Foreign Direct Investment, Roads, and Markups: the case of Ethiopia

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Motivation

- There is a large literature that studies foreign direct investment (FDI) and its connection to economic development
- There are few if any studies of how FDI can affect market power and thereby the measured gains from FDI
  - Foreign firms could lower the markups of local firms which could be beneficial to welfare
  - On the other hand, foreign firms may be very efficient and thus charge a high markup which could be harmful to welfare
- Literature has pointed out that competition from foreign firms has an effect on local firms
  - Abebe, McMillan, and Serafinelli's (2020) survey of Ethiopian manufacturing plants to see how they are connected to foreign plants shows that the most commonly reported linkage was "competition from foreign plants in the output market"

What we do in this paper

- In this paper, we measure the welfare effects from FDI in Ethiopian manufacturing within a framework that allows for variable markups (i.e., markups are endogenous in the model and react to the presence of foreign firms)
- We use the case of Ethiopian manufacturing
  - There has been a substantial increase in (manufacturing) FDI over the last 10 years encouraged by government policy
  - There is also detailed microlevel data
- We also evaluate the improvement of roads and study whether it is complementary the presence of foreign-owned firms

Methodology

- Use Atkeson, Burstein (2008) model of internal trade with 9 non-symmetric economies (regions of Ethiopia)
  - Key model ingredient: oligopolistic competition among firms
  - Presence of foreign firms will affect the level of competition throughout the country (and hence allocative efficiency)
- We calibrate the model to 2016 and then remove foreign firms
- Decompose changes in Ethiopian welfare into four separate channels
  - Ricardian channel (gains under a perfectly competitive framework)
  - Allocative efficiency (through changes in markups dispersion)
  - Terms of trade (from markups)
  - Changes in GNP / GDP
- Raise transportation costs in calibrated model to 1996 levels
- Model and data comparison
  - Econometric exercise linking firms' markups to FDI exposure

Results

- There are large gains in real income for Ethiopians from the presence of foreign firms, 10.1% increase (in terms of the manufacturing sector)

- Changes in GNP includes the income that accrues to nationals whereas GDP includes profits that accrue to foreign owners $\rightarrow$ almost 1/3 of the gains in GDP is not reflected in GNP meaning that foreign firms capture a large portion of the gains

- Foreign firms worsen allocative efficiency, which reduces real income by 0.9% (foreign firms have large market shares in some sectors)

- We find that improved road since 1996 had positive effects on real income by 2.4% and there were improvements in allocative efficiency

- Complementarity between the presence of foreign-owned firms and better roads although the effects are small

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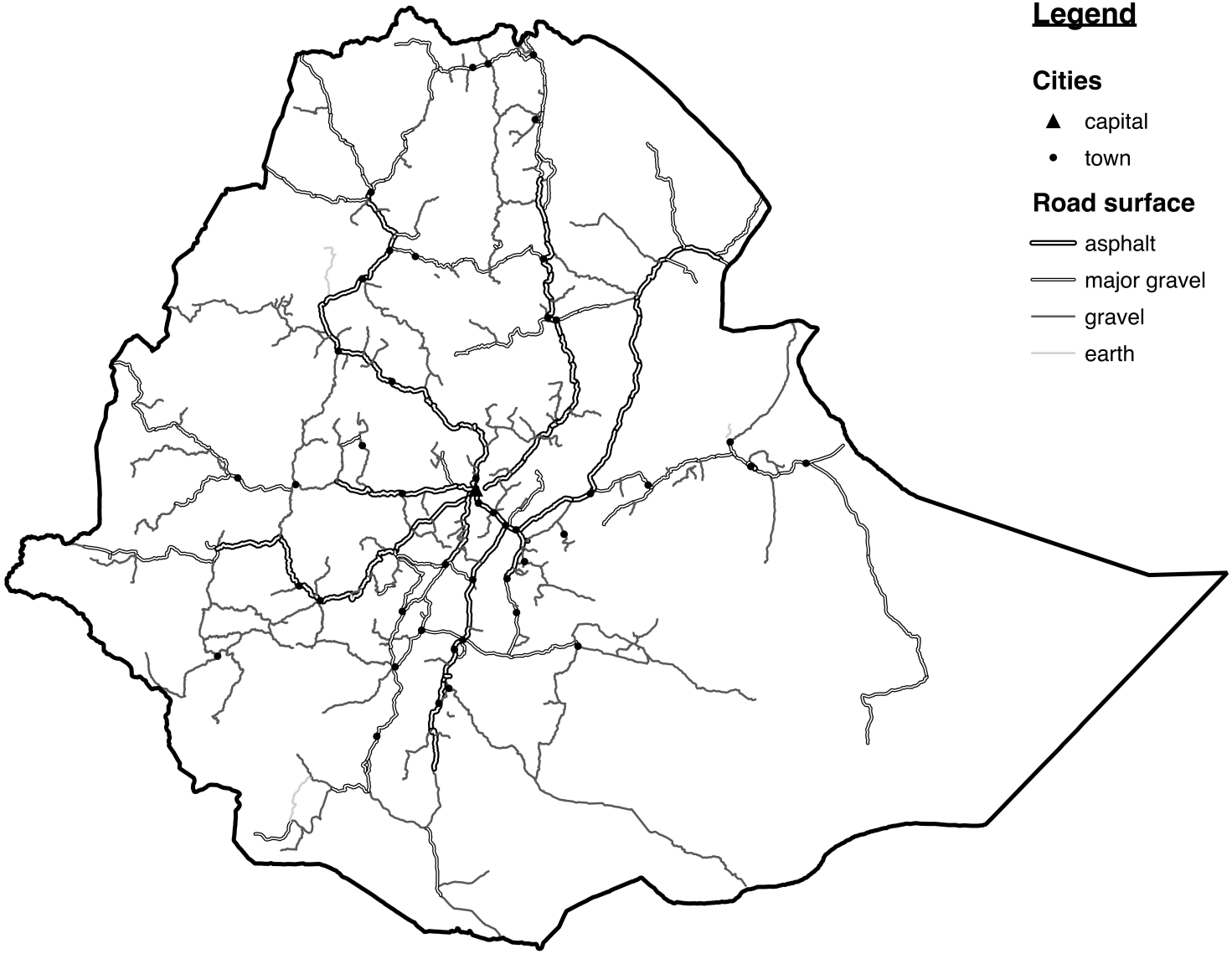
Manufacturing data

