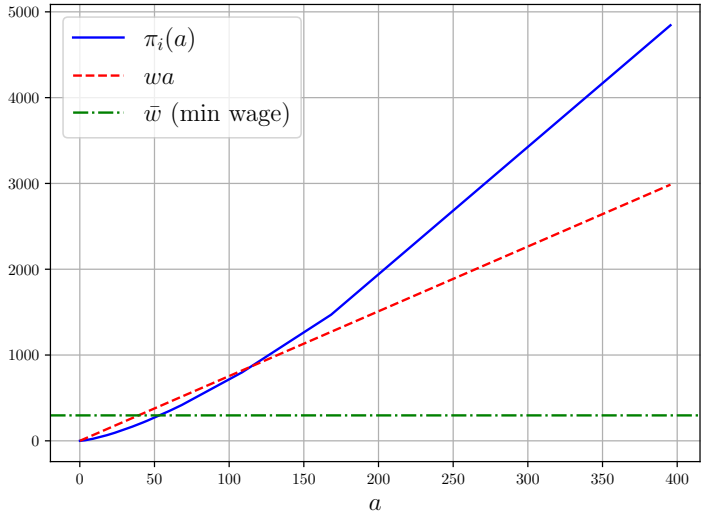


Notes: Equilibrium prices are $w^* = 6.74$ and $P^*_{M,M} = 0.01$.

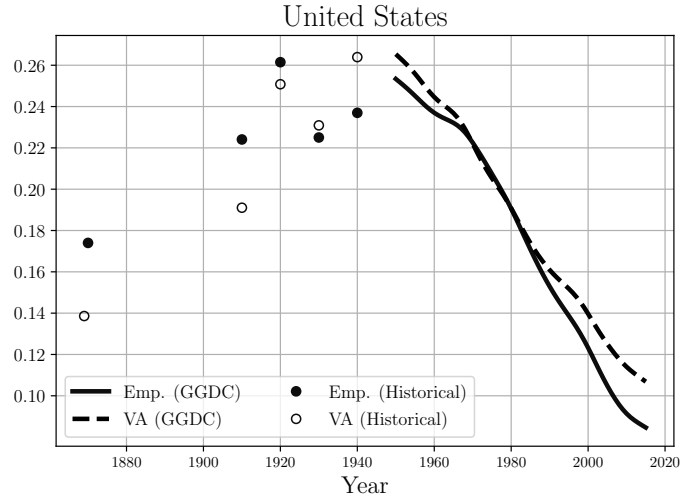
Occupational Choice: $\bar{w}$ Back



Notes: Equilibrium prices are $w^* = 7.551$ and $P^*_{M,M} = 0.02$.

Manufacturing Employment and Value Added Shares. United States (1869–2018)

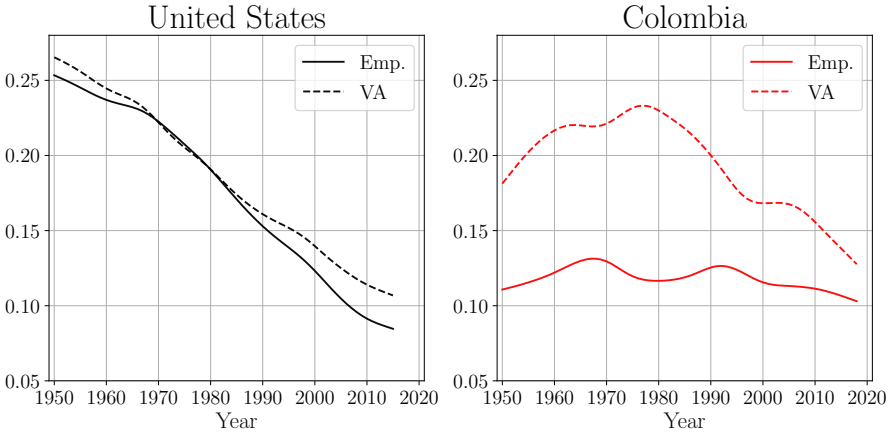
Shares = f(GDP pc)



Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; Kuztnets (1966), Mitchell (2007).

Jobless Industrialization. USA *vis-à-vis* Colombia

Employment and Value Added Shares in Manufacturing



Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; MOxLAD Database.

