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Impacts of Chinese African Swine Fever Losses and Pig Herd Recovery on the U.S. Agricultural Sector

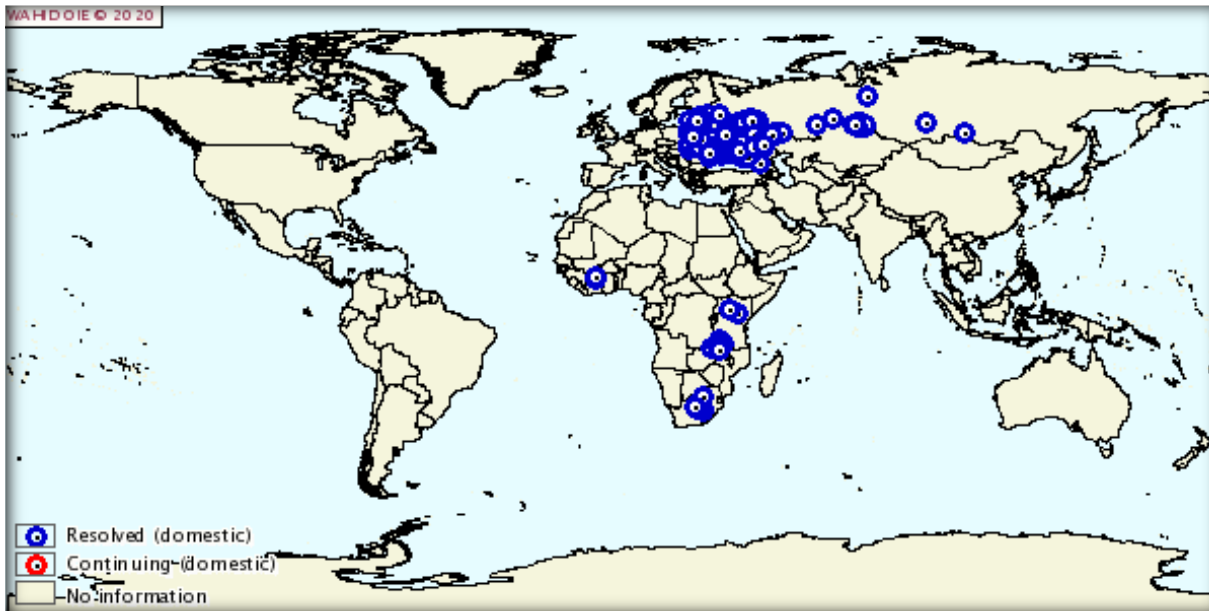
Lesley Ahmed

This research build upon previous work: Ahmed, et. al. "GE Analysis of the Effects of U.S. Market Facilitation Payments on the U.S. Farm Sector." 2019 IATRC Annual Meeting: Washington DC, December 8-10, 2019.

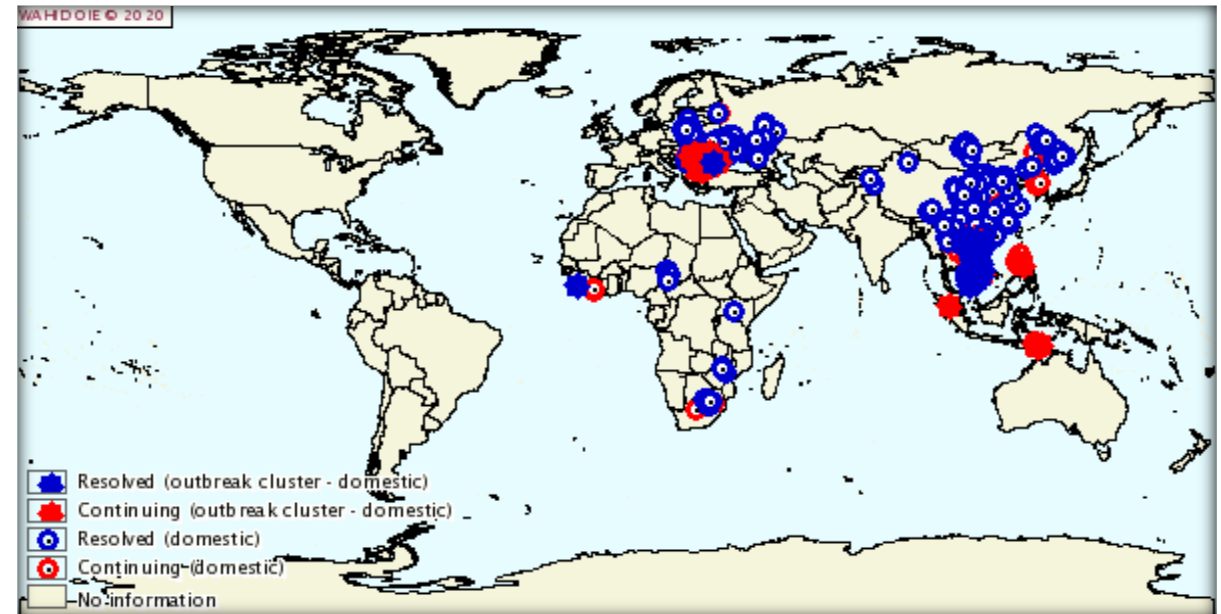
Disclaimer: This presentation is the result of the ongoing professional research of USITC staff and solely represents the opinions and professional research of the individual author. It is not meant to represent in any way the views of the U.S. International Trade Commission or any of its individual Commissioners.