- Annual census of large and medium ($\geq$ 10 persons engaged) manufacturing firms from Central Statistical Agency (CSA) Ethiopia
- Include information on location, employment, production, costs, capital expenditures, inputs and outputs
- Plant-level data from 1996 to 2016
- We define a plant as foreign-owned if initial paid-up capital owned by a foreign individual is greater than 10%
- Foreign-owned plants are domestically oriented in their sales
  - Exports account for 4% of total sales of foreign-owned firms in 2016

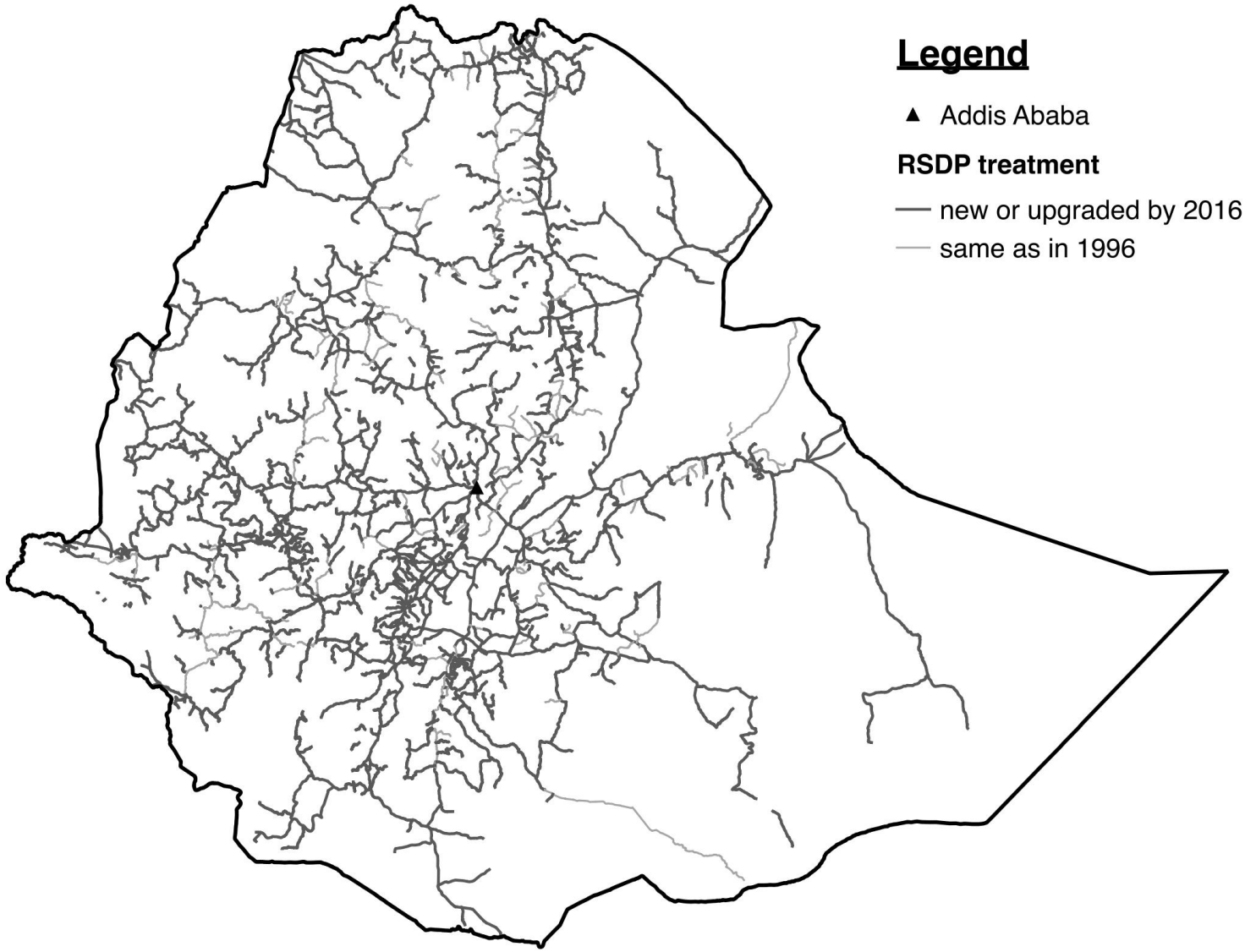
Road data

- Data on Ethiopian roads targeted by the Road Sector Development Program (RSDP)
  - RSDP began in 1997 and implemented over multiple phases to improve road network
  - Large improvements in the roads: almost 11,000 km's of roads were paved between 1997 to 2016
- Data on the quality of road segments (e.g., paved, major gravel, minor gravel)
- ERA's assessment of average speed in km/h allows us to calculate travel times for each year

RSDP road network in 1996 by surface type



Upgraded and new roads from the 1996 RSDP road network in 2016



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Main features

- N regions endowed with L_i labor units trade between each other
- Labor is the only factor of production (immobile across regions)
- There is a continuum of sectors indexed by j
- In each sector, K_{ij} firms competing à la Cournot
- Within a sector, firms produce differentiated products
- Firms face transportation costs to sell their goods to other regions

GDP and GNP

- $GDP_n = W_n L_n + \Pi_n$ where Π_n is the total profits earned by firms located in region n

$$\Pi_n = \int_0^1 \left(\sum_{d=1}^{N} \sum_{k=1}^{K_{nj}} \pi_d^n(j,k) \right) dj$$

