WHY GOVERNMENTS TAX OR SUBSIDIZE TRADE: EVIDENCE FROM AGRICULTURE

KISHORE GAWANDE

BUSH SCHOOL OF GOVERNMENT, TEXAS A&M UNIVERSITY

kgawande@tamu.edu

BERNARD HOEKMAN

WORLD BANK AND CEPR

Bhoekman@worldbank.org

Agricultural Distortions Working Paper 85, May 2009

This is a product of a research project on Distortions to Agricultural Incentives, under the leadership of Kym Anderson of the World Bank's Development Research Group. The authors are grateful for helpful comments from participants at the World Bank conference on Political Economy of Distortions to Agricultural Incentives held in Washington, DC in May 2008, and for funding from World Bank Trust Funds provided by the governments of the Netherlands (BNPP) and the United Kingdom (DfID). This paper will appear in *Political Economy of Distortions to Agricultural Incentives,* edited by K. Anderson (forthcoming 2010).

Abstract

This paper empirically explores the political-economic determinants of why governments choose to tax or subsidize trade in agriculture. We use a new data set on nominal rates of assistance (NRA) across a number of commodities spanning the last five decades for 64 countries. NRAs measure the effect on domestic (relative to world) price of the quantitative and price-based instruments used to regulate agricultural markets. The data set admits consideration of both taxes and subsidies on exports and imports. We find that both economic and political variables play important roles in determining the within-variation in the NRA data. Based on our results we offer a number of data-driven exploratory hypotheses that can inform future theoretical and empirical research on why governments choose to tax or subsidize agricultural products – an important policy question that is also one of the least understood by scholars.

JEL classification numbers: D72, D78, F11, F13, H23, Q17

Keywords: Agricultural price distortions, political economy of trade policy

Contact author details:

Kishore Gawande
Bush School of Government and Public Service
Texas A&M University,
College Station, TX 77843-4220
Phone: +1 979 458 8034
kgawande@tamu.edu

WHY GOVERNMENTS TAX OR SUBSIDIZE TRADE: EVIDENCE FROM AGRICULTURE

Why governments choose the instruments they do to restrict or promote trade is not well understood by scholars in economics and political science (Rodrik 1995). That poor understanding helps explain why much of the theoretical and empirical work in international economics has failed to have much of an impact on policymakers, especially when it comes to agricultural trade policies. In practice, episodes of liberalization and reform are often made in the context of crises or under pressure from outside forces (e.g., trade negotiations) rather than from an internal consensus among policymakers about the efficiency gains from agricultural reform. There are significant differences across sectors, countries and time, but when it comes to agriculture government interventions across the world have been particularly widespread and persistent, with significant variance in the aim of policies and the types of instruments used.

This chapter is motivated by the question of what motivates governments to tax or subsidize imports and exports. This question, in turn, is important in understanding the constraints that governments perceive they face economically and politically, and in understanding the broader question of the choice of instruments to regulate trade.[1] Better understanding of this question should help in designing multilateral negotiations and agreements that will lead to real reform. A more informed view of the political economy forces that underpin status quo policies is critical in designing and implementing reform strategies. Top-down reform programs that fail to consider and understand the grassroots influences and constraints that make government behave the way they do will frequently be doomed to fail. The lack of progress in the Doha round of multilateral trade negotiation

[1] We are therefore able to explore associations between political, institutional and economic variables on the one hand, and the preferences of policy-makers on the other. De Gorter and Swinnen (2002) indicate the relevance of connecting institutions to agricultural policy outcomes. Olper and Raimondi (2010) is exemplary in this regard.

during 2001-2008 is an illustration of the consequences of underestimating the constraints governments face.

In this chapter seeks we explore the determinants of effective taxation and subsidization of agriculture in developing and developed economies. We use the new agricultural price distortions database compiled by Anderson and Valenzuela (2008) which provides nominal rates of assistance (NRA) across a number of commodities spanning the last five decades for 64 countries. The NRAs measure the effect on domestic (relative to world) prices of a wide range of quantitative and price-based instruments used to regulate agricultural trade. The predominant instruments used by governments to regulate agricultural trade are border measures, and the dataset expresses those in ad valorem-equivalent terms as export taxes, export subsidies, import tariffs and import subsidies (see Anderson et al. 2010, tables 8 and 9).

The focus of the present study is on the determinants of the binary choice of taxes versus subsidies for exported and imported products. We first pool the sample across the commodities distinguished in the dataset. The same results are then presented for each commodity. In addition, we present results for the applied rate of tax or subsidy. The determinants of the choice of type of trade policy (tax or subsidy) are thus differentiated from the determinants of the level of the trade tax/subsidy that is imposed.

Based on our findings, we develop a number of data-driven exploratory hypotheses concerning the economic and political/institutional determinants of the direction of policy towards agricultural trade. The findings go well beyond previous empirical studies, and hopefully will be a useful input into further theoretical and empirical modeling of the choice of instruments used by governments to regulate trade.

The chapter proceeds as follows. The next section briefly surveys some of the relevant literature in this area. Then we describe the distortions estimates, which are sweeping in the extent of countries, commodities, and time period covered. They constitute a major advance over what has been available to researchers to date regarding agricultural trade policies around the world. An exploratory econometric model is then estimated, and aggregate as well as by-product results are reported and analyzed. The puzzle of instrument choice in agriculture is somewhat, though not fully, resolved, and the results suggest a number of hypotheses worthy of further exploration.

Conceptual issues

Why do countries use the policies they do? This is the question with which we are concerned in this chapter. There is a huge, mostly theoretical, literature that analyzes the implications of the use of trade versus non-trade policies (e.g., the use of tariffs rather than more efficient production or consumption subsidy/tax instruments) to achieve specific objectives. Within the trade literature there are numerous papers analyzing the equivalence or non-equivalence of instruments used to restrict trade, in particular tariffs versus quotas, under a variety of assumptions, beginning with the seminal papers of Bhagwati and Ramaswami (1963) and Johnson (1965). Rodrik (1986, 1992) has conjectured that developing country governments choose trade policy instruments such as import tariffs over more efficient policies or combinations of policies because they must deal with a great number distortions as they prioritize their development agendas. A plan to industrialize can create a huge number of distortions that favor industry at the expense of other sectors such as agriculture. Labor market inflexibilities can present another set of distortions. Trade policies may be used because they are easier to implement and because it may be difficult, even impossible, to ascertain what the most efficient policies are in a world of many distortions. There are also administrative costs of implementing policies, and there is no guarantee that prevailing weak institutional structures will allow those policies to be executed as well as a single trade policy.

Our focus is limited to the direction of policy, that is, to the determinants of whether the set of policy instruments used by governments imply net taxation or subsidization of an importable or exportable agricultural commodity. We do not address the question of the choice of specific instrument to achieve the desired level of net support. This is not because we think this question is unimportant. Over 20 years ago Deardorff (1987) noted his dissatisfaction with the then-already considerable economics literature is this area, arguing that the economically elegant literature failed to provide much concrete insight into what actually determines how governments choose their policies. In Deardorff's view, nontariff barriers were probably used not on the grounds emphasized in the literature, namely efficiency or inefficiency (welfare), profit-shifting motives, or large-country optimal tariff considerations. Instead, he argued, the real reasons were more down to earth, and were driven in part by constraints imposed as a result of multilateral trade agreements (such as tariff bindings and related disciplines on the use of tariffs, and prohibitions on the use of export subsidies),[2] and by the overriding concern of governments with protecting employment.

