

The rapid expansion of herbicide use in smallholder agriculture in Ethiopia: --- **Patterns, drivers and implications**

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1. Introduction

- Fast transformation of agriculture in developing countries in the last decade
- Modern inputs have played an important part (especially chemical fertilizer and improved seeds)
- Very little attention towards agro-chemicals
- They however play a crucial role in modernizing farming systems in developing countries

1. Introduction

- We will look in this study at herbicide use



1. Introduction

- Most of the research on the environmental and health implications; Little evidence on the economics of adoption of herbicides
- We address four questions:
 - Updated typology of herbicide use in the country
 - Distribution and policies
 - Link of herbicide adoption with labor productivity
 - Associates of adoption

2. Data and methodology

Two types of data sources:

A. Qualitative information

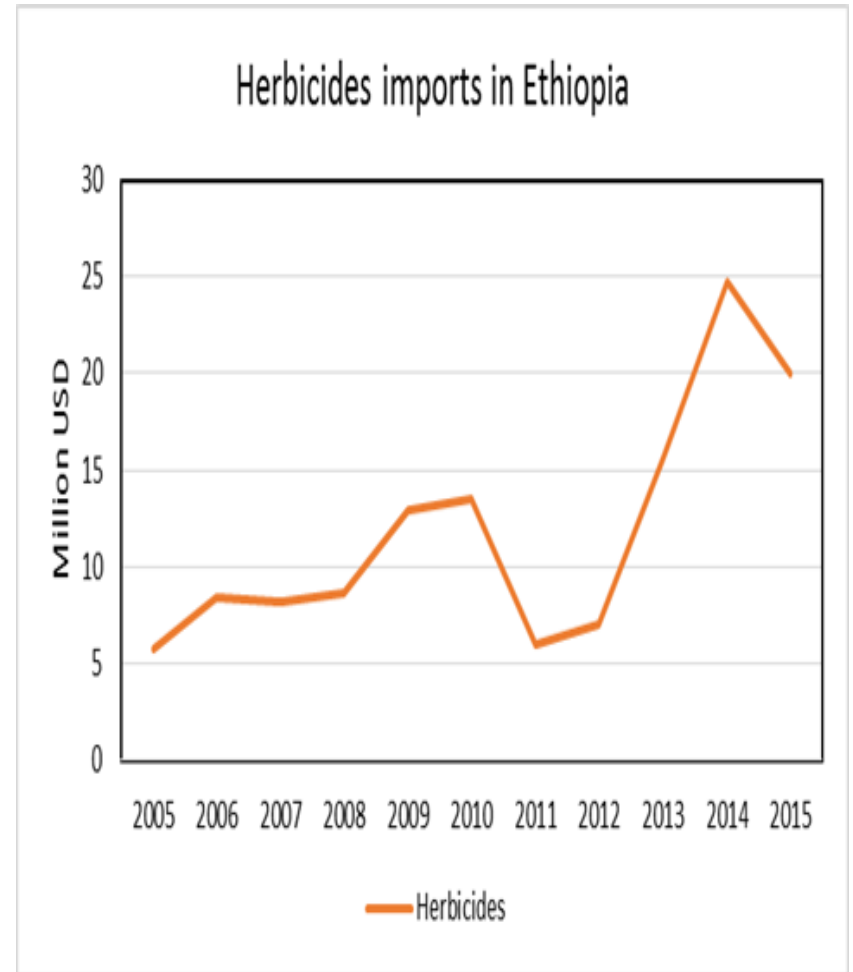
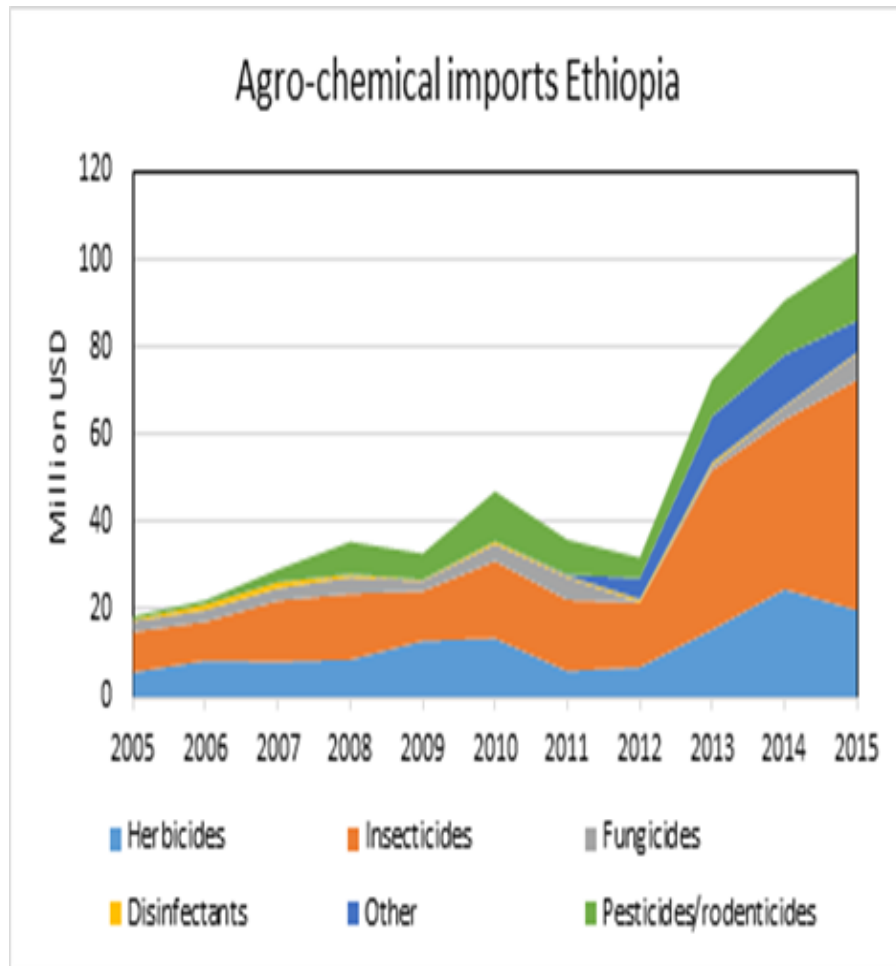
Interviews with: key stakeholders in the value chain:
MoNAR, EIAR, Adami Tulu, Importers, private traders,
farmers, etc.

