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Developing Countries' Policy Responses to Food Price Boom and Biofuel Policies

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Economists have been unanimous that developing countries' policy response in restricting exports and promoting imports increased both world price levels and volatility. Furthermore, the literature emphasizes the self-defeating aspects of policy responses, as more exporters restrict exports and importers encourage more imports, world prices increase even further, thereby raising domestic prices in the same countries imposing the policy responses to protect domestic consumers. Because of the crop-biofuel price linkages, we show that developing countries' policy responses had little impact on world prices in 2008 and a maximum impact in reducing domestic price in developing countries. There is little evidence of "standing up in the stadium" effects. Given that most studies on developing countries' policy response analyze the impacts on poverty in developing countries, this paper highlights the importance of our framework for that analysis.

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Introduction

The year 2008 saw large swings in grain and oilseed prices which have continued unabated to this day. This price instability has had large and differing effects on farmers, market participants and consumers. Moreover, significant price risk/uncertainty was introduced to the detriment of all market participants (Chavas et al., 2014). The causes of such high prices and volatility have generated much interest around the world. The "perfect storm" factors cited as causes for this price upheaval include low stocks, a speculative bubble, flooding and droughts, exchange rates, easy money and low interest rates, the "financialization" of grain/oilseed markets, developing countries' policy responses, the searing income growth in highly populated Asia, biofuels, sharp increases in crop input costs due to high crude oil prices, bans on genetically modified crops, global warming and declining public research and development (Trostle 2008, 2011).

Economists disagree, however, on the most important factors of the price swings. Wright (2011, 2014) and de Gorter et al. (2013a), for example, put a high weight on biofuels policies while others discount them (e.g., Baffes and Haniotis, 2010). Some put more weight on supply/demand shifts (e.g., Abbott et al. 2008, 2009) and macroeconomic factors (e.g., Frankel and Rose, 2009). Some emphasize speculation (e.g., Timmer 2010) while others argue there is no evidence that speculation had any effect (e.g., Irwin and Sanders, 2010).

However, none of the economists has ever questioned the adverse impacts of developing countries' policy responses on world market prices and price volatility.[1] All studies on the causes of the 2007/08 food commodity price spikes are in agreement that developing countries' policy responses were a significant contributor to higher prices and price volatility.

Many empirical studies have allegedly confirmed the self-defeating effects of developing countries' policy responses in addition to their adverse effects on world markets. The most cited evidence is given by Anderson et al. (2014a): the price of rice, soybeans, wheat and corn rose 52, 31, 18 and 18 percent, respectively, and due solely to developing countries restricting exports or promoting imports.[2]

In contrast to the previous literature, in this paper we show that developing countries' policy responses had little impact on world prices in 2008—the year for which most empirical studies analyze policy responses. The sudden increase in grain and oilseed prices may have caused policy responses but not *vice versa*. The approach we take to come to this conclusion is the theory of biofuel policy as developed by de Gorter and Just (2008, 2009), Drabik (2011), Cui et al. (2011), Hochman et al. (2011), Mallory et al. (2012), Rajagopal et al. (2011), Lapan and Moschini (2012) and Babcock (2013), among others. This approach recognizes the key price links between corn and ethanol (and between soybean oil and biodiesel) with high crop-biofuel multipliers. We explain that because corn and soybean prices were locked onto crude oil prices

[1] We will show later that there are a couple of papers that argue these developing countries' policy responses may not have been detrimental for these countries (e.g., Timmer and Dawe (2012) and Galtier (2013), as we will conclude also, but for different reasons. Furthermore, Timmer and Dawe (2012) do not deny significant impacts on world markets which we argue were minimal occur in 2008.

[2] This study is a culmination of a series of papers written by Martin and Anderson over the years on the importance of developing countries' policy responses in the 2008 price boom. Other empirical studies of developing countries' responses include Bouet and Laborde (2010), Giordani et al. (2012) and Rutten et al. (2013).

all the way up and all the way down the peak in 2008, the entire price increase for the coarse grain and oilseed price would have occurred regardless of any of the "perfect storm" factors. Furthermore, the literature shows that all crop prices follow each other because of competition for land and substitution in demand. This paper highlights the importance of the framework of the theory of biofuel policies for policy analysis given this new biofuel era.

The remainder of the paper is organized as follows. In the next section, we provide background on the literature of biofuel policy effects. Section 3 provides an autopsy of the 2007/08 price boom while Section 4 develops the theory of the "standing up in the stadium" effect and an alternative theory based on biofuel policy effects. Section 5 provides the empirical analysis of the impact of biofuel policies in the face of developing countries' policy responses in 2008. The final section provides some concluding remarks.

2. Background

Because a significant share of crop production in the United States and in the rest of the world has been used for biofuel production, crop and biofuel prices are now locked onto each other indefinitely. This is a phenomenon of this new biofuel era. Although the link between prices of biofuels and their feedstocks has been very tight (e.g., Mallory et al. 2012), the strength of the link between biofuel and crude oil (or gasoline/diesel) prices depends on which biofuel policy determines the biofuel market price (de Gorter and Just (2009), Cui et al. (2011) and Drabik (2011)). Globally, two policies have been used to promote the use of biofuels: biofuel mandates[3] and excise tax exemptions (or tax credits in the United States). The literature analyzing the theory of biofuel policies (in the papers mentioned in the second to last paragraph of the introduction of this paper) has shown that biofuel and energy (i.e., gasoline/diesel) prices are locked onto each other when the tax credit is binding; if the mandate determines the biofuel market price (above what it would be under the tax credit), then biofuel prices are delinked from energy prices; one could also say that biofuel prices "float up and away" from energy prices.

Given the different price links under different biofuel policies, we identify two states of nature (we use corn and ethanol as an example of a crop-biofuel pair). First, corn and ethanol prices are *lowest* when ethanol prices are *locked* onto gasoline prices which are locked onto crude oil prices. Second, when the mandate determines the ethanol price ethanol, and hence corn prices, float up and away from energy prices. *Lowest* when *locked* represents a new counterfactual and is different than supposing no biofuels as the alternative.