A noteworthy feature of the WTO is that its member governments are much less constrained in using trade policies that affect agriculture than they are with respect to non-agricultural sectors. It is only since the late 1990s that there have been effective constraints imposed through the WTO on the use of agricultural import quotas. The use of tariffs on farm products remains to a large extent unconstrained, and disciplines on farm subsidies often do not have any bite because the permitted levels of subsidization exceed applied levels, especially in developing countries. Thus agriculture is "special" in that the types of constraints identified by Deardorff that increase the incentives to use non-tariff barriers rather than tariffs or subsidies apply to a much lesser extent than for non-farm goods. That is, in the case of agriculture the more general question of what determines the stance of governments (i.e., to tax or subsidize) is much less affected by international trade agreements.

From a policy perspective, a precondition for analyzing the specific choice of instrument is to understand the determinants of the direction (aim) of policy – whether and why a government seeks to tax or support agriculture in general, and within agriculture, tax or subsidize specific types of output or commodities. From a political economy perspective, an essential difference between agricultural policies of developed and developing countries is that in the former, policymakers respond much more to private incentives and lobbies in forming policies, while policymakers in the latter intervene in agricultural markets for a different set of reasons (Anderson, Hayami and Others 1986, de Gorter and Swinnen 2002). Objectives of developing country governments include raising revenue, the pursuit of industrialization, and satisfying the median voter's demand for cheap food. One result of differences in motivation and initial conditions at any given point in time (such as fiscal constraints) is that export subsidies are predominantly found in developed countries (to satisfy export lobbies). This is because export subsidies are too expensive for developing country governments to provide, and are also less "needed" because these countries do not confront

[2] Naoi's (2009) study of Japan's choice of trade instruments (VERs) focuses on the first of these considerations, namely the role of the GATT in curtailing flexibility in the use of other instruments.

the issue of excess production stimulated by protection that can only be sold on world markets with a subsidy. However, developing countries may use subsidies to lower the consumer prices of key food staples. Exports taxes are much more prevalent in poorer countries – agricultural export lobbies there often must swim against the tide. Import taxes satisfy both the protectionist motive of developed country governments in response to import-competing lobbies and the revenue needs of developing country governments. However, while the citizenry of developing countries may vigorously oppose higher import taxes on commonly consumed food products, the public in rich countries cares less because it spends a much smaller proportion of its income on food. Thus, protectionism in developing countries is probably politically easier to impose on goods that are consumed at the high end of the income distribution.

Average rates of protection for industries tend to decline across countries as the national capital-labor ratio increases. Industrialized countries with large capital stocks – both physical plant and equipment and human capital – relative to labor are more open to trade than countries with large stocks of labor relative to capital as in most developing countries (Rodrik 1995). However, rich countries tend to be much more protectionist towards agriculture, supporting domestic production and closing-off markets against import competition. In contrast, poor countries tend to promote imports, either explicitly through import subsidies, or implicitly by taxing domestic production.

Anderson (1995) argues that this can be explained as follows. In a poor country, food accounts for a large share of total household consumption, whereas in rich countries food accounts for only a small share of expenditure. Moreover, agriculture is the main source of employment in a poor country, while it typically accounts for less than five percent of the labor force in a rich one. In poor countries agriculture is also much less capital intensive than in rich ones. If agriculture is protected in a poor nation, the resulting increases in food prices have a large impact on the demand for labor (given the size of the agricultural sector) and thus on economy-wide wages (because labor is mobile). The wage rise will be offset to a greater or lesser extent by the rise in domestic food prices, food being so important in consumption. At the same time the wage increase puts upward pressure on the price of nontradables (services) and has a negative impact on industry by lowering profits. As the gains per farmer of protection are low, and the loss per industrialist is high, the latter will be induced to invest resources to oppose agricultural support policies. Supporting agricultural production in a poor country therefore may not make political sense. The converse applies to rich nations, where agricultural support has much less of an impact on wages (the sector being a relatively small employer), on the prices of nontradables, and on industrial profits. These stylized facts do much to explain the different policy stances that are observed as between rich industrial and poor agrarian countries.

Anderson (1995) builds a simulation model that incorporates these basic differences between poor and rich countries and finds that a 10 percent rise in the relative price of manufactures in a poor nation would reduce farm incomes by only 2 percent, while raising those of industrialists by 45 percent. In contrast, a 10 percent tax on industry in a rich country raises incomes of farmers by over 20 percent, while reducing those of industrialists by only 3 percent. These differences in costs and benefits for different groups in society – in conjunction with the differences in sizes of the various groups and hence in their costs of getting together to lobby collectively – help explain why farmers in rich countries are willing to invest substantial resources to obtain and maintain protection, and why industrialists and urban populations in developing countries are able to benefit at the expense of farmers.

Honma (1993) empirically investigates whether agricultural protection is determined according to the Anderson-Hayami (1986) framework of endogenous protection. Using panel data on 14 industrial countries for the period 1955-87, Honma finds that the nominal rate of protection declines the higher the ratio of labor productivity in agriculture to that in industry, rises as the share in agriculture increases to 4.5 percent and falls beyond thereafter, and increases as the terms of trade of agricultural relative to manufactured goods decline.

Data

The world's governments employ a multitude of price and quantity measures to regulate trade in agriculture. How these disparate instruments change relative prices is measured in great detail in the new agricultural distortions database compiled by Anderson and Valenzuela (2008), using the methodology described in Anderson et al. (2008). An achievement of the trade distortions database is to distill the use of multiple instruments into one ad valorem measure of distortions – the nominal rate of assistance (or NRA) for each covered commodity – for 75 countries annually since 1955. For the present study we confine ourselves to estimates for 64 countries over the years between 1960 and 2004.

The NRA provided by the government of a country to agricultural good *i*, or NRA_i, is the tax equivalent of border and domestic measures used by the government (e.g. trade taxes and subsidies, any quantitative trade restrictions, plus domestic taxes or subsidies for farm outputs and inputs). This measure is our dependent variable. NRAs are disaggregated into four different border measures plus domestic market support or taxation on farm inputs and outputs. The largest component is due to output price distortions, and their predominant cause is border interventions. The de facto evidence is therefore that governments mostly use trade regulatory instruments in agriculture.[3]

The commodity coverage of the NRA data accounts for around 70 percent of the value of output of agriculture and lightly processed foods in each focus country (Anderson and Valenzuela 2008). It includes the major food items (rice, wheat, maize or other grains, soybean or other temperate oilseeds, palm or other tropical oils, sugar, beef, sheep/goat meat, pork, chicken, eggs and milk) as well as cash crops such as tea, coffee or other tree crop products, tobacco, cotton and wool). The trade distortions database affords complete data on trade, production and the NRA measure for 75 high-, middle-, and low-income countries that collectively account for between 92 and 95 percent of global GDP, population and agricultural output and trade.

One noteworthy feature of the data is that the sizes of the NRAs, whether positive or negative, are generally high in both developed and developing countries. That is, leaving agricultural prices undistorted is the exception, not the rule. A second feature of the estimated NRAs is that many developing country governments have effectively taxed producers of farm goods over many years. Argentina, Brazil, Bulgaria, Estonia, Ethiopia, Kenya, Madagascar, Malaysia, Mozambique, Nicaragua, Sri Lanka, Sudan, Tanzania, Thailand, Zambia and

[3] This is consistent with the findings of Hoekman, Ng and Olarreaga (2004) and Anderson, Martin and Valenzuela (2006). Unlike manufacturing tariffs among GATT nations, which were negotiated multilaterally and maintained that way under GATT/WTO rules, agriculture remained excluded from the multilateral round agreements preceding the Uruguay round. Therefore, as noted above, agricultural policies have been largely unilaterally determined to date.