B. Quantitative data

1. Customs/Comtrade data (imports)
2. CSA data (2004-2015)
3. AGP- 8,000 HHs in high potential areas
4. ESSP's 2012 teff survey-5 major zones: 1200 HHs

3. Herbicide use

- Rapid rise in imports of agro-chemicals/herbicides



3. Herbicide use

- Changes in country of origin and herbicide types

	2005			2015		
	USD (millions)	Share	Price (USD/liter)	USD (millions)	Share	Price (USD/liter)
Country of Consignment						
China	0.28	8.92	2.37	7.58	47.54	2.49
India	0.00	0.00	1.19	2.31	14.50	2.98
Switzerland	0.06	2.01	4.19	2.23	13.96	4.52
Belgium	0.26	8.29	6.41	1.25	7.86	6.04
France	0.18	5.80	21.99			
Germany	1.16	36.40	2.90	1.20	7.53	22.53
Others	1.23	38.57	3.39	1.37	8.61	7.61
Total	3.19	100.00	3.36	16.00	100.00	3.36
Herbicide Type						
2-4-D	2.50	78.24	3.00	6.57	41.16	2.63
Round Up	0.10	3.17	3.27	3.61	22.66	3.99
Others	0.59	18.59	6.79	5.77	36.18	4.27
Total	3.19	100.00	3.36	16.00	100.00	3.36

3. Herbicide use

- For agro-chemicals, mostly herbicides (AGP data)

Crop/Farm size	Share of crop area applied on		
	Herbicides	Insecticides	Fungicides
By crop			
All crops	23.2	1.0	1.7
Cereals	35.8	1.2	1.5
Teff	45.8	0.3	0.8
Barley	39.2	0.6	0.8
Wheat	59.9	5.0	1.5
Maize	15.2	0.3	2.1
Sorghum	16.9	0.4	2.6
Pulses	1.7	0.3	3.9
Oil-seeds	4.4	0.1	0.4
Vegetables	6.6	8.2	0.3
Root crops	1.3	4.2	6.2
All other crops	4.2	0.3	1.1

3. Herbicide use

- Large farmers use more (AGP data)

Farm size	Share of households applying		
	Herbicides	Insecticides	Fungicides
Quintile 1 (0.2 ha)	18.6	3.3	2.7
Quintile 2 (0.5 ha)	31.3	5.6	4.0
Quintile 3 (0.9 ha)	38.0	6.4	4.0
Quintile 4 (1.5 ha)	48.0	4.8	2.3
Quintile 5 (3.0 ha)	53.4	7.4	2.9
All households (1.1 ha)	36.8	5.4	3.2

