Growth and Transformation Plan (2010/11 -2014/15) and Monetary policy in the five-years : The Case of Ethiopia

I. Main development agenda of the Ethiopian government is: poverty reduction.

through:

- Broad-based; and
- Accelerated and Sustained economic growth
  - the country is believed to join the middle income group in the next 10 to 15 years

II. Towards this main agenda, the Five-Year (2010/11 – 2014/15) Growth and Transformation Plan has been prepared.

III. GTP comprises of detailed socio-economic transformation plans and targets. My presentation focuses on the economic side of it.

IV. GTP is a closed and internally consistent plan: the plan has tried to ensure consistency between growth and macroeconomic stability objectives.

A/ Sector-wide growth and investment Plan

B/ Five-years financial Programming

A/ Sector-wide growth and investment Plan

Four main objectives:

1. Achieve at least an average real GDP growth of 11.2% and attain MDGs

- In the Five-years GTP (2010/11 – 20014/15)

	higher-case	base-case
Real GDP growth	14.9%	11.2%
– agriculture	14.9%	8.6%
– industry	21.3%	20.0%
– services	12.8%	10.6%

- This would be achieved through high and sustained investment and increase domestic savings
  - Gross capital formation - to - GDP ratio to reach 28.2% (in 2014/15) from 22.3% (in 2009/10)
    - » Investment in infrastructure and social development (expansion and ensuring quality)
      - Easy access to power (e.g. electricity coverage from 41% to 75%)
      - Transport (e.g. average time taken to all-weather roads from 3.7hrs to 1.4hrs;
      - Communication (e.g. fixed line telephone density from 1.36% to 3.4%)

- » Investment in industries

  e.g.

  - Sugar exports earnings to reach USD 661.7 million in 2014/15 from zero in 2009/10
  - Textile and garment export earnings to reach USD 1000 million in 2014/5 from USD 21.8 million in 2009/10

– Domestic saving-to-GDP ratio is targeted to reach 15.0% (2014/15 from 5.5% in 2009/10)
  - » Broadening the tax base and increase tax collection capacity;
  - » Introducing new financial saving instruments and markets such as
  - » Government saving bonds introduced;
  - » Other contractual saving instruments such as private pension funds to start soon.

2. Expand and ensure the qualities of education and health services and achieve MDGs in the social sector
3. Establishing suitable conditions for sustainable nation building through the creation of a stable democratic and developmental state;
4. Ensuring the sustainability of growth though stable macroeconomic framework

B/ Financial Programming

- The objectives of Financial programming is to ensure internal consistency between growth and macroeconomic stability objectives
- The GTP takes maintaining a stable macroeconomic environment as a necessary condition to attain high and sustained real GDP growth.

So, the four pillars of the FP are:

- GDP growth and investment targets
- Monetary Policy (Inflation) targets
- BOP targets
- Fiscal target

1/ Monetary Policy:

Objectives:

a. containing inflation in single digit while allowing macroeconomic space for growth (inflation rate of 6-9.5%)
   - Helps for accelerated growth and investment
   - Supports for achieving poverty reduction efforts

b. Allowing for monetization of the economy (to accelerate the rate of domestic savings)
   - Reaching out those sections of the society that has not been monetized. This would be supported by financial sector policies (no. 3 below)
   - Accelerating specialization and division of labor

Monetary transmission mechanism

Policy instruments → operational target → intermediate target → Goals

Policies and targets:

Targets:

operational target (nominal anchor) – Reserve money

Policies:

- Statutory reserve requirement
- treasury bills (primary market)
- Moral suasion

2/ Fiscal policy

- Sustainable fiscal balance
  - Budget deficit–to-GDP ratio of not more than 3 percent
    - Increasing tax revenue/ GDP ratio to 15% (2014/15) from 11.3% in 2009/10
- Central Treasury towards **not resort to central bank borrowing**

3/ Financial sector policies

- Establishing accessible, efficient and competitive financial system
  - Access to finance to reach 67% in 2014/15 from 20% in 2009/10
    - E.g. introducing modern national payment system

4/ Sustainable trade balance of the balance of payments

- trade deficit-to-GDP ratio to decline to -15 percent by 2014/15
- Current account deficit also to drop to -2 % of GDP by the end of the plan period
- Policies include : competitive exchange rate; doing aggressive work on improving the quality of exports; infrastructure expansion and selected incentives to export sector; and market based import substitution strategy.

Main Challenges of Monetary Policy

- Loose link between operational target (RM) and intermediate target (MS)
  - Volatility of the money multiplier

- Inadequate foreign exchange sterilization instruments
  - huge inflow of foreign exchange bloating RM

- High correlation between international food and fuel inflation and domestic inflation
  - Imported inflation through:
    - Exports - agriculture accounts more than 80 percent of total exports
    - Imports – fuel accounts more than 15 percent of total imports

Macroeconomic Developments and prospects through the GTP

		2010/11		2011/12
	2003/04-2009/10	Target	Actual/ Estimate	Projection
Real GDP growth	11.0	11.2	11.0 *	11.2
Trade deficit/GDP	-21.0	-23.6	-17.7	-20.0
▪ Export growth	19.4	37.1	37.1	35.0
Investment/GDP	23.6	28.7	na	
Inflation (moving average)	14.9	7.5	18.1	8.5
o/w food	17.6	7.0	15.7	8.0

Analysis of inflation

2010/11

Headline

- including all items in the basket 18.1%
- excluding items sensitive to international trade 5.8%

Food

- including all items in the basket 15.7%
- excluding items sensitive to international trade 4.2%

Non-food

- including all items in the basket 21.8%
- excluding items sensitive to international trade 8.2%

Note:

- excluded from food includes pulses; oils and fats; vegetables and fruits; spices; and coffee

Main Challenges for 2011/12

- World food & fuel inflation
- Slow recovery from financial crises

Thank you

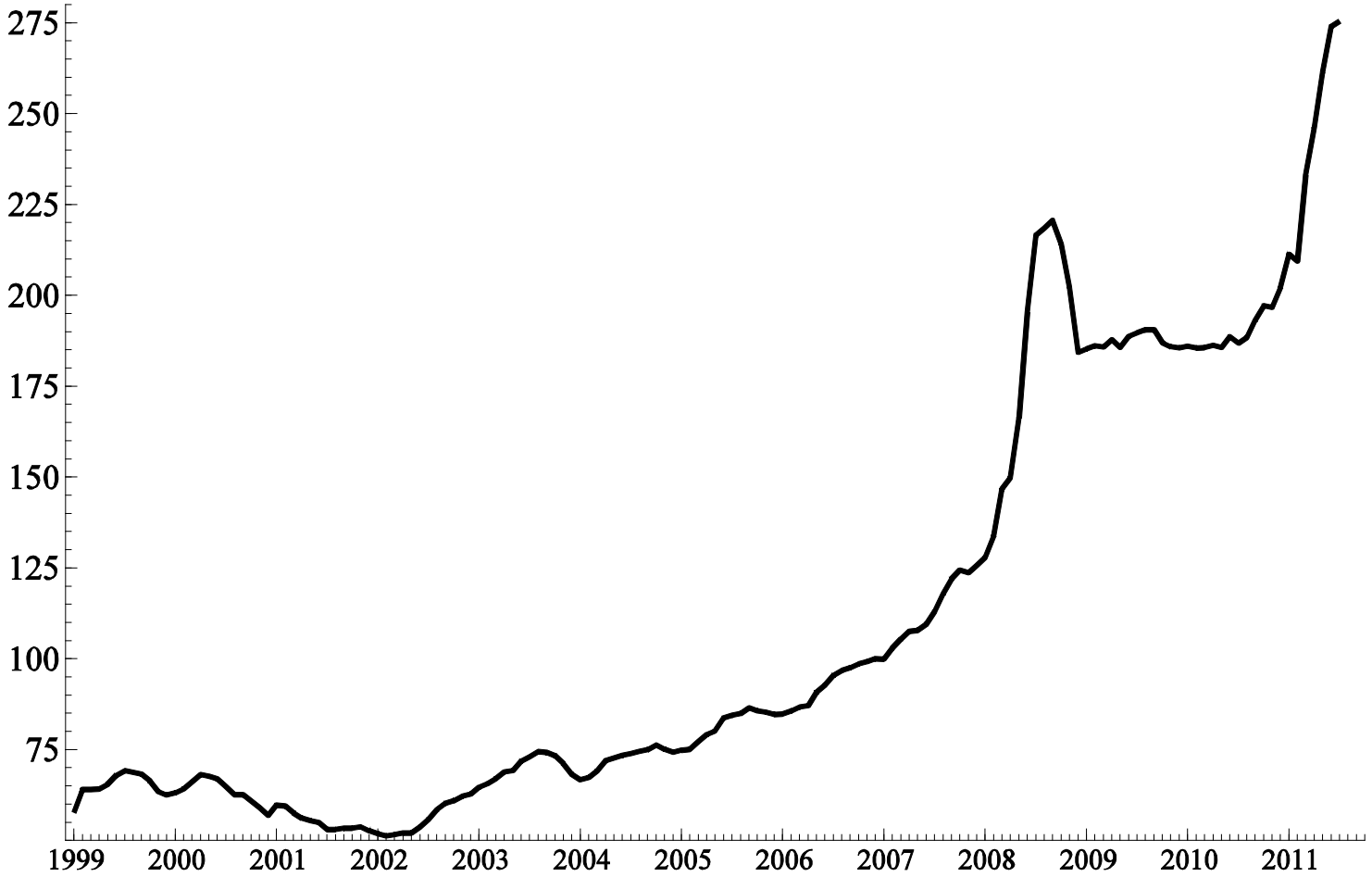
Food Prices and Inflation in Ethiopia

Dick Durevall (University of Gothenburg)
Josef Loening (World Bank)
Yohannes Ayalew Birru (University of Sussex)