Zimbabwe have lowered their domestic prices of farm products relative to world prices on average over the 1961-2004 period. While most countries in this group tax their exports, a few African countries (Mozambique, Tanzania, Zambia, Zimbabwe) also subsidize staple food imports (see Appendix Tables A1 to A4).

Averaging over the entire period hides the fact that there are frequent sign changes in the NRAs over time for each product. One reason for this large variation may be quantitative import restrictions that remain fixed in quantity terms and so cause large changes in NRAs as world prices change. A case in point is the year 1986, the year of the lowest real international food prices on record, thanks to the US-EU farm export subsidy war. Countries insulating themselves from international price fluctuations registered big NRA increases that year, which took time to dissipate. Also, the NRAs in many developing countries show rising agricultural protection of import-competing industries. Even countries that began general trade and domestic economic reforms in the 1980s have their NRAs trending upwards (i.e., agricultural protection growth), around which the NRAs still fluctuate inversely with world prices. (Appendix Figure A1 shows for each country a bar for the range of NRAs over the sample time period over which 95 percent of the NRAs fall, a shaded area within which 50 percent of the NRAs fall, and a vertical line within that which is the median NRA for the sample.)

Import-competing and exportable products are identified by the classification of farm products supplied in Anderson and Valenzuela (2008). For goods with predominantly one-way trade, such a classification is more readily possible than for goods with substantial two-way trade. For the latter, if the share of production exported is substantially above (below) the share of consumption imported, the sector is classified as exportable (importable). Otherwise two-way traded goods are split into exportables and importables and their value of production is split according to those two shares in total trade. In the Anderson and Valenzuela sample, 40 percent of farm products are classified as exportables, 55 percent as importables, and 5% as nontradable. We exclude the nontradables from our sample, which then comprises 14,862 observations on importables (43 products pooled across countries and time) and 11,505 observations on exportables (58 products).

Dependent variable

A categorical NRA dependent variable is defined to equal 1 if the NRA is positive and -1 if the NRA is negative for some of the regressions, while for others the level of the NRA is used.

Independent variables

Table 1 presents descriptive statistics for all the variables used in the empirical analysis. The NRA database has imports, exports and output data, which we use to construct imports-to-output and exports-to-output ratios. We also employ a set of time-varying political economy regressors in our econometric models constructed from the World Bank's *World Development Indicators 2007* database and its Database on Political Institutions (DPI, see Beck et al. 2001, 2008). They include Rural Population Density, which measures whether land is a source of comparative advantage (the higher is the density the greater is the productivity of land), and the percentages of total land that is arable and that has access to irrigation (%Arable Land and %Irrigated Land). The latter is sometimes regarded as a measure of land quality and thus a source of comparative advantage but, as we shall see, this interpretation is at odds with the results. Imports/Output and Exports/Output ratios measure comparative costs (Baldwin 1985): the greater is the imports-to-output ratio, the higher are unit costs relative to sectors with lower ratios. The converse is true for the exports-to-output ratio: the greater this ratio, the lower are unit costs relative to sectors with lower ratios.

There is overwhelming evidence in the political economy literature that governments are not welfare maximizers. Instead, they balance the potential costs of being welfare maximizers with the benefits they receive privately (either for what the private gains are worth per se, or for how the private gains can help them stay in power). We use a set of variables that measure political constraints, opportunities and pressure. The share of the population that is rural (%Rural Population) indicates whether the median voter is rural. In developing countries a rural worker is also poor, and so policies that are politically motivated may, at the margin, consider the rural voter to be pivotal. In order to investigate whether and how existing institutions condition policy outcomes, three political institutions variables are used: %Majority (the percent of total seats in the legislature held by the ruling party or coalition), the EIEC (an index of executive electoral competition), and Divided Government (which indicates whether the executive and the ruling party in the legislature are from the same party). These may be important determinants of the choice by governments to tax or subsidize trade in agriculture, especially in democracies where these institutions act as checks on the abilities of governments to serve their own interests rather than the public interest.

Since the regressors are not as completely available as the NRA data, the sample available is smaller than the full distortions database (as reported in Appendix Tables A1 and A2). For example, the political institution variables from DPI are available only from 1975. If the DPI variables are omitted, the sample size is 9,478 for export goods and 11,111 for import goods. Including those variables limits the samples to 5,555 and 6,481 observations, respectively. For this reason, we present results from both samples.

Exploratory empirical analysis

In this section we present results first for exports and then for imports, and in each case we first report the pooled sample results for all products in that group before providing disaggregated results by product.

Exports: pooled sample

Table 2 presents the country-fixed effects regression of the choice to tax (binary NRA=1) or subsidy (binary NRA =0) for exportables in the full sample. The sample pools across three dimensions: countries, products, and time. The reported coefficients indicate the statistical significance of percent arable land, percent rural population, and rural population density. The signs on those coefficients imply that: the greater the percentage of land that is arable, the higher the probability that exports will be taxed, the higher the proportion of the population that is rural, the greater the likelihood that exports will be taxed, and the greater the rural population density, the greater the probability that exports will be subsidized.

Rural population density varies positively with land productivity up to the point where overcrowding leads to land degradation or over-fragmentation. In a sophisticated survey of household response to rural population growth, Pender (1999) describes when rural population density can enhance land productivity, and when it cannot. When higher levels of population density are combined with low wages and few off-farm opportunities, more labor-intensive methods are adopted in agriculture.[4] But while greater labor intensity increases land productivity, it reduces labor productivity unless the labor input is complemented by increased capital intensity or technical change. Unfortunately, data on capital use in agriculture are not available, and we leave this conditioning hypothesis to be tested in future studies. Another mechanism is that as rural populations increase, the fallow period is shortened in response to lower labor productivity, in order for farmers to have opportunities to work longer and keep their income from declining. As land becomes increasingly scarce, the increased labor intensity may either benefit land conditions or lower it. For example, more intensive farming can reduce the rate of deforestation and increase vegetative cover on the land. Adoption of labor-intensive soil fertility management practices may improve soil fertility, but they may not be able to offset the increased outflow of soil nutrients due to intensive farming. Finally, greater concentration of persons per square mile implies possible economies of agglomeration (urbanization), and the rural population density may measure the concentration of farming skills at a particular location. This may be especially true of developed countries: if the geographic size of the country is small relative to its population, we may expect that the productivity of land increases with population concentration.

The preceding discussion implies that rural population density should be correlated with the demand for export subsidization, since increasing land productivity confers a comparative advantage in agriculture (up to the point of overcrowding). The positive and statistically significant sign on %RuralPopulation density supports this view.[5] The coefficient of 0.211 indicates that an increase of 233 persons per square kilometer (one standard

[4] For example "use of hoeing and hand weeding can replace burning to clear crop fields, both because vegetation is reduced by declining fallow periods and because the amount of labor available per unit of land is rising. Planting density may increase, as may the care given to planted crops through various labor-intensive methods to improve soil fertility, such as application of compost or mulch" (Pender 1999).

[5] Including a quadratic Rural Population Density variable reinforced these results: the linear term is not statistically significant but the quadratic term is positive and statistically significant in both sample.

deviation) would increase the probability of export subsidization (over taxation) by around 5 percent.