3. Herbicide use

- Large changes over time (CSA) - pesticides

Crop	2004/05	2014/15
All crops	12.1	22.3
Cereals	16.7	29.5
Teff	24.5	45.7
Wheat	38.0	52.4
Pulses	0.8	7.3
Oilseeds	1.1	4.0
Vegetables	2.3	4.0
Root crops	3.0	17.0

4. Herbicide policies

- Strict regulatory framework on agro-chemicals has been established in Ethiopia
- Due to potential health and environmental risks associated with their handling -Importers are required to registering and certifying the herbicides they import.
 - *No pesticide shall be registered unless the efficacy, safety and quality is tested under field or laboratory conditions and approved by the Ministry. No person may formulate, manufacture, import, pack, re-pack, label, sell, distribute, store or use a pesticide not registered by the Ministry or contrary to the conditions of its registration' [Pesticide Registration and Control Proclamation No. 674/2010 (Negarit Gazeta 2010)]*

4. Herbicide policies

- Registration requires efficacy tests by a national Pesticide Registration Committee:
 1. Apply to MoANR to have the product tested and registered.
 2. The Ministry then identifies and assigns a research institute to test the product
 3. If EIAR, the company provides a sample of about 2 liters (2 kg if powder) for testing.
 4. Once the test results are available, the MoANR will then comprehensively evaluate the applying company's dossier/application
 5. If the dossier meets the requirement, MoANR will offer an Import Certificate and the herbicide is considered registered.

4. Herbicide policies

- There are two registration processes: **verification** and **pre-verification**.
- **Verification process:** [if the active ingredient of the herbicide to be imported is not new to Ethiopia]
 - Verification process tests are undertaken on a single plot
 - Using the company's recommended herbicide application rate.
 - Could take between 6 and 12 months

4. Herbicide policies

- **Pre-verification process:**[if the active ingredient is being imported into Ethiopia for the first time]
 - Tests on three plots using varying application rates
 - the dose with the best result in terms of weed control is selected.
 - Takes between 6 and 12 months
 - The new sample then goes through a verification process and is tested on a wider area over another 6 to 12 month
- The Certificate of Registration -Valid for five years from the issue date
 - with a good chance of renewal, provided that the product criteria specified on registration are maintained.

4. Herbicide policies

- **A second license is required (both for importers and distributors), a Certificate of Competence:**
 1. The dealer should be either a plant science expert or should hire at least one such expert
 2. The dealer should have proper storage facility,
 3. Non-importing dealers should have an agreement with an importer (registrant).

5. Distribution of herbicides

- The public sector play a central role in fertilizer and improved seed distribution in Ethiopia
 - but smaller role in agro-chemicals distribution

Source	Herbicides	Insecticide	Fungicides	Chemical fertilizer		Improved seed
				DAP	Urea	
Government related	27	31.4	43.3	83.3	84.8	87.6
Private	67.7	64	51.1	13.9	11.9	6.2
Other farmers	3.8	2.7	2.7	1.1	1	2.3
Development organizations/church	0.3	0.7	1.6	1.4	1.9	2.4
Others	1.1	1.2	1.4	0.3	0.4	1.4
Total	100	100	100	100	100	100

- The majority of herbicides available in Ethiopia are imported and distributed by the private sector.

