International Spillover Effects of China's Potential Import Diversification Efforts under Trade Policy Uncertainties: a Gridded CGE Analysis

Introduction

China's annual agricultural imports have exceeded $200 billion in recent years, firmly positioning the country as the world's largest agricultural importer. Its agricultural imports cover both bulk commodities such as soybeans (with annual imports exceeding $60 billion) and high-value foods such as beef and dairy products, making it one of the major driving forces of global agricultural production and land use. Whether or not China will continue to be such a driving force depends on its own trade policy development and the evolvement of the global trading environment, a topic that is at the center of the current paper.

Although the Chinese government at times recognizes international resources and international markets as important mechanisms for maintaining domestic food security, rising import volume and highly concentrated import sources for several key commodities (e.g. soybean and maize) have raised serious domestic concerns, especially considering the current geopolitical environment. For instance, more than 90% of China's soybean and maize imports were sourced from only three countries (Brazil, the US, and Ukraine) in 2022. Recent events (e.g. US-China tariff war and Russian's invasion of Ukraine) have impacted China's trade with two of the three main sourcing countries (US and Ukraine) directly and the remaining country (i.e. Brazil) indirectly. Managing the risks associated with large import volumes from highly concentrated import sources points to the need for China to adopt an import diversification strategy across both products and sources. Wang et al. (2026) conducted such an analysis against a base case of 2021 (when China-US agricultural trade largely retuned to "normalcy" after the shocks from the first Trump trade war) and suggest that lowering the higher trade barriers on meat imports while maintaining the lower trade barriers on imported feed grains and oilseeds can result in lowered import dependencies of the latter products, while rising meat imports can result in better consumer welfare. It also points to uneven global spillover effects across products and sources, with the US gaining more than Brazil due to its existing trade pattern with China. With bilateral trade tensions between the US and China on the rise again, the US' global tariffs against its many trading partners, and the Russia-Ukraine war still ongoing, the global agricultural trading environment is expected to become even more volatile, a situation that can further drive China's import diversification efforts but can also limit the scope of such efforts. Therefore, an assessment of China's import diversification efforts must be conducted vis-à-vis the uncertain trade relations with key trading partners and the overall uncertainties in the global agricultural trading system. This is the first objective of this paper.

As a large importer, any significant adjustment in China's agricultural trade policy will also have important international spillover effects, both on the country's main trading partners (such as the US and Brazil) directly and on other importing countries indirectly. While the international spillover effects of China's import diversification effects at country level have been explored in Wang et al. (2026) using the GTAP model, limitations remain on insufficiently capturing the spatial heterogeneous responses and spillover effects on land use and land use changes. Recent development to embed a gridded crop production and land use system within

the GTAP model – nicknamed GTAP-SIMPLE-G (Wang 2024) – opens a new avenue to better account for these spillover effects. This model (in its second version) provides grid-level representations of land use and crop production at a 5-arcminute resolution in both Brazil and the US, making it possible to capture localized responses to China's import diversification efforts in crop production and national responses in livestock production. When aggregated at national levels, these responses can also shape the effectiveness of China's policy action. In addition to key economic outcomes, the application of the GTAP-SIMPLE-G model also allows for evaluation of environmental outcomes such as GHG emissions related to changing production and land use patterns. Thus, accounting for country-level and within-country spatially explicit spillover effects in China's main trading partners (particularly the US and Brazil) is the second objective of this paper.

Model and data

We use the GTAP-SIMPLE-G model for our modeling analysis. This model embeds grid-level land use and crop production systems within the GTAP model, allowing for agricultural and land use heterogeneity and spillover effects across both domestic and international spaces, as well as across sectors, in responding to changing national trade policy practices at home or abroad (Wang 2024). In addition to the national-level simulations, GTAP-SIMPLE-G further allows land use and crop production for both Brazil and the US to operate at grid levels, thereby capturing much richer spillover effects in China's top two agricultural trading partners in responding to China's policy changes. As compared to the original version of the GTAP-SIMPLE-G model, this paper applies an updated model version with several model enhancements, including a two-layer nested constant elasticity of transformation (CET) crop production system that allows for single- and multi-cropping systems. This modeling enhancement is supported by enhanced data sets that contain maize and soybean production distinguished by cropping systems in Brazil. Another major enhancement is that the model endogenizes total managed land supply that responds to changes in land rents with estimated grid-level land supply elasticities, enabling more realistic representation of land use conversion and the corresponding induced GHG emission.

The GTAP-SIMPLE-G model is expected to run against the GTAP version 12 database with 2021 as the base year, matched with grid-level data for Brazil and the US for the same year. The choice of 2021 as the base year is motived by the availability of the latest GTAP 12 dataset. In 2021, the agricultural trade relationships between the US and China had largely been normalized and that the Russian invasion in Ukraine started the following year. Therefore, it can be considered as a reasonable baseline to construct alternative trade policy scenarios.

Scenarios

Using the GTAP-SIMPLE-G model featuring gridded crop production and land use systems in Brazil and the US, we consider China's import diversification scenarios under trade policy uncertainties. As with Wang et al. (2026), China's import diversification scenarios are assumed to be realized through unilateral trade liberalization that lowers the high tariff and non-tariff barriers on meat products, reflecting the expectation that these actions would result in lowered

feed grain and oilseed import demand sourced from relatively few suppliers and rising meat imports from relatively more suppliers. Specifically, we consider two main scenarios:

(a). Unilateral MFN trade liberalization by China: removal of import tariffs in meat products, plus reductions of non-tariff barriers for the same products

(b). Unilateral MFN trade liberalization by China except for rising trade barriers against US agricultural exports: component (a) for non-US sourced imports, plus rising effective import barriers against US-sourced imports (tracking annualized import levels for major products prior to the recent US-China trade truce)

These two main scenarios will be simulated against the status-quo embodied in the GTAP 12 database, depicting the global trading environment in 2021. In addition, we also consider uncertainties in the global agricultural trading environment, by taking into considerations of scenarios of elevated US tariffs on its many trading partners, as well as possible retaliatory tariffs from its trading partners, using recently compiled tariff data sets.

Expected results

Model simulations with the GTAP-SIMPLE-G model will not only capture restructured Chinese agricultural import patterns across product and trading partner dimensions at national level, but also the spatially heterogeneous impacts on the grid-level crop production and land use in Brazil and the US. Furthermore, results will also reveal the subnational spillover effects within the US and Brazil due to competition of agricultural inputs between crops and land use competitions between cropland, pastureland, and forestland, allowing for more comprehensive evaluation of localized agricultural impacts of the policy scenarios under trade uncertainties. Finally, we will integrate the grid-level land use conversion with fine-resolution carbon stock data to investigate the total volume and subnational pattern of GHG emission induced from agricultural trade, providing additional insights on trade policy assessment s and environmental risk mitigation.

References:

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