These two states of nature are important because if corn prices are locked onto crude oil prices through the tax credit (if any), then supply/demand shocks in corn markets have no impact on corn prices (except for the effect of the *change* in ethanol production on world crude oil prices, which will be modest at best). Only when biofuel prices float up and away from energy prices can crop supply/demand shocks affect corn prices.

[3] We define a "mandate" as being a situation where consumers have no choice to choose ethanol on the basis of miles traveled. This "no choice" and hence ethanol price premium above that generated by the tax credit alone can be a result of several situations, including the formal mandate itself; *de facto* mandates in the form of environmental regulations); when consumers are unable to choose between ethanol and gasoline at the gasoline pump on a miles obtained basis because of a lack of flex cars and E-85 stations, so ethanol may be sold at a premium; or when prices are determined in world markets where biofuel policies in the rest of the world are determining the ethanol price premium (perhaps with the help of tax credits on exports as was the case in the United States up to 2012).

Another important aspect of crop prices is their strong co-movement (e.g., Roberts and Schlenker 2009). All prices adjust quickly to one another because of competition for land on the supply side and substitution in demand. We call this the *law of one relative international price* for grains and oilseeds. To illustrate this notice how prices for yellow corn fed to livestock went up 88 percent in six months in 2006/07 yet white corn for tortillas in Mexico went up 107 percent; this means farmers can substitute any grain and oilseed in a very short time period for feed to livestock or for food. The share of wheat fed to livestock went up over 20 percent in the time of the food price crisis (not only more than double the wheat production shortfall due to bad weather in 2007/08 that so many economists argue precipitated the price boom, but also recurring, unlike the bad weather).[4] This shows how demand substitution forces cereal prices to follow each other. Another incentive for this to happen is the fact that about two billion people in the world spend at least 50 percent of their incomes on food, and so when wheat prices skyrocketed in 2008, consumers had a huge incentive to (quickly) switch to other commodities, bringing their prices up (and stemming the increase in wheat prices).

3. The 2007/08 price boom: an autopsy

Biofuel policies and corn markets started the ball rolling and spilled over into the wheat market (wheat could not and therefore did not spill over into the coarse grain/oilseed prices; the latter prices were locked onto crude oil prices—there was no choice; this is the nature of crop-biofuel price links in this new era), which, in turn, spilled over into the political decision making of Asian governments, causing policy responses and speculation, including hoarding by individual consumers; this allegedly caused rice prices to maintain its historical values with wheat and corn.[5]

Corn prices almost doubled in five months beginning in September 2006, precipitating the Mexican tortilla crises in January 2007 and India's ban of wheat exports the following month. This was the beginning of a long list of countries restricting exports (e.g., export bans, export taxes, value-added tax rebates and actions by state trading enterprises and government to government sales) and promoting imports (e.g., lowering import barriers and manipulating domestic prices to be below world prices).[6] Even peasants hoarded rice (Timmer, 2008) which can have the same effects as a developing country's policy response. Developing countries are presumed to be responding to a world market price shock, which we argue was due to biofuel policies while most others argue it was a perfect storm of factors. The source of the shock concerns us here only to the extent that we understand that crop-biofuel price links, and given the biofuel-energy price links, are affected by crude oil prices. It is fundamental to the economics of developing country policy responses.[7]

[4] Economists who emphasize quantity to explain the price boom (unlike price links in this book) should at least emphasize the correct quantities like feed wheat demand increasing because of high corn prices due to ethanol policies rather than a one-off episode of bad weather.

[5] Our central thesis is that if Asian governments, state trading enterprises and peasants did not make rice prices keep their relative value to other grains, then other market participants would have. Hence, there has been overemphasis on the impacts of government policy responses and state trader behavior in impacting rice prices (de Gorter et al. 2013b).

[6] For a detailed summary and analysis of all of the types of developing countries' policy responses, see Sharma (2011), Jones and Kwiecinski (2010), Konandreas (2012) and Anania (2013).

[7] In the next section, we analyze an exogenous shift in both excess supply and demand for cereals.

The overwhelming consensus in the policy debate is that these policy responses by developing countries had a significant impact on not only increasing world prices in 2007/08 and thereafter but also on increasing world price volatility. Furthermore, the literature emphasizes the self-defeating effects of developing countries' policy responses. That is, as more exporters restrict exports and importers encourage more imports, world prices increase even further, thereby raising domestic prices in the same countries imposing the policy responses to protect domestic consumers. Of course, these policy responses hurt poor consumers in countries that do not have policies to insulate their domestic prices from world price increases.

All empirical studies that analyze the impact of policy responses of developing countries are for the year 2008. It should also be pointed out that most of these studies analyze the impacts on poverty in developing countries. We will show that developing countries' policy responses had little impact on world prices and maximum impact in reducing domestic price in developing countries. Hence, the literature's conclusions on poverty are reversed.

4. The economics of the "standing up in the stadium" effect

Let us first present a simplistic model to explain the logic of the self-defeating effects of developing countries' policy responses. These responses are essentially measures to insulate domestic market prices from world prices while at the same time exacerbating world price increases and volatility. Anderson et al. (2014a) argue that if many countries insulate by imposing export restrictions or adopting policies that encourage imports, the net effect is to increase world prices; this effect may be zero insulation from the initial exogenous shock. This argument is best summarized by Anderson et al. (2014b):

> *"Indeed, we have shown that if the same proportion of the world's exporting and importing country groups happened to insulate to the same extent, domestic prices in both country groups would rise just as much as if no country had insulated. This is akin to a crowd of people of equal height in a stadium trying to see better by standing up.*

Hence, both the world price increasing effect of developing countries' policy responses to an exogenous world price shock and the self-defeating aspect of developing countries trying to insulate their domestic prices from higher world prices are summarized in the term "standing up in the stadium effect".[8] We now explain this phenomena using traditional supply and demand analysis, ignoring for a moment the theory of biofuel policy.