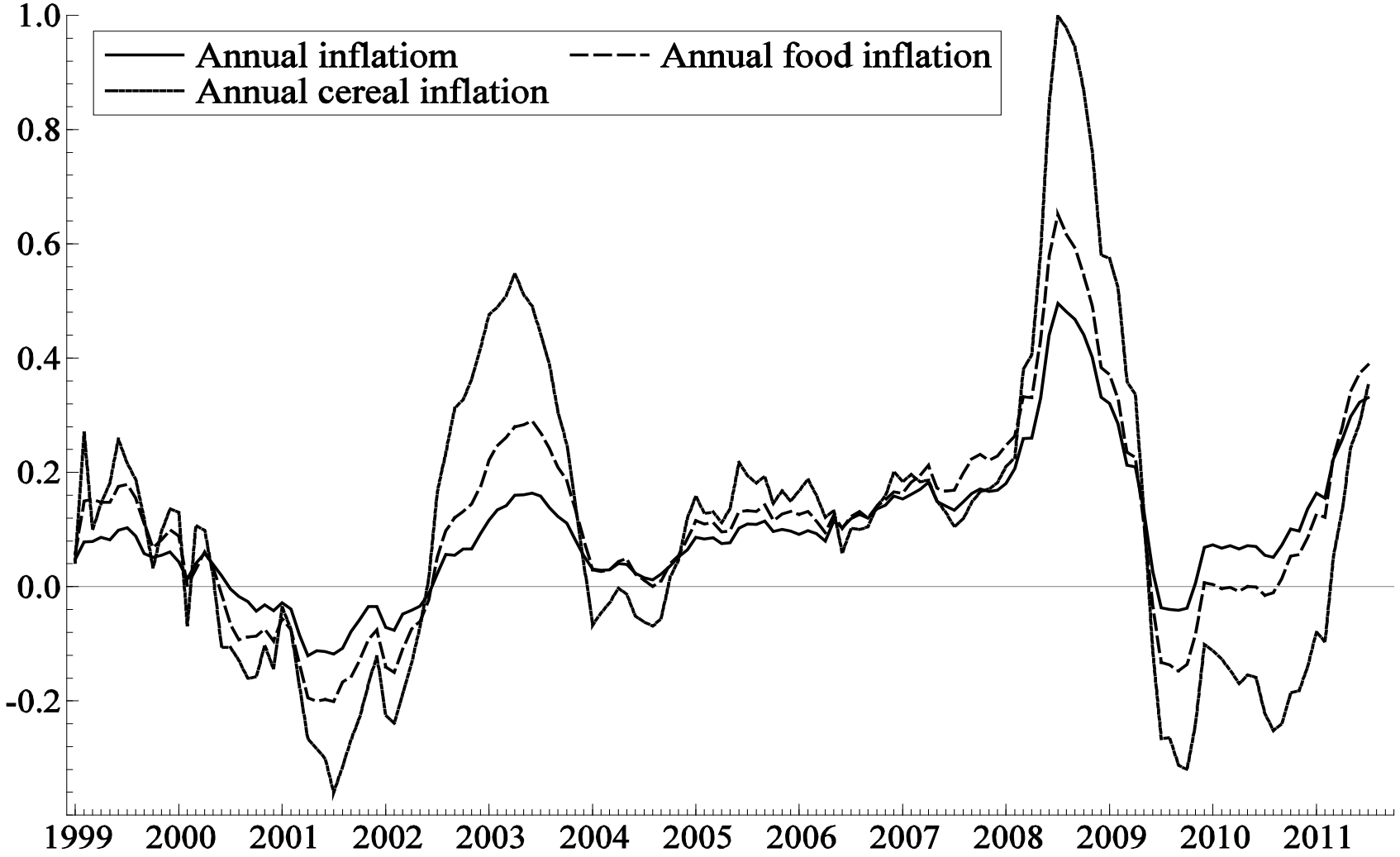
Outline

1. What is the problem?
2. Model(s)
3. Methods
4. Main findings
5. Summary and implications

CPI for food, 1999:1-2011:7



Annual CPI, Food CPI and Cereal CPI inflation



2. Approach/Empirical model

- "Hybrid" approach: inflation results from 'excess demand and supply' in key markets
  - Monetary sector (excess money supply)
  - External sector (measured with domestic and international prices in domestic currency)
    - Treat food and non-food prices (markets) separately
  - Agricultural sector (output gap)
  - Plus several short-run and seasonal factors

Empirical model

$$m - p = \gamma_0 + \gamma_1 y + \gamma_2 R$$ Money market

$$pnf = e + wp - \tau_1$$ Non-food external sector

$$pf = e + wfp - \tau_2$$ Food external sector

$$ag = agri.\ prod. - \tau_3$$ Domestic agricultural sector

R = Various determinants of money demand
pnf = Non-food CPI
pf = Food-price CPI
wp= World producer price index
wfp = World food price index
ag = Agricultural output gap
Agri. prod. = domestic grain production
τ_i = (stochastic) trend

Modellling approach

1. Estimate long run relationships with cointegration analysis and/or filtering
2. Formulate error correction models for CPI, food prices, cereal prices and non-food prices
3. Use Autometrics and general-to-specific modelling to obtain parsimonous error correction models and test hypotheses

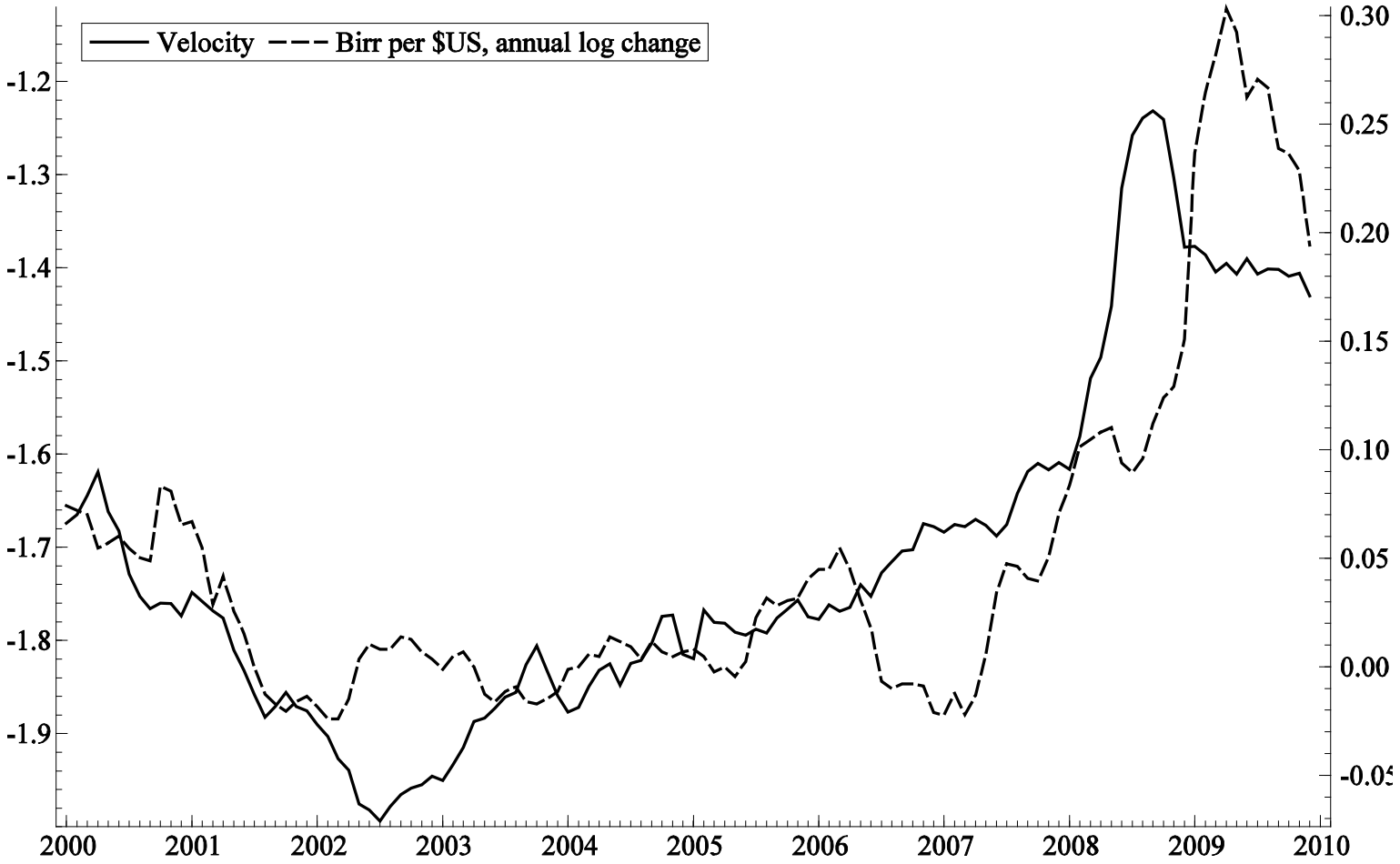
    Autometrics is an algorithm that does automatic model selection while keeping the significance level constant (Doornik 2008)

A stylized error correction model

$$\Delta p_t = \sum_{i-1}^{k-1} \pi_{1i} \Delta p_{t-i} + \sum_{i=0}^{k-1} \pi_{2i} \Delta m_{t-i} + \sum_{i=0}^{k-1} \pi_{3i} \Delta R_{t-i} + \sum_{i=0}^{k-1} \pi_{4i} \Delta e_{t-i} + \sum_{i=0}^{k-1} \pi_{5i} \Delta wfp_{t-i} + \sum_{i=0}^{k-1} \pi_{6i} \Delta wp_{t-i}$$

$$\pi_7 ag_{t-1} + \alpha_1 (m - p - \gamma_1 y - \gamma_2 R)_{t-1} + \alpha_2 (e + wp - pnf - \tau_1)_{t-1} + \alpha_3 \left(e + wfp - pf - \tau_2\right)_{t-1} + \pi_7 D_t + v_t,$$