The coefficient of %RuralPopulation is perhaps better explained from the political economy perspective described in the conceptual section above. Since taxation of exports reduces the price of food products, in countries where a high percentage of the population, and therefore the median voter, is rural we should expect there to be a political motivation behind subsidizing rural consumption. An assumption, one that is satisfied in developing countries, is that the median voter spends a significant proportion of income on food. Even non-democracies that care less about their median voters, but have embarked upon industrialization programs, squeeze their farmers and rural populations by taxing agriculture. This provides food cheaply to their growing urban populations, and also encourages migration into urban areas. Regimes that favor urbanization (either because urban residents are the median voters in democracies or because they are a critical component of the industrialization program, or both) might tax exports for those reasons.[6] We find that governments with greater rural populations tax exports more. The quantitative implication is significant: a country with a rural population that is ten percent higher than another country is 8.75 percent more likely to tax exports (the numbers are almost twice as high in the smaller sample with the institutional variables).

The positive sign on %ArableLand is puzzling. If %ArableLand is a measure of comparative advantage, the Stolper-Samuelson theorem would predict that political pressure from landowners would lead to export subsidization (a positive coefficient on %ArableLand). An alternative explanation, where revenue-starved governments cannot commit to long-term low-tax regimes, is advanced in McMillan (2001): once farmers incur sunk costs, they are sure to produce the exportable so long as their price covers marginal cost. The government then has an incentive to tax them, regardless of other promises they may have made in the past (to induce farmers to sink investment costs). In our context, sinking in the costs of making land arable commits landowners to producing if price covers variable costs of

---

[6] This is probably the more likely motivation, since even though export taxes may benefit rural consumers, to the extent that they are rural workers, the decline in the domestic price of the exportable diminishes their real wage. For urban consumers, there is only the benefit to be gained from lower prices on food products (unless they are migrant workers whose main source of income is from rural work, and is supplemented by urban work off-season).

production. If %ArableLand proxies for sunk costs incurred by landowners, then the positive sign on its coefficient affirms McMillan's hypothesis. The %IrrigatedLand variable similarly proxies sunk costs of irrigation, and we would expect it to have the same sign. That evidence is too weak to support the same hypothesis. McMillan's model, more generally, implies that specific factors are likely to be taxed in countries that are desperate for revenue. Add to this the political incentive to subsidize urban workers, as described above, and the motivation for an export tax becomes clear – it works to the government's benefit to beggar their rural sectors to benefit urban voters. To the extent land is specialized and farmers are inflexible in their production decisions, they will be forced to produce. If they are producing for exports, their taxation is further facilitated by the fact that government infrastructure is already set up to record and document the amount of exports. There is no place to hide their output from the grabbing hand.

The second model (see column 2 of table 2) includes variables for political institutions and has a smaller sample since the DPI data are recorded only from 1975 onwards. The coefficients on percent rural population and rural population density have the same sign as the smaller model. The %Arable land variable is not statistically significant in this sample, indicating that McMillan's hypothesis may be less of a concern worldwide now than it was in the 1960s and 1970s (though it may continue to apply in specific countries, as she shows to be the case with a number of sub-Saharan African countries). The new findings in this extended regression are that: the greater is the majority of the governing party or coalition in legislature the greater the likelihood that exports are subsidized; and electoral competition for the office of the executive encourages export subsidization.

There are several possible reasons for these findings. With greater majorities, legislators are expected to favor special interests more since they are less worried about instituting polices that impose welfare losses on their public (e.g. export subsidies) than governments with thin or unstable majorities. At a deeper level, if pluralitarian systems are more likely to deliver greater majorities (as has been argued of winner-take-all systems) compared to a proportionate system of representation, the coefficient on %Majority implies that pluralitarian systems are more likely to award export subsidies.

Political theories of electoral competition with uninformed voters (Baron 1994, Grossman and Helpman 1996) indicate that the greater is electoral competitiveness, the more prone are candidates to satisfy special interests. This is because candidates need monetary contributions from special interests in order to sway uninformed voters. This is precisely what the positive coefficient on EIEC affirms.

The last two columns of Table 2 seek to explain the variation in the level of the NRA, using the same political economy and institutional variables as for the binary NRA regressions. An important difference in the two sets of results is that while the inferences about %RuralPopulation and Rural population density in the subsidize-or-tax choice regressions carry over to the subsidy/tax level regressions, political institutions are unimportant to the latter decision. The effect of some variables on the level of the tax/subsidy is dramatic. For example, the coefficient of 0.641 in the last column on Rural population density indicates that an increase of 279 persons per square kilometer (one standard deviation) would increase the level of the export subsidy by nearly 18 percentage points!

An additional factor that becomes an important determinant of the level of tax or subsidy is the exports-to-output ratio. Since the greater export-to-output ratios measure competitive cost advantage (Baldwin 1986), the positive sign indicates that industries that demonstrate great potential to export are subsidized. There is a potential endogeneity problem here, however, since the subsidization of exports may be the reason why those products have large export-to-output ratios.

Measures of fit are reported towards the bottom of Table 2. The country-fixed effects are statistically significant and the explanatory power overall is quite admirable for a rather spartan regression. Thus, within-country variation in the data is intuitively well explained by this set of political economy and institutional variables. The broad inference is that the political and institutional considerations are important to a government's choice to tax versus subsidize exports, whereas economic considerations are more important determinants of the level at which governments decide to tax and subsidize. The greater the comparative cost advantage, the higher the subsidy, the greater the rural population, the greater the tax; and the greater the rural population density, the greater the export subsidy.

Exports by product

Table 3 presents the tax/subsidy choice regressions for each exportable product with country-fixed effects. Of interest is the question of whether the inferences from the pooled sample carry over to the by-product regressions. Coefficients are lightly shaded if they share the statistical significance and the sign from the pooled sample, but are darker shaded if they are statistically significant but of the opposite sign. Coefficients reported in boldface font indicate that while they were not statistically significant in the pooled sample, they are so in the product regressions (regardless of their sign).

For example, the negative coefficient on %RuralPopulation is shared by the product regressions for apple, banana, barley, beef, coffee, egg, pig meat, potato, rice and tomato. Thus, as the fraction of the rural population rises, governments tax exports of these products. However, for five products—rapeseed, rubber, sunflower, soybean and wheat—governments subsidize exports as %RuralPopulation. There is no clear cash crop/food crop dichotomy that separates these opposite signs. For example, rubber and coffee are both cash crops, yet their signs are different.

The positive coefficient on rural population density is in evidence for just two products, rice and apples. It is negative for beef, cocoa, rapeseed, rubber, tobacco and wheat. Thus, a small subsample dominates the pooled sample results. The heterogeneity across crops is clearer in these by-product regressions. It appears that exports of cash crops are more likely to be taxed when the rural population density is high. This finding goes against the Stolper-Samuelson prediction that the source of comparative advantage (here, land) will be subsidized, not taxed. Evidently, governments make more than welfare-maximizing calculations while setting policy. That is, the revenue motive trumps comparative advantage in agriculture when governments choose whether to tax or subsidize exports. It is highly likely that the heterogeneity across products in this result is driven by the institutional heterogeneity among countries that specialize in those products. In particular, countries specialized in those products may have weak systems of monitoring, collecting and enforcing tax collection. This generates our first *post-hoc* exploratory hypothesis:

H1: Exports of cash crops are more likely to be taxed the higher is rural population density.