Consider an exogenous shift left in the world's excess supply of grains and oilseeds due to biofuels policies in rich countries diverting grains and oilseeds to biofuels. This is depicted in Figure 1 as a shift in the excess supply curve ES to ES′, causing world prices to increase from P_{W0} to P_{W1}. Because of import tariffs, the domestic price in a developing country that is an importer increases from P_{M0} to P_{M1} due to the shock in excess supply (a move from point *a* to point *b* in Figure 1).

Now consider an export tax, t_X, by developing countries. The world price increases to P_{W2}, the domestic price in developing countries that impose the export tax declines to P_{X2} and the domestic price in developing countries that are importers with a tariff t_M rises to P_{M2} (point *c*). Finally, assume that importing countries eliminate their tariff, the final equilibrium world price is given by P_{W3} (equal to domestic prices in importing countries) and the domestic price in

[8] Rutten et al. (2013) have "Sit down at the Ball Game" in the title of their paper describing the same phenomena.

exporting countries is given by P_{X3}. In this example, domestic prices in exporting countries that try to insulate from world price shocks are lower than the post-shock price of P_{X1} but this needs not be; it depends on the relative shifts in excess supply and demand due to policy responses and the relative elasticities of excess supply and demand. But the weighted average domestic prices are likely to be higher than P_{W1} so it has been self-defeating. And world prices are higher due to developing country policy response, moving from P_{W1} to P_{W3}.

5. The economics of biofuel policies and developing countries' policy responses in 2008

But how could such policy responses to higher world prices have any further impact on the world prices of soybeans and corn when these prices were locked onto the crude oil prices all the way up and all the way down in the 2008 price spike? (see Figure 2). Coarse grains and oilseeds represent 62 percent of all cropland (USDA WASDE). And if wheat is easily substituted for corn as feed, why would we not expect wheat price to keep pace as corn prices rise? Rausser and de Gorter (2012) show that white corn (used to produce tortillas consumed in Mexico) rose 107 percent in the five months after October 2006—US farmers began to use white corn for feed as it is not used in ethanol production. And if wheat prices triple as they did in 2007/08, why would we not expect rice prices to go up due to similar substitutions? More wheat is consumed in Indonesia than rice and Asians are quite capable of switching. This is especially the case when a couple billion people spend close to 50 percent or more of their income for basic foodstuffs.

Therefore, let us characterize a world grain and oilseed market in 2008 as one that is locked onto crude oil prices (through the appropriate price links discussed for corn (applicable to wheat as well)). What would one expect the impact of developing countries' policy response to be? Consider the world price of a crop to be locked on the crude oil price through the tax credit. The impact of an export restriction in response to an exogenous increase in the world price is given in panel (a) of Figure 3. The excess supply curve for the exporting country is given by ES. The exporting country faces a flat excess demand curve ED (which represents the world price). The exporter could be a 'large' country exporter in the traditional sense but here faces a perfectly elastic excess demand curve (because we assume the *change* in biofuel production due to developing country's policy response does not impact crude oil prices).

We depict the export tax equivalent of the export restriction by t_X which is shown to exactly offset the exogenous increase in price (this is not necessary; obviously some countries have partially offset the world price increases; other may have overcompensated). Because we have selected a restriction that exactly offsets the exogenous price increase in Figure 3a, exports and therefore domestic producer and consumer prices remain unchanged from the levels observed before the world price spike. The incidence of the policy is a 100 percent reduction in the domestic market price spike compared to what it would have been without the policy.

The exact same story can be given for an importer that reduces import barriers. The excess demand curve ED is given in panel b of Figure 3, where the (perhaps 'large country') importer faces a perfectly elastic excess supply curve that represents the fixed price of the grain or oilseed (because it is locked onto the world crude oil price). Again, we arbitrarily show a full offset of the exogenous increase in the crop price by promoting imports by the import tariff equivalent t_M and the incidence is once again 100 percent in reducing the domestic price spike compared to if no actions were taken.

The results of our characterization of the market are in sharp contrast to those of the literature

(e.g., Anderson et al., 2014a) who argue government policy responses not only exacerbate the international price spike but also are self-defeating in terms of insulating themselves from the original world price shock (as per our discussion of Figure 1).

Yet our (albeit simple) characterization of the market and impacts of policy response in Figure 3 gives a very different picture. There is little "standing in the stadium" effect. Figure 3 by construction has developing country responses of the eliminated import tariff (by importers) and export tax (by exporters) maintain domestic prices at pre-shock levels in each case. There is no effect on world prices because corn (and hence all grain/oilseed) prices are locked onto crude oil prices. (The impact of the change in biofuel production on crude oil prices is ignored to keep the analysis simple). Therefore, consumers are fully protected from price increases. Producers are unable to benefit from price increases.

Taking the case of corn, the economic impact of developing countries' policy response is to shift out the non-ethanol demand curve for corn and so reduce the amount of corn going into ethanol. Less domestic supply, more domestic demand due to developing country policy responses means less grains and oilseeds diverted to biofuels in the rest of the world. The reduced domestic supply and increased domestic consumption of grains and oilseeds in developing countries imposing export restrictions and import enhancements reduce the supply to the rest of the world but crop prices are locked onto crude oil prices and so are unaffected. Biofuels consumption declines. In theory, all of the increased consumption and reduced production in developing countries due to policy responses is crop that otherwise would have gone to biofuel consumption but now is eaten by consumers, including poor consumers.

This is what would happen, unless the mandate is binding. If the mandate is binding, the reduction in grain and oilseed available for biofuels drives the world price up even further as blenders scramble to meet a less and less attainable mandate. But that is not the avenue by which Anderson et al. (2014a) argue developing country policy responses operate. And the mandate was not binding in 2008, the year for which all studies on the economic impact of developing country policy responses are on.