where j indexes the sector and k indexes the firm

- $GNP_n = W_n L_n + \Pi_n^L$ where Π_n^L the fraction of profits that accrues to Ethiopians

$$\Pi_n^L = \int_0^1 \left(\sum_{d=1}^{N} \sum_{k=1}^{K_{nj}} \phi(j,k) \pi_d^n(j,k) \right) dj$$

where $\phi(j,k)$ is the fraction of the firm owned by Ethiopians

- We will use GNP_n/P_n as our measure of welfare

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Quantitative exercises

- Calibrate model to match key features of Ethiopian manufacturing and transportation costs across the country to 2016
- Conduct quantitative experiments in the model

Three quantitative experiments using calibrated model

1. Calculate benefit of having foreign firms by supressing foreign firms in model and comparing results

2. Same as #1 except that we use 1996 transportation costs to examine interaction of policies
   - If the benefit from having foreign firms is higher when transportation costs are lower, then the two policies are complements

3. Calculate benefits of lower transportation costs by raising transportation costs to those of 1996 and comparing results

Changes in real income with foreign firms (%)

Region	GDP/P	GNP/P
Harari	4.40	4.40
Somali	6.34	6.34
Afar	6.67	6.67
Dire Dawa	26.09	10.78
Amhara	11.08	6.49
SNNP	5.33	5.00
Tigray	5.52	3.64
Oromia	25.77	13.20
Addis Ababa	13.94	9.93
Aggregate	16.62	10.20

- Large gains in the real income of Ethiopia, approximately 10%
- Approximately 1/3 of the increase in GDP is not captured in GNP

Decomposition of changes in welfare

- We extend the Holmes, Hsu, and Lee (2014) (HHL) decomposition to decompose Ethiopian real income of region n

$$\frac{GNP_n}{P_n} = \frac{W_n L_n}{P_n^{pc}} * \frac{\mu_n^{sell}}{\mu_n^{buy}} * \frac{P_n^{pc}}{P_n} \mu_n^{buy} * \frac{GNP_n}{GDP_n}$$