The new results (compared to Table 2) are the statistical significance of %Irrigated Land and Exports/Output for a number of products. The negative sign on %Irrigated Land for cocoa, coffee, oat and palm oil affirm the McMillan (2001) hypothesis that governments will take advantage of sunk cost commitments made by landowners, and tax them for revenues. In fact, McMillan's sample of Sub-Saharan African countries affirmed her hypothesis using similar products in her sample. However, there is also evidence that governments can also support landowner interests. The positive signs on coconut, groundnut, maize, milk, pig meat, rapeseed and soybean indicate the likelihood of government subsidizing exports increases with %Irrigated Land.

The statistical significance of Exports/Output indicates that the likelihood of government taxation increases with exports for apple, bean, cocoa, egg and grape. On the other hand, the likelihood of government subsidization increases with exports for cashew, coffee, maize, rubber, tea and tobacco. This is the clearest demarcation of the heterogeneity of government policy on a cash crop/food crop basis. We advance the following exploratory hypothesis based on these results:

> **H2:** Governments choose to subsidize cash crops as their exports to output ratio increases, and tax food crops as their export to output ratio increases.

This hypothesis is in line with the idea that taxation of exports, in addition to providing revenue, is politically motivated by providing cheap food to the public. It should be noted, as we did earlier, that future studies that seek to confirm this result should take account of the inherent endogeneity problem in estimating the coefficient on the export-to-output ratio.

Table 4 presents the regressions by product for the smaller sample with institutional variables included. There are fewer conflicts with the corresponding results from the pooled sample in Table 2. We focus on just the institutional variables in order to draw exploratory hypotheses. The only products for which the %Majority is negative are soybean and rapeseed, while the positive sign is supported by banana, cashew, coconut, cotton and rubber. While not unanimous, these results provide considerable support for our next hypothesis:

> **H3:** Legislatures in which the governing party or governing coalition has a comfortable majority are more likely to subsidize their exports rather than tax them.

A similar hypothesis applies to executive electoral competition. The positive sign on EIEC is evident for banana, cashew, coconut, cotton, egg, milk, rapeseed, rubber, sugar and tomato, and is only contradicted by poultry and tea. We thus hypothesize that:

H4: Countries in which there is strong electoral competition for the office of executive are more likely to subsidize their exports rather than tax them.

These two institutional variables indicate that democracies that feature legislative decision-making and electoral competition are more receptive to special interest pressure from their exporters than are other governments. It should be noted that the third institutional variable, Undivided government, which was statistically insignificant in the pooled sample, is statistically significant for banana, rapeseed, sunflower and tomato. However, that is not sufficient basis *per se* to advance an exploratory hypothesis about whether divided governments are more likely to tax or subsidize exports.

Imports: pooled sample

Table 5 presents the results from the pooled sample of imports. The first model, from the larger sample without political institutions variables, indicates the statistical significance of percent arable land, percent rural population, and rural population density. The results are strikingly similar to the corresponding results from the exports sample: the signs on these coefficients are the same as in the corresponding Table 2 results. The coefficient estimate signs imply that: the greater the percentage of land that is arable, the higher the probability that imports will be subsidized; the higher the share of the population that is rural, the greater the likelihood that imports will be subsidized; and the greater the rural population density, the greater the probability that imports will be taxed.

In order to explain the negative sign on percent arable land (which is puzzling if %ArableLand is taken to measure comparative advantage), we rely on an extension of McMillan's logic to imports. Governments that wish to keep domestic food prices low must also care less about protecting their growers from imports. Thus, governments – especially in poor countries – take advantage of the specificity of land to producing import-competing crops and effectively subsidize imports to get political support from their public by providing food, even imports, cheaply. The specificity of land is guaranteed once landowners commit to production by sinking costs into making land arable.

The reason imports are subsidized when %RuralPopulation is high is similar to why exports are taxed when %RuralPopulation is high, namely to keep the price low for their domestic consumers. In a democracy the government's target may be groups from which legislators draw the median voter(s), and in non-democracies the target may be urban groups that further the government's priorities (for example, a program of industrialization).

Finally, if Rural population density is a measure of land productivity then import competing producers (land owners) will demand protection from imports. The positive sign indicates that governments are very likely to sell protection in return for contributions from special interests.

The extended version of this tax/subsidy choice regression with the institutional variables (and a smaller sample) produces some new results and calls into question others. As shown in column 2 of table 5, %Arable land is no longer statistically significant but %Irrigatedland is. The argument advanced about governments gaming the commitment by landowners to sink costs (into irrigation), and squeezing them to further their own political goals, applies to this finding as well. The variable %Ruralpopulation is also no longer statistically significant, and neither is the import-to-output ratio in the smaller sample. The new findings are that %Majority and EIEC are important determinants of the tax-or-subsidize choice. The greater is the majority in legislature, the higher the likelihood that legislators will subsidize food imports (which is the opposite of what we found for exports). Perhaps the reason why the legislature enjoys a majority is in part the fact that they are able to keep food prices, even of imports, low for their publics. This mechanism perpetuates policies that continue to keep food prices low. The positive coefficient on EIEC (similar to the export sample) is in line with the theoretical argument of the electoral competition literature: that the greater is electoral competition, the more the platforms of candidates are bent to satisfy special interests in return for monetary donations (political support) that are used to enhance electability.

The NRA levels regressions (right-hand half of table 5) are not qualitatively different from the choice regressions in the imports sample, in contrast to the exports sample. Thus, the institutional variables %Majority and EIEC are as important to the tax versus subsidy choice as they are to determining the levels of import taxes and subsides. The smaller model indicates that the higher the share of land that is arable the greater the import subsidy; the greater the percentage of the population that is rural the greater the import subsidy; the greater the rural population density the greater the level of protection to agriculture; and the greater the import penetration ratio the greater is the tax on imports.

Imports by product

Table 6 presents the tax/subsidy choice regressions for each importable product with country-fixed effects. In order to draw exploratory inferences, we are interested to see whether inferences from the pooled sample are robust in the by-product regressions. The negative sign on %Arable Land is affirmed for barley, beef, maize, milk, poultry, soybean, sunflower and wheat, and not contradicted in any product regression. Further, %Irrigated Land also has a negative and statistically significant coefficient for egg, maize, soybean, sugar, sunflower and wheat. This robust finding deserves explanation. If both these variables are proxies for sunk costs by landowners, then McMillan's logic may be extended to explain why these products are likely to see import subsidization (rather than protection), all else held constant.

The idea here is that governments gain politically by squeezing landowners in order to satisfy their public's demand for cheap food. It is not surprising that most of these are food products, not cash crops. Thus, governments know that farmers and landowners are committed to production and game that commitment to satisfy a larger and politically more important constituency. In addition to satisfying the median voter in democracies or the urban consumer in industrializing non-democracies, by gaming landowners governments are assured of at least some domestic output which lowers their costs of import subsidization. As we mentioned earlier, this is more of a developing country phenomenon, where tax systems are quite undeveloped or inefficient. We thus advance the following hypothesis:

> **H5:** The imports of agricultural consumption goods are more likely to be subsidized the greater is the proportion of land that is arable or irrigated.