Motivation

**African Swine Fever Outbreaks
2017**



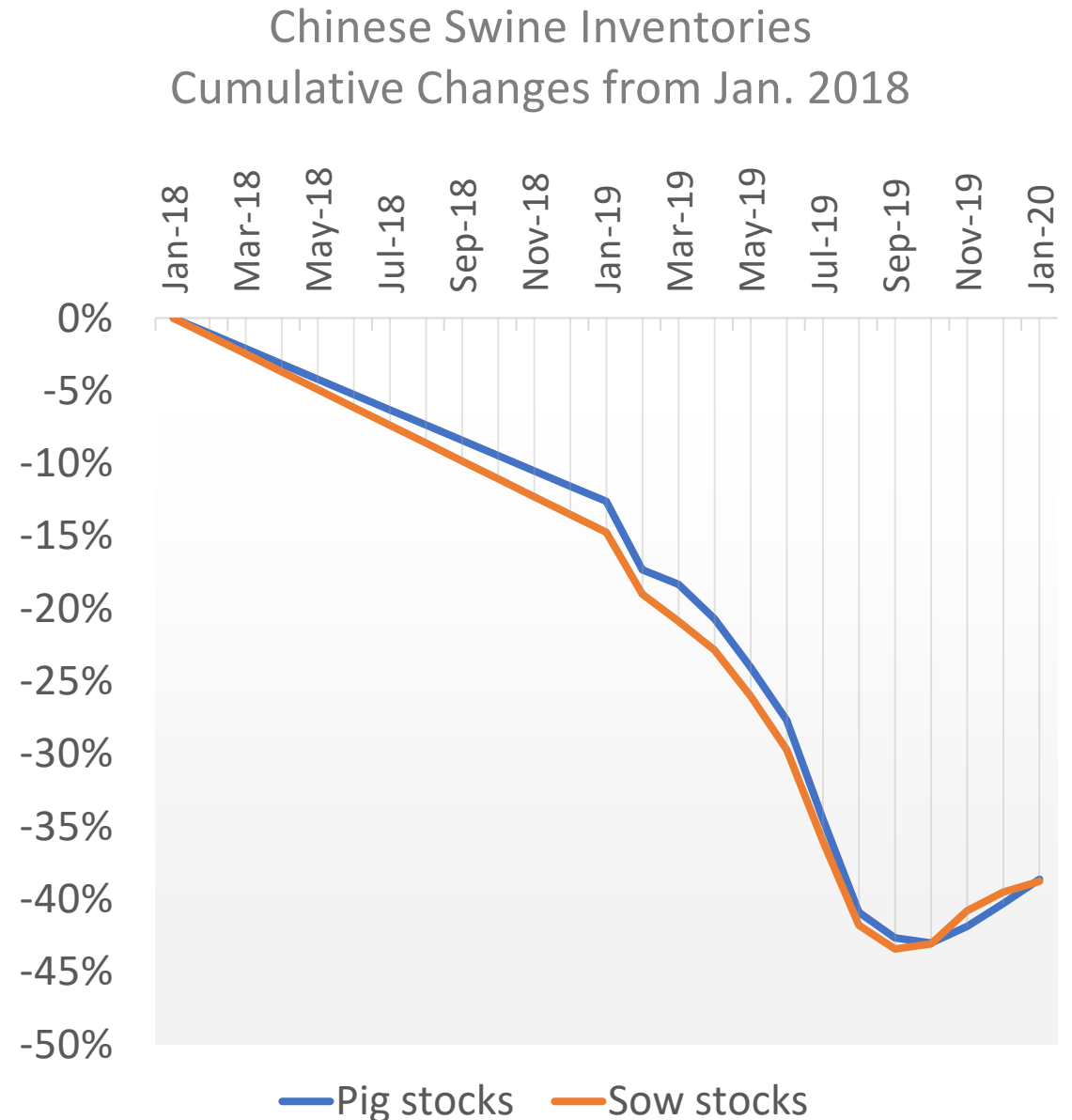
**African Swine Fever Outbreaks
2019**



Source: OIE, World Animal Health Information Database

Motivation

- China: world's largest pork producer and consumer, with around 60% of global swine stocks (pre-ASF).
- ASF losses caused Chinese swine stocks to fall by over 40%.
- ASF losses in China affect global pork and soybean markets.



