Appendix

A.1. Model proofs

To motivate our empirical analysis, we construct a two-period, two-sector model of a local economy which combines the Lucas (1978) insights of entrepreneurial choice with a model of heterogeneous firms and firm entry. The model features exogenous profitability shocks to the local commodity sector in period 2. In the model, the local economy comprises two sectors, producing commodity goods and local non-tradable goods, indexed respectively by $j \in \{C, N\}$. The commodity sector provides a single homogenous good. The local non-tradable sector is comprised of a continuum of differentiated goods, indexed by varieties ω. The model is described in the paper in Section 2. In the propositions below, we study the effects of an exogenous increase in the price $P_{t,C}$ of the commodity good in period 2. We are particularly interested in the effects of such an increase on employment and the magnitude of the firm entry response in the non-tradable sector,.

Proof of proposition 1

From equations (7) and (8), it is clear that:

$$\frac{d\ln \pi_{t,N}}{d\ln P_{t,C}} - \frac{d\ln w_t}{d\ln P_{t,C}} = \frac{d\ln l_{t,C}}{d\ln P_{t,C}}.$$

It is then easy to check from Eq. (9) that:

$$\frac{d\ln M_t}{d\ln P_{t,C}} = \Xi \frac{d\ln l_{t,C}}{d\ln P_{t,C}}.$$

for some constant $0 < \Xi < 1$. That is, a change in the commodity price will increase the number of entrepreneurs if it increases the number of workers in the commodity sector. By perfect mobility, we know that:

$$\begin{aligned} 0 &= \frac{d\ln w_t}{d\ln P_{t,C}} - \alpha \frac{d\ln P_{t,N}}{d\ln P_{t,C}} \\ &= (1-\alpha)\frac{d\ln w_t}{d\ln P_{t,C}} + \frac{\alpha}{\sigma - 1}\frac{d\ln M_t}{d\ln P_{t,C}} \\ &= (1-\alpha)\frac{d\ln w_t}{d\ln P_{t,C}} + \frac{\alpha}{\sigma - 1}\Xi\frac{d\ln l_{t,C}}{d\ln P_{t,C}}. \end{aligned}$$

By equations (4) we then have

$$0 = (1-\alpha)\left[1 - \gamma\frac{d\ln l_{t,C}}{d\ln P_{t,C}}\right] + \frac{\alpha}{\sigma - 1}\Xi\frac{d\ln l_{t,C}}{d\ln P_{t,C}}$$

Then:

$$\frac{d\ln l_{t,C}}{d\ln P_{t,C}} = \frac{(1-\alpha)}{\gamma(1-\alpha) - \frac{\alpha}{\sigma-1}\Xi}.$$

Since by assumption $\gamma(1-\alpha) > \alpha/(\sigma - 1)$, the above expression is positive, which implies that commodity price increases leads to nontradable firm entry.

Derivation of Eq. (16)

By Eq. (9), we have:

$$M_{tj} = \frac{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)}{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)+1}\varphi_j L_{0j},$$

where M_{tj} is the number of entrepreneurs of demographic j. Taking logs we have:

$$\ln M_{tj} = \ln \frac{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)}{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)+1} + \ln \varphi_j + \ln L_{0j}.$$

Differentiating with respect to $\ln P_{t,C}$ gives:

$$\begin{aligned}\frac{d\ln M_{tj}}{d\ln P_{t,C}} &= \left[\frac{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)}{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)} - \frac{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)}{\exp\left(\frac{v_{E,jt}-v_{W,t}}{\kappa_j}\right)+1}\right]\left(\frac{d\ln v_{E,jt}}{d\ln P_{t,C}} - \frac{d\ln v_{W,jt}}{d\ln P_{t,C}}\right)/\kappa_j. \\ &= (1-p_{tj})\left(\frac{d\ln v_{E,jt}}{d\ln P_{t,C}} - \frac{d\ln v_{W,jt}}{d\ln P_{t,C}}\right)/\kappa_j,\end{aligned}$$

where p_{tj} is the probability an individual in population $\varphi_j L_{0j}$ chooses to become an entreprneur. By equations (2) and (7):

$$\frac{d\ln v_{E,jt}}{d\ln P_{t,C}} = \frac{d\ln \pi_{t,N}}{d\ln P_{t,C}} = \frac{d\ln Y_t}{d\ln P_{t,C}} - \frac{d\ln M_t}{d\ln P_{t,C}}.$$

By Eq. (3):

$$\frac{d\ln v_{W,jt}}{d\ln P_{t,C}} = \frac{d\ln w_t}{d\ln P_{t,C}}.$$

Since $(1-p_{tj}) \approx 1$, putting everything together yields:

$$\frac{d\ln M_{tj}}{d\ln P_{t,C}} \approx \left(\frac{d\ln Y_t}{d\ln P_{t,C}} - \frac{d\ln M_t}{d\ln P_{t,C}} - \frac{d\ln w_t}{d\ln P_{t,C}}\right)/\kappa_j.$$

This immediately yields Eq. (16).