Jobless Industrialization: Colombia

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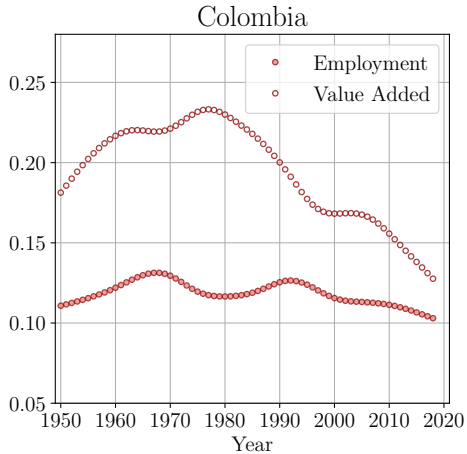
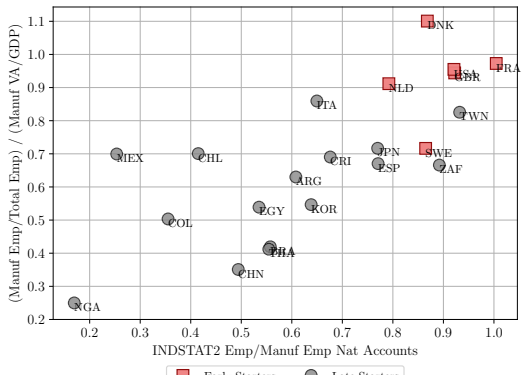
Manufacturing Share of the Economy's Employment and Value Added

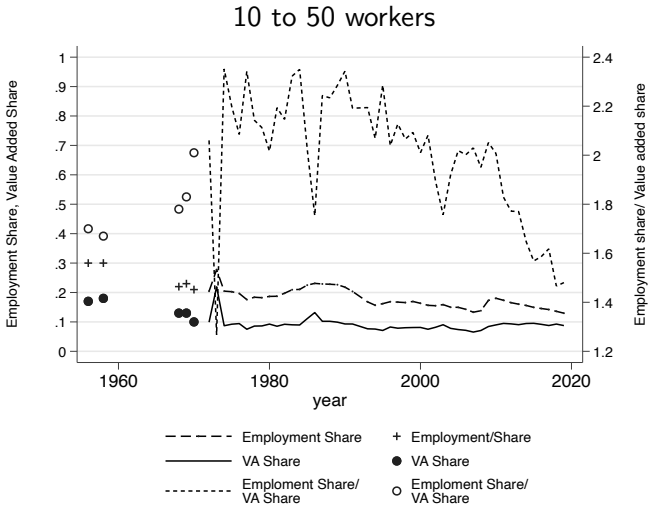


Manufacturing in employment relative to VA vs. weight of modern firms in manufacturing employment



Notes: Data sources: GGDC 10-Sector Database; Economic Transformation Database; World KLEMS; MOxLAD Database; INDSTAT2 (UNIDO). *Early Starters*: Great Britain, United States, Denmark, France, The Netherlands and Sweden. *Late Starters*: Argentina, Brazil, Chile, Colombia, Costa Rica, Egypt, Spain, Indonesia, Italy, Japan, South Korea, Mexico, Mauritius, Malaysia, Nigeria, Phillipines, Thailand, Taiwan and South Africa. Late starters are defined as countries that had a manufacturing value added share over 20% of GDP at some point in its history.

Share of manufacturing survey employment and value added represented by different sizes: time series



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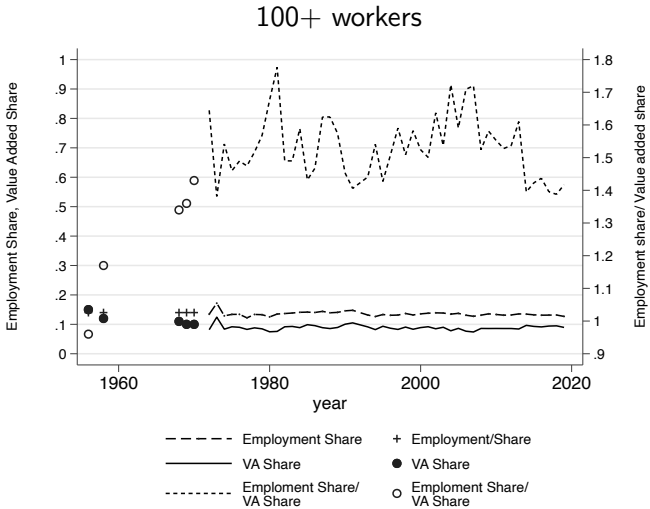

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Employer size	Ratio of category's weight in employment to category's weight in ...			Individual-level Survey	
	value added (Manufacturing Survey)	worker earnings (Colombia)	worker earnings (CPS USA)	Weight of category in manufacturing employment (Colombia)	Weight of category in manufacturing employment (USA)
Panel B: 2018					
$\leq$ 10 workers (inc. Self-employed)		1.431	1.294	0.564	0.100
10-50 workers	1.772	0.887	1.174	0.125	0.138
51-100 workers	1.537	0.750	1.138	0.036	0.093
101+ workers	0.856	0.662	0.930	0.276	0.669

The Manufacturing Survey (first column) covers all manufacturing establishments with at least 10 employees. Last four columns are based on surveys of individuals representative of all occupied individuals. For the US, this is the Annual Social and Economic Supplement of the Consumer Population Survey (ASEC-CPC). For Colombia, it is the Households Survey (official source of labor market statistics) in 2018 and the Life Quality Survey in 1997. The Life Quality Survey was also collected in 2018 and yielded similar results to those of the householdsâ€™ survey.