5. Distribution of herbicides

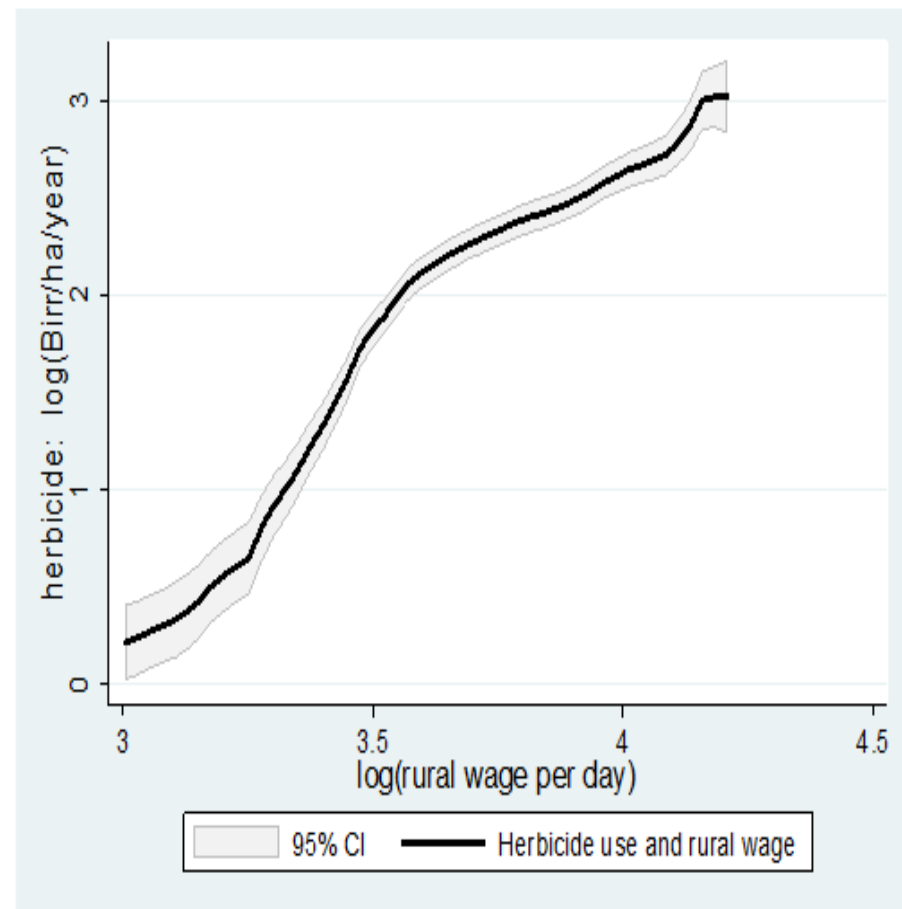
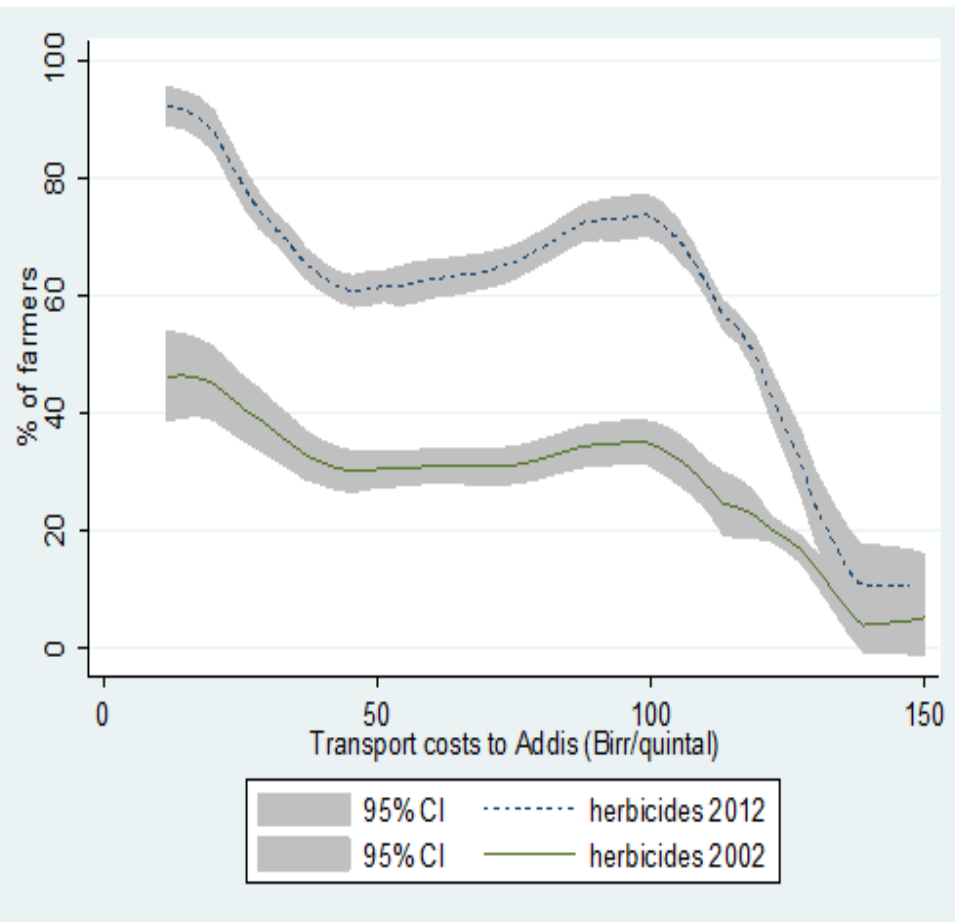
- However, three notable public enterprises active in the distribution of agro-chemicals in the country:
 - the Adami Tulu Pesticide Processing Share Company (ATPPSC)
 - the Agricultural Inputs Supply Enterprise (AISE)
 - the Oromiya Agricultural Cooperatives Federation
- The importers [mostly private sector] typically sell their products to government enterprises and private wholesalers in major cities such as Addis Ababa, Adama, Bahir Dar, and Mekelle.
 - The latter then distribute to private retailers that sell the products to farmers in rural areas.