Motivation

- Complicating background factors: concurrent policy actions
 - Trade actions including Chinese tariffs on U.S. soybeans, pork, and swine
 - Market Facilitation Program (MFP) payments to U.S. farmers
- Chinese pig herd recovery beyond 2020
 - Chinese government plans favor large, modern swine operations
 - Currently no ASF vaccine => ASF likely endemic
- Limited literature on economic impact of China ASF Outbreak

Research Questions

- What are the effects of Chinese ASF swine inventory losses on U.S. and Chinese ag. sectors?
- What are possible implications from potential scenarios for Chinese pig herd recovery?

Using a GE framework, simulate the effects of Chinese ASF losses and scenarios for Chinese pig herd recovery with consolidation and modernization on U.S. and Chinese agricultural sectors, while incorporating concurrent policy actions (MFP payments and trade actions).

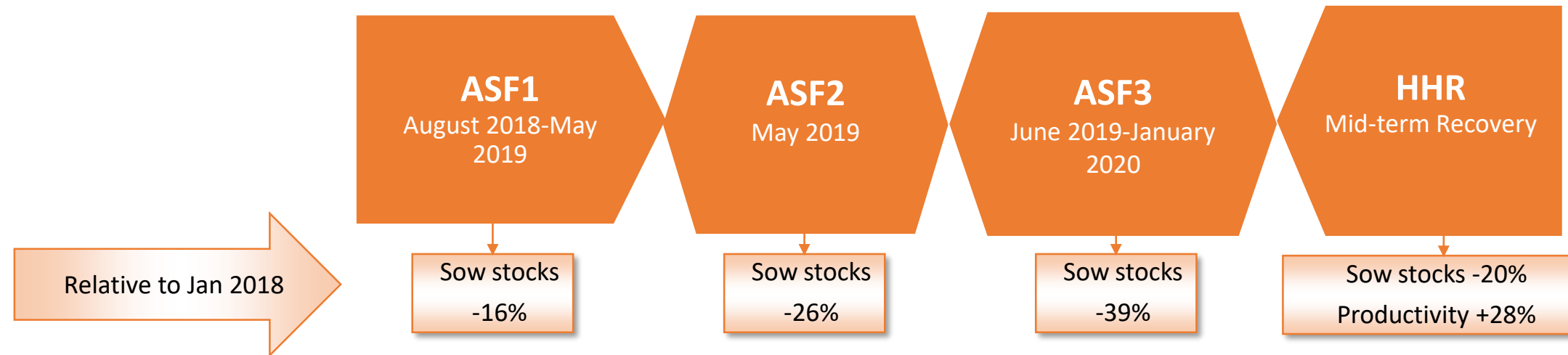
Modeling Approach

- GTAP-AGR Model (Keeney and Hertel, 2005)
 - Limits factor mobility between ag and non-ag sectors and among ag sectors compared to the standard model
 - Models demand for livestock fodder by allowing for feedstuff substitution
 - Land is only used by the farm sectors (mostly crops, a little in livestock and forestry)
 - Provides framework for estimating change in farm income (both off- and on-)
- GTAP-AGR closure
 - Limited ag factor (land) movement between ag sectors
 - Land, labor, and capital are fully utilized
- GTAP v.10 database
 - I-O tables, agricultural subsidy rates updated from v.9
 - 2014 base year

