Online Appendix

Cities, Productivity, and Trade

Alvaro Garcia-Marin Andrei Potlogea Nico Voigtländer Yang Yang

A Proof of Equilibrium Existence

The equilibrium is constructed in four steps. First, we solve for the equilibrium subsidy offered by city developers. Second, we show that it pins down how firms match with city sizes within countries, as well as the set of city sizes generated in each country in equilibrium by city developers. Third, general equilibrium quantities are determined in each country by market clearing conditions and free entry conditions in the traded goods sectors, once we know the equilibrium matching functions from step 2. Finally, the city-size distribution within countries is determined by these quantities, using labor-market clearing conditions. In each step, the relevant functions and quantities are uniquely determined; hence, the equilibrium is unique.

Step 1: Equilibrium Subsidies

Lemma 1. *To determine the equilibrium subsidies, we first outline the optimization problem of city developers. City developers revenue comes from fully taxing the profits of local landlords. In turn, housing market clearing in each city implies that total landlord profits in each city are given by:*

$$\pi_H(L) = b(1-\eta)w(L)L \tag{A.1}$$

Thus, a city developer i developing a city of size L faces the following problem:

$$\max \Pi_L = b(1-\eta)w(L)L - \sum_{j=1}^{S} \int_z T_j^i(z,L)\pi_j^o(z,L)1_j(z,l,i)M_j dF_j(z) \tag{A.2}$$

such that

$$1_j(z,L,i) = 1 \text{ if } L = \arg\max \pi_{Sub,j}^T(z,L) \text{ and firm } z \text{ chooses city } i$$
$$1_j(z,l,i) = 0 \text{ otherwise}$$

In this expression, M_j denotes the mass of firms in sector j in each country (which will be the same in all countries by symmetry), $F_j(.)$ is the distribution of raw efficiencies in sector j in each country and $\pi_j^T(z,L)$ is the total profit before subsidy of a firm of efficiency z in sector j, as defined in equation (15) (which again will be the same in all countries by symmetry).
With the above set-up in place, it can be shown that, in equilibrium, city developers offer and firms

take-up operational profit subsidies according to the schedule:

$$T_j(z,L) = T_j^* = \frac{\beta(1-\eta)(\sigma_j - 1)}{1-(1-b)(1-\eta)} \tag{A.3}$$

Proof: Competition among city developers means that the revenues raised from attracting any firm and sector category to the city exactly balance out the subsidies offered to that firm and sector combination:

$$\beta(1-\eta)w(L)L_j(z,L) = T_j(z,L)\pi_j^o(z,L) \tag{A.4}$$

where $L_j(z,L)$ represents the total number of workers drawn to the city when attracting a firm of productivity z in sector j in the productive conditions of a city of size L; while the LHS of (A.4) represents the total expenditures on housing of the workers drawn to the city as a result of the firm choosing to locate in the city. This expenditures represent the (marginal) revenue of the city developer from attracting a firm of productivity z in sector j in the productive conditions of a city of size L. If the above equation were not to hold the city developer would either be making losses or positive profits. In the latter case, another developer would have an incentive to start a city of size L and offer subsidies slightly lower than $T_j(z,L)$, draw all firms of productivity z in sector j and make a profit. This can't be the case in equilibrium.

Starting from (A.4) we can obtain the subsidy schedule in (A.3) by noting that the total number of employees drawn to a city when a firm of productivity z in sector j chooses the city is equal to the workforce of the firm plus a multiplier effect brought by the workers purchase of locally produced housing. Thus the number of workers drawn to the city by a firm is related to the firm's equilibrium employment via the equation:

$$l_j(z,L) = \left[1-(1-b)(1-\eta)\right] L_j(z,L) \tag{A.5}$$

Moreover, to obtain the subsidy schedule established by the above Lemma, we need to note that firm level can be written as:

$$l_j(z,L) = \begin{cases} \frac{(\sigma_j-1)\pi_j^D(z,L)}{w(L)} & \text{if } z < z_j^*(L) \\ \frac{(\sigma_j-1)\pi_j^D(z,L)}{w(L)}\left(1+\frac{C-1}{\tau^{\sigma_j-1}}\right) & \text{if } z \geq z_j^*(L) \end{cases}$$

which can be equivalently written:

$$l_j(z,L) = \frac{(\sigma_j-1)\pi_j^o(z,L)}{w(L)} \tag{A.6}$$

Finally substituting (A.5) and (A.6) in (A.4) yields the subsidy schedule established in (A.3).

Moreover, substituting the optimal subsidies in (A.3) and the expressions for domestic profits from (11) into (16) yields the following expressions for total profits after subsidies:

$$\pi^T_{Sub,j}(z,L) = \begin{cases} k_{1j}\left(1+T_j^*\right)\left[\frac{\psi(z,L,s_j)}{w(L)}\right]^{\sigma_j-1} E_j P_j^{\sigma_j-1} & \text{if } z < z_j^*(L) \\ k_{1j}\left(1+T_j^*\right)\left[\frac{\psi(z,L,s_j)}{w(L)}\right]^{\sigma_j-1} E_j P_j^{\sigma_j-1}\left(1+\frac{C-1}{\tau^{\sigma_j-1}}\right) - (C-1)Pf_j^e & \text{if } z \geq z_j^*(L) \end{cases} \tag{A.7}$$

where the parameter k_{1j} is given by

$$k_{1j} = \frac{1}{\sigma_j^{\sigma_j}}\left(\sigma_j - 1\right)^{\sigma_j-1}$$

Step 2: Equilibrium City Sizes and the Matching Function

Within each country, the city developers'problem determines the equilibrium city sizes generated in equilibrium. Cities are opened up when there is an incentive for city developers to do so, i.e. when there exists a set of firms and workers that would be better off choosing this city size. Workers are indifferent between all locations within their countries, but firms are not, since their profits vary with city size. Given the equilibrium subsidies offered by city developers, the profit function of a firm with raw productivity z in sector j is given by (A.7).