Long run relationships: Monetary sector

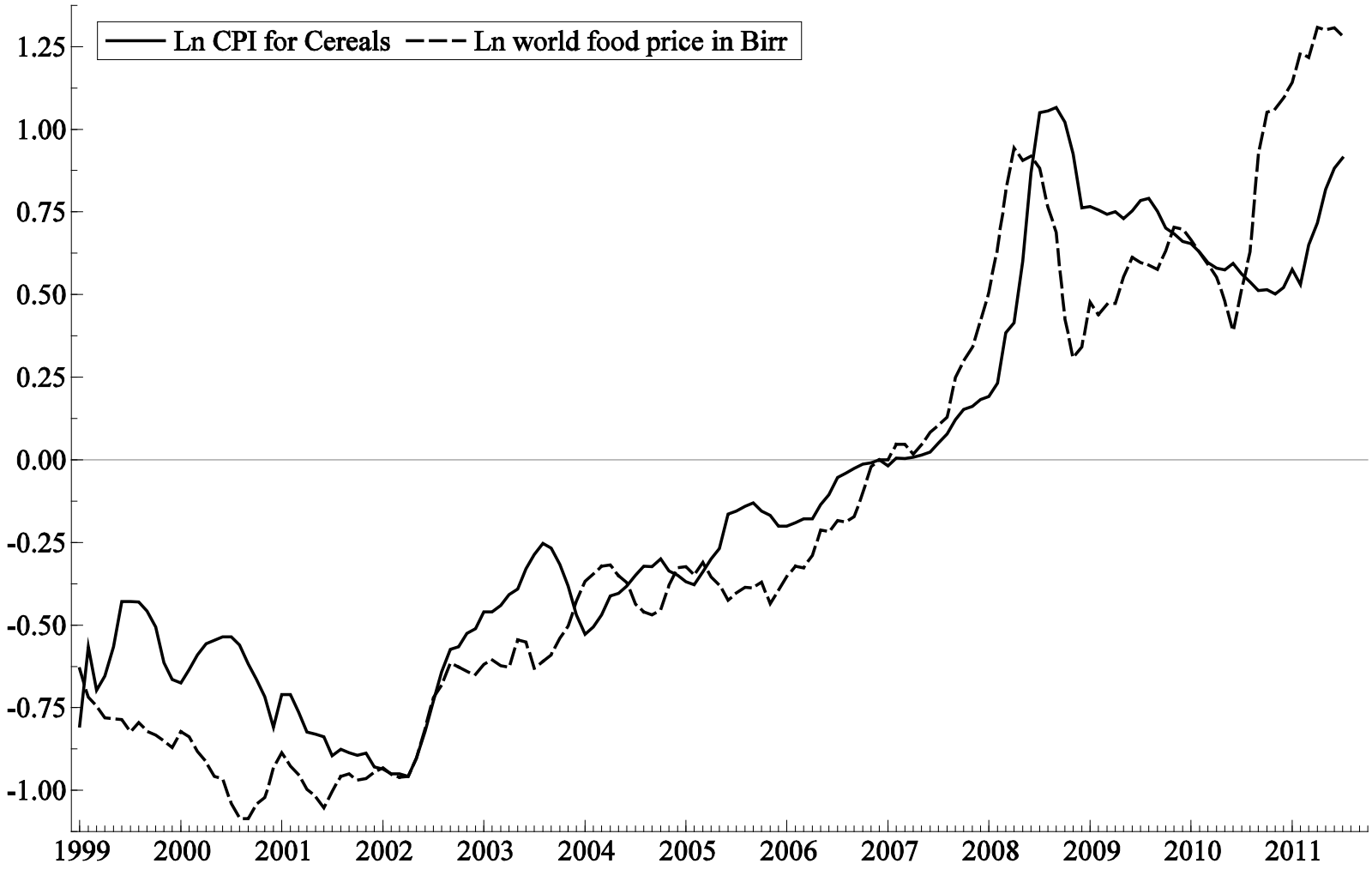


Money market cointegrating vector (monetary overhang)

$$(m-p)-0.86y+1.85\Delta_{12}eus$$

With inflation added $(m-p)-0.85y+1.34\Delta_{12}eus+0.52\Delta_{12}p$

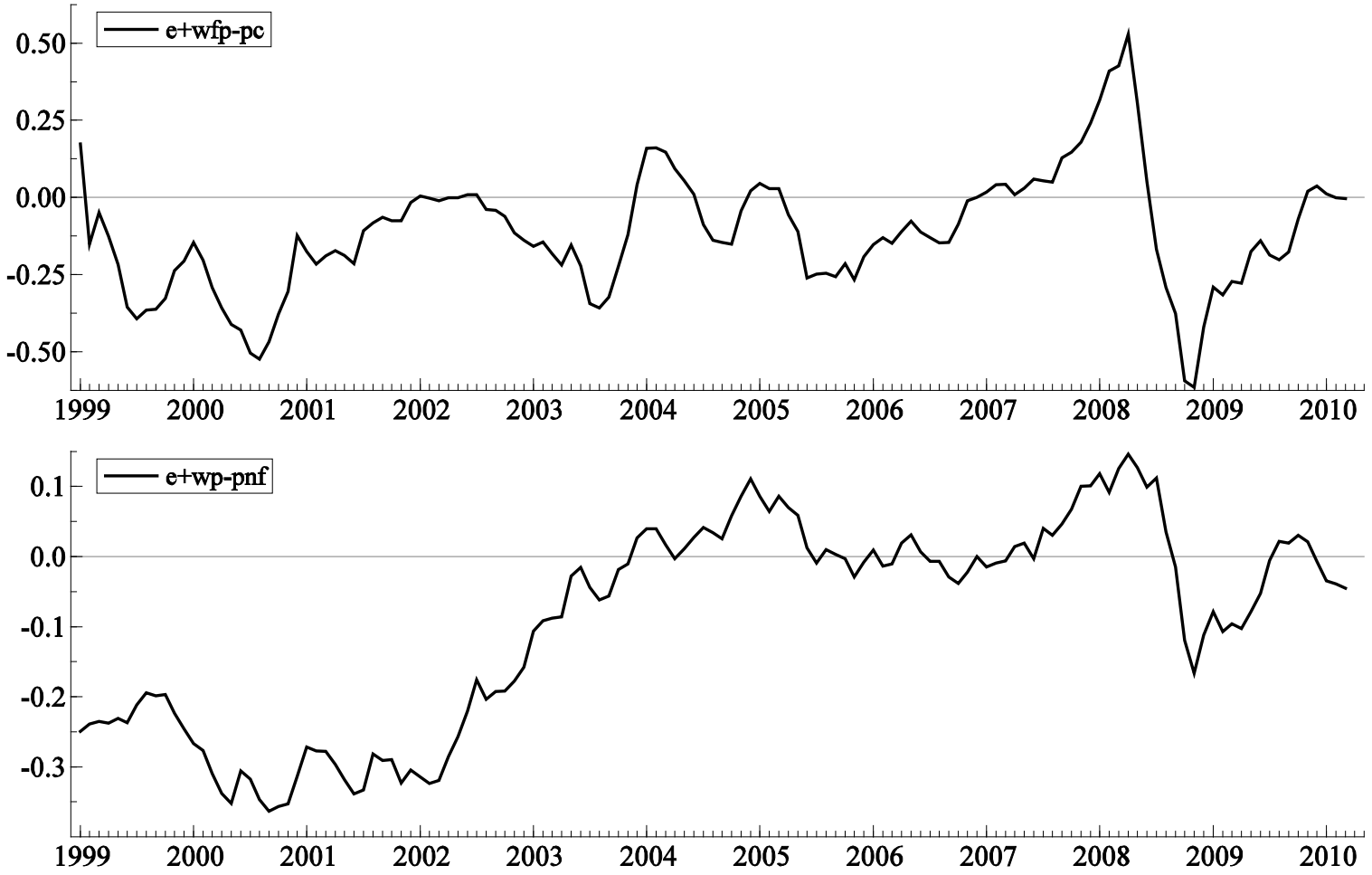
External food sector: Cereal price index and world price index of grain in Birr (in logs)



External sectors: relative food and non-food prices

Food: *e+pwf-pc is stationary*

Non-food: *e+pw-pnf is made stationary with Hodrick-Prescott filter*



Agricultural output gap (obtained with interpolated annual harvests and Hodrick-Prescott filter) and food inflation