The variable %Rural Population has a negative coefficient for beef, egg, maize, milk, oat, soybean, sugar and sunflower, mostly food crops or food products. However, it has a positive coefficient for cotton, potato, poultry, rice and sheep meat, many of which are also food products. Thus, no obvious generalization may be made on the basis of %Rural Population. Rural population density has a positive coefficient for beef, egg, maize, milk, oat, sorghum, sugar and wheat, but a negative coefficient for cotton, rice and sunflower. It appears that whenever land (rural labor) is more (less) productive it is usually protected against imports (cotton, rice and sunflower being the exceptions). This suggests the following exploratory hypothesis:

H6: Land (labor) as a source of comparative (disadvantage) advantage is more usually protected than not.

An interesting and important finding is that the positive coefficient on the imports to output ratio continues to hold for beef, groundnut, sugar, rice and wheat. Thus, the imports to output ratio is associated positively with the likelihood of protection or import taxation (we will also see a similar pattern with the smaller sample in the next table). We advance the hypothesis:

H7: Greater import penetration leads to a higher likelihood of governments protecting (rather than subsidizing) imports of important consumption products such as staple foods.

This positive coefficient on the imports to output ratio could also be caused by greater protection of these products. It is important that future studies resolve this endogeneity problem. Implicit in hypothesis H7 is the idea that the causality is far stronger in the direction implied.

The results with the institutional variable sample are presented in Table 7. The exceptional result is the positive coefficient on executive electoral competition (EIEC) for a number of products: barley, maize, milk, oat, sugar, sunflower and wheat. Egg is the only contrary result. Overwhelmingly, this result supports the theory that greater competition to get elected leads candidates to favor special interests (Baron 1994, Grossman and Helpman 1995). Here that means protecting import-competing producers or landowners. This leads to our last exploratory hypothesis:

H8: Greater electoral competition makes import protection more likely.

Concluding remarks

In this chapter we have undertaken an exploratory econometric analysis of the association between some of the economic and political/institutional factors that are commonly used in the empirical political economy of agricultural trade policy literature and the observed stance of governments towards net taxation of agricultural exports and imports. The Anderson and Valenzuela (2008) dataset provides substantial empirical support for the pattern of relative protection/taxation of agriculture across countries with differing levels of income that was first set out in Anderson, Hayami and Others (1986).

We also find significant support for the importance of political economy variables that have been identified in the more-recent literature. In particular, the data suggest that the greater the percentage of arable land and the higher the proportion of the population that is rural, the higher the probability that exports will be taxed.

Our product-specific regression results suggest a number of hypotheses that can form the basis for subsequent research using the Anderson and Valenzuela dataset on NRAs. Some of these are intuitive and consistent with our priors. They include the result that countries with strong electoral competition are more likely to subsidize their exports and engage in import protection; that greater import penetration leads to a higher likelihood of governments protecting (rather than subsidizing) imports of important consumption products such as staple foods; and that the determinants of taxation of cash crops versus food crops differ.

Others results are less intuitive. Examples are that imports of agricultural consumption goods are more likely to be subsidized the greater the proportion of land that is arable or irrigated; that land as a source of comparative advantage is protected; that governments seem to choose to subsidize cash crops but tax food crops as their exports to output ratio increases; and that legislatures in which the governing party or governing coalition has a comfortable majority are more likely to subsidize their exports. Clearly these results (and the associated hypotheses) call for more in-depth analysis which we hope will be taken up by researchers in future work.

References

Anderson, K. (1995), "Lobbying Incentives and the Pattern of Protection in Rich and Poor Countries," *Economic Development and Cultural Change* 43: 401–23.

Anderson, K. (ed.) (2010), *Political Economy of Distortions to Agricultural Incentives,* forthcoming.

Anderson, K., J. Croser, D. Sandri and E. Valenzuela (2010), 'Agricultural Distortion Patterns since the 1950s: What Needs Explaining', Ch. 2 in Anderson (2010).

Anderson, K., Y. Hayami and Others (1986), *The Political Economy of Agricultural Protection: East Asia in International perspective,* Sydney: Allen and Unwin.

Anderson, K., W. Martin and E. Valenzuela (2006), "The Relative Importance of Global Agricultural Subsidies and Market Access," *World Trade Review* 5(3): 357-76.

Anderson, K., M. Kurzweil, W. Martin, D. Sandri and E. Valenzuela (2008), "Measuring Distortions to Agricultural Incentives, Revisited", *World Trade Review* 7(4): 1-30.

Anderson, K. and E. Valenzuela (2008), *Global Estimates of Distortions to Agricultural Incentives, 1955 to 2007*, database available at www.worldbank.org/agdistortions.

Baldwin, R.E. (1985), *The Political Economy of US Import Policy*. Cambridge MA: MIT Press.

Baron, D.P. (1994), "Electoral Competition with Informed and Uninformed Voters", *American Political Science Review* 88: 33-47.

Beck, T., G. Clarke, A. Groff and P. Keefer (2001), "New Tools in Comparative Political Economy: The Database of Political Institutions", *World Bank Economic Review* 15(1): 165-76.

Beck, T., P.E. Keefer and G.R. Clarke (2008), *Database of Political Institutions,* accessible at http://go.worldbank.org/2EAGGLRZ40

Bhagwati, J. and Ramaswami, V.K. (1963), "Domestic Distortions, Tariffs and the Theory of the Optimum Subsidy", *Journal of Political Economy* 71: 44–50.

De Gorter, H. and J. Swinnen (2002), "Political Economy of Agricultural Policy", pp. 1893–1943 in B.L. Gardner and G. Rausser (eds.), *Handbook of Agricultural Economics, vol. 2B.* Amsterdam, Elsevier.

Deardorff, A.V. (1987), "Why Do Governments Prefer Nontariff Barriers?" *Carnegie-Rochester Conference Series on Public Policy* 26: 191-216.

Grossman, G.M. and E. Helpman (1994), “Protection for Sale,” *American Economic Review* 84: 833-50.

Grossman, G.M. and E. Helpman (1996), “Electoral Competition and Special Interest Politics", *Review of Economic Studies* 63: 265-86.

Hoekman, B., F. Ng and M. Olarreaga (2004), “Reducing Agricultural Tariffs versus Domestic Support: What is More Important for Developing Countries?” *World Bank Economic Review* 18(2): 175-204.

Honma, M. (1993), “Japan’s Agricultural Policy and Protection Growth,” in T. Ito and A.O. Krueger (eds.), *Trade and Protectionism*, Chicago: University of Chicago Press.

Johnson, H.G. (1965), “Optimal Trade Interventions in the Presence of Domestic Distortions”, pp. 3-34 in R. Caves, H. G. Johnson and P. Kenen (eds.), *Trade, Growth and Balance of Payments*, Amsterdam: North-Holland.

McMillan, M. (2001), "Why Kill the Golden Goose? A Political-Economy Model of Export Taxation", *Review of Economics and Statistics* 83(1): 170-84.

Naoi, M. (2009), "Shopping for Protection: The Politics of Choosing Trade Instruments in a Partially-Legalized World", *International Studies Quarterly* 53(2). forthcoming.

Olper, A. and V. Raimondi (2010), “Constitutional Rules and Agricultural Policy Outcomes", Ch. in Anderson (2010).

Pender, J. (1999), “Rural Population Growth, Agricultural Change and Natural Resource Management in Developing Countries: A Review of Hypothesis and Some Evidence from the Honduras”. EPTD Discussion Paper 48, International Food Policy Research Institute, Washington DC.

Rodrik, D. (1986), “Tariffs, Subsidies and Welfare with Endogenous Policy”, *Journal of International Economics* 21: 285-96.

Rodrik, D. (1992), "Conceptual Issues in the Design of Trade Policy for Industrialization", *World Development* 20: 301-20.