A.2. Estimating entrepreneur characteristics

In this section, we describe how to formally estimate the distributional characteristics of those entrepreneurs who start a firm in response to local demand shocks. This is be useful in comparing the characteristics of these entrepreneurs to the characteristics of the average entrepreneur in the Brazilian population, as discussed in Section 6.

As in the main text, let the binary indicator variable T_{ijt} denote the decision in year t of an individual i in municipality j to become an entrepreneur. We again let $Z_{jt} = 1$ denote a time of exogenous increase in local demand in municipality j, as proxied for by local agricultural endowment shocks. Let T_{1ijt} and T_{0ijt} denote the choice to become an entrepreneur when $Z_{jt} = 1$ and $Z_{jt} = 0$, respectively. Then we focus on the "responsive entrepreneurs", namely those individuals who start

a business in response to the endowment shock; that is, an individual i for whom $T_{1ijt} = 1$ and $T_{0ijt} = 0$ or, equivalently, $T_{1ijt} > T_{0ijt}$. Our goal is to estimate the size and characteristics of this population.

Towards this end, we investigate heterogeneity in the entrepreneurial response to local demand shocks by sorting on individual characteristics. Specifically, let the variable n index demographic categories (e.g. quartiles) of a characteristic of interest such as age. We then estimate the following linear probability model for each subpopulation indexed by n, in particular for young individuals and then again for old individuals:

$$T_{injt} = \alpha_{nj} + \delta_{nt} + \beta_n \cdot Z_{jt} + \varepsilon_{injt}. \tag{1}$$

where α_{nj} denote municipality fixed effects and δ_{nt} denote time fixed effects. We allow each subpopulation to have its own baseline level of entrepreneurship and to have its own time trend.

Two assumptions are key to our empirical strategy. First, as long as Z_{jt} is uncorrelated with the error term, this specification provides a consistent estimate of β_n. Second, we assume monotonicity, which says that $T_{1ijt} \geq T_{0ijt}$ for all i. This rules out cases where an individual starts a business when economic opportunities are weak, but does not start a business when opportunities are strong.

The assumptions of orthogonality and monotonicity imply that:

$$\begin{aligned} P\left(T_{1injt} > T_{0injt}\right) &= E\left[T_{1injt} - T_{0injt}\right] \\ &= E\left[T_{injt}|Z_{jt} = 1\right] - E\left[T_{injt}|Z_{jt} = 0\right] \\ &= \beta_n. \end{aligned}$$

Within this framework, the treatment coefficient β_n reveals not only the increase in the probability to become an entrepreneur, but also the proportion of individuals in demographic category n who are responsive entrepreneurs.

Additionally, we would like to determine the distribution of characteristics *conditional* on being a responsive entrepreneur. This will allow us to compare their characteristics to the overall population of workers and to the overall set of entrepreneurs. We can accomplish this with Bayes's rule. Let X_i be the characteristic of interest. Then, conditional on an individual i being a responsive entrepreneur, the probability that i is in category n can be calculated as follows:

$$\frac{P\left(X_i = n|T_{1ijt} > T_{0ijt}\right)}{P\left(X_i = n\right)} = \frac{P\left(T_{1ijt} > T_{0ijt}|X_i = n\right)}{P\left(T_{1ijt} > T_{0ijt}\right)} = \frac{\beta_n}{\beta}$$

where β is found by estimating Eq. (1) on the entire population. This implies that the distribution of characteristics of responsive entrepreneurs is given by:

$$P\left(X_i = n|T_{1ijt} > T_{0ijt}\right) = \frac{\beta_n}{\beta} P\left(X_i = n\right).$$

Statistics for all entrepreneurs in the population are computed directly from the data, as the fraction of individuals who create a new firm in a given year and that are in a particular age quartile.

A.3. Structural counterfactuals

To study the counterfactual impact of different demographics on the firm entry response to commodity price shocks, we use our structural model to recover

$$\frac{d^2 \ln M_t}{d \ln P_{t,C} d \ln L_{j0}} \Big/ \frac{d \ln M_t}{d \ln P_{t,C}},$$

that is how the elasticity of entrepreneurship to commodity prices varies with the size L_{j0} of demographic j in the local population. As shown in Section A.1, we have

$$\begin{aligned} 0 &= (1-\alpha) \frac{d \ln w_t}{d \ln P_{t,C}} + \frac{\alpha}{\sigma - 1} \frac{d \ln M_t}{d \ln P_{t,C}} \\ &= (1-\alpha) \left(1 - \gamma \frac{d \ln l_{t,C}}{d \ln P_{t,C}} \right) + \frac{\alpha}{\sigma - 1} \frac{d \ln M_t}{d \ln P_{t,C}} \end{aligned}$$

Furthermore, we have:

$$\begin{aligned} \frac{d \ln M_t}{d \ln P_{t,C}} &= \sum_j \phi_{jt} \frac{\frac{d \ln \pi_t}{d \ln P_{t,C}} - \frac{d \ln w_t}{d \ln P_{t,C}}}{\kappa_j} \\ &= \sum_j \phi_{jt} \frac{\frac{d \ln Y_t}{d \ln P_{t,C}} - \frac{d \ln M_t}{d \ln P_{t,C}} - \frac{d \ln w_t}{d \ln P_{t,C}}}{\kappa_j} \\ &= \sum_j \phi_{jt} \frac{\frac{d \ln l_{t,C}}{d \ln P_{t,C}} - \frac{d \ln M_t}{d \ln P_{t,C}}}{\kappa_j} \end{aligned}$$

where $\phi_{jt} = M_{jt}/M_t$, the share of total entrepreneurs in demographic j, which is observable. This system of equations can be solved for $\frac{d \ln M_t}{d \ln P_{t,C}}$ and $\frac{d \ln l_{t,C}}{d \ln P_{t,C}}$.