Note that the firm's problem can be reduced to maximizing the expression in the square brackets in (A.7) which yields the first order condition:

$$\frac{\psi_2(z,L,s_j)L}{\psi(z,L,s_j)} = b\frac{1-\eta}{\eta} \tag{A.8}$$

with $w(L)$ being the wage schedule established by equation (8). There is a unique profit-maximizing city size for a firm of type z in sector j, under the regularity conditions we have assumed. Define the optimal city size as follows:

$$L_j^*(z) = \arg\max_{L\geq 0} \pi^T_{Sub,j}(z,L)$$

Assume that, for some firm type z and sector j, no city of size $L_j^*(z)$ exists. There is then a profitable deviation for a city developer on an unoccupied site to open up this city. It will attract the corresponding firms and workers, and city developers will make a positive profit by subsidizing firms at a rate marginally smaller than $T_j(z,L)$. The number of such cities adjusts so that each city has the right size in equilibrium. This leads to the following lemma, letting $\mathcal{L}$ denote the set of city sizes in equilibrium:

Lemma 2. *The set of city sizes for each country in equilibrium, $\mathcal{L}$, is the set of optimal city sizes for firms.*

Given this set of city sizes, the optimal choice of each firm in every country is fully determined. Define the matching function

$$L_j^*(z) = \arg\max_{L \in \mathcal{L}} \pi_{Sub,j}^T(z, L)$$

It is readily seen that the profit function of the firm (equation (A.7)) inherits the strict log-supermodularity of the productivity function in z and L. Therefore, the following lemma holds.

Lemma 3. *The matching function $L_j^*(z)$ is increasing in z.*

This result comes from a classic theorem in monotone comparative statics (Topkis (1998)). The benefit to being in larger cities is greater for more productive firms and only they are willing in equilibrium to pay the higher wages there. Furthermore, within each country the matching function is fully determined by the firm maximization problem, conditional on the set of city sizes $\mathcal{L}$. As seen from equation (A.7), this optimal choice does not depend on general equilibrium quantities that enter the profit function proportionally for all city sizes. Finally, under the regularity assumptions made on ψ as well as on the distribution of z, $F_j(.)$, the optimal set of city sizes for firms in a given sector and country is an interval (possibly unbounded). The sectoral matching function is invertible over this support. For a given sector, we use the notation $z_j(L)$ to denote the inverse of $L_j^*(z)$. It is increasing in L. The set of city sizes $\mathcal{L}$ available in equilibrium in each country is the union of the sector-by-sector intervals.

Moreover, given the bijection between productivity levels and city sizes within each sector and country in equilibrium, there will be a productivity threshold z_j^* associated with export participation (i.e. for all $z \geq z_j^*$ firms are involved in exporting to all countries, while for $z < z_j^*$ firms are purely domestic). Due to symmetry, these sectoral exporting thresholds z_j^* are the same in all countries.

Step 3: General Equilibrium Quantities

The equilibrium has been constructed up to the determination of the following general equilibrium values. The reference level of wages $\bar{w}$ defined in equation (8) is taken as the numeraire. The remaining unknowns are the aggregate revenues in the traded goods sector in each country E (identical in all countries), the mass of firms M_j in each sector and country (M_j's are the same in all countries due to symmetry), the sectoral price indexes P_j (identical in all countries), and the sectoral exporting thresholds z_j^*.

At the level of each country and sector, aggregate operational profits (ignoring fixed costs of

exporting but including subsidies) are given by:

$$\pi^{o}_{Agg,j} = \int_{z_{min}}^{z_j^*} k_{1j}(1+T_j^*)\left[\frac{\psi(z,L_j^*(z),s_j)}{w(L_j^*(z))}\right]^{\sigma_j-1} E_j P_j^{\sigma_j-1} M_j dF_j(z) + \int_{z_j^*}^{z_{max}} k_{1j}(1+T_j^*)\left[\frac{\psi(z,L_j^*(z),s_j)}{w(L_j^*(z))}\right]^{\sigma_j-1} E_j P_j^{\sigma_j-1}\left(1+\frac{C-1}{\tau^{\sigma_j-1}}\right) M_j dF_j(z) \quad \text{(A.9)}$$

which can be rewritten

$$\pi^{o}_{Agg,j} = k_{1j}(1+T_j^*)E_j P_j^{\sigma_j-1} M_j \underbrace{\left[\int_{z_{min}}^{z_j^*}\left[\frac{\psi(z,L_j^*(z),s_j)}{w(L_j^*(z))}\right]^{\sigma_j-1} dF_j(z) + \int_{z_j^*}^{z_{max}}\left[\frac{\psi(z,L_j^*(z),s_j)}{w(L_j^*(z))}\right]^{\sigma_j-1}\left(1+\frac{C-1}{\tau^{\sigma_j-1}}\right) dF_j(z)\right]}_{S_j(z_j^*)} \quad \text{(A.10)}$$

Having an expression for aggregate operational profits at the sectoral level, it is straightforward to obtain an expression for aggregate revenues at the sectoral level:

$$R^{o}_{Agg,j} = E_j = \sigma_j k_{1j} E_j P_j^{\sigma_j-1} M_j S_j(z_j^*) \quad \text{(A.11)}$$

We can also derive an expression for the aggregate labor force used in sector j in every country

$$l_{Agg,j} = \int_z \frac{(\sigma_j-1)\pi^{o}_{Agg,j}}{(1+T_j^*)w(L_j^*(z))} M_j dF_j(z) \quad \text{(A.12)}$$

which can be expanded as

$$l_{Agg,j} = k_{1j}(\sigma_j-1)E_j P_j^{\sigma_j-1} M_j \underbrace{\left[\int_{z_{min}}^{z_j^*}\frac{\psi(z,L_j^*(z),s_j)^{\sigma_j-1}}{w(L_j^*(z))^{\sigma_j}} dF_j(z) + \left(1+\frac{C-1}{\tau^{\sigma_j-1}}\right)\int_{z_j^*}^{z_{max}}\frac{\psi(z,L_j^*(z),s_j)^{\sigma_j-1}}{w(L_j^*(z))^{\sigma_j}} dF_j(z)\right]}_{Emp_j(z_j^*)} \quad \text{(A.13)}$$

Finally, employing the expression for aggregate operational profits derived above we can find an expression for aggregate total profits

$$\pi^{T}_{Agg,j} = \pi^{o}_{Agg,j} - M_j \int_{z_j^*}^{z_{max}} (C-1)Pf_j^e dF_j(z)$$

$$\pi^{T}_{Agg,j} = k_{1j}(1+T_j^*)E_j P_j^{\sigma_j-1} M_j S_j(z_j^*) - M_j\left[1-F_j(z_j^*)\right](C-1)Pf_j^e \quad \text{(A.14)}$$

By the free entry condition we then have that:

$$E(\pi^T) = k_{1j}(1+T_j^*)E_j P_j^{\sigma_j-1} S_j(z_j^*) - \left[1-F_j(z_j^*)\right](C-1)Pf_j^e = Pf_j \quad \text{(A.15)}$$