Rodrik, D. (1995), “Political Economy of Trade Policy”, pp. 1457–94 in G.M. Grossman and K. Rogoff (eds.), *Handbook of International Economics*, Vol. 3, Amsterdam: North-Holland.

World Bank (2007), *World Development Indicators 2007*, Washington DC: World Bank.

Table 1: Descriptive statistics of variables

			Full[a] exports sample			Full[a] imports sample		
Source	Variable	Description	N^b	mean	sd	N^b	mean	sd
Distortions database	NRA	Nominal rate of assistance [approximates (*p*-*p**)/*p**]	9478	0.098	0.761	11111	0.535	1.026
Distortions database	NRA10	1 if NRA≥0, and 0 otherwise	9478	0.536	0.499	11111	0.801	0.399
WDI	%Arable Land	Arable land as fraction of total land area	9478	0.184	0.154	11111	0.206	0.143
WDI	%Irrigated Land	Irrigated land as fraction of total land area	9478	0.360	0.692	11111	0.521	0.759
WDI	%Rural Population	Rural population as fraction of total	9478	0.463	0.243	11111	0.418	0.201
WDI	Rural popn density	000 persons per square km. of arable land	9478	0.233	0.279	11111	0.301	0.313
Distortions database	Imports/Output	Imports-to-output ratio				11111	1.245	3.916
Distortions database	Exports/Output	Exports-to-output ratio	9478	0.457	0.598			
DPI	%Majority	Fraction of seats held by ruling party or coalition in legislature	5555	0.659	0.209	6481	0.621	0.181
DPI	EIEC	Index of competition for election to the executive	5555	6.164	1.641	6481	6.502	1.300
DPI	Undivided government	1 if executive and party in power are both from the same party and 0 otherwise.	5555	0.500	0.500	6481	0.414	0.493

Notes:

[a] Statistics for the abridged sample that includes DPI variables are close to those reported from the larger sample for non-DPI variables. The larger data set is over 1961-2004; the smaller data set is over 1971-2000. The sample pools data across 56 agricultural products and 64 countries.

[b] The samples are those used in the regressions.

Sources: Distortions database from Anderson and Valenzuela (2008); WDI=World Bank (2007); DPI= Beck et al. (2001, 2008).

Table 2: Exports regressions for tax/subsidy choice (binary NRA) and their levels (NRA), OLS with fixed effects

Dependent Variable →	Binary NRA		NRA	
%Arable Land	−0.518	−0.627	−0.493	0.777
	[2.61]**	[1.42]	[1.37]	[0.93]
%Irrigated Land	−0.004	−0.006	−0.004	−0.006
	[0.18]	[0.15]	[0.09]	[0.08]
%Rural Population	−0.875	−1.506	−1.646	−2.467
	[7.56]**	[6.92]**	[7.95]**	[6.19]**
Rural population density	0.211	0.257	0.457	0.641
	[2.86]**	[1.96]*	[3.44]**	[2.66]**
Imports/Output				
Exports/Output	−0.004	0.012	0.192	0.248
	[0.59]	[1.55]	[16.17]**	[16.73]**
%Majority		0.117		−0.012
		[2.76]**		[0.16]
EIEC		0.02		0.017
		[3.36]**		[1.57]
Undivided government		0.026		0.005
		[1.50]		[0.15]
N	9972	5975	9478	5555
#countries	64	63	64	63
overall-R^2	0.24	0.27	0.11	0.19
Fraction of var due to FE	0.40	0.45	0.36	0.41
F-statistic for Ho: all FE=0	66.10	40.43	49.15	31.62

Notes:

1. Absolute *t*-values in brackets; ***, **, and * denote statistical significance at 1%, 5% and 10%, respectively.
2. Imports sample abridged at Imports/Output<50 percent. (Exports/output is always below that.)
3. Country-fixed effects and year dummies included but not reported.

Source: Authors' calculations

Table 3: Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

(full sample, OLS with fixed effects)

	apple	*banana*	*barley*	*bean*	*beef*	*cashew*	*cocoa*	*coconut*	*coffee*	*cotton*
%Arable Land	2.769	−7.215	3.79	14.365	−1.558	−20.611	−3.647	−4.664	−1.407	1.398
	[0.52]	[1.06]	[1.07]	[1.13]	[1.70]	[0.47]	[1.55]	[0.43]	[0.89]	[0.90]
%Irrigated Land	−1.847	0.592	0.7	16.453	−0.252	0.675	**−0.76**	**0.559**	**−0.182**	0.106
	[1.97]	[2.82]**	[1.12]	[1.97]	[0.88]	[0.03]	**[4.08]****	**[2.85]****	**[2.09]***	[0.56]
%Rural Population	−4.742	−15.078	−2.155	22.365	−1.485	2.436	0.503	1.982	−2.175	−0.133
	[3.34]**	[5.91]**	[2.01]*	[1.63]	[1.99]*	[0.39]	[0.48]	[0.89]	[2.69]**	[0.30]
Rural pop. density	7.322	0.156	3.381	2.364	−2.042	−1.102	−0.898	−0.395	0.117	0.315
	[2.18]*	[0.06]	[1.72]	[0.38]	[3.16]**	[0.36]	[2.02]*	[0.28]	[0.22]	[1.22]
Exports/Output	**−0.483**	−0.139	0.031	**−7.324**	−0.061	**0.369**	**−0.127**	0.906	**0.171**	0.019
	[5.44]**	[1.50]	[0.22]	**[3.39]****	[0.44]	**[2.41]***	**[2.10]***	[1.27]	**[3.24]****	[0.48]
N	170	168	255	60	477	57	242	117	456	610
#countries	5	5	17	4	28	2	6	3	14	18
R-squared	0.44	0.46	0.4	0.73	0.11	0.7	0.26	0.58	0.27	0.1

Table 3 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

	egg	*grape*	*groundnut*	*maize*	*milk*	*oat*	*oilseed*	*orange*	*palmoil*	*pigmeat*
%Arable Land	−0.06	15.357	2.914	−0.379	0.047	−3.08	−1.495	5.351	−11.495	−2.345
	[0.10]	[2.69]**	[0.69]	[0.23]	[0.14]	[0.76]	[0.78]	[0.05]	[1.17]	[1.21]
%Irrigated Land	0	1.098	**2.391**	**0.383**	**0.167**	**−8.044**	60.111	−135.629	**−1.541**	**0.333**
	[0.00]	[1.18]	**[4.00]****	**[2.08]***	**[2.24]***	**[2.44]***	[1.01]	[0.30]	**[2.16]***	**[1.98]***
%Rural Population	−1.3	−0.289	−0.733	−0.794	0.072	−1.109	28.781	−31.094	−3.366	−1.973
	[2.24]*	[0.22]	[0.49]	[0.84]	[0.13]	[0.52]	[1.24]	[0.23]	[1.40]	[2.77]**
Rural pop. density	0.477	−0.657	−0.052	0.969	0.03	18.042	−1.212	44.86	0.328	0.357
	[0.89]	[0.20]	[0.03]	[1.09]	[0.09]	[1.25]	[0.16]	[0.38]	[0.52]	[0.27]
Exports/Output	**−0.419**	**−0.123**	−0.333	**0.456**	0.009	0.277	0.177	−1.833	−0.158	−0.197
	[2.57]*	**[2.62]****	[1.17]	**[2.99]****	[0.45]	[0.51]	[2.01]	[0.59]	[0.50]	[1.30]
N	502	183	217	390	626	134	60	53	127	330
#countries	26	5	9	25	29	10	5	2	5	22
R-squared	0.37	0.38	0.4	0.17	0.1	0.48	0.53	0.95	0.51	0.28