5. Distribution of herbicides

- The most important private herbicide importers include:
 - General Chemical & Trading PLC
 - Syngenta Agroservices Ag. Ethiopia
 - Chemtex PLC
 - Lions International Trading PLC
 - Makobu Enterprises
 - Girma Teferi
 - Wondimagegn
 - B-Nyse General Trading PLC
 - Mekamba PLC, and
 - Rangvet PLC.

6. Adoption and possible drivers

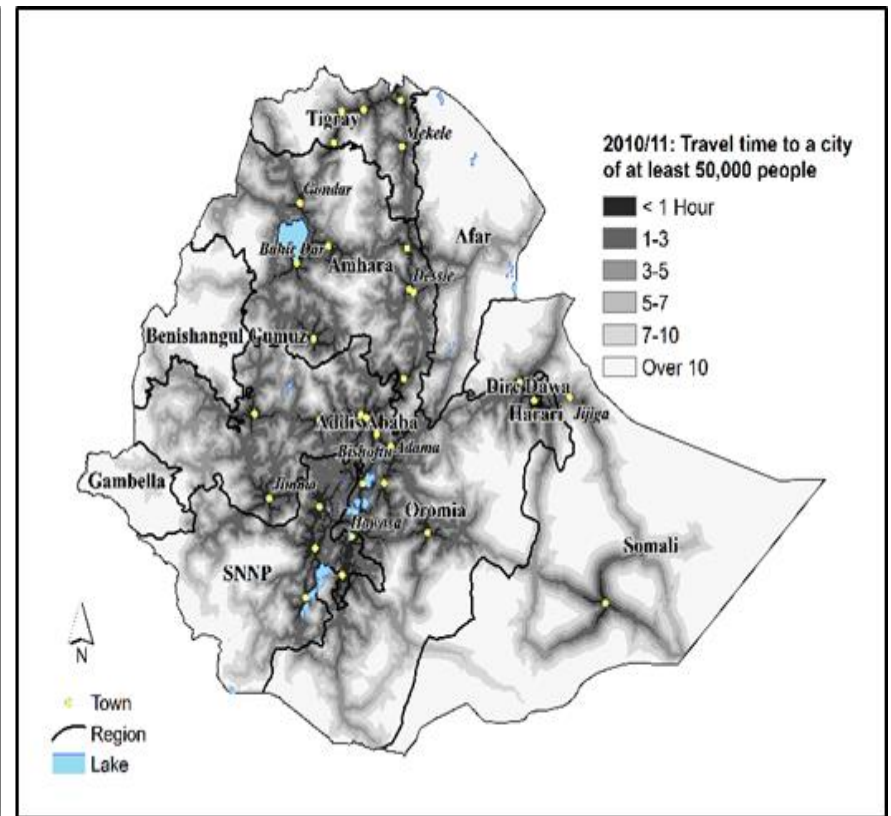
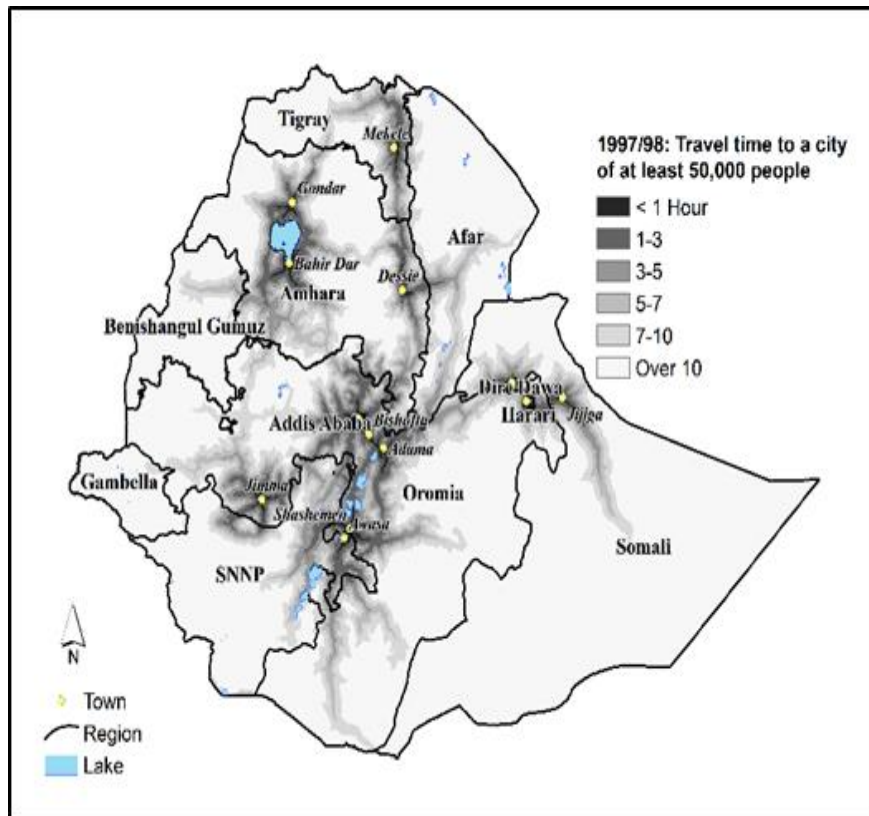
Adoption rates are considerably higher in areas that are better connected both at the time of the survey and 10 years earlier.