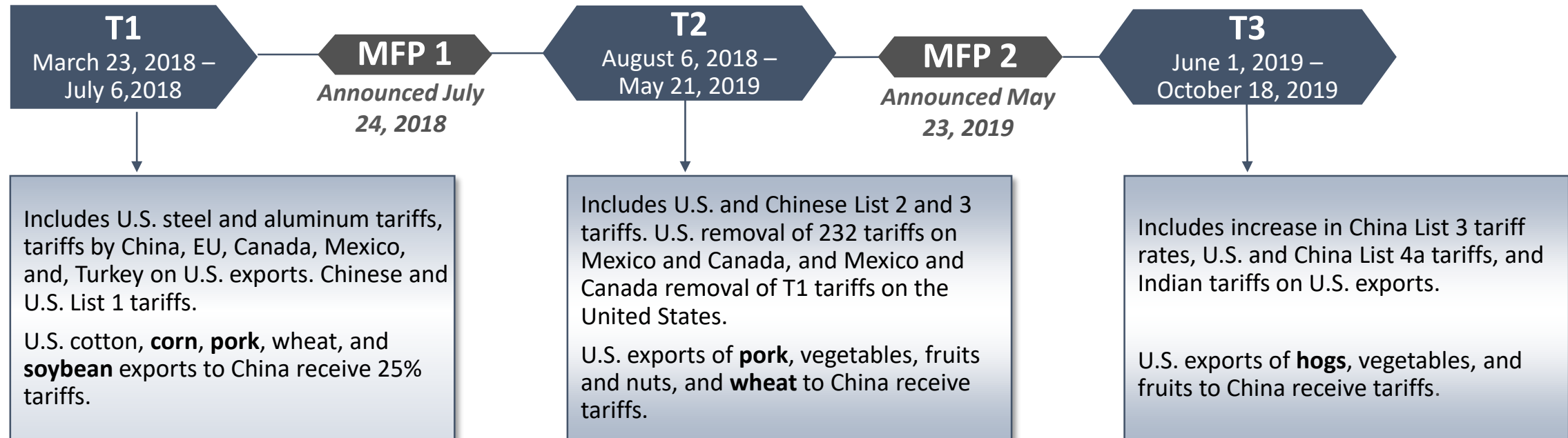
Modeling Approach (cont.)

- GTAP sectors splits
 - Other Animal Products (OAP) split into **swine (SWI)** and other (OAPother)
 - Other Meat (OMT) split into **pork (POR)** and other (OMTother)
 - Oilseeds (OSD) split into **soybeans (SBS)** and other (OSDoother)
 - Vegetable oils (VOL) split into **soybean meal (SBM)** and other (VOLother)
- Capital disaggregated into breeding stock and capital for 4 livestock sectors
 - Swine breeding stock (SwiK), beef cattle breeding stock (CTLk), Other Animal products (OAPotherK), and dairy cattle breeding stock (RmkK)
- Parameters changed to elicit short-run response, limit input substitution for CHN SWI
 - ESUBT (Elasticity of substitution between intermediate inputs and value added)
 - ETRAEL (Elasticity of transformation of land between sectors)
 - APEVAL (Elasticity of substitution between land labor and capital)

Timeline: ASF Losses and Concurrent Policies



Concurrent Background Policy Shocks



Policy Experiments and Parameters

Parameters:

ESUBT

ESUBT(PROD_COMM,REG)

Elasticity of substitution
between intermediate
inputs and value added

Default
parameters
in the AGR
Model

0.90

Short-run response,
production decisions
already made

0.10

Default
parameters
in the AGR
Model

0.90

0.90

Short-run
response to
limit input
substitution

0.15

0.15

Default
parameters
in the AGR
Model

0.90

0.90

Default
parameters
in the AGR
Model

0.90

ETRAE

ETRAE(ENDW_COMM,REG)

Elasticity of transformation
of land between sectors

-0.40

0.00

-0.40

-0.40

-0.10

-0.10

-0.40

-0.40

-0.40

APEVA

APEVA(PROD_COM,REG)

Elasticity of substitution
between land labor
and capital

0.30

0.00

0.30

0.30

0.00

0.00

0.30

0.30

0.30



MFP 1

T2

MFP 2

T3

HHR

ASF Shocks:

SwiK
-16%

SwiK
-12%

SwiK
-18%

Productivity
+28%
SwiK
+31%

(trade actions are implemented as import tariffs and MFP shocks as combination of output and land subsidies)

Description of Shocks

- ASF shocks
 - CHN SwiK shocks calculated from Official Chinese Statistics
 - Hog herd recovery scenarios
 - sow stocks return to 80 percent of pre-ASF levels
 - Productivity increasing to equal U.S. productivity based on pounds of gain per day (Chinese pork production 78% as efficient as U.S. pork production (Gale, 2017)).
- Background shocks to account for concurrent and significant policy actions
 - Trade actions
 - Data from Iowa State Center for Agricultural and Rural Development
 - Assigned to a tranche based on the implementation date
 - MFP Payments
 - Payment rate data from USDA, production and acreage from USDA NASS
 - Modeled as in effect from the announcement date until the next payment is announced
- Run as a series of comparative static simulations
 - Didn't allow for changes to capital stocks