Figure 4 gives the consumption weighted average price of cereals in developing countries for 2008. The weighted average domestic price in developing countries did go up in 2008 but that can be explained by various factors consistent with our hypothesis. It seems like the policy reactions were effective in containing the increase in the domestic price. Our model can explain this lack of price response. Some countries may have overreacted (in other words, t_X or t_M were greater than depicted in Figure 3) or underreacted. Overall, according to our theory, given the empirical evidence for 2008 in Figure 4, countries slightly underreacted. Bartel (2013) shows India overreacted for wheat (domestic wheat prices declined in 2008) while in China, there was a slight increase. China left soybean prices to follow world markets. So an outcome in Figure 4 is entirely plausible with our thesis. For rice, Bangladesh, China and Indonesia, among others kept prices low through their policy measures. For wheat China, India, Turkey, Pakistan and Japan were among the countries which were able to keep domestic price below the no country intervention level with their policy reactions.

Table 1 uses the average monthly data for 2008 from Figure 4, with the baseline world price taken from the trend before the price boom. Therefore, the first four rows of Table 1 summarize the baseline data that is the same for both models. Weighting the Anderson et al. (2014a)

estimates of the price changes in each crop by consumption of calories, we estimate the price increase due to developing country policy response implied by Anderson et al. (2014a) to be 28.75 percent. From this, we calculate the implied world price after the shock but with no developing country policy response (in our analysis, we assume the world price does not change with the policy response). We can then calculate the alleged standing up effect of 0.178 to the actual outcome which is -0.259. In fact, the final row gives the share of the price increase due to the initial shock that was closed by the policy responses. The data does not support the standing up effect when we combine the information in Anderson et al. (2014a) with that in Figure 4 derived by Ivanic and Martin (2014b). The difference between our simple models in generating 79 percent effectiveness with that of theirs (62 percent) is not that large and is acknowledged in Ivanic and Martin (2014b) who recognize the price shock was significantly dampened by developing country policy response.

The evidence appears to be in favor of our hypothesis that the incidence was closer to 100 percent in the domestic market than a "standing up in the stadium" effect. We maintain that for 2007/08, the world prices for 62 percent of the cropland could not have been affected at all by these developing countries' policies. The only remaining question is how strong the law of one relative price of wheat vis-à-vis coarse grains and oilseeds or rice must have been?

Jones and Kwiecinski, (2010) provide evidence that China, India, and Ukraine reduced wheat exports significantly as did China and Ukraine for corn, and China and India for rice. Dawe and Timmer (2012, p. 129) underline how:

> *"during the world rice crisis of 2008, three countries (China, India and Indonesia, the three most populous developing countries in the world) successfully insulated their domestic rice economies from the turmoil on world markets. … this was one reason why the crisis pushed fewer people into poverty and undernourishment than was initially feared."*

This is a conclusion entirely in line with the theory of biofuel policy for the year 2008. Anderson et al. (2014a) skirt around the possibility that biofuel policies may have impacted the outcome by assuming biofuels had little impact. The word "biofuels" appears in an earlier paper of theirs (if only briefly):

> *Other sources of volatility that have been emphasized include government programs such as biofuel mandates, which link the price of grains to those of volatile fuel prices; however the evidence regarding the impact of such mandates on global price volatility remain inconclusive (Zhang et al., 2010).* Ivanic and Martin (2013, p. 273)

So Anderson et al. (2014a) and their other studies absolve themselves of any responsibility for recognizing the role of biofuel policies and thereby require no adjustment to their traditional form of analysis by relying on the oft cited econometrics analysis in Zhang et al. (2010), which like many in this genre, do not find a link between crop and biofuel prices and therefore (erroneously) conclude biofuel policy is not of relevance.[9] Hence, they do not consider the possibility that crop prices are related to energy prices when there are no mandate premiums, as

[9] The analysis by de Gorter and Just (2009), Cui et al. (2011) and Drabik (2011) show that if the mandate is binding, an increase in crude oil prices should have a weak negative relationship with corn prices, *ceteris paribus*. This does not imply biofuel policies do not have an effect; quite the contrary, as these aforementioned papers show, that is when they have maximal effect!

was the case in 2008. Hence, the literature on developing country policy responses were influenced by a literature that fails to determine the effects of biofuel policies correctly.

6. Concluding remarks

In contrast to the previous literature, in this paper we show that developing countries' policy responses had little impact on world prices in 2008. This indicates that the profession may have made an error in regards to the issue of the effects of developing countries' policy responses. This is significant because many studies on developing country policy response analyze the implications on poverty. The implications maybe be altered significantly in that respect; Dawe and Timmer (2012) (see quote above) and analysis by Galtier (2013) and others may be more correct than most of the literature that concludes otherwise.

Using our theory of biofuel policies in analyzing the economics of developing country policy responses exemplifies the implications if one continues with traditional supply/demand analysis and ignores this theory. The policy implications of the theory we develop in this paper may have diametrically opposite conclusions. The example of the market impacts of developing countries' policy response highlights the potential importance of the framework of analysis presented in this paper.

References

Abbott, Philip C., Christopher Hurt, and Wallace E. Tyner. "What's Driving Food Prices?" Farm Foundation Issue Report. Farm Foundation, Oak Brook, IL, 2008.

Abbott, Philip C., Christopher Hurt, and Wallace E. Tyner. "What's Driving Food Prices? March 2009 Update." Issue Report, Farm Foundation, Oak Brook, IL, 2009.

Anania, Giovanni. "Agricultural Export Restrictions and the WTO: What Options do Policy-Makers Have for Promoting Food Security?" ICTSD Programme on Agricultural Trade and Sustainable Development Issue Paper no. 50, November 2013.

Anderson, Kym, Maros Ivanic, and Will Martin. "Food Price Spikes, Price Insulation, and Poverty." In *The Economics of Food Price Volatility*, edited by Jean-Paul Chavas, David Hummels, and Brian D. Wright, Chapter 8 (pages 311-344). University Chicago Press (2014a)

Anderson, Kym, Maros Ivanic, and Will Martin. "Trade Insulation for Food Does not Decrease Global Poverty." East Asia Forum, March 13, 2014b. http://www.eastasiaforum.org/2014/03/13/trade-insulation-for-food-does-not-decrease-global-poverty/

Babcock, Bruce A. "Ethanol without Subsidies: An Oxymoron or the New Reality?" *American Journal of Agricultural Economics* 95, no. 5 (2013): 1317—1324.