All in all, within each country, equilibrium is defined by the system of equations (A.16) to (A.19):

$$k_{1j}(1+T_j^*)\left[\frac{\psi(z,L_j^*(z_j^*),s_j)}{\left((1-\eta)L_j^*(z_j^*)\right)}\right]^{\sigma_j-1}E_jP_j^{\sigma_j-1}\frac{1}{\tau^{\sigma_j-1}}=f_j^eP\ \ \forall j\in 1,\ldots,S \tag{A.16}$$

$$P\left\{f_j+(C-1)\left[1-F_j(z_j^*)\right]f_j^e\right\}=k_{1j}(1+T_j^*)E_jP_j^{\sigma_j-1}S_j(z_j^*)\ \ \forall j\in 1,\ldots,S \tag{A.17}$$

$$1=\sigma_jk_{1j}P_j^{\sigma_j-1}M_jS_j(z_j^*)\ \ \forall j\in 1,\ldots,S \tag{A.18}$$

$$N=\sum_{j=1}^{S}k_{1j}(\sigma_j-1)E_jP_j^{\sigma_j-1}M_jEmp_j(z_j^*)+N(1-b)(1-\eta) \tag{A.19}$$

where (A.16) comes from the definition of z_j^*, (A.17) comes from a re-writing of the zero profit condition in (A.15), (A.18) is a rewriting of (A.11), while (A.19) is a national labor market clearing condition.

This system of $3S+1$ equations characterizes the general equilibrium in each country. Given the symmetry of the countries, the same general equilibrium quantities apply for each country (in particular trade balance ensures that expenditures on all tradables are the same in each country). Inverting this system of $3S+1$ equations gives the $3S+1$ unknowns (for each country, but these quantities have the same values for all countries): P_j the price index for sector j in each country, M_j, the mass of firms that enters in sector j in each country, and z_j^*, the exporting threshold for each country, for all $j\in\{1,...,S\}$. It also gives E, the aggregate revenues in the traded goods sector in each country by performing the substitution $E_j=\xi_jE$ in the equations above.

Step 4: Equilibrium City-Size Distribution

Within each country, the city developers'problem and the firms'problem jointly characterize (1) the set of city sizes that necessarily exist in equilibrium and (2) the matching function between firm type and city size. Given these, the city-size distribution is pinned down by the national labor market clearing conditions. The population living in a city of size smaller than any L in each country must equal the number of workers employed by firms in that country that have chosen to locate in these same cities, plus the workers hired to build housing. Thus, $\forall L>L_{min}$

$$\int_{L_{min}}^{L}uf_L(u)du=\sum_{j=1}^{S}M_j\int_{z_j(L_{min})}^{z_j(L)}l_j(z,L_j^*(z))dF_j(z)+(1-b)(1-\eta)\int_{L_{min}}^{L}uf_L(u)du \tag{A.20}$$

where $L_{min}=\inf\mathcal{L}$ is the smallest city size.

Differentiating this with respect to L and dividing by L on both sides gives the city size density

($f_L(L)$ is not normalized to sum to 1):

$$f_L(L) = k_2 \frac{\sum_{j=1}^{S} M_j 1_j(L) l_j(z_j(L), L) f_j(z_j(L)) \frac{\partial z_j(L)}{\partial L}}{L} \tag{A.21}$$

where $k_2 = \frac{1}{1-(1-b)(1-\eta)}$ is a constant and $1_j(L) = 1$ if sector j has firms in cities of size L and 0 otherwise. The equilibrium distribution of city sizes $f_L(.)$ is uniquely determined by equation (A.21), hence the following lemma:

Lemma 4. *$f_L(.)$ is the unique equilibrium of this economy in terms of the distribution of city sizes within countries. Note that this distribution is the same for all countries (due to symmetry).*

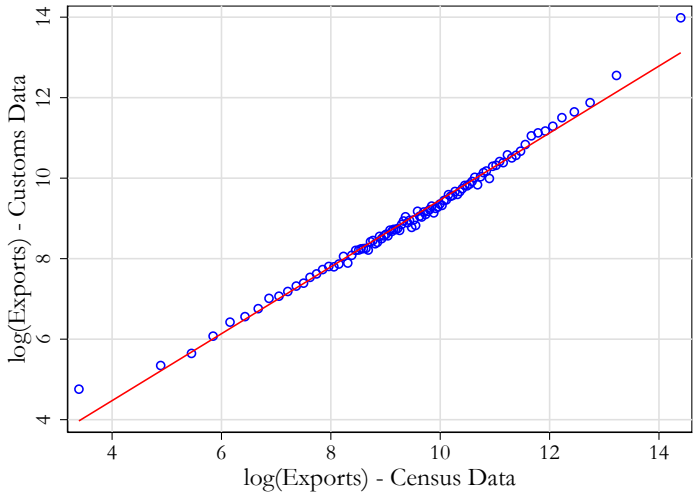
Note that for each city size, the share of employment in each sector can be computed using the same method, now sector by sector (and country by country). For a given city size, the average sectoral composition over all cities of a given size L is determined by the model. On the other hand, the model is mute on the sectoral composition of any individual city of size L, which is irrelevant for aggregate outcomes. This comes from the fact that agglomeration externalities depend on the overall size of the city, and not on its sectoral composition.

This step completes the full characterization of the unique equilibrium of the economy.

B Additional Figures and Tables

B.1 Additional Results and Robustness Checks

Figure B.1: Firm Export: Chinese Census of Manufacturing vs. Customs Administration



Notes: The figure plots a binscatter diagram between firm-level export information from the Chinese Census of Manufacturing and official export information from the Chinese Customs Administration. Both variables are in logarithms. The procedure we follow to match customs information to the Census of Manufacturing allows us to match one-third of the exporters in the Customs dataset. The correlation between exports from the two sources of information is 0.75.

Table B.1: Export intensity and City Size: Dropping Large Companies

	Coeff./ St. Dev.	Obs./ R^2	Geographic Controls	Employment Threshold
Dropping largest 1%	0.326***	1,048	yes	Overall
	(0.045)	0.177		
Dropping largest 5%	0.327***	991	yes	Overall
	(0.046)	0.180		
Dropping largest 10%	0.325***	931	yes	Overall
	(0.046)	0.191		
Dropping largest 1%	0.327***	1,044	yes	Within-sectors
	(0.046)	0.176		
Dropping largest 5%	0.330***	986	yes	Within-sectors
	(0.046)	0.182		
Dropping largest 10%	0.336***	922	yes	Within-sectors
	(0.047)	0.189		

Notes: The Table replicates results in Table 2 dropping large companies to control for firms reporting sales and exports in the location of the companies' headquarters offices. Brandt et al. (2014) shows that single-establishment firms are prevalent in the Chinese Census of manufacturing, and these tend to be relatively large. Thus, by dropping large firms, we indirectly control for the possibility that our results are driven by firms reporting their sales and exports to the location of the companies' headquarters.