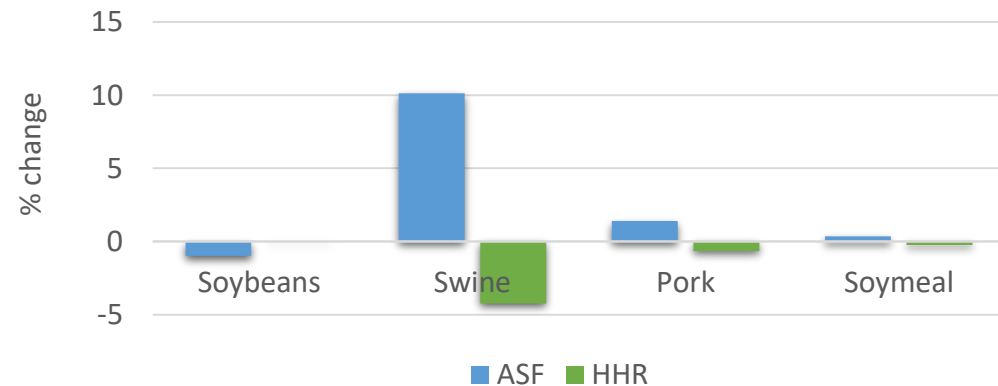
Results

- Output
 - With the ASF and policy shocks in place, Chinese output for swine and pork decline.
 - After pig herd recovery, Chinese swine and pork output increase.
- With the ASF and policy shocks in place, U.S. output for swine and pork increase
- After pig herd recovery, U.S. swine and pork output decrease.

ASF and HHR Effects on Chinese Output



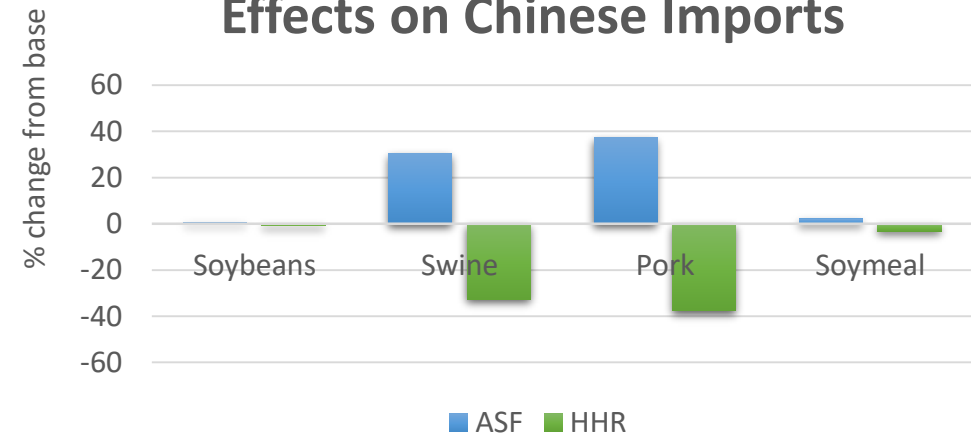
ASF and Hog Herd Recovery Effects on U.S. Output



Results

- Trade
 - With the ASF and policy shocks in place, Chinese imports of swine and pork increase.
 - After pig herd recovery, Chinese swine and pork imports decrease.
- With the ASF and policy shocks in place, U.S. exports of swine and pork increase and soybean exports decrease
- After pig herd recovery, U.S. swine and pork exports decrease.

**ASF and Hog Herd Recovery
Effects on Chinese Imports**



**ASF and Hog Herd Recovery
Effects on U.S. Exports**



Conclusions

- CHN ASF has significant negative effects on CHN pork production
 - => large increases in pork imports
 - Not completely offsetting lower pork consumption in China.
- Simulated CHN recovery pork output < pre-ASF level
 - => Continued higher Chinese pork imports.
- CHN SWN Imports and USA SWN output have large % increase, but from small base
- Parameter adjustment can be a helpful tool for industry-specific analysis



Tony Clayton

President at Clayton Agri-Marketing, Inc.

2d

Clayton Agri-Marketing, Inc. made our first swine shipment of 2020 to China last night from Chicago. We hope the agreements of the Phase I Treaty with the Chinese will allow import permits to be issued on a timely basis so more exports of swine genetics from the United States can be made.



Areas for future research

- Alternate ASF recovery scenarios:
 - Consider alternate recovery scenario (levels of sow stocks and productivity)
- ASF in other countries:
 - Include shocks to other major hog producing countries that 1) have had ASF losses, or 2) are at risk of ASF losses (e.g., major pork exporting country)
- COVID-19:
 - Consider ASF production and supply shocks in combination with COVID-19 shocks (expenditures, demand, population, distribution, supply)
- Sensitivity analysis of parameter changes

Thank You!

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