Baffes, John, and Xiaoli L. Etienne. "Analyzing Food Price Trends in the Context of Engel's Law and the Prebisch-Singer Hypothesis." Paper presented at the International Conference on Food Price Volatility: Causes and Consequences, Rabat, Morocco, February , 2014.

Baffes John, and Tassos Haniotis. "Placing the 2006/08 Commodity Price Boom into Perspective." Policy Research Working Paper 5371, The World Bank, Washington, DC, 2010.

Baltzer, Kenneth. "International to domestic price transmission in fourteen developing countries during the 2007-08 food crisis." WIDER Working Paper No. 2013/031, March 2013.

Bouet, Antoine, and David Laborde. "Economics of Export Taxation in the Context of Food Crisis: A Theoretical and CGE Approach Contribution." International Food Policy Research Institute, Discussion Paper no. 00994, 2010.

Chavas, Jean-Paul, David Hummels, and Brian D. Wright, eds. *The Economics of Food Price Volatility*. University Chicago Press (2014).

Cui, Jingbo, Harvey Lapan, GianCarlo Moschini, and Joseph Cooper. "Welfare Impacts of Alternative Biofuel and Energy Policies." *American Journal of Agricultural Economics* 93, no. 5 (2011): 1235—1256.

de Gorter, Harry, and David R. Just. (2008). "'Water' in the U.S. Ethanol Tax Credit and Mandate: Implications for Rectangular Deadweight Costs and the Corn-Oil Price Relationship." *Review of Agricultural Economics*. Volume 30, Number 3, Fall: 397-410.

de Gorter, Harry, and David R. Just. "The Economics of a Blend Mandate for Biofuels." *American Journal of Agricultural Economics* 91, no. 3 (2009): 738—750.

de Gorter, Harry, Dusan Drabik and David R. Just. "Biofuel Policies and Food Grain Commodity Prices 2006-2012: All Boom and No Bust?" *AgBioForum.* 16(1) (2013a): 1-13.

de Gorter, Harry, Dusan Drabik, and David R. Just. "How Biofuels Policies Affect the Level of Grains and Oilseed Prices: Theory, Models and Evidence." *Global Food Security* 2, no. 2 (2013b): 82—88.

Drabik, Dusan. "The Theory of Biofuel Policy and Food Grain Prices." Dyson School of Applied Economics and Management Working paper # 2011-20, Cornell University, December 2011.

Frankel, Jeffrey, and Andrew K. Rose. "Determinants of Agricultural and Mineral Commodity Prices." In *Inflation in an Era of Relative Price Shocks*, edited by Renée Fry, Callum Jones, and Christopher Kent, Sydney: Reserve Bank of Australia, 2009.

Galtier, Franck. "Managing Food Price Instability: Critical Assessment of the Dominant Doctrine." *Global Food Security* 2, no. 2 (2013): 72—81.

Giordani, Paolo E., Nadia Rocha, and Michele Ruta. "Food Prices and the Multiplier Effect of Export Policy." WTO Working Paper ERSD-2012-08, April 2012. http://www.wto.org/english/res_e/reser_e/ersd201208_e.pdf

Hochman, Gal, Deepak Rajagopal, Govinda Timilsina, and David Zilberman. "The Role of Inventory Adjustments in Quantifying Factors Causing Food Price Inflation." Policy Research Working Paper 5744, Development Research Group, Environment and Energy Team, Washington, DC: World Bank, August 2011.

Irwin, Scott H., and Dwight R. Sanders. "Index Funds, Financialization, and Commodity Futures Markets." *Applied Economic Perspectives and Policy* 33, no. 1 (2011): 1—31.

Ivanic, Maros, and Will Martin. "Implications of Domestic Price Insulation for Global Food Price Behavior." *Journal of International Money and Finance* 42, (2014a): 272—288.

Ivanic, Maros, and Will Martin. "World Food Price Rises and the Poor 2006–12: A Slow Food Price Crisis?" Unpublished World Bank Working Paper, June 9, (2014b).

Jones, Darryl, and Andrzej Kwiecinski. "Policy Responses in Emerging Economies to International Agricultural Commodity Price Surges." OECD Food, Agriculture and Fisheries Papers no. 34, 2010. http://dx.doi.org/10.1787/5km6c61fv40w-en

Konandreas, Panos. "Trade Policy Responses to Food Price Volatility in Poor Net Food-Importing Countries." ICTSD Programme on Agricultural Trade and Sustainable Development Issue Paper no. 42, June 2012.

Lapan, Harvey, GianCarlo Moschini. "Second-best Biofuel Policies and the Welfare Effects of Quantity Mandates and Subsidies." *Journal of Environmental Economics and Management* 63, no. 2 (2012): 224—241.

Mallory, Mindy L., Scott H. Irwin, Dermot J. Hayes. "How Market Efficiency and the Theory of Storage Link Corn and Ethanol Markets." *Energy Economics* 34, no. 6 (2012): 2157—2166.

Rajagopal, Deepak, Gal Hochman, and David Zilberman. "Indirect Fuel Use Change (IFUC) and the Life Cycle Environmental Impact of Biofuel Policies." *Energy Policy* 39, no. 1 (2011): 228—233.

Rausser, Gordon C, and Harry de Gorter. "US Policy Contributions to Food Grain Commodity Prices." Presentation at UNU-Wider Workshop on The Political Economy of Food Price Policy, Cornell University, Ithaca NY, July 9-12, 2012. http://www.wider.unu.edu/publications/working-papers/2013/en_GB/wp2013-033/

Roberts, Michael J., and Wolfram Schlenker. "World Supply and Demand of Food Commodity Calories." *American Journal of Agricultural Economics* 91, no. 5 (2009): 1235—1242.