It is then clear that the cross partial derivative can be recovered from the system of equations:

$$\begin{aligned} 0 &= -(1-\alpha) \gamma \frac{d^2 \ln l_{t,C}}{d \ln P_{t,C} d \ln L_{j0}} + \frac{\alpha}{\sigma - 1} \frac{d^2 \ln M_t}{d \ln P_{t,C} d \ln L_{j0}} \\ \frac{d^2 \ln M_t}{d \ln P_{t,C} d \ln L_{j0}} &= \sum_j \phi_{jt} \frac{d \ln \phi_{jt}}{d \ln L_{j0}} \frac{\frac{d \ln l_{t,C}}{d \ln P_{t,C}} - \frac{d \ln M_t}{d \ln P_{t,C}}}{\kappa_j} + \sum_j \phi_{jt} \frac{\frac{d^2 \ln l_{t,C}}{d \ln P_{t,C} d \ln L_{j0}} - \frac{d^2 \ln M_t}{d \ln P_{t,C} d \ln L_{j0}}}{\kappa_j}. \end{aligned}$$

It thus simply remains to determine $\frac{d \ln \phi_{tj}}{d \ln L_{j0}}$.

Recall that:

$$M_{jt} = \sum_j \frac{\exp\left(\frac{v_{E,jt} - v_{W,t}}{\kappa_j} \right)}{\exp\left(\frac{v_{E,jt} - v_{W,t}}{\kappa_j} \right) + 1} \varphi_j L_{0j}.$$

Then:

$$0 = -(1-\alpha)\gamma \frac{d\ln l_{t,C}}{d\ln L_{j0}} + \frac{\alpha}{\sigma - 1}\frac{d\ln M_t}{d\ln L_{j0}}$$

$$\frac{d\ln M_t}{d\ln L_{j0}} = \phi_{jt} + \sum_j \phi_{jt} \frac{\frac{d\ln l_{t,C}}{d\ln L_{j0}} - \frac{d\ln M_t}{d\ln L_{j0}}}{\kappa_j}.$$

Solving this system equations, we can then compute:

$$\frac{d\ln \phi_{jt}}{d\ln L_{j0}} = 1 + \frac{\frac{d\ln l_{t,C}}{d\ln L_{j0}} - \frac{d\ln M_t}{d\ln L_{j0}}}{\kappa_j} - \frac{d\ln M_t}{d\ln L_{j0}}.$$

Plugging this into the system equations above allows us to fully solve for our counterfactual simulations.

Fig. A.1. Residualized crops index

The graph captures the variation in the residuals $\hat{u}_{jt}$, estimated from equation 11 in the paper. We plot these regression residuals (thin gray lines) for a 10% random sample of all the municipalities in our sample over 1998-2014. The solid lines indicate the median, while the dashed lines indicate the tenth and ninetieth percentiles of the empirical distribution.