Table B.2: Export intensity and City Size: Further Robustness Checks

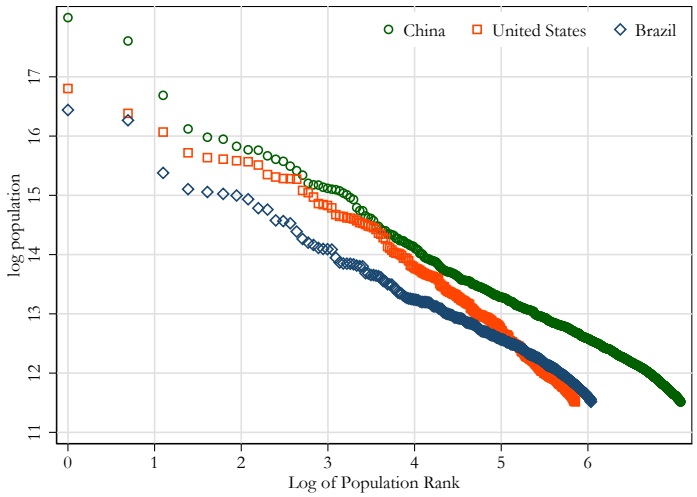
	Coeff./ St. Dev.	Obs./ R^2	Geographic Controls	Processing Trade	City definition
Urban population, additional controls	0.275***	1,061	yes	yes	MA
	(0.0447)	0.2035			
Overall MA population	0.1413**	1061	yes	yes	MA
	(0.0571)	0.1903			
Using export information from customs	0.275***	1,061	yes	yes	MA
	(0.0447)	0.2035			
Urban population, baseline controls	0.726***	323	no	no	Prefecture
	(.119)	0.1658			
Urban population, geographic controls	.274***	220	yes	no	Prefecture
	(0.0920)	0.3926			
Urban population, additional controls	0.233**	220	yes	yes	Prefecture
	(0.0893)	0.4413			
Overall MA population	0.233**	220	yes	yes	Prefecture
	(0.0937)	0.4417			
Using export information from customs	0.235***	220	yes	yes	Prefecture
	(0.0892)	0.4434			

Notes: The Table replicates results in Table 2 under different controls, agglomeration measures, and city definitions. For all regressions, the dependent variable corresponds to the natural logarithm of export intensity, computed as the ratio of city-level exports and sales, computed over all Chinese manufacturing firms in 2004.

B.2 City Size Distribution in the Data and the Model

Figure B.2 shows, the city size distribution for China the United States and Brazil. The Figure shows that both China and Brazil have a relatively higher density of small cities than the United States.

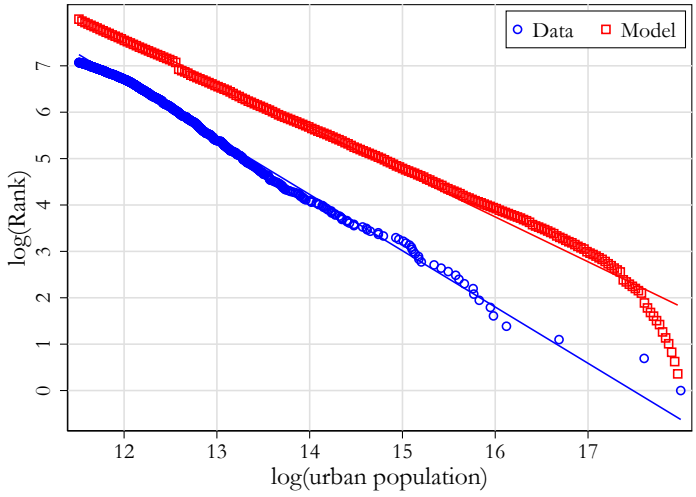
Figure B.2: City Size Distribution in China, United States and Brazil



Notes: The figure shows the distribution of city size – measured in terms of population. It plots the logarithm of each city's ranking against its corresponding population (in logarithms). Cities in China and the United States are defined in terms of metropolitan areas, and as microregions in the case of Brazil (see section 2.1 for details). For all countries, the analysis only considers cities with population over 100,000 people.

Figure B.3 plots the the city size distribution estimated by the model. For this, we compute the number of cities that endogenously arise in each city size bin once the model is simulated. As can be seen, the city-size is well-approximated by a linear regression. The estimated coefficient of the related population-rank regression is -1.004 (robust standard error 0.021), suggesting that the city-size distribution follows Zipf's law. Compared with the actual city-size distribution in China, we observe that the model predicts a higher proportion of large cities and a lower proportion of small cities than the data. This may be due to additional mobility frictions, such as migration restrictions (Au and Henderson, 2006) not explicitly explored by our model.

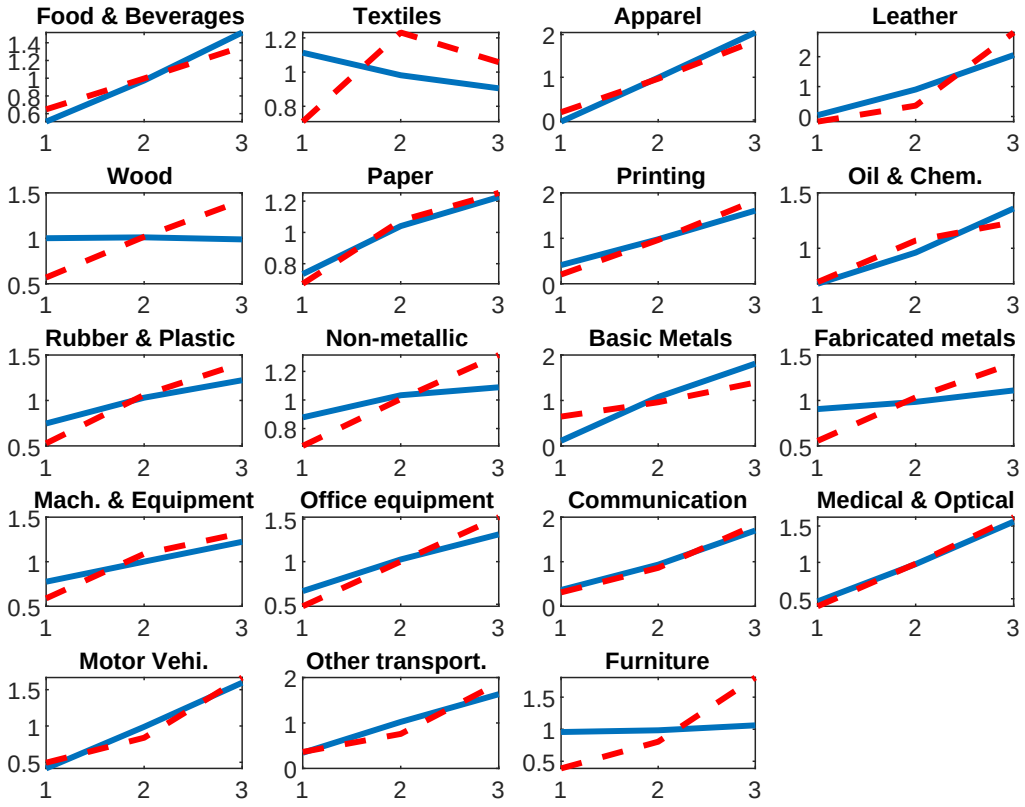
Figure B.3: City Size Distribution: Model vs. Data