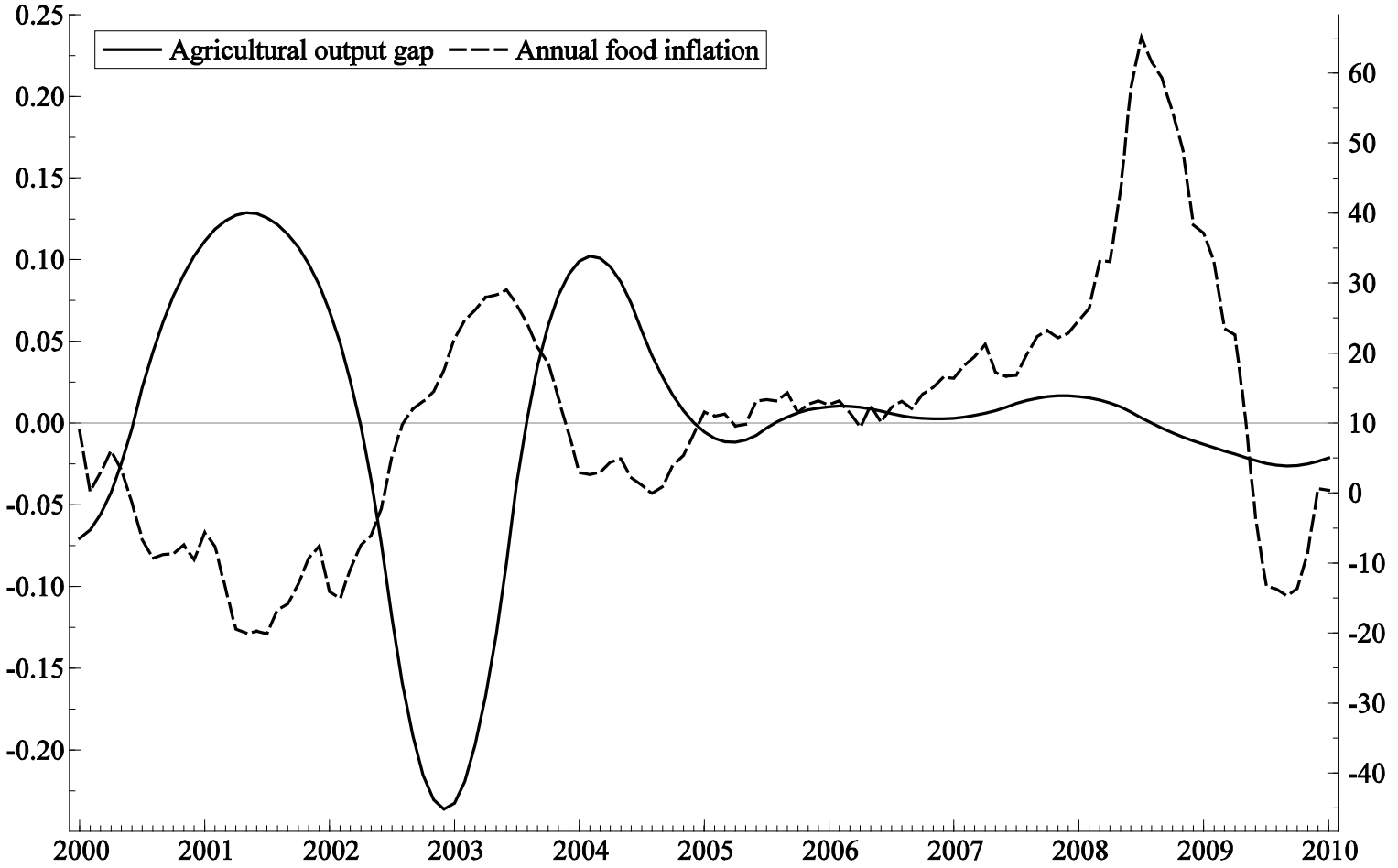


Table 4: Parsimonious inflation models for Ethiopia, January 2000–December 2009

Explanatory variables		Model 1: Cereals Δpc	Model 2: Food Δpf	Model 3: Nonfood Δpnf	Model 4: CPI Δp
EC-Monetary sector	$(m-p)-0.88y+1.88\Delta_{12}eus.$	0.006 (0.28)	−0.017 (−1.21)	0.003 (0.30)	−0.006 (−0.83)
EC-External food sector	$[e+wfp-pc]_{t-1}$	0.125** (9.22)	0.081** (11.2)		0.047** (10.7)
EC-External non- food sector	$[e+wp-pnf-trend]_{t-1}$			0.108** (5.30)	
Agricultural output gap	ag_{t-1}	−0.197** −(6.34)	−0.125** (−7.35)		−0.070** (−6.90)
Lagged inflation	Δp_{t-10}				0.16** (4.24)
Lagged non-food inflation	Δpc_{t-1} ,				
Lagged non-food inflation	$(\Delta pc_{t-4}+\Delta pc_{t-5})/2$			0.514** (4.35)	
Exchange rate change	Δe_t			0.146** (4.03)	
Lagged money	Δm_{t-9}	0.072 (0.37)	0.107 (1.02)	0.191** (2.75)	0.167** (2.85)
Food imports	Δwfp_{t-8}		−0.095** (−2.73)		
Indicator for Food CPI[a)]	2000:1=1, 2008:5=1, 2008:6=1.5, 2008;7=1	0.119** (9.34)	0.069** (10.0)		
Indicator for CPI[a)]	2000:1=1, 2008:3=1, 2008:5=1, 2008:6=1.5, 2008;7=1, 2008:12=−1				0.048** (14.1)
Constant[b)]		−0.004 −(0.01)	0.066 (1.54)	−0.008 (−0.29)	0.025 (1.20)
Seasonal dummies[b)]		Yes	Yes	Yes	Yes

Note: t-values in parenthesis. * indicates significance at 5 percent level and ** significance at 1 percent level.

[a)] The indexes for the dummies were constructed by running the dummy saturation procedure in Autometrics. The weights are based on the coefficients from the general models.

[b)] The constant and seasonal are fixed when running Autometrics and thus remain in the models by force.

Main finding: dominant role of world food prices and agricultural supply

- Domestic food prices adjust to changes in world food prices (plus exchange rate)
  - But large deviations from long-run equilibrium prices because of agricultural supply shocks and expectations
  - Food price inflation (2004-2007) was mainly triggered by global food price developments
- Little evidence for "structural" change story
  - Inter-seasonal speculation due to news probably explains 2008 cereal price increases ('similar' episodes in 1980/81, 1983/84, 1990/91, etc. (see Osborne, 2004)
- Domestic non-food prices adjust to changes in world producer prices (plus exchange rate)
- Money supply not the main driver of inflation

Interpretation of findings:

- Monetary policy was 'accommodating'
  - Large excess reserve ratios in banking system severs link to monetary policy instruments. NBE had little control of money supply (recurred to credit ceilings in 2009)
  - Exchange rate policy matters for inflation
- The world food price transmission mechanism is not fully understood
  - Weak private and financial sectors
  - Restrictions on regional commodity trade and access to foreign currency,
    - But there is 'informal' cross-border trade
  - Donors and government imports do some of the arbitrage
  - Wholesale market dominated by few companies,
    - Is there a role for price information without much trade?

Main findings: Food price transmission

- The world food price transmission mechanisms is not fully understood
  - Weak private and financial sectors
  - Restrictions on regional commodity trade and access to foreign currency,
    - But there is some cross-border trade
  - Donors and government imports do some of the arbitrage
  - Is there a role for price information without much trade?

Thank you for the attention

Crop Production in Ethiopia: Assessing the Evidence for a Green Revolution

Douglas Gollin

Department of Economics, Williams College

IGC Growth Week, September 19, 2011

Outline

1. Background and Motivation

- Data show enormous increases in Ethiopia's grain production over the past decade or more.
- Production of Ethiopia's most important cereal grains – wheat, maize, sorghum, millet, barley, and teff – more than doubled between 1998 and 2009.
- Using 3-year averages, 72% increase between 1998-2000 and 2007-09.
- Important to understand recent trends in yield and to make sense, where possible, of the Ethiopian experience.
- Part of a broader study looking at crop yield levels and growth in Ethiopia, Kenya, Tanzania, and Uganda.

A Green Revolution?

- From 1999 to 2009, grain yields for the six main cereal crops combined grew at an annual average growth rate of 3.89%.
- Area harvested also grew, at a rate of 2.31% annually.
- Together, this resulted in an annual average increase in grain production of 6.29%, sustained over a decade.
- Compare this with India's Green Revolution experience: in the peak 10-year period, grain production grew at an annual average rate of 4.15% (1965 to 1975).

2. Methodology and Approach

- No new primary data.
- Review data on output, yield.
- Look at evidence on inputs.
- Consider data on trade, prices, etc.
- Interpret results.
- Identify specific targets for further data collection.

Comparisons

- Compare Ethiopia with Kenya, Uganda, and Tanzania – both in levels and growth rates.
- Compare Ethiopia's experience in cereals with evidence from other crops and commodities.
- Compare recent period with longer time trends.
- Compare Ethiopia's experience with "original" Green Revolution in India and other countries.

3. Production, Area, and Yield

- Production is rising rapidly in Ethiopia; how do these changes compare to other countries?
- First, consider cereals...

Table: Average annual growth rates of cereal yields (wheat, maize, sorghum, and millet)

	Ethiopia	Kenya	Tanzania	Uganda	All but Ethiopia
2002-2009	3.60%	-2.49%	-3.37%†	-0.82%	-2.16%†
1993-2009	2.35%	-0.34%	-1.38%††	0.572%	-0.64%††
1961-2009	1.58%	0.56%	1.55%†††	1.13%	0.95%†††
1961-2002	1.74%	0.70%	2.29%	1.33%	1.51%

Source: FAOSTAT.

† Data for 2002-2008. †† Data for 1993-2008. ††† Data for 1961-2008.

Grain production in Ethiopia

- Ethiopia's production of cereal grains is rising rapidly.
- The data suggest that Ethiopia's total cereal production has risen from 25% of the region's total in the early 1990s to over 40% in recent years.
- This *differential* success is striking.
- Is this coming at the expense of other crops?
  - Not at the expense of root crops, beans, coffee and sugar, all of which are continuing to grow in Ethiopia.

Sources of Growth

- Production of almost all crops appears to be growing rapidly. With few exceptions, growth is faster than in neighboring countries.
- Is this a Green Revolution?
- What are the sources of growth?
  - Area
  - Labor
  - Fertilizer
  - Irrigation
  - Other inputs

Growth in Cropped Area

- Area harvested is growing rapidly for most major crops.
- The total area harvested to these crops has increased at 4.2% annually for the past 15 years.

Ethiopia's growth in area harvested, 1993-2008

Crop	Area Growth		Crop	Area Growth
Beans	7.69%		Sorghum	5.24%
Coffee	2.42%		Sugarcane	3.01%
Maize	2.57%		Sweet Potato	9.21%
Millet	3.66%		Wheat	5.84%
Potato	2.28%			

Total Input Use

Table: Levels of input use, 2007/2008.

	Ethiopia	Kenya	Tanzania	Uganda
Labor per cropped ha	1.97	2.17	1.33	1.45
Fertilizer (nutrient kg/ha)	6.93	23.73	4.93	0.97
Tractors and combines per ha	0.21	2.60	2.11	0.61
Irrigation (% of cropped area)	1.45	1.70	3.11	< 1.00

Source: FAOSTAT.

Input Growth Rates

Table: Average annual growth rates of input use per hectare of cultivated land, 1998-2007.