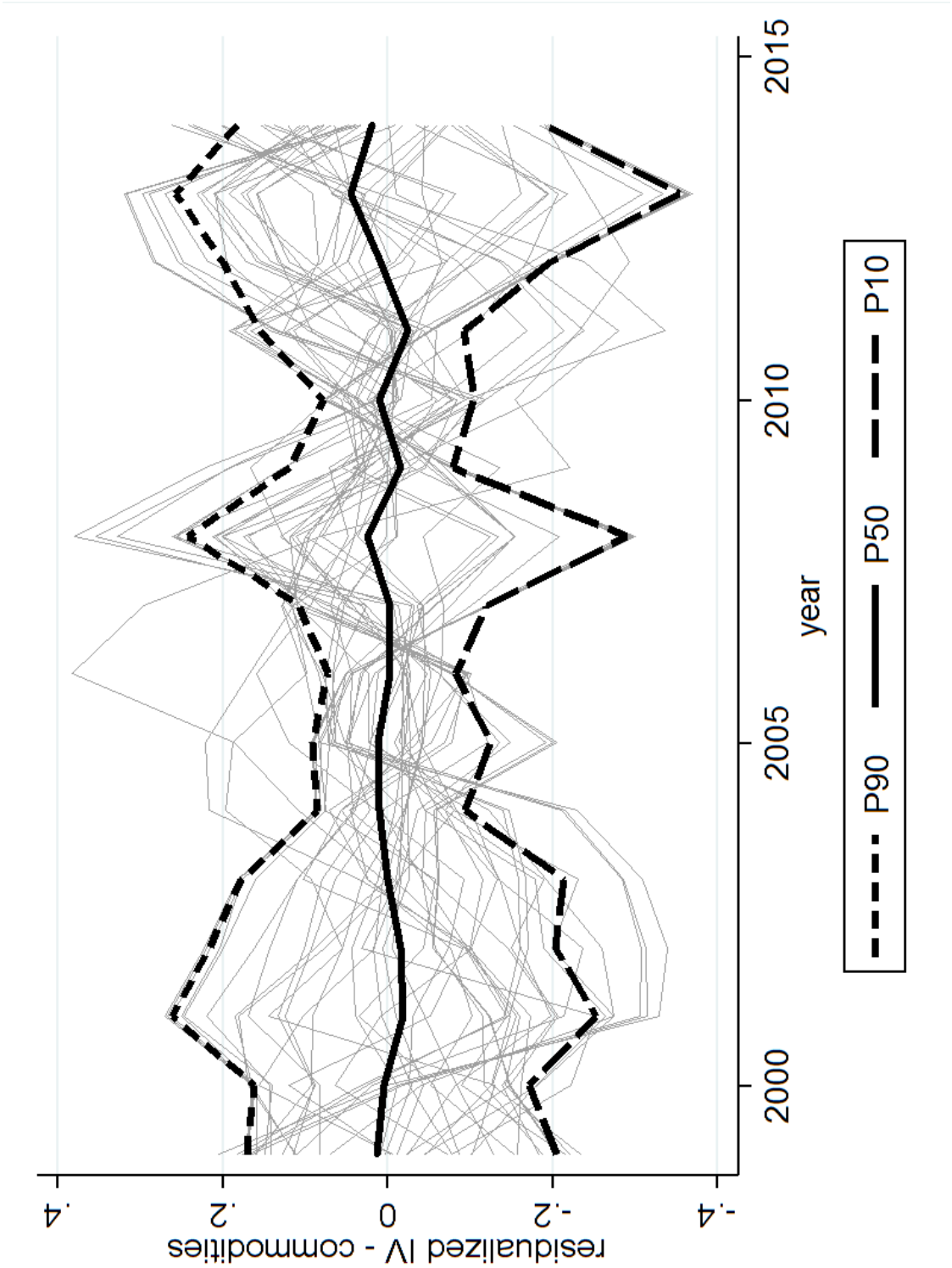

Fig. A.2. Crops index and aggregate income

The graph shows the relationship between the log of the crops index ($\ln CI_{jt}$) and the total payroll in each municipality. Both variables are regressed on local population, year and municipality fixed effects to control for municipality size, aggregate fluctuations and time-invariant differences across municiaplities. Then, the residuals from the crops index are collected in 100 bins, and each bin is plotted agains the avearage residual from the payroll regression.

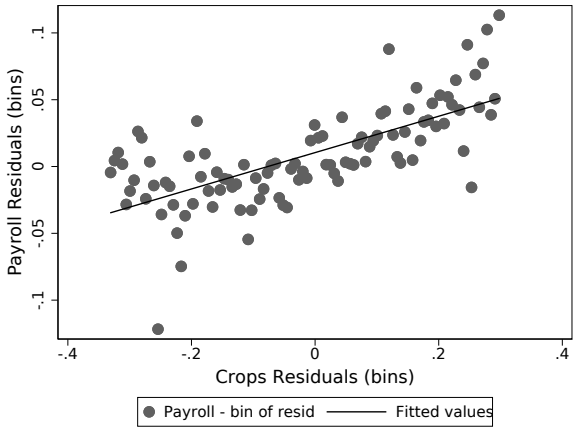

Table A.1

Agricultural endowments across municipalities

This table provides a breakdown of agricultural crops and the number of municipalities in which they are being produced. We have global commodity prices prices for 26 crops. Six of these (bean, broadbean, pea, rye, sunflower, triticale) were discarded as we were only able to find a price for generic "grains". Among the remaining 20, 3 different types of coffee are aggregated into the "Total coffee" category in the table below. Similarly, two types of cotton are aggregated in a unique "total cotton" category. As a result from these aggregation we are left with the 17 types of crops listed below.

Crops	Total Municipalities
Maize	5003
Rice	4045
Banana	3870
Orange	3763
Sugarcanes	3529
Total Coffee	2030
Soybeans	1495
Cotton	1210
Tobaccos	973
Wheat	815
Yerba mate	541
Rubber	421
Oatmeal	411
Sorghums	375
Cocoa	278
Barley	183
Indiantea	7

Table A.2

Aggregate results: Sources of employment creation

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes, splitting across sources of employment creation. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln CI_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5. The dependent variable in column 1 is the total number of employees who were either unemployed or informal (i.e. who were not in the RAIS dataset) in $t-1$. The dependent variable in column 2 is the total number of employees who were working in a different municipality in $t-1$. All dependent variables are in logs. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
	Employment from:	
	Unemployment / Informality	Different municipality
Treatment	0.202***	0.213***
	(0.021)	(0.024)
Year FE	Yes	Yes
Municipality FE	Yes	Yes
Controls	Yes	Yes
Observations	80,455	79,629
Municipalities	5,442	5,442