Rutten, Martine, Lindsay Shutes, and Gerdien Meijerink. "Sit down at the Ball Game: How Trade Barriers Make the World Less Food Secure." *Food Policy* 38, no. 1 (2013): 1—10.

Sharma, Ramesh. "Food Export Restrictions: Review of the 2007-2010 Experience and Considerations for Disciplining Restrictive Measures." FAO Commodity and Trade Policy Research Working Paper no. 32, FAO, Rome, 2011. http://www.ictsd.org/downloads/2011/05/sharma-export-restrictions.pdf

Timmer, Peter C. "Causes of High Food Price." ADB Economics Working Paper no. 128, Asian Development Bank, Manila, October, 2008.

Timmer, Peter C. "Reflections on Food Crises Past." *Food Policy* 35, no. 1 (2010): 1—11.

Timmer, Peter C., and David Dawe. "Food Crises Past, Present (and Future?): Will We Ever Learn?" In *The Rice Crisis: Markets, Polices and Food Security*, edited by David Dawe, 3-14. London and Washington, D.C.: Food and Agriculture Organization and Earthscan Publishing, 2010.

Trostle, Ronald. "Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices." WRS-0801, Economic Research Service, U.S. Department of Agriculture, May 2008.

Trostle, Ronald, Daniel Marti, Stacey Rosen, and Paul Westcott. "Why Have Food Commodity Prices Risen Again?" WRS-1103, USDA, Economic Research Service, June 2011.

Wright, Brian D. "The Economics of Grain Price Volatility." *Applied Economic Perspectives and Policy* 33, no. 1 (2011): 32—58.

Wright, Brian D. "Global Biofuels: Key to the Puzzle of Grain Market Behavior." *Journal of Economic Perspectives* 28, no. 1 (2014): 73—98

Zhang Zibin, Luanne, Lohr, Cesar Escalante, and Michael Wetzstein. "Food versus Fuel: What Do Prices Tell Us?" *Energy Policy* 38, no. 1 (2010): 445—451.

Table 1: Standing up in the stadium effect of developing country policy responses (average 2008)

	Anderson et al. (2014)	Model depicted in Figure 3
Final world price (pt *a* in Figure 4)	1.859	1.859
Initial world price (pt *c* in Figure 4)	1.24	1.24
Change in world price (pt *a* minus pt *c* in Figure 4)	0.619	0.619
Domestic price developing countries (pt *b* in Figure 4)	1.422	1.422
World price after shock*	1.681*	1.859**
Standing up effect		
Alleged	0.178	0
Actual	-0.259	0
Percent of price increase due to shock closed because of policy responses	59	71

Source: calculated
* Price increase due to developing country policy response of 28.75 percent using consumption shares for wheat, corn, rice and soybeans with price increasing effects of 51, 18, 18 and 31 percent, respectively (Anderson et al., 2014a).
** Assumes no impact on world prices of developing country policy response as per Figure 3.

Figure 1: Developing country policy response and the "standing up in the stadium" effect