	Ethiopia	Kenya	Tanzania	Uganda
Labor	-4.16%	1.01%	5.22%	-0.98%
Fertilizer (kg nutrients)	-11.70%	2.81%	16.93%	5.87%
Tractors and combines	-1.18%	1.26%	1.62%	0.92%

Source: FAOSTAT.

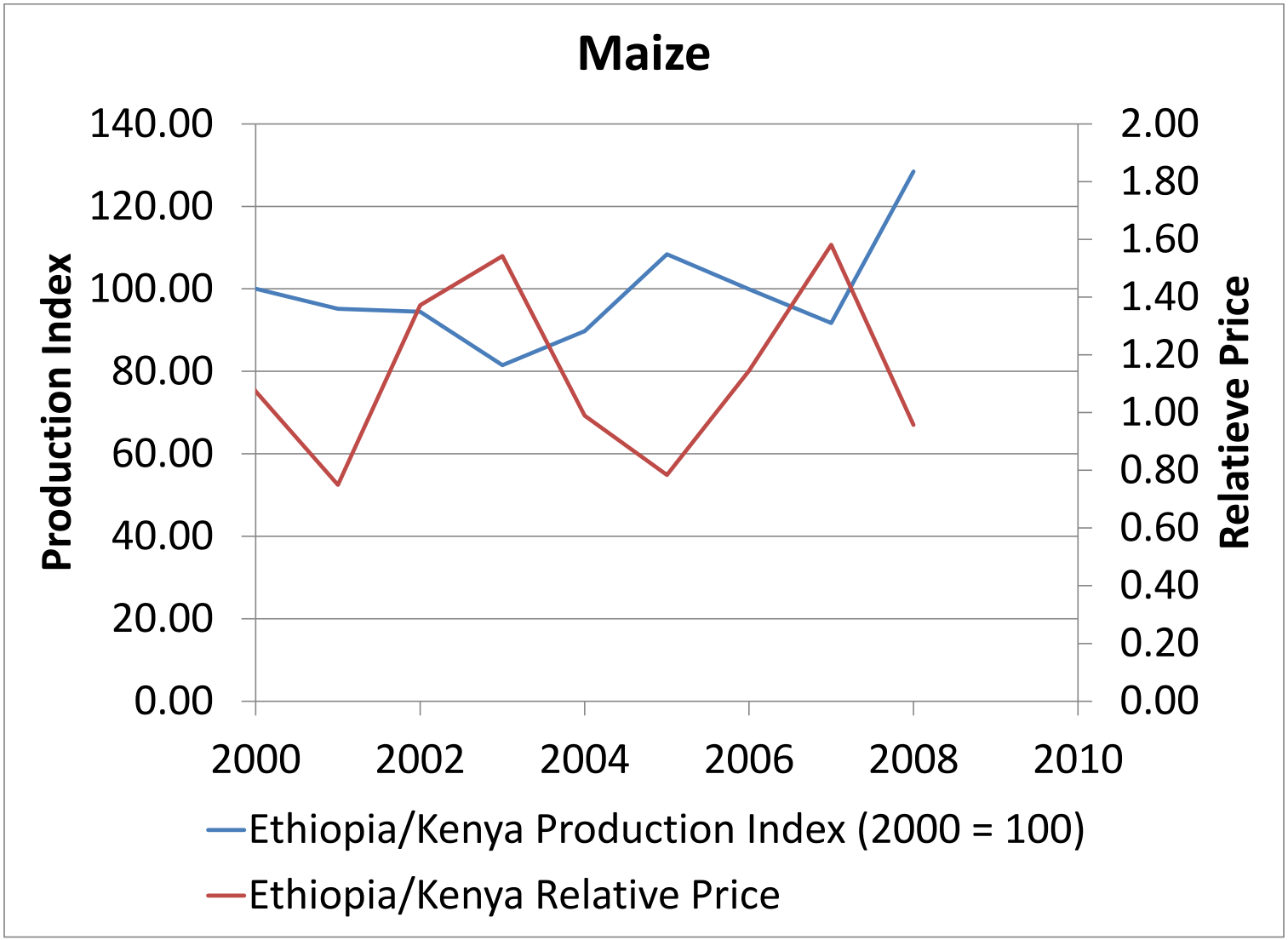
4. Prices

- Agricultural price data are difficult to interpret.
  - Nominal prices of different commodities track together.
  - Prices are in local currency units; difficult to make comparisons across countries.
- Relationship of prices to production increases is in any event ambiguous; shift in supply vs. movement along the supply curve.

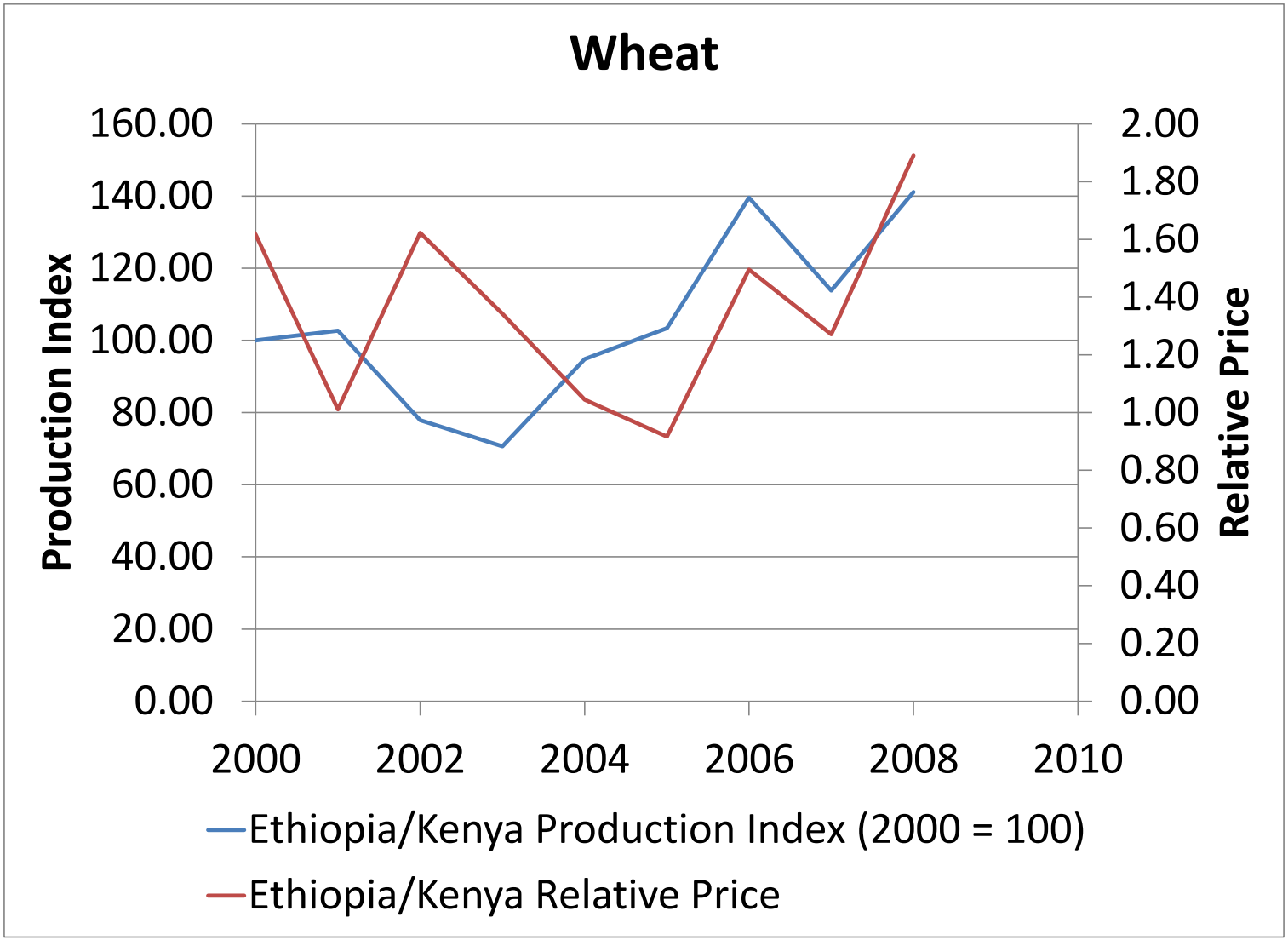
Relative Price Comparisons

- Analyze relative prices in Ethiopia and Kenya.
- Consider local prices of food crops (partly determined on domestic markets) relative to local price of coffee (largely determined on world market).
- See how these relative prices move over time within the two countries – and how the relationship between the relative prices changes with production levels in the two countries.
- In general, when Ethiopia's production rises relative to Kenya's, we would expect relative prices of these commodities to fall relative to Kenyan prices.