6. Adoption and possible drivers

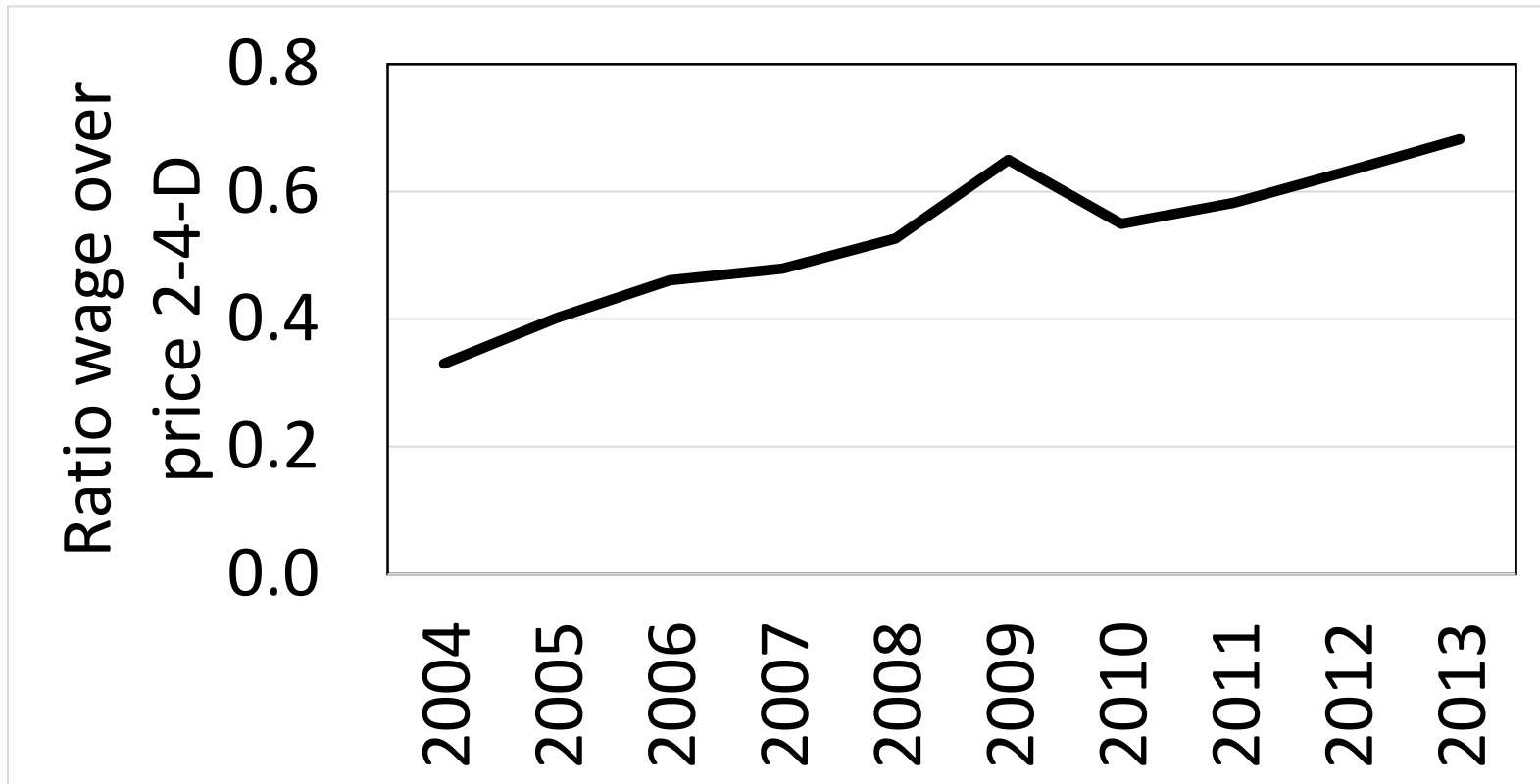
The increased market access by Ethiopian farmers