Table A.3
Aggregate results: Dropping "World Producer" municipalities

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes, excluding municipalities who produce a large share of the world production of any crop. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln CI_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5. *Total Employment* is the total number of employees, *Total Income* is the sum of payroll across all firms, *Number of Firms* is the total number of firms, and *Number of Closures* is the total number of firms that exit. All dependent variables are in logs. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. In Panel A (Panel B), the sample excludes municipalities that ever produced 1% (0.5%) or more of the world production of any commodity in any year in the period 1996-2015. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A - Dropping 1% World Producers

	(1)	(2)	(3)	(4)
	Total Employment	Total Income	Number Firms	Number Closures
Treatment	0.204***	0.220***	0.075***	-0.009
	(0.020)	(0.021)	(0.010)	(0.017)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	79,942	79,942	79,942	65,211
Municipalities	5,378	5,378	5,378	5,296

Panel B - Dropping 0.5% World Producers

	(1)	(2)	(3)	(4)
	Total Employment	Total Income	Number Firms	Number Closures
Treatment	0.206***	0.220***	0.074***	-0.007
	(0.020)	(0.022)	(0.010)	(0.017)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	78,403	78,403	78,403	63,761
Municipalities	5,275	5,275	5,275	5,193

Table A.4
Aggregate results: Heterogeneity by type of shock

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes, using different variations of the commodity shock, as defined in Section 5.5.2. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta Z_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5, but where Z_{jt} is either in the top 10% (row 1), top 25% (row 2), bottom 10% (row 3), or bottom 25% (row 4). In row 5, Z_{jt} is the continuous version of the shock $\ln CI_{jt}$, as defined by equation 11. *Total Employment* is the total number of employees, *Total Income* is the sum of payroll across all firms, *Number of Firms* is the total number of firms, and *Number of Closures* is the total number of firms that exit. All dependent variables are in logs. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
		Total	Number of	Firm
	Employment	Income	Firms	Closures
Treatment - Top 10%	0.069***	0.078***	0.027***	-0.008
	(0.007)	(0.008)	(0.010)	(0.007)
Treatment - Top 25%	0.057***	0.063***	0.020***	-0.009*
	(0.006)	(0.006)	(0.010)	(0.005)
Treatment - Bottom 10%	-0.065***	-0.068***	-0.018***	0.004
	(0.008)	(0.009)	(0.010)	(0.007)
Treatment - Bottom 25%	-0.047***	-0.048***	-0.019***	-0.001
	(0.005)	(0.006)	(0.010)	(0.005)
Treatment - Continuous variable	0.206***	0.222***	0.076***	-0.009
	(0.020)	(0.021)	(0.010)	(0.017)

Table A.5
Aggregate results: Persistence of the shock

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes, exploring how persistent the effects of the shocks are. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is as described in Section 5. *Total Employment* is the total number of employees, *Total Income* is the sum of payroll across all firms, *Number of Firms* is the total number of firms, and *Number of Closures* is the total number of firms that exit. All dependent variables are in logs. In column 1, $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. Columns 2 to 5 indicate different variations of the main treatment variable, where the shock refers to 1, 2, 3, or 4 years before year t, respectively. Each row indicates a different dependent variable, and therefore each cell represents the coefficient of one single regression. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Lag treatment	0	1	2	3	4
Total employment	0.206***	0.169***	0.140***	0.121***	0.089***
	(0.020)	(0.018)	(0.017)	(0.015)	(0.013)
Total income	0.222***	0.175***	0.147***	0.136***	0.115***
	(0.021)	(0.020)	(0.018)	(0.017)	(0.016)
Total number of firms	0.076***	0.078***	0.069***	0.063***	0.052***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Number of closures	-0.009	0.000	0.005	0.011	0.001
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)

Table A.6

Aggregate results: Formal vs informal sector

This table reports the estimated effect of commodity price shocks on the number of formal and informal firms and workers in a given municipality. All the outcomes are obtained starting from PNAD data from 2009-2014, as discussed in the paper. State level counts of formal and informal firms/workers are assigned to municipalities based on population shares. The count of workers in column 3 and 4 include both employees and self-employed. All dependent variables are in logs. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4, so as to capture elasticities. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Firms		All workers	
	Formal	Informal	Formal	Informal
Treatment	0.073***	-0.001	0.040***	-0.001
	(0.009)	(0.004)	(0.003)	(0.003)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	21,726	21,726	21,726	21,726
Municipalities	5,435	5,435	5,435	5,435

Table A.7

Aggregate results: Dropping municipalities above the 95th percentile

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln CI_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. *Total Employment* is the total number of employees, *Total Income* is the sum of payroll across all firms, *Number of Firms* is the total number of firms, and *Number of Closures* is the total number of firms that exit. All dependent variables are in logs. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Total Employment	Total Income	Number Firms	Number Closures
Treatment	0.166***	0.181***	0.086***	0.031*
	(0.020)	(0.022)	(0.010)	(0.017)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	76,757	76,757	76,757	62,276
Municipalities	5,262	5,262	5,262	5,174