Notes: The figure compares the city size distribution implied by the estimated model with the Chinese data. For both, model and data, the figure plots the logarithm of urban population for each city against its corresponding ranking (in logarithms). Cities are defined in terms of metropolitan areas (see section 2.1 for details). The analysis only considers cities with population above 100,000 people.

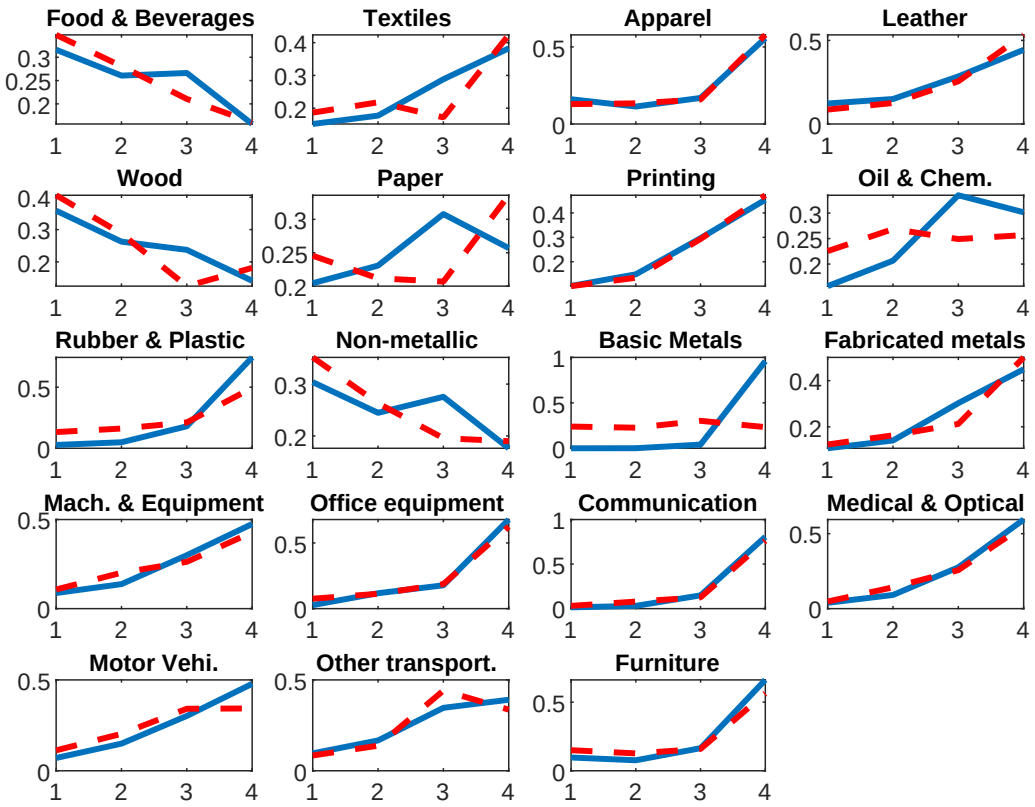
B.3 Model Fit

Figure B.4: Average value added by city size



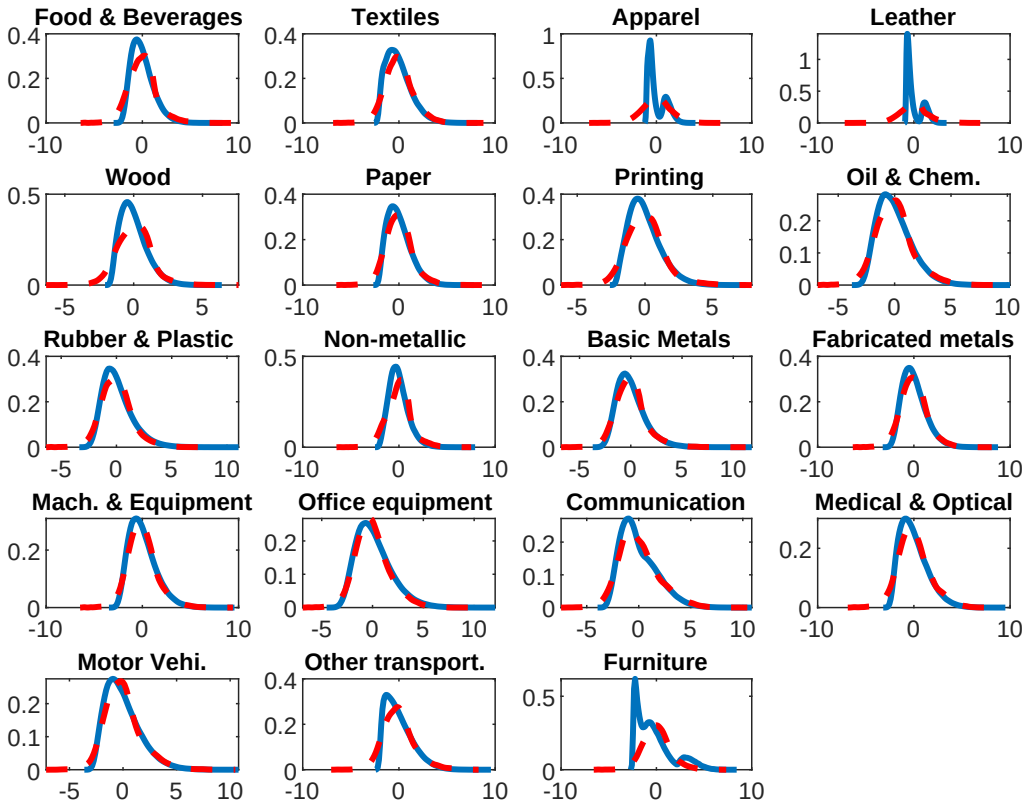
Notes: The figure shows the fit of the model (blue, solid line) to the observed (red, dashed line) average value added by city size in the Chinese manufacturing sector. Average value added is normalized by the average value added across all city sizes.