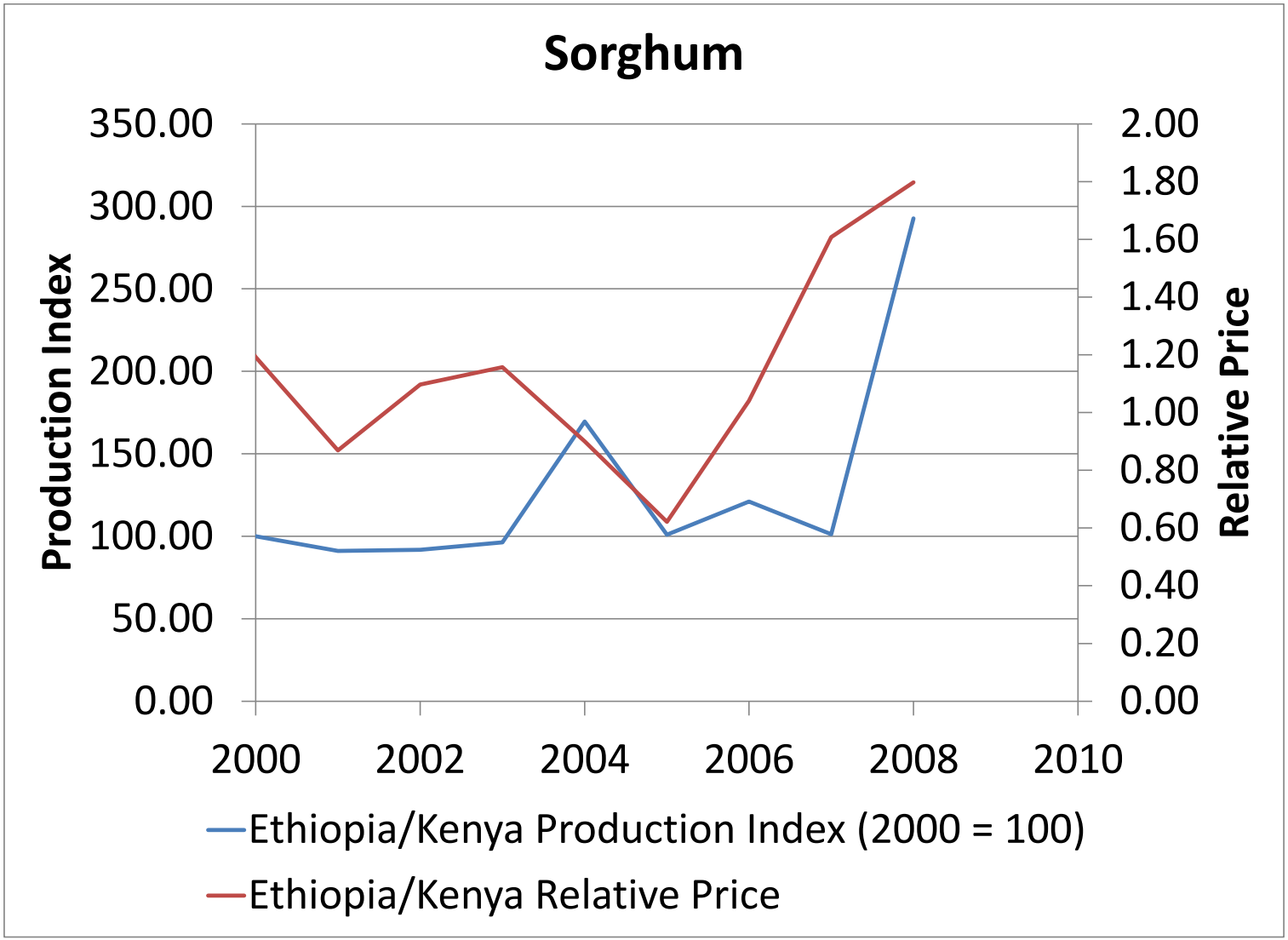
Maize Production and Price



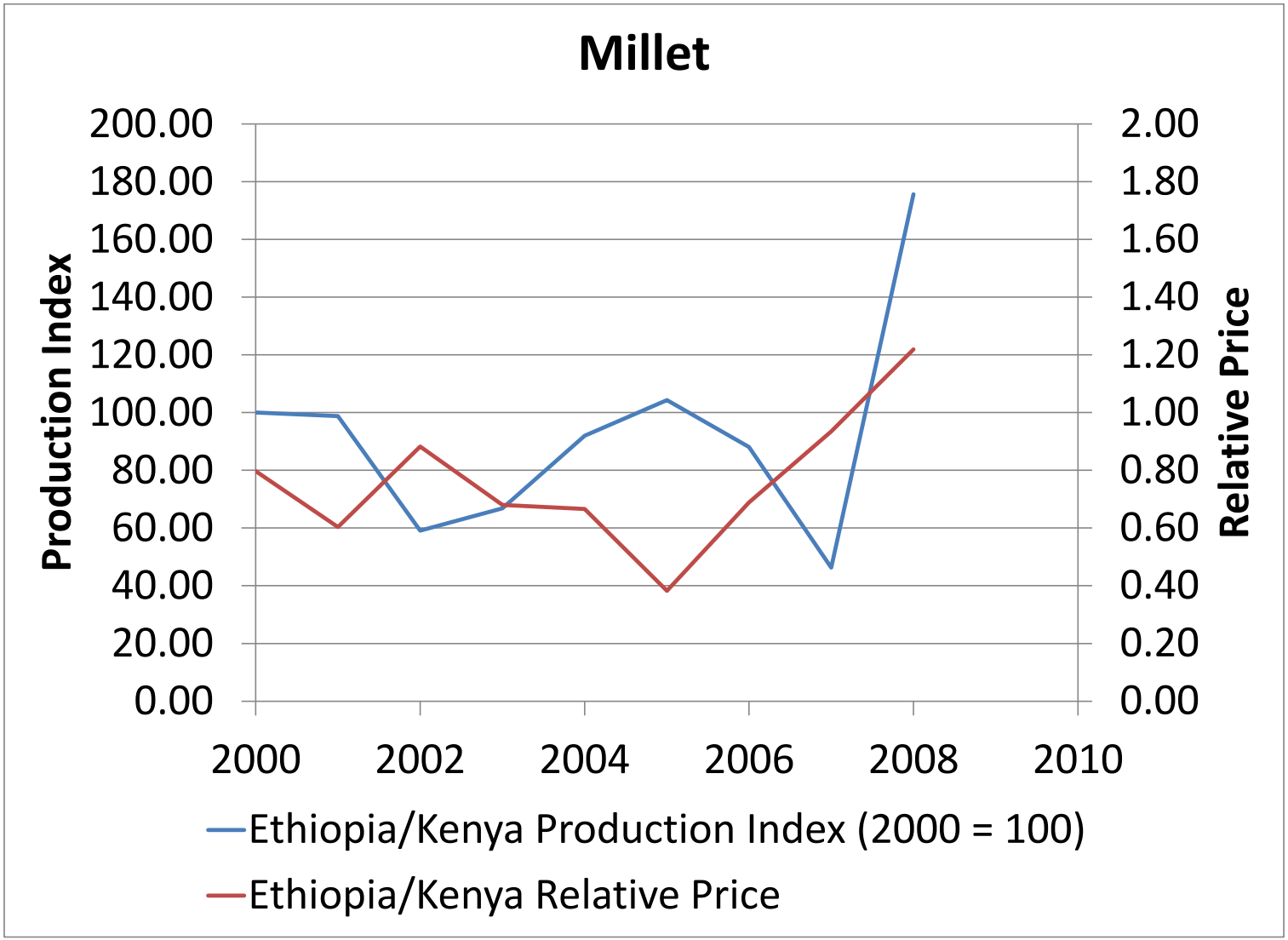
Wheat Production and Price



Sorghum Production and Price



Millet Production and Price



Prices – A Summary

- It does not appear that prices are falling to the extent that we might expect if production is growing at the current rate, and if domestic markets are (as we think) poorly integrated with world markets.
- Not conclusive evidence, but these data challenge our thinking with respect to reported production increases:
  - They are collected independently from production data.
  - Should incorporate all the forces on the supply side.
  - Prices are intrinsically important; directly related to the welfare of urban consumers.

5. Comparisons with India's Green Revolution

- Useful to compare Ethiopia's experience with that of India in 1965-75.
- How close are the parallels?
- In what ways do the data from Ethiopia mirror those from Green Revolution India, and in what ways do the data differ?

Breadth and Depth of the Green Revolution

- Ethiopia's experience involves a much broader increase in crop productivity:
  - India's Green Revolution was initially confined to two crops: wheat and rice. Some (smaller) productivity gains arrived later in maize, sorghum, and millet.
- Ethiopia has seen far larger increases in area harvested.
  - India saw limited growth in the total area planted to cereals, with only 0.86% average annual growth in cereals from 1965-75.
  - Rapid increases in wheat area (4.56% annual growth) and maize (1.79% from a small base).
  - Sorghum and millet actually declined in area, at annual growth rates of -1.51% and -0.27% respectively; crowded out by productivity gains in the other grains.
  - Cereals collectively displaced other crops; negative growth in area planted to other crops.

Input Intensification

- India's Green Revolution was heavily dependent on input intensification.
- Nitrogen fertilizer use:
  - 3.5 kg/ha in 1965
  - 16.4 kg/ha in 1975
- Tractors:
  - 48,000 in 1965
  - 168,000 in 1975
- Agricultural labor use
  - 480 million in 1964/65
  - 599 million in 1974/75

Input Intensification, cont.

- Irrigation
  - 26.5 million ha in 1965 (16.3% of cultivated area)
  - 33.7 million ha in 1975 (20.1% of cultivated area)
- Improved seeds
  - Essentially zero in 1965
  - By 1975, semi-dwarf varieties on 75% of wheat area and 27% of rice area.

India's Neighbors

- India's Green Revolution was part of a well-documented regional techological revolution.
- Rice production in India's neighbors – Bangladesh, Nepal, Pakistan, and Sri Lanka – rose at an average annual rate of 2.1% from 1965-75, and wheat production in those countries grew at a rate of 6.9%.
- The Southeast Asian region as a whole saw a 3.1% average annual increase in rice production during this period as well.
- In short, India's Green Revolution was widely shared and came from a well-understood mechanism.
- Ethiopia's experience is not typical of any of its neighbors.

6. Further Questions

- Are the data in fact reliable?
- Sampling issues are complicated, because patterns of population and production change over time.
- With urban growth, area sampling frameworks can easily overweight intensive production that is close to cities.
- Many other possibilities for sampling error and misreporting.

Does it matter?