Table A.8

Aggregate results: Dropping municipalities above the 99th percentile

This table reports the estimated effect of commodity price shocks on several municipality-level outcomes. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln C_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. *Total Employment* is the total number of employees, *Total Income* is the sum of payroll across all firms, *Number of Firms* is the total number of firms, and *Number of Closures* is the total number of firms that exit. All dependent variables are in logs. Z_{jt}Treatment is the log Crop Index $\ln C_{jt}$. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Total Employment	Total Income	Number Firms	Number Closures
Treatment	0.195***	0.212***	0.079***	0.001
	(0.020)	(0.021)	(0.001)	(0.017)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	80,078	80,078	80,078	65,349
Municipalities	5,428	5,428	5,428	5,343

Table A.9
Young responsiveness: Robustness to different shock definitions

This table reports the estimated effect of commodity price shocks on the probability of becoming an entrepreneur, using different variations of the commodity shock, as defined in Section 6. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The basic empirical specification (column 1) is $T_{ijt} = \alpha_j + \delta_t + \beta \cdot Z_{jt} + \varepsilon_{ijt}$, as described in Section 6, and where Z_{jt} is either in the top 10% (specification 1), bottom 25% (specification 2), bottom 10% (specification 3) or bottom 25% (specification 4), as described in Section 4. Column 1 includes only municipality and year fixed effects. Columns 2, 3, 4, and 5 add different sets of fixed effects, and include an interaction term constructed as an indicator equal to 1 for individuals in the bottom quartile of the age distribution in the sample. *Sector* controls include dummies for seven different sectors referred to the job in year $t-1$. *Education Controls* include a binary variable for high school diploma, and a dummy variable for above high school education. *Occupation Controls* include a binary variable that equals one if previous occupation is a white collar worker, a binary variable that equals one if previous occupation is defined as generalist, a control for the type of occupation (i.e., requires non-routine cognitive skills), and a control for experience within the firm. *Wage at Previous Job* control for the rank of the individual within the wage distribution in a municipality. Column 6 includes municipality-by-year fixed effects and Sector controls. Column 7 also includes *Education*, *Occupation* and *Wage at Previous Job* controls. The dependent variable, *Founder*, is an indicator equal to 1,000 if the individual has founded a firm in year t, and 0 otherwise. Variables are defined in Section 3. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Founder	Founder	Founder	Founder	Founder	Founder	Founder
Specification 1							
Top 10%	0.145***	0.058	0.055	0.061	0.071		
	(0.046)	(0.044)	(0.044)	(0.044)	(0.044)		
Top 10% X Young		0.298***	0.304***	0.298***	0.290**	0.229***	0.25***
		(0.113)	(0.113)	(0.113)	(0.113)	(0.085)	(0.082)
Specification 2							
Top 25%	0.066**	0.004	0.0012	0.00539	0.014		
	(0.032)	(0.031)	(0.0308)	(0.0308)	(0.0311)		
Top 25% X Young		0.227***	0.231***	0.231***	0.220***	0.207***	0.150***
		(0.077)	(0.077)	(0.077)	(0.077)	(0.061)	(0.057)
Specification 3							
Bottom 10%	-0.093**	-0.031	-0.029	-0.034	-0.049		
	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)		
Bottom 10% X Young		-0.231**	-0.231**	-0.234**	-0.229**	-0.148*	-0.201**
		(0.109)	(0.109)	(0.109)	(0.109)	(0.081)	(0.077)
Specification 4							
Bottom 25%	-0.077***	-0.022	-0.021	-0.025	-0.037		
	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)		
Bottom 25% X Young		-0.21***	-0.211***	-0.213***	-0.205***	-0.216***	-0.217***
		(0.071)	(0.071)	(0.071)	(0.071)	(0.056)	(0.053)
Year	Y	Y	Y	Y	Y	N	N
Municipality	Y	N	N	N	N	N	N
Municipality X Young.	N	Y	Y	Y	Y	N	N
Municipality X Year	N	N	N	N	N	Y	Y
Sector	N	Y	Y	Y	Y	Y	Y
Education Controls	N	N	Y	Y	Y	N	Y
Occupation Controls	N	N	N	Y	Y	N	Y
Wage at previous job	N	N	N	N	Y	N	Y
Observations (mil)	23.8	23.6	23.6	23.6	23.6	23.8	23.6

Table A.10

Young responsiveness: Attrition - additional controls (1)