- $\frac{W_n L_n}{P_n^{pc}}$: Real income of consumers under marginal cost pricing
- $\frac{\mu_n^{sell}}{\mu_n^{buy}}$: Markup ToT
- $\frac{P_n^{pc}}{P_n} \mu_n^{buy}$: Allocative efficiency
- $\frac{GNP_n}{GDP_n}$: Fraction of GDP that is captured in GNP

Changes in real income with foreign-owned firms (%)

Region	GNP/P	Ricardian	Markup ToT	AE	GNP/GDP	Residual
Harari	4.40	12.99	-7.43	-1.16	0.00	0.00
Somali	6.34	12.12	-4.57	-1.21	0.00	0.00
Afar	6.67	13.41	-5.64	-1.10	0.00	0.00
Dire Dawa	10.78	16.13	11.12	-1.16	-15.31	0.00
Amhara	6.49	13.40	-1.18	-1.14	-4.58	0.00
SNNP	5.00	10.07	-3.59	-1.15	-0.33	0.00
Tigray	3.64	8.62	-2.11	-0.99	-1.88	0.00
Oromia	13.20	23.79	3.05	-1.07	-12.57	0.00
Addis Ababa	9.93	16.25	-1.63	-0.68	-4.01	0.00
Aggregate	10.20	17.71	0.00	-0.86	-6.42	-0.22

- Ricaridan term is important but tends to overstate gains
- Allocative efficiency has small and consistently negative effects
- Markup ToT has important distributional consequences across regions, especially smaller regions with no foreign firms

Changes in real income with foreign-owned firms under 1996 transportation costs (%)

Region	GNP/P	Ricardian	Markup ToT	AE	GNP/GDP	Residual
Harari	4.24	12.82	-7.43	-1.14	0.00	0.00
Somali	6.22	12.03	-4.60	-1.21	0.00	0.00
Afar	6.56	13.23	-5.62	-1.06	0.00	0.00
Dire Dawa	10.65	16.04	11.12	-1.14	-15.36	0.00
Amhara	6.34	13.19	-1.12	-1.10	-4.63	0.00
SNNP	4.73	9.78	-3.63	-1.08	-0.33	0.00
Tigray	3.45	8.32	-2.07	-0.90	-1.90	0.00
Oromia	13.37	23.65	3.09	-0.82	-12.55	0.00
Addis Ababa	9.74	15.94	-1.69	-0.51	-4.01	0.00
Aggregate	10.12	17.46	0.00	-0.69	-6.41	-0.23

- Small decrease in the Ricaridan term with higher transportation costs – complementarity of policies
- Higher transportation costs lower the losses in allocative efficiency

Changes in real income with lower transportation costs (%)

Region	GNP/P	Ricardian	Markup ToT	AE	GNP/GDP	Residual
Harari	5.23	5.04	0.04	0.15	0.00	0.00
Somali	7.86	7.78	0.01	0.07	0.00	0.00
Afar	3.32	2.85	0.32	0.15	0.00	0.00
Dire Dawa	5.32	5.17	-0.03	0.13	0.05	0.00
Amhara	4.98	4.86	-0.01	0.08	0.04	0.00
SNNP	7.90	7.67	0.12	0.11	0.00	0.00
Tigray	6.64	6.06	0.43	0.13	0.02	0.00
Oromia	2.28	2.80	-0.38	-0.11	-0.02	0.00
Addis Ababa	1.36	0.87	0.29	0.20	0.00	0.00
Aggregate	2.42	2.27	0.00	0.09	-0.01	0.07

- Regions farther away from the main industrial hubs of Oromia and Addis gain the most with lower transportation costs
- Allocative efficiency has positive effect (lower transportation costs open local firms to more competition), consistent with existing literature (e.g., China and India)

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Conclusion

- We use the case of Ethiopia to try to fill gaps in the literature
  - It is not well understood how the presence of foreign owned firms affect the level of markups in the economy and the implications for welfare
  - We further study whether the road improvement policy is complementary with the presence of foreign owned firms

- Next steps we are thinking about
  - Comparison of model and data to better understand our results
  - We find that the aggregate markup has increased in Ethiopian manufacturing. To what extent can this be explained by the presence of foreign-owned firms?
  - Policy implications?

Empirical Analysis

- We design a model linking a firm markup to FDI (and road) exposure:

$$\mu_{irjt} = \beta_0 + \beta_1(N\_FDI)_{rjt} + \beta_2(FDIMarketAccess)_{rjt} + \gamma_{rj} + \theta_{rt} + \rho_{jt} + \epsilon_{ijst}$$

- where i is a firm, r a district, j an industry and t a year
- μ is estimated with the cost approach
- β_1 measures exposure to FDI in the *same district* r and sector j; β_2 the exposure to FDI from *other districts* weighted by travel time
- s.e. clustered at the district-industry level
- Results point consistently to a drop in markups in districts where exposure to FDI (and roads) increase