Figure B.5: Share of total value added by city quartile



Notes: The figure shows the fit of the model (blue, solid line) to the observed (red, dashed line) employment share in each quartiles of city size in the Chinese manufacturing sector. The model does not directly target the employment distribution across city sizes.

Figure B.6: Firm size distribution



Notes: The figure shows the fit of the model (blue, solid line) to the observed (red, dashed line) log-revenue distribution in the Chinese manufacturing sector. The model only targets the top decile of the distribution of revenues in each sector.

Table B.3: Estimated Coefficients

		s		σ_z		σ_R		A		θ		f_x †	
ISIC	INDUSTRY	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.
15	Food and beverages	0.371	(0.044)	0.137	(0.012)	0.084	(0.014)	-0.008	(0.003)	0.204	(0.006)	0.165	(0.058)
17	Textiles	0.133	(0.118)	0.058	(0.026)	0.128	(0.026)	0.108	(0.16)	0.147	(0.037)	0.004	(0.004)
18	Apparel	0.589	(0.111)	0.019	(0.002)	0.013	(0.001)	0.086	(0.033)	4.425	(0.767)	1.863	(0.657)
19	Leather products	0.141	(0.196)	0.006	(0.055)	0.019	(0.002)	0.097	(0.162)	4.980	(0.028)	2.115	(0.694)
20	Wood (except furniture)	0.253	(0.158)	0.100	(0.019)	0.131	(0.016)	0.078	(0.013)	0.084	(0.009)	0.035	(0.020)
21	Paper	0.072	(0.015)	0.098	(0.02)	0.187	(0.013)	0.089	(0.001)	0.031	(0.004)	0.002	(0.001)
22	Publishing & printing	0.387	(0.067)	0.087	(0.02)	0.069	(0.023)	0.086	(0.005)	0.013	(0.001)	0.005	(0.005)
23-24	Petroleum and fuel;	0.269	(0.103)	0.181	(0.031)	0.195	(0.057)	0.034	(0.018)	0.293	(0.013)	0.083	(0.026)
25	Rubber & plastics	0.435	(0.167)	0.205	(0.04)	0.021	(0.051)	0.264	(0.116)	0.024	(0.014)	0.000	(0.000)
26	Non-metallic mineral	0.768	(0.29)	0.240	(0.057)	0.080	(0.101)	0.015	(0.031)	0.045	(0.003)	0.065	(0.022)
27	Basic metals	0.309	(0.232)	0.194	(0.034)	0.015	(0.026)	0.429	(0.174)	4.934	(0.103)	0.908	(0.367)
28	Fabricated metal	0.243	(0.032)	0.178	(0.024)	0.133	(0.028)	0.141	(0.009)	0.038	(0.002)	0.000	(0.000)
29	Machinery and equipment	0.328	(0.083)	0.202	(0.056)	0.184	(0.096)	0.102	(0.006)	0.038	(0.004)	0.001	(0.001)
30-31	Office, accounting,	0.320	(0.376)	0.268	(0.021)	0.102	(0.063)	0.265	(0.033)	0.041	(0.017)	0.000	(0.000)
32	Radio, television and	0.591	(0.197)	0.190	(0.03)	0.168	(0.083)	0.104	(0.085)	0.964	(0.929)	0.766	(0.783)
33	Medical, precision and	0.173	(0.098)	0.144	(0.025)	0.442	(0.042)	0.104	(0.003)	0.079	(0.004)	0.007	(0.004)
34	Motor vehicles, trailers	0.276	(0.12)	0.149	(0.059)	0.300	(0.117)	0.039	(0.071)	0.091	(0.016)	0.005	(0.002)
35	Other transport	0.032	(0.06)	0.015	(0.023)	0.378	(0.048)	0.094	(0.011)	0.087	(0.003)	0.008	(0.002)
36	Furniture	0.273	(0.025)	0.204	(0.032)	0.023	(0.011)	0.293	(0.062)	1.288	(2.474)	0.934	(1.052)

Notes: The Table shows the parameters for the model presented in section 3 estimated for the Chinese manufacturing sector in 2004. The quantitative analysis considers a mixed strategy, calibrating parameters that can be directly mapped to particular moments of the data (upper panel), and estimating the remaining parameters (bottom panel) through simulated method of moments. †: As a share of median domestic profits.

Table B.4: Model Fit: Targeted Moments

		Average Value Added by City Size						VA Share by City Quartiles						Export		Export	
		Small Cities		Medium Cities		Large Cities		Bottom Quartile		Top Quartile		Size Distribution		Participation		Intensity	
ISIC	INDUSTRY	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model
15	Food and beverages	0.926	0.655	1.423	1.257	1.932	1.863	0.290	0.260	0.230	0.193	0.100	0.101	0.060	0.059	0.058	0.059
			(0.071)		(0.077)		(0.103)		(0.021)		(0.039)		(0.004)		(0.001)		(0.005)
17	Textiles	0.831	1.257	1.440	1.271	1.237	1.302	0.145	0.105	0.509	0.515	0.100	0.096	0.182	0.178	0.119	0.175
			(0.195)		(0.023)		(0.218)		(0.048)		(0.167)		(0.002)		(0.001)		(0.006)
18	Apparel	0.075	0.081	0.399	0.501	0.765	1.131	0.110	0.107	0.620	0.651	0.100	0.095	0.310	0.309	0.190	0.440
			(0.128)		(0.02)		(0.094)		(0.008)		(0.017)		(0.003)		(0.004)		(0.016)
19	Leather products	-0.052	0.009	0.111	0.539	0.861	1.214	0.091	0.087	0.504	0.520	0.100	0.097	0.276	0.276	0.085	0.430
			(0.011)		(0.011)		(0.018)		(0.002)		(0.006)		(0.004)		(0.002)		(0.004)
20	Wood (except furniture)	0.383	0.692	0.684	0.684	0.951	0.717	0.372	0.307	0.236	0.190	0.100	0.098	0.097	0.094	0.073	0.132
			(0.075)		(0.028)		(0.089)		(0.057)		(0.071)		(0.003)		(0.003)		(0.003)
21	Paper	0.676	0.852	1.081	1.060	1.260	1.244	0.213	0.160	0.403	0.338	0.100	0.099	0.043	0.043	0.012	0.015
			(0.034)		(0.033)		(0.063)		(0.017)		(0.022)		(0.003)		(0.002)		(0.002)
22	Publishing & printing	0.166	0.277	0.785	0.751	1.494	1.365	0.072	0.067	0.519	0.546	0.100	0.102	0.024	0.017	0.004	0.015
			(0.151)		(0.029)		(0.09)		(0.006)		(0.082)		(0.003)		(0.002)		(0.003)
23-24	Petroleum and fuel;	1.295	1.106	1.993	1.745	2.303	2.248	0.139	0.120	0.399	0.367	0.100	0.099	0.081	0.081	0.043	0.042
	Chemical products		(0.013)		(0.075)		(0.048)		(0.005)		(0.053)		(0.002)		(0.001)		(0.004)
25	Rubber & plastics	0.520	0.741	1.044	1.039	1.388	1.494	0.118	0.022	0.521	0.791	0.100	0.102	0.091	0.085	0.033	0.055
			(0.195)		(0.159)		(0.168)		(0.038)		(0.199)		(0.001)		(0.002)		(0.013)
26	Non-metallic mineral	0.631	0.625	0.935	0.780	1.221	0.982	0.283	0.242	0.278	0.227	0.100	0.100	0.046	0.045	0.030	0.044
	products		(0.202)		(0.049)		(0.084)		(0.041)		(0.01)		(0.002)		(0.003)		(0.003)
27	Basic metals	1.118	0.454	1.664	0.719	2.413	1.740	0.189	0.000	0.295	0.977	0.100	0.101	0.054	0.053	0.037	0.034
			(0.594)		(0.278)		(0.165)		(0)		(0.015)		(0.003)		(0.001)		(0.003)
28	Fabricated metal	0.499	0.982	0.929	1.096	1.268	1.202	0.103	0.070	0.548	0.551	0.100	0.099	0.102	0.094	0.045	0.098
	products		(0.094)		(0.035)		(0.143)		(0.026)		(0.079)		(0.004)		(0.004)		(0.003)
29	Machinery and equipment	0.808	0.969	1.495	1.242	1.816	1.705	0.079	0.072	0.508	0.540	0.100	0.100	0.083	0.081	0.035	0.043
			(0.084)		(0.081)		(0.128)		(0.014)		(0.058)		(0.003)		(0.002)		(0.004)
30-31	Office, accounting,	0.629	1.010	1.321	1.631	2.006	2.193	0.053	0.017	0.686	0.677	0.100	0.099	0.140	0.138	0.040	0.228
	computing, electrical mach.		(0.203)		(0.038)		(0.125)		(0.02)		(0.062)		(0.002)		(0.005)		(0.038)