This table reports the estimated effect of commodity price shocks on the probability of becoming an entrepreneur, where we control for previous experience as entrepreneur. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The basic empirical specification (column 1) is $T_{ijt} = \alpha_j + \delta_t + \beta \cdot \ln CI_{jt} + \varepsilon_{ijt}$, as described in Section 6, and where $\ln CI_{jt}$ is the log of the the crops index, described in Section 4. Column 1 includes only municipality and year fixed effects. Columns 2, 3, 4, and 5 add different sets of fixed effects, and include an interaction term constructed as an indicator equal to 1 for individuals in the bottom quartile of the age distribution in the sample. *Sector* controls include dummies for seven different sectors referred to the job in year $t-1$. *Education Controls* include a binary variable for high school diploma, and a dummy variable for above high school education. *Occupation Controls* include a binary variable that equals one if previous occupation is a white collar worker, a binary variable that equals one if previous occupation is defined as generalist, a control for the type of occupation (i.e., requires non-routine cognitive skills), and a control for experience within the firm. *Wage at Previous Job* control for the rank of the individual within the wage distribution in a municipality. Column 6 includes municipality-by-year fixed effects and Sector controls. Column 7 also includes *Education*, *Occupation* and *Wage at Previous Job* controls. The variable *Previously Founder* in Panel A, is equal to 1 in year t if the individual has founded a firm prior to year t, and 0 otherwise. The variable *Previously Founder (5yr)* in Panel B, is equal to 1 in year t if the individual has founded a firm in the five years prior to year t, and 0 otherwise. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Controlling for past experience - ever founder

	(1) Founder	(2) Founder	(3) Founder	(4) Founder	(5) Founder	(6) Founder	(7) Founder
Treatment	.251**	.0703	.0663	.0657	.0577		
	(.0985)	(.094)	(.0937)	(.0937)	(.094)		
Treatment X Young		.544**	.551**	.548**	.588**	.0772***	.0626***
		(.231)	(.231)	(.231)	(.232)	(.00908)	(.00943)
Previously Founder		.12***	.12***	.12***	.122***	.12***	.122***
		(.00124)	(.00124)	(.00124)	(.00128)	(.00124)	(.00128)
Year	Y	Y	Y	Y	Y	N	N
Municipality	Y	N	N	N	N	N	N
Municipality X Young	N	Y	Y	Y	Y	N	N
Municipality X Year	N	N	N	N	N	Y	Y
Sector Controls	N	Y	Y	Y	Y	Y	N
Education Controls	N	N	Y	Y	Y	N	Y
Occupation Controls	N	N	N	Y	Y	N	Y
Wage at previous job	N	N	N	N	Y	N	Y
Observations (mil)	23.8	23.6	23.6	23.6	23.6	23.8	23.6

Table A.11
Young responsiveness: Attrition - additional controls (2)

Controlling for past experience - 5 year founder

	(1) Founder	(2) Founder	(3) Founder	(4) Founder	(5) Founder	(6) Founder	(7) Founder
Treatment	.251**	.0191	.0155	.0155	.00223		
	(.0985)	(.0888)	(.0887)	(.0886)	(.0889)		
Treatment X Young		.551**	.558**	.555**	.599***	.0743***	.0596***
		(.226)	(.226)	(.227)	(.227)	(.00866)	(.00906)
Previously Founder (5yr)		.145***	.145***	.145***	.147***	.145***	.147***
		(.00128)	(.00128)	(.00128)	(.00132)	(.00129)	(.00132)
Year	Y	Y	Y	Y	Y	N	N
Municipality	Y	N	N	N	N	N	N
Municipality X Young	N	Y	Y	Y	Y	N	N
Municipality X Year	N	N	N	N	N	Y	Y
Sector Controls	N	Y	Y	Y	Y	Y	N
Education Controls	N	N	Y	Y	Y	N	Y
Occupation Controls	N	N	N	Y	Y	N	Y
Wage at previous job	N	N	N	N	Y	N	Y
Observations (mil)	23.8	23.6	23.6	23.6	23.6	23.8	23.6

Table A.12
Heterogeneity within municipality: Interactions

This table reports the estimated effects of commodity price shocks on the probability of becoming an entrepreneur, testing for heterogeneous treatment effects across individuals with different skills, within the set of young individualas (i.e. in the bottom quartile of the age distribution). The empirical specification is $T_{ijt} = \alpha_j + \delta_t + \alpha_{jPV} + \delta_{tPV} + \beta_0 \cdot Z_{jt} + \beta_1 \cdot PV_{ijt} + \beta_2 Z_{jt} PV_{ijt} + \varepsilon_{ijt}$, where Z_{jt} is the log of the Crop Index. PV_{ijt} is an indicator variable that characterizes an individual's skill. In column 1, $PV_{ijt} = 1$ if in $t-1$ the individual has at least a high school level of education. In column 2, $PV_{ijt} = 1$ if in $t-1$ the individual was working in an occupation that required cognitive non-routine skills. In column 3, $PV_{ijt} = 1$ if in $t-1$ the individual had above median within-firm level of experience. The dependent variable, *Founder*, is an indicator equal to 1000 if the individual has founded a firm in year t, and 0 otherwise. All specification includes fixed effects for year, municipality, year by partition variable, and municipality by partition variable. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
	Founder	Founder	Founder
Treatment	-.0849	.615**	.332
	(.309)	(.245)	(.24)
Treatment X Partition Variable	1.14***	.92*	.927**
	(.402)	(.522)	(.416)
Partition Variable	Education	Non-Routine Cognitive	Experience
Year X PV FE	Y	Y	Y
Municipality X PV FE	Y	Y	Y
Baseline control for PV	Y	Y	Y
Observations	6,590,259	6,590,208	6,590,341