-Travel time to a city of at least 50,000 people (1996/97 and 2010/11)



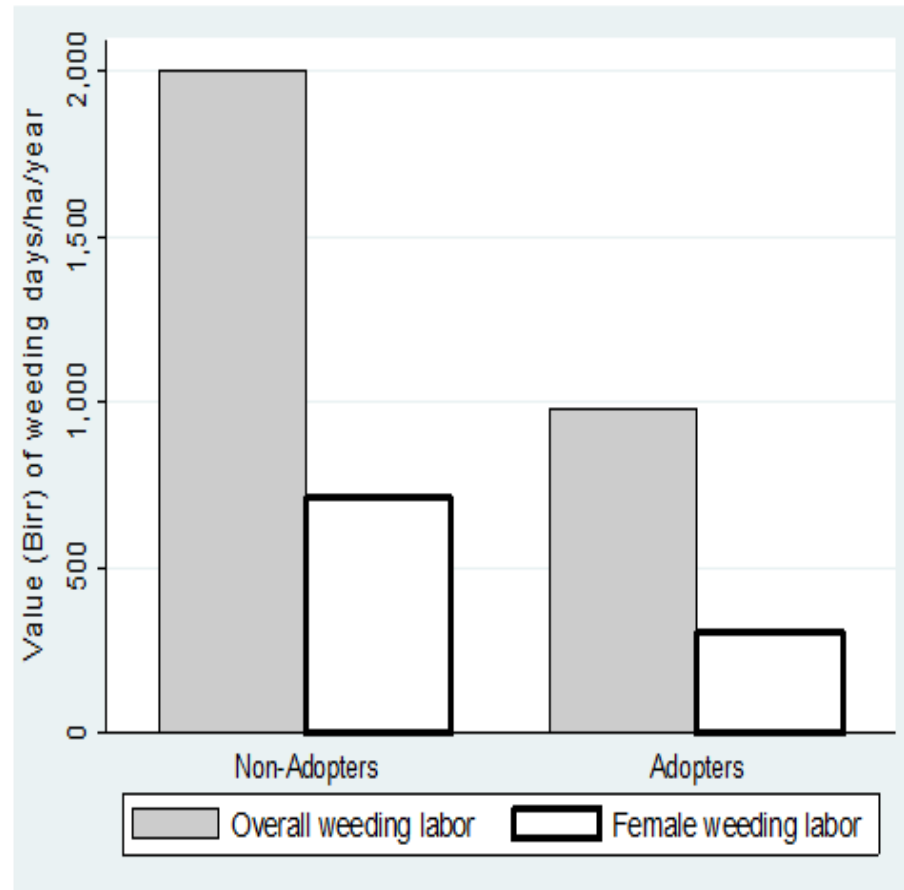
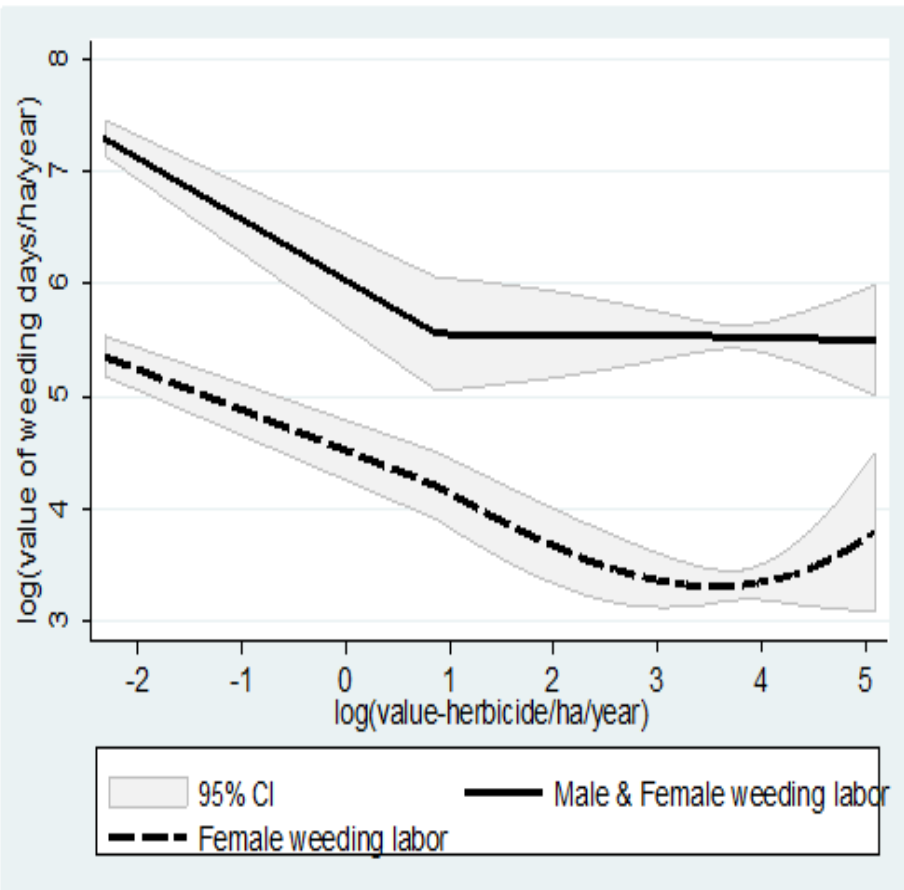
6. Adoption and possible drivers