- Very important not to make policy decisions based on misunderstanding of agricultural output levels and trends.
- Can lead to complacency about agricultural sector.
- Can lead to dangerous policy decisions; e.g., if grain is thought to be abundant, then governments might encourage using it for animal feed – to the detriment of the poor.
- Crucially important to reconcile the agricultural statistics with information coming from other sources

The Influence of Neighbours vs Extension Visits

P. Krishnan & M. Patnam
Cambridge University, UK

Adoption of Seed and Fertiliser in Ethiopia 1999-2009

Slow Adoption

- Adoption of fertiliser and improved seeds key to increased land productivity
- However, the adoption and diffusion of such technologies has been slow
- Many potential reasons

Current adoption in Ethiopia (CSA)

- Improved seed use is 5% of cropped area (cereals) AND ONLY SLOW CHANGE SINCE
- For maize in particular, higher at 20% (fourfold increase since 97/98)
- Fertiliser is 39% of cropped area (cereals) – a rise from 32% in 97/98
- In this paper – trying to understand role of learning and extension in adoption over time

Reasons for low adoption

- Constraints on supply/distribution? – especially relevant for seed in Ethiopia but not fertiliser
- Returns to adoption? (inputs expensive, costly credit, returns are heterogenous and uncertain) (Suri/Dercon) – plausible
- Imperfect information & *uncertainty* about return on own land – need to learn (Udry & Conley)
- We concentrate on the last

Data Used

- Ethiopian Rural Household Survey, as it is a longitudinal data set 1994-2009
- 15 villages, so not nationally representative for levels of adoption or yield
- But villages in 4 main regions and representing diversity of most of rural Ethiopia, so helpful in study of processes of change and its determinants
- A longitudinal study can allow causal analysis of these changes

Data on yields ERHS (Getachew Abegaz, 2011)

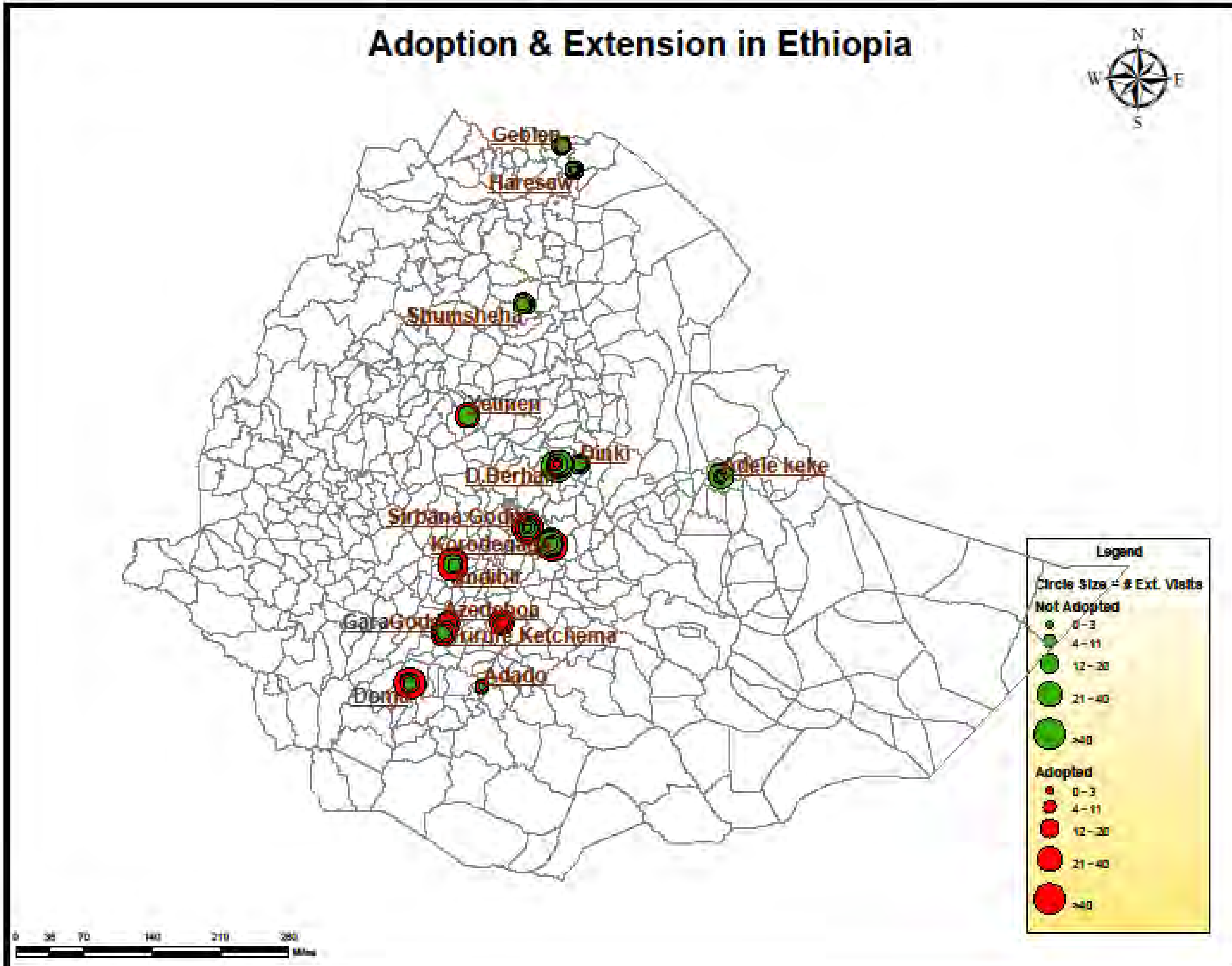
- Cereal yield grew by 21% (wheat by 62%, maize by 19% and barley by 11%) since 99

Modern input use higher in this sample than in national average

- 14% of cereal crop area cultivated with improved seeds
- *Caution: Improved seed is bought/exchanged – so unclear if all seed use is “improved”

ERHS 1999-2009

Seed and Fertiliser adoption


Adoption & Extension in Ethiopia
N
W
E
S
Geblen
Haresaw
Shumsheha
Yetmen
Dinki
D.Berhan
Adele keke
Azedebo
Turufe Ketchema
Adado
Legend
Circle Size = # Ext. Visits
Not Adopted
0 - 3
4 - 11
12 - 20
21 - 40
>40
Adopted
0 - 3
4 - 11
12 - 20
21 - 40
>40
0 35 70 140 210 280
Miles

Differences between adopters and non-adopters

- Seed: better educated, no real differences in wealth
- Fertiliser: better educated, wealthier, more and better land
- Both: More extension visits in 99
- **Key difference**: adopters are more likely to have neighbours who are adopters too

Identifying the effects of neighbours

- Spatial neighbours based on a distance of 1 km from the household.
- Instrument for the average neighbour's decision to adopt : the **non-overlapping** sets of neighbours – or neighbours of neighbours
- Affect the decisions of spatial neighbours directly – but not the household's own decision
- Robust to variations and distance – and the use of self-reported neighbours

The importance of neighbours for seed adoption

- An increase of one standard deviation in the average neighbours' adoption raises the probability of own adoption by about 11% points in 1999 and 12% points in 2009
- Average adoption rates range from 0.18–0.23, so this is large – more than double current levels.

Adoption of new seed 1999–2009

The effect of extension visits on seed adoption

- An increase of 1 sd in visits – ie about 1.3 visits in 1999 raises the probability of adoption by 3.7% points – (Interpretation: SMALL BUT IMPORTANT!)
- This falls to 1.3% in 2004 and to 2.9% points by 2009 (here, 1 sd increase is 10 visits)
- The increased probability of adoption is about 1/10th the effect in 1999 (VERY SMALL IMPACT)
- (Effects confirmed by controlling for unobserved household characteristics/unobserved targeting of farmers)
- Consistent with a reasonable (but not high) return to extension early on, but close to zero return later on

Cross-section versus panel data: Fixed effects

- The cross-section controls for village-level effects – like distance to nearest extension office
- But suppose that extension was targeted at the "better" farmers – that there are unobserved characteristics at the household level – then cross-section will overstate the effect
- So also do this in changes in adoption – removes household specific characteristics that do not change
- Also check: is effect the same in each year?
- And does learning occur via current neighbours' adoption and extension or via past adoption by them?

Estimated effects for seed (with household fixed effects)

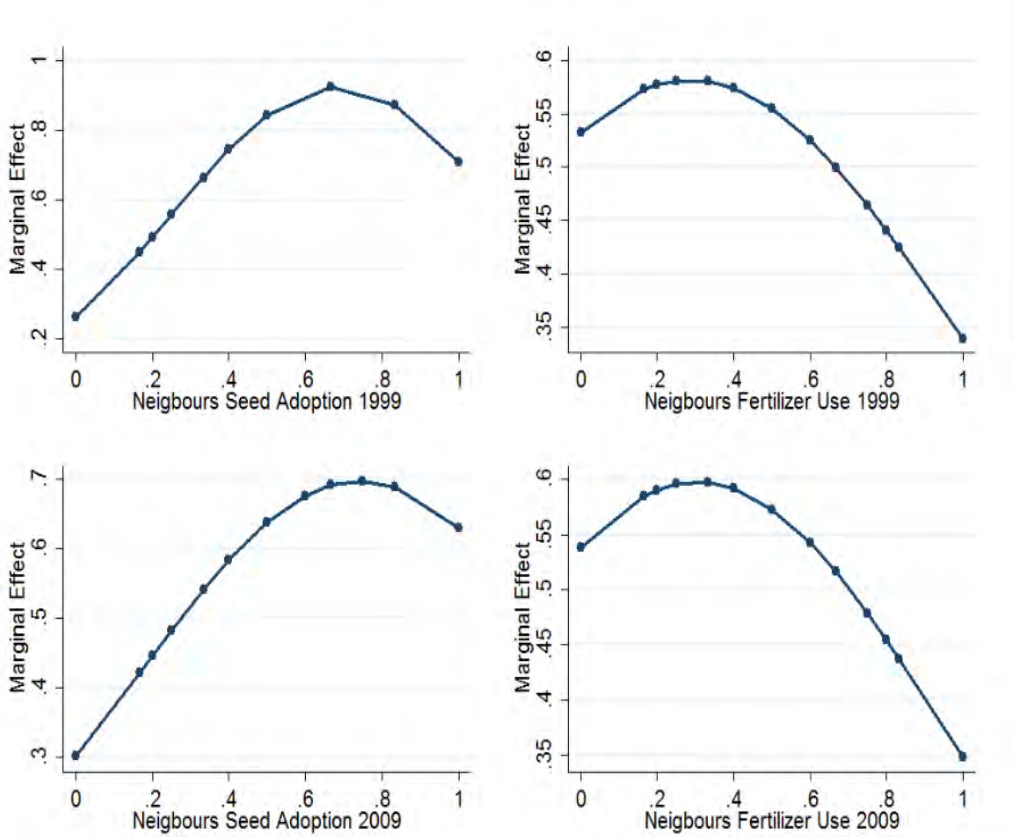
Neighbours versus Extension in Fertiliser Use

Impacts of neighbours again- on fertiliser

- A one standard deviation increase in the average fertiliser adoption of neighbours raises own probabilities of adoption of fertiliser by 19%.
- The effects are similar in both 1999 and 2009
- A substantial effect given that adoption is already about 62% in the survey areas.