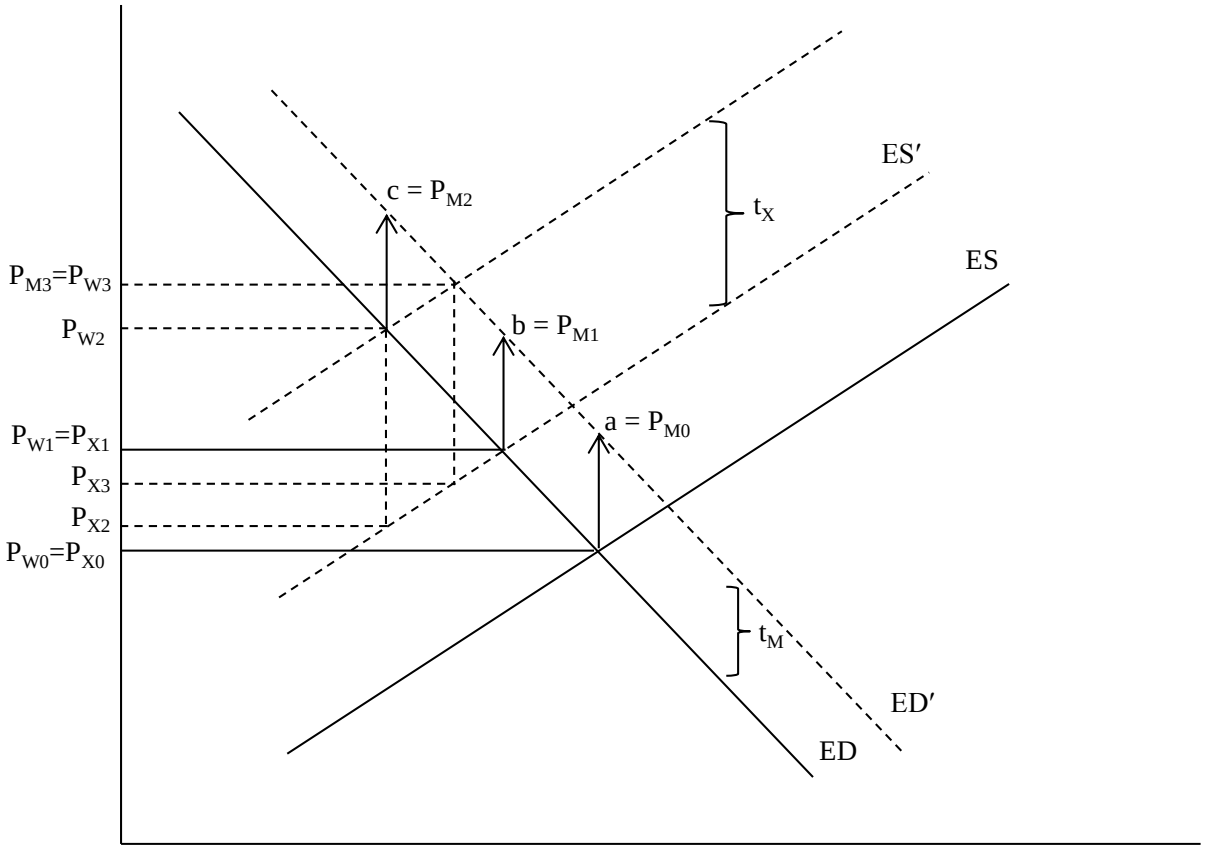


Figure 2: Near futures prices for corn, soybeans and crude oil

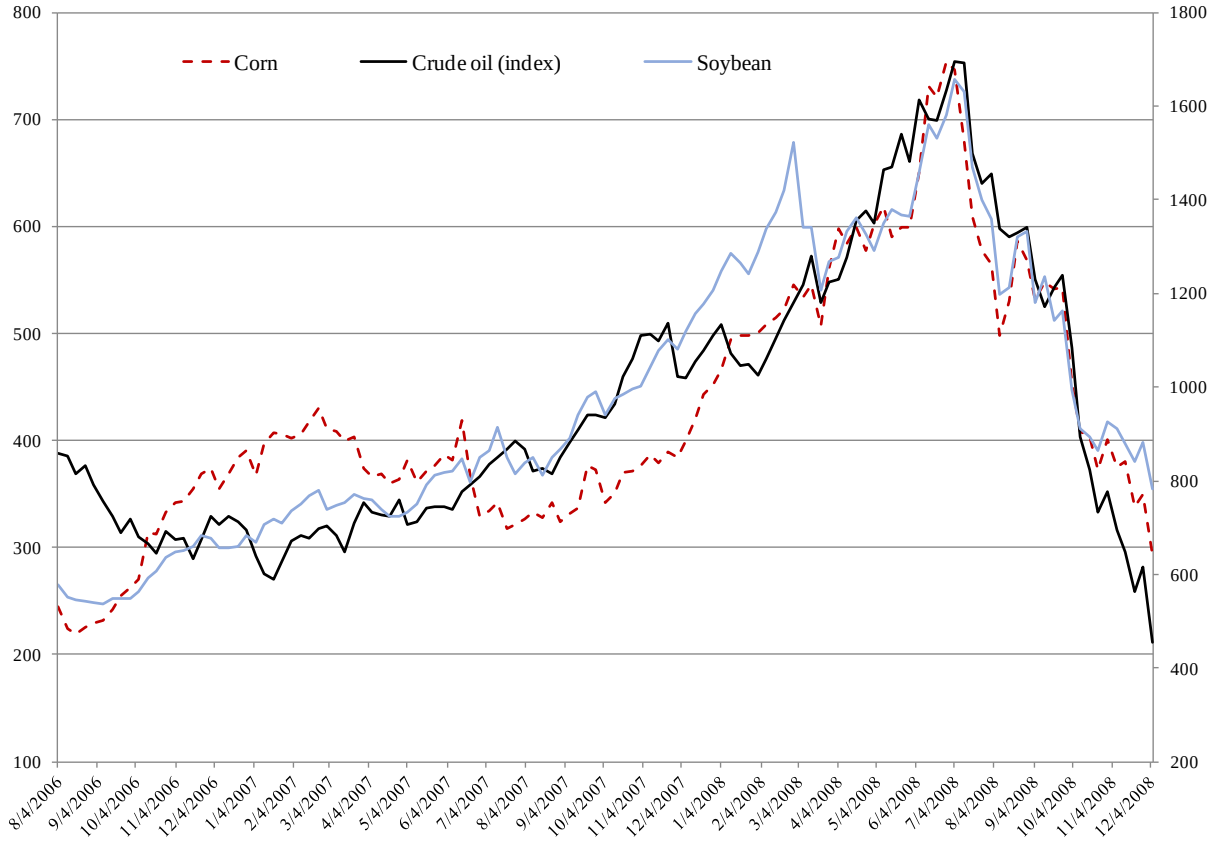


Figure 3: Effects of a Developing Country's Policy Response in 2008 assuming biofuel price links