Changes in incentives



7. Labor productivity

- Weeding and herbicide use in teff:
 - negative association between weeding labor and adoption and level of use of herbicides



8. Conclusions and implications

- Rising use of agro-chemicals, particularly herbicides, in the country, mostly on commercial cereals.
- Value of herbicide imports more than three-fold over the last decade
- Private sector has been instrumental in this growth.
- 2-4-D has been most widely used
- Recently greater diversification towards second-generation herbicides (Pallas, Atlantis, etc.) that deal with a wider range of weeds

8. Conclusions and implications

- Herbicide application associated with substantial improvement in labor productivity (by between 9 and 18 percent).
- Drivers that mainly influence the adoption and amount of herbicide
 - Transport cost to a big city
 - Rural wage rate levels
 - Access to an all-weather road

8. Conclusions and implications

1. Producers save significantly on weeding labor-with important gender implications [given that traditionally women's contribution in weeding is relatively high].
2. Further large-scale investments in road infrastructure and urban development, increased herbicide use will likely continue and will further release labor, which will have considerable interdependence with labor markets, both in rural and urban areas

9. Further research and food for thought

I. According to focus group discussions with key stakeholders, there are sometimes reported issues in distribution [However, seemingly not that widespread, especially compared to other African countries]. As no data, are these real issues and how big is the problem?

- Issue 1: Difference between the products registered for importation and those that actually are then imported.

- Issue 2: Not enough supervision and control mechanisms in place; Counterfeit products are sometimes found in the market.

9. Further research and food for thought

- Issue 3: Commercial growers are sometimes exempt from registration as importers of pesticides, but might sell some of their leftovers at lower prices in the market, creating unfair competition.
- Issue 4: Sometimes herbicides are being distributed by unqualified individuals with minimal training on the safe handling of herbicides.
- Issue 5: Safe use of herbicides is not always followed; might have health implications for those farmers that do not follow proper practices for safe herbicide use

9. Further research and food for thought

II. With 2-4-D, there were apparently no big yield effects, however that might change with the new generation of herbicides?

III. With increasing mechanization, there is more need for herbicide use?

IV. With rapid rise of herbicides, do we need review of institutional set-up for regulations and monitoring?

THANK YOU!