Impact on own adoption, given levels of adoption by neighbours

Note : additional adoption from more neighbours adopting peaks at some point, and peak is relatively low for fertiliser – reflecting heterogenous (and low) returns, compared to seed.



Interpreting the graphs

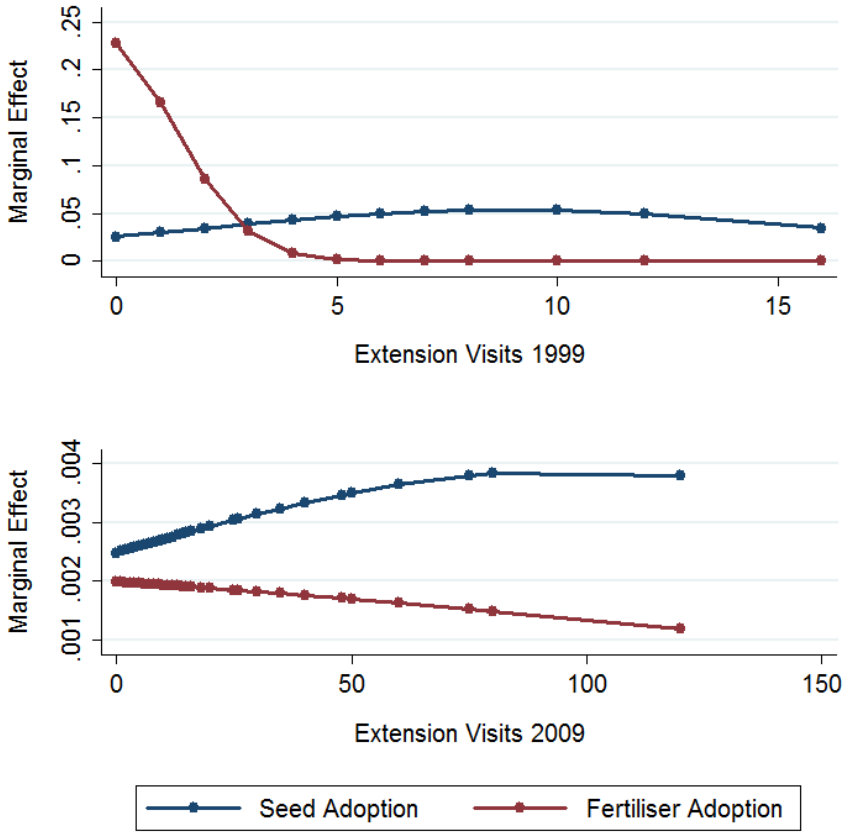
- Seed: The speed of diffusion through learning from others increases until local diffusion levels of 70 percent have been reached
- Fertiliser: these benefits from learning appear to tail off at about 30 percent diffusion levels.
- In both cases: an increase by 10% points in diffusion in the neighbourhood increases the probability of adopting by about 5% points *at current levels of diffusion*

Impact of extension on fertiliser use

- In comparison to effect of neighbours, the impact of extension is :
- Large and significant in 1999
- Collapses by 2009 (similar to effect of extension on seed adoption)
- Potentially explained by the targeting of farmers more likely to adopt fertiliser in 1999
- True “value-added” of extension might be rather low
- However, potential impact on other practices useful for yield growth not examined here

Estimated Impact on Fertiliser Use (Household Fixed Effects)

Impact on own adoption given extension visits
(note axis difference)



Nore: Marginal Effects on the y-axis are scaled to reflect the probability change in own adoption for a 1 unit change in extension visits

Is this really learning? So what?

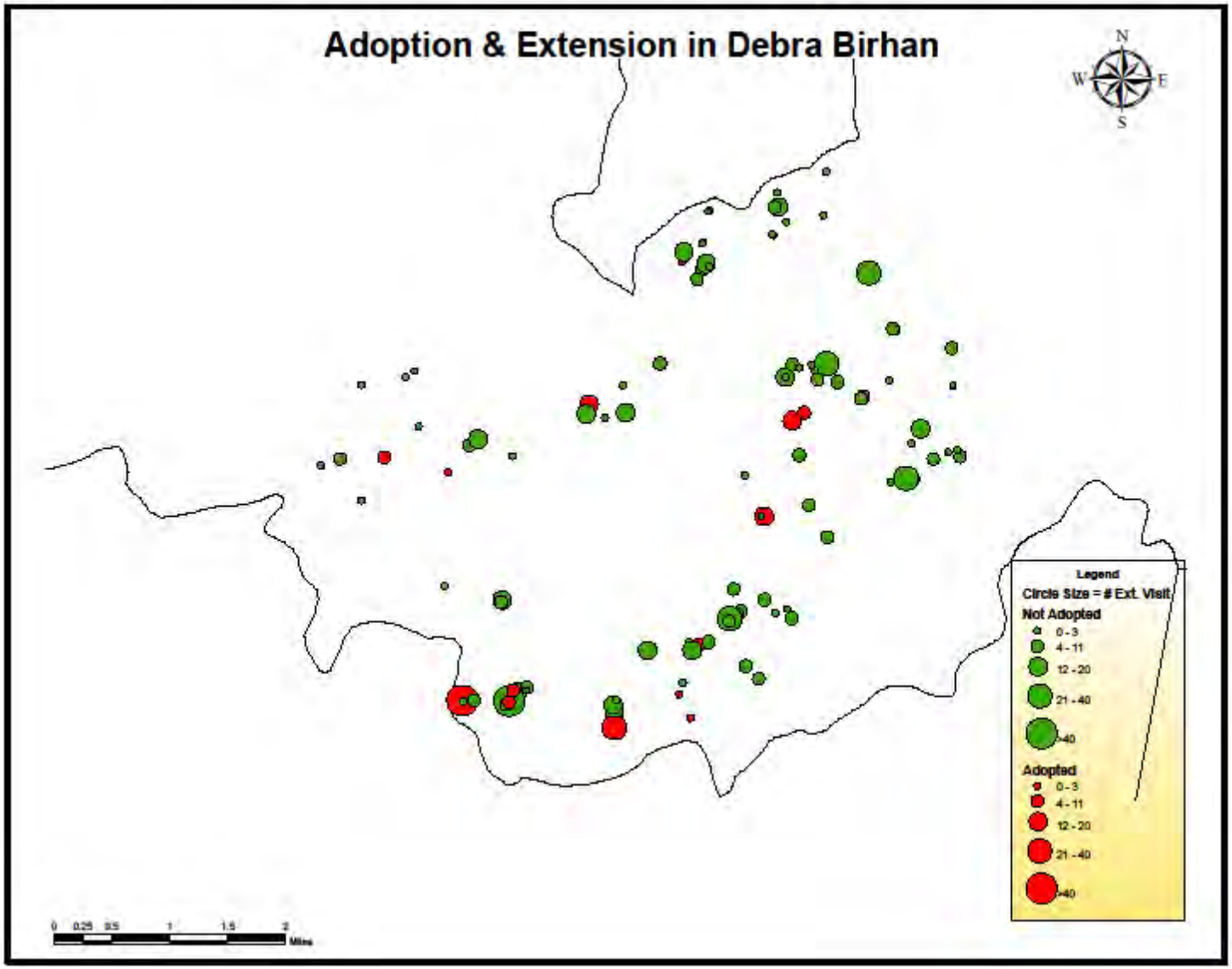
- We examine improved seed that is bought/exchanged
- Potentially, supply constraints might mean sharing of seed more important
- Also, farmers report facing changing land fertility – 58% in 1999 said fertility was decreasing – making future returns uncertain with new technology
- So yes, likely to be learning but..
- Learning from others is a powerful tool, but is not amenable to rapid change through policy (such as via extension), as it reflects steady but careful learning from the experiences of others.

Summing up

- Clear evidence that adoption occurs in neigbhourhoods with learning from each other a plausible explanation
- Stable return to learning from others – remarkably stable
- Extension not terribly effective for adoption – except at start in 1999
- Striking; maybe not surprising given the evidence from green revolution (once started, spread fast and not via extension)

Extension services in 2009

Help offered by extension agents in 2009		%
NA		41
Source of introduction to new inputs		23
Introduction to new methods of cultivation		20
Source of introduction to new crops		5
Assist in obtaining fertilizer		7
Assist in obtaining improved seeds		3
Assist in obtaining credit		0.3
Others		0.3
How to prepare and use compost		0.2
How to prevent soil erosion		0.9
How to crossbread livestock		0.2
How to make water harvest		0.2


Adoption & Extension in Debra Birhan
N
W
E
S
Legend
Circle Size = # Ext. Visit
Not Adopted
0 - 3
4 - 11
12 - 20
21 - 40
>40
Adopted
0 - 3
4 - 11
12 - 20
21 - 40
>40
0 0.25 0.5 1 1.5 2
Miles

Historical experience (Green Revolution from Ruttan)

- New wheat and rice varieties adopted rapidly where clear evidence of technical & economic superiority
- Neither farm size nor tenure mattered in adoption
- In Indian Punjab proportion of area planted rose from 3 in 66/67 to 66% by 69/70
- Adoption in Philippines between 60-95% in 4 years
- Largest increments came in relatively arid areas with access to irrigation
- But where the seed needed to be adapted for specific environments, the rate of diffusion was much slower
- Extension services generally low impact – with influence only in initial take up