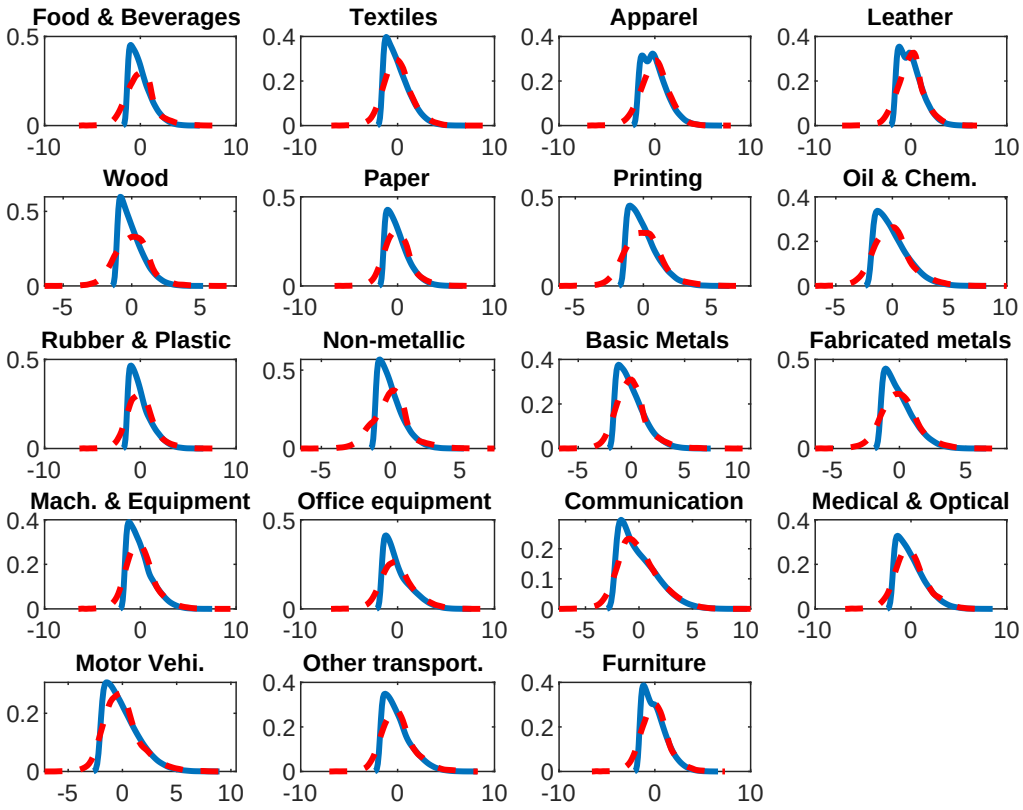
Table B.5: Model Fit: Targeted Moments (continued)

		Average Value Added by City Size						VA Share by City Quartiles				Top Decile Firm		Export		Export	
		Small Cities		Medium Cities		Large Cities		Bottom Quartile		Top Quartile		Size Distribution		Participation		Intensity	
ISIC	INDUSTRY	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model
32	Radio, television &	0.423	0.441	1.169	1.301	2.476	2.640	0.012	0.008	0.821	0.814	0.100	0.096	0.254	0.257	0.044	0.365
	communication equipment		(0.077)		(0.184)		(0.264)		(0.004)		(0.047)		(0.005)		(0.004)		(0.073)
33	Medical, precision &	0.443	0.515	1.095	1.194	1.808	1.908	0.031	0.029	0.644	0.646	0.100	0.094	0.160	0.159	0.031	0.216
	optical instruments		(0.111)		(0.061)		(0.016)		(0.004)		(0.025)		(0.002)		(0.003)		(0.003)
34	Motor vehicles, trailers	0.889	0.797	1.506	1.791	2.996	2.894	0.047	0.043	0.505	0.625	0.100	0.101	0.098	0.099	0.024	0.029
	& semi-trailers		(0.151)		(0.093)		(0.064)		(0.014)		(0.077)		(0.002)		(0.004)		(0.002)
35	Other transport	0.506	0.505	1.060	1.581	2.622	2.480	0.072	0.072	0.416	0.453	0.100	0.096	0.098	0.098	0.019	0.066
	equipment		(0.052)		(0.073)		(0.068)		(0.008)		(0.016)		(0.002)		(0.002)		(0.001)
36	Furniture	0.267	0.774	0.552	0.758	1.239	1.110	0.138	0.055	0.565	0.729	0.100	0.099	0.221	0.207	0.132	0.285
			(0.61)		(0.485)		(0.3)		(0.052)		(0.188)		(0.003)		(0.014)		(0.100)
	Average	0.580	0.671	1.089	1.102	1.687	1.654	0.134	0.097	0.485	0.545	0.100	0.099	0.127	0.125	0.055	0.146

Notes: The Table summarizes the moments targeted by the parameter of the model when taking the model to the data. With the exception of the composite parameter $b(1-\eta)/\eta$, all parameters are computed at level of 2-digit ISIC sectors (revision 3). The quantitative analysis considers a mixed strategy, calibrating parameters that can be directly mapped to particular moments of the data (upper panel), and estimating the remaining parameters (bottom panel) through simulated method of moments.