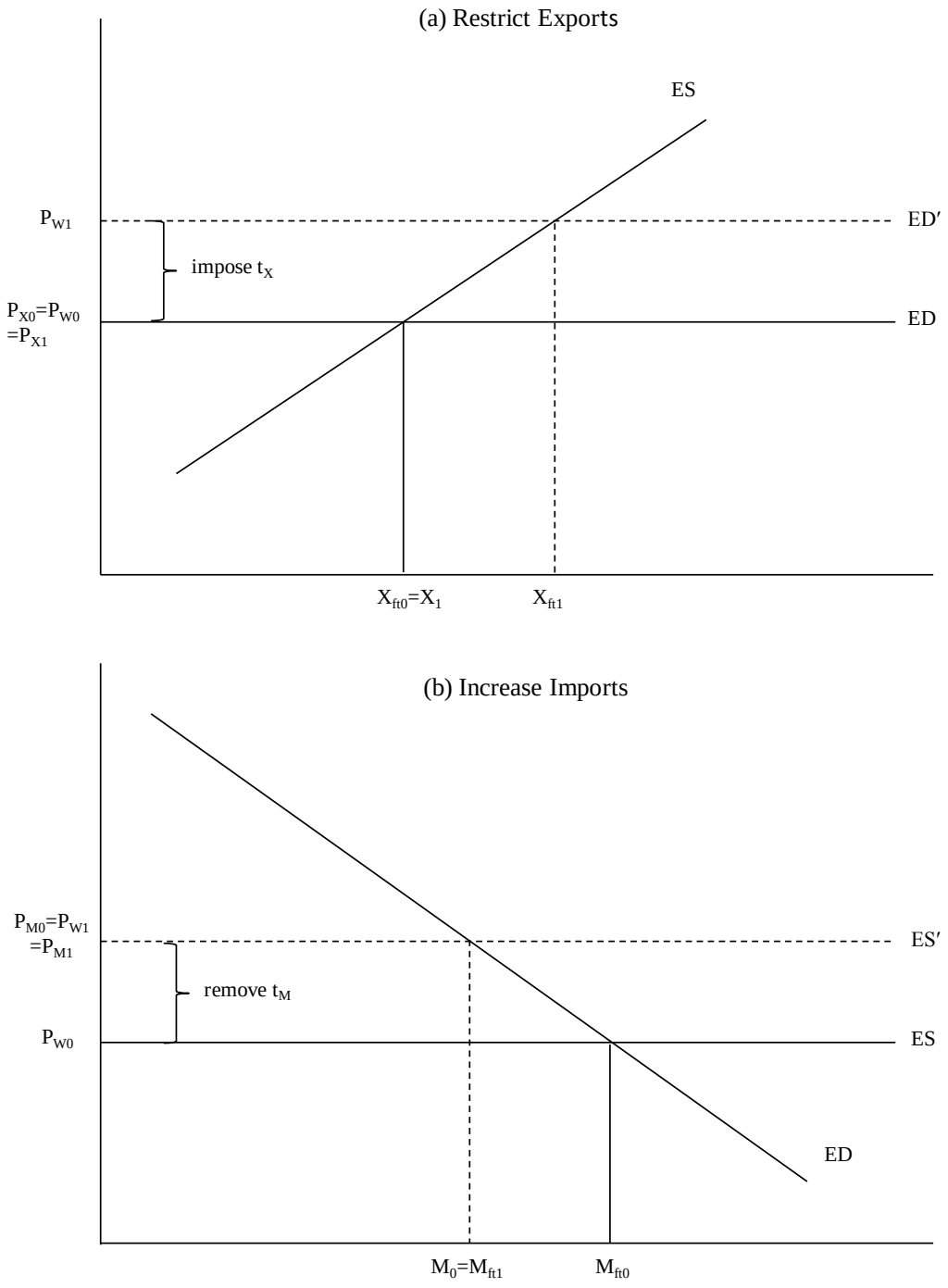
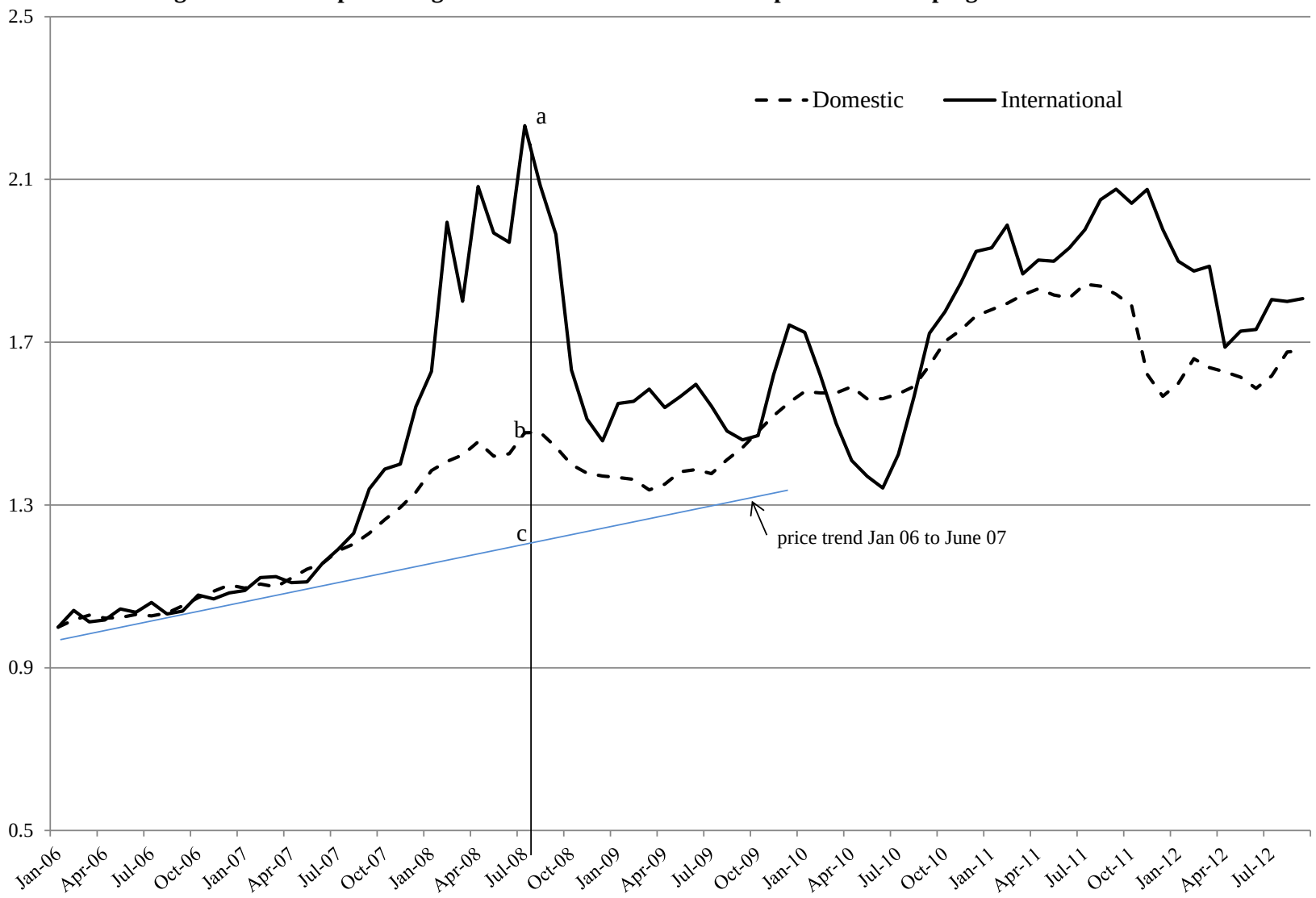


Figure 4: Consumption weighted domestic and international prices in developing countries*



* Price index of rice, wheat, maize and sugar.