Table A.13
Heterogeneity within municipalities: Binary shock

This table reports the estimated effect of commodity price shocks on the probability of becoming an entrepreneur. Panel A explores individual responsiveness within the sample of young individuals in the bottom quartile of the age distribution. Panel B explores individual responsiveness within the sample of older individuals, in the top three quartiles of the age distribution. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. We estimate the individual level specification with the binary treatment, namely $T_{ijt} = \alpha_j + \delta_t + \beta \cdot Z_{jt} + \varepsilon_{ijt}$, across various sample splits, with the aim of characterizing skilled versus unskilled individuals within the young population. Z_{jt} (Treatment) is the top 10% local shock indicator generated from the crops index. The first two columns split the sample into individuals with high school or higher education (column 1) versus others (column 2). The second split is between individuals who engaged in non-routine cognitive occupations in $t-1$ (column 3) versus others (column 4). The third split is between individuals with above (column 5) or below years of within-firm experience in the $t-1$ and others (column 6). The dependent variable, *Founder*, is an indicator equal to 1000 in year t if the individual has founded a firm in year t, and 0 otherwise. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Young individuals (bottom age quartile)

	(1)	(2)	(3)	(4)	(5)	(6)
	Founder	Founder	Founder	Founder	Founder	Founder
Treatment	0.468***	-0.022	0.813***	0.242**	0.566***	0.147
	(0.126)	(0.154)	(0.234)	(0.112)	(0.168)	(0.115)
Partition	Education		Non-routine Cognitive		Experience	
Partition Criteria	>=HS	<HS	Yes	No	>median	<median
Year FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Observations (mil)	5.342	1.249	1.334	5.256	3.331	3.259

Panel B: Older individuals

	(3)	(4)	(1)	(2)	(5)	(6)
	Founder	Founder	Founder	Founder	Founder	Founder
Treatment	0.063	0.053	0.144	0.039	0.0232	0.096
	(0.063)	(0.055)	(0.110)	(0.049)	(0.067)	(0.061)
Partition	Education		Non-routine Cognitive		Experience	
Partition Criteria	>=HS	<HS	Yes	No	>median	<median
Year FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
Observations (mil)	11.000	6.295	3.488	13.800	8.664	8.583

Table A.14
Aggregate Results by Age Quartile

This table reports the estimated effect of commodity price shocks on income and employment at the municipality level for four quartiles of the age distribution. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln CI_{jt} + \gamma X_{jt} + u_{jt}$, as described in Section 5. *Total Employment* is the total number of employees in each municipality in the specified age group, *Total Income* is the sum of payroll across all firms paid to employees in the specifiied age group. All dependent variables are in logs. $\ln CI_{jt}$ (Treatment) is the log of the the crops index, as described in Section 4. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: By age quartile - employment

	(1)	(2)	(3)	(4)
	Total Employment Q1	Total Employment Q2	Total Employment Q3	Total Employment Q4
Treatment	0.178***	0.170***	0.214***	0.181***
	(0.022)	(0.020)	(0.019)	(0.018)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	80,604	80,747	80,761	80,709
Municipalities	5,443	5,443	5,443	5,443

Panel B: By age quartile - total income

	(1)	(2)	(3)	(4)
	Total Income Q1	Total Income Q2	Total Income Q3	Total Income Q4
Treatment	0.180***	0.195***	0.241***	0.212***
	(0.024)	(0.023)	(0.022)	(0.020)
Year FE	Yes	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	80,604	80,747	80,761	80,709
Municipalities	5,443	5,443	5,443	5,443

Table A.15
Additional results for structural estimation

This table reports the estimated effect of commodity price shocks on wages, number of firms created by young individuals, and number of firms created by old individuals. The analysis sample covers the period 1998-2014 and its construction is described in Section 3. The empirical specification is $Y_{jt} = \alpha_j + \delta_t + \beta \ln(CI_{jt}) + \gamma X_{jt} + u_{jt}$,, as described in Section 5. *Wages* is the wage per employee in the municipality, *Firms by Young* is the total number of firms in the non-tradable sector in the municipality whose founder is Young the year of firm creation, and *Firms by Old* is the total number of firms in the non-tradable sector in the municipality whose founder is Old the year of firm creation. Young and Old are defined as in Table 6. All dependent variables are in log(1+) in order to keep the number of observations constant. $\ln CI_{jt}$ (Treatment) is the log of the crops index, as described in Section 4. All specifications include controls for log-population, year dummies and municipality fixed effects. Standard errors are clustered by municipality. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
	Wages	Firms by Young	Firms by Old
Treatment	.017***	.116***	.067***
	(.005)	(.015)	(.015)
Year FE	Y	Y	Y
Municipality FE	Y	Y	Y
Observations	80,902	80,902	80,902