C Model without Geography

Figure C.7: Firm size distribution



Notes: The figure shows the fit of the model (blue, solid line) to the observed (red, dashed line) log-revenue distribution in the Chinese manufacturing sector. The model only targets the top decile of the distribution of revenues in each sector.

Table C.6: Estimated Coefficients

		σ_z		θ		f_x †	
ISIC	INDUSTRY	Coeff.	St.dev.	Coeff.	St.dev.	Coeff.	St.dev.
15	Food and beverages	0.217	(0.005)	1.491	(0.031)	0.052	(0.004)
17	Textiles	0.147	(0.005)	0.998	(0.031)	0.028	(0.005)
18	Apparel	0.230	(0.005)	0.116	(0.080)	0.000	(0.000)
19	Leather products	0.214	(0.011)	0.205	(0.096)	0.000	(0.001)
20	Wood (except furniture)	0.156	(0.007)	1.030	(0.026)	0.056	(0.005)
21	Paper	0.241	(0.005)	1.772	(0.065)	0.062	(0.008)
22	Publishing & printing	0.156	(0.004)	1.441	(0.033)	0.102	(0.011)
23-24	Petroleum and fuel;	0.436	(0.010)	1.731	(0.143)	0.022	(0.006)
25	Rubber & plastics	0.155	(0.003)	1.372	(0.021)	0.091	(0.006)
26	Non-metallic mineral	0.341	(0.007)	1.516	(0.055)	0.061	(0.005)
27	Basic metals	0.153	(0.003)	1.827	(0.050)	0.087	(0.011)
28	Fabricated metal	0.217	(0.007)	1.056	(0.038)	0.037	(0.005)
29	Machinery and equipment	0.426	(0.009)	2.031	(0.053)	0.088	(0.008)
30-31	Office, accounting,	0.295	(0.017	1.264	(0.041)	0.142	(0.022)
32	Radio, television and	0.771	(0.048)	1.290	(0.099)	0.046	(0.013)
33	Medical, precision and	0.778	(0.031)	0.916	(0.134)	0.029	(0.007)
34	Motor vehicles, trailers	0.630	(0.019)	1.627	(0.221)	0.014	(0.005)
35	Other transport	0.367	(0.008)	1.839	(0.063)	0.092	(0.012)
36	Furniture	0.292	(0.018)	0.329	(0.095)	0.004	(0.005)

Notes: The Table shows the parameters for the model presented in section 3 estimated for the CHinese manufacturing sector in 2004. The quantitative analysis considers a mixed strategy, calibrating parameters that can be directly mapped to particular moments of the data (upper panel), and estimating the remaining parameters (bottom panel) through simulated method of moments. †: As a share of median domestic profits.

Table C.7: Model Fit: Targeted Moments

		Top Decile Firm Size Distribution		Export Participation		Export Intensity	
ISIC	INDUSTRY	Data	Model	Data	Model	Data	Model
15	Food and beverages	0.100	0.100 (0.003)	0.060	0.060 (0.002)	0.092	0.091 (0.003)
17	Textiles	0.100	0.100 (0.004)	0.182	0.182 (0.005)	0.266	0.268 (0.009)
18	Apparel	0.100	0.100 (0.003)	0.310	0.311 (0.005)	0.475	0.478 (0.011)
19	Leather products	0.100	0.101 (0.002)	0.276	0.277 (0.005)	0.467	0.465 (0.013)
20	Wood (except furniture)	0.100	0.099 (0.003)	0.097	0.098 (0.002)	0.192	0.193 (0.007)
21	Paper	0.100	0.101 (0.003)	0.043	0.044 (0.002)	0.065	0.067 (0.006)
22	Publishing & printing	0.100	0.100 (0.002)	0.024	0.024 (0.001)	0.070	0.069 (0.005)
23-24	Petroleum and fuel; Chemical products	0.100	0.099 (0.004)	0.081	0.081 (0.004)	0.067	0.066 (0.008)
25	Rubber & plastics	0.100	0.101 (0.003)	0.091	0.091 (0.003)	0.199	0.203 (0.013)
26	Non-metallic mineral products	0.100	0.099 (0.002)	0.045	0.046 (0.003)	0.087	0.086 (0.006)
27	Basic metals	0.100	0.101 (0.004)	0.054	0.055 (0.003)	0.066	0.066 (0.003)
28	Fabricated metal products	0.100	0.099 (0.002)	0.102	0.102 (0.003)	0.192	0.191 (0.014)
29	Machinery and equipment	0.100	0.102 (0.003)	0.083	0.083 (0.003)	0.168	0.168 (0.007)
30-31	Office, accounting, computing, electrical mach.	0.100	0.098 (0.002)	0.140	0.140 (0.005)	0.495	0.498 (0.013)
32	Radio, television & communication equipment	0.100	0.098 (0.003)	0.254	0.255 (0.006)	0.495	0.493 (0.012)
33	Medical, precision & optical instruments	0.100	0.099 (0.004)	0.160	0.161 (0.003)	0.337	0.338 (0.023)
34	Motor vehicles, trailers & semi-trailers	0.100	0.100 (0.002)	0.098	0.098 (0.003)	0.073	0.071 (0.013)
35	Other transport equipment	0.100	0.101 (0.003)	0.098	0.100 (0.004)	0.208	0.210 (0.007)
36	Furniture	0.100	0.099 (0.003)	0.221	0.219 (0.005)	0.475	0.467 (0.011)
	Average	0.100	0.100	0.128	0.128	0.236	0.236

Notes: The Table summarizes the moments targeted by the parameter of the model when taking the model to the data. With the exception of the composite parameter $b(1-\eta)/\eta$, all parameters are computed at level of 2-digit ISIC sectors (revision 3). The quantitative analysis considers a mixed strategy, calibrating parameters that can be directly mapped to particular moments of the data (upper panel), and estimating the remaining parameters (bottom panel) through simulated method of moments.