Table 3 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

	potato	*poultry*	*rapeseed*	*rice*	*rubber*	*rye*	*sesame*	*sheepmeat*	*sorghum*	*soybean*
%Arable Land	0.05	−0.471	−0.274	2.86	−5.372	6.794	−10.367	2.805	12.762	4.887
	[0.08]	[0.76]	[0.06]	[1.95]	[2.59]*	[0.79]	[0.16]	[1.99]*	[1.25]	[0.85]
%Irrigated Land	−0.065	0.05	**3.448**	−0.045	0.064	−36.079	8.965	0.365	−0.955	**0.707**
	[0.67]	[0.66]	**[2.49]***	[0.42]	[0.37]	[1.61]	[0.06]	[1.89]	[0.98]	**[2.12]***
%Rural Population	−1.102	−0.742	15.014	−2.944	3.068	32.036	26.144	0.025	−1.208	2.51
	[2.89]**	[1.27]	[3.30]**	[3.46]**	[2.43]*	[0.45]	[1.05]	[0.07]	[0.98]	[2.16]*
Rural pop. density	0.646	−0.549	−41.264	0.647	−0.903	55.873	37.588	0.09	6.945	0.266
	[1.69]	[1.05]	[3.60]**	[2.89]**	[2.26]*	[1.22]	[0.89]	[0.07]	[1.70]	[0.20]
Exports/Output	−0.005	0	−0.155	0.035	**0.586**	−0.734	0.02	−0.018	−0.016	−0.146
	[0.10]	[0.00]	[1.59]	[0.51]	**[3.08]****	[1.20]	[0.07]	[0.17]	[0.13]	[0.42]
N	417	555	124	334	168	27	56	245	112	196
#countries	15	27	9	15	5	6	2	13	6	11
R-squared	0.4	0.16	0.43	0.21	0.43	0.88	0.77	0.31	0.49	0.42

Table 3 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

	sugar	*sunflower*	*tea*	*tobacco*	*tomato*	*vegetables*	*wheat*	*wine*	*wool*
%Arable Land	−0.022	−1.623	3.525	−2.231	0.53	235.132	−1.156	9.983	−5.369
	[0.02]	[0.63]	[1.43]	[0.51]	[0.13]	[1.13]	[1.85]	[1.19]	[0.66]
%Irrigated Land	0.11	0.591	0.103	0.359	−0.288	**10.406**	0.034	**1.111**	−0.185
	[1.13]	[0.98]	[0.92]	[0.84]	[0.99]	**[3.09]****	[0.24]	**[2.70]****	[0.21]
%Rural Population	−0.402	6.027	1.021	−1.567	−4.703	0.143	2.067	4.01	4.519
	[0.59]	[2.07]*	[0.75]	[1.82]	[2.67]**	[0.00]	[2.30]*	[1.65]	[0.50]
Rural pop. density	0.741	−3.228	0.116	−2.739	6.572	8.514	−1.778	0.062	−9.043
	[1.21]	[0.50]	[0.17]	[2.77]**	[1.27]	[0.27]	[3.03]**	[0.06]	[0.32]
Exports/Output	0.039	0.049	**0.239**	**0.042**	0.096	−0.495	0.013	0.195	0.111
	[0.93]	[1.23]	**[4.69]****	**[2.23]***	[0.73]	[1.28]	[0.40]	[1.07]	[0.33]
N	430	166	218	176	143	64	614	127	86
#countries	21	13	6	5	8	2	30	5	2
R-squared	0.33	0.26	0.3	0.44	0.41	0.9	0.44	0.33	0.53

Source: Authors' calculations

Table 4: Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

(truncated sample, OLS with fixed effects)

	apple	*banana*	*barley*	*bean*	*beef*	*cashew*	*cocoa*	*coconut*	*coffee*
%Arable Land	−5.961	−22.299	3.148	−3.281	2.924	**391.96**	−4.564	−3.759	2.998
	[0.66]	[1.23]	[0.59]	[0.13]	[1.11]	**[2.59]***	[0.90]	[0.17]	[0.86]
%Irrigated Land	−2.696	**0.758**	−0.614	27.517	0.228	34.39	−0.972	0.54	−0.119
	[1.78]	**[2.55]***	[0.67]	[0.94]	[0.42]	[0.82]	[1.99]	[1.36]	[0.84]
%Rural Population	−6.715	7.189	−6.271	25.119	0.474	−36.564	0.894	11.494	−3.394
	[3.16]**	[1.54]	[3.98]**	[0.95]	[0.25]	[2.46]*	[0.25]	[1.93]	[2.23]*
Rural pop. density	10.498	−8.776	5.446	−8.554	−2.364	22.314	1.181	−2.396	−0.441
	[1.30]	[0.91]	[2.60]*	[0.85]	[2.12]*	[2.69]*	[1.41]	[0.82]	[0.56]
Exports/Output	−0.288	−0.023	0.002	**−7.759**	0.199	0.245	**−0.368**	4.699	0.225
	[1.33]	[0.26]	[0.01]	**[2.36]***	[0.87]	[1.39]	**[3.60]****	[1.23]	[3.48]**
%Majority	−0.771	0.7	0.022	−0.293	0.264	3.758	−0.048	1.671	0.251
	[1.73]	[2.48]*	[0.08]	[0.55]	[1.59]	[2.45]*	[0.17]	[2.21]*	[1.96]
EIEC	−0.053	0.307	0.036	0.04	0.109	0.376	−0.071	0.233	0.023
	[0.73]	[6.93]**	[0.78]	[0.43]	[1.34]	[2.47]*	[1.80]	[3.33]**	[1.38]
Undivided govt.	−0.14	**0.604**	0.095	0.145	−0.022	−0.393	0	0.143	0.066
	[0.69]	**[2.90]****	[1.03]	[0.47]	[0.28]	[1.83]	[.]	[0.31]	[1.02]
N	91	97	154	46	278	48	106	72	296
#countries	5	5	14	4	23	2	6	3	14
R-squared	0.49	0.76	0.53	0.71	0.13	0.83	0.39	0.67	0.26

Table 4 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

	cotton	*egg*	*grape*	*groundnut*	*maize*	*milk*	*oat*	*oilseed*	*palmoil*
%Arable Land	3.095	−0.667	8.519	8.965	−6.55	0.165	1.22	5.237	−26.156
	[0.83]	[0.80]	[1.02]	[1.03]	[1.63]	[0.28]	[0.11]	[0.95]	[1.41]
%Irrigated Land	0.486	0.108	2.049	**3.765**	0.476	0.031	**−10.196**	−72.718	**−4.058**
	[1.33]	[0.65]	[1.45]	**[4.42]****	[1.45]	[0.30]	**[2.03]***	[0.88]	**[2.60]***
%Rural Population	0.591	−1.628	−1.389	−2.85	−4.567	−0.139	11.169	93.791	−0.496
	[0.80]	[1.58]	[0.74]	[1.23]	[1.96]	[0.16]	[1.06]	[1.67]	[0.10]
Rural pop. density	−0.238	0.111	−0.871	−1.793	−0.625	0.076	43.501	13.999	1.33
	[0.44]	[0.17]	[0.09]	[0.55]	[0.23]	[0.15]	[1.06]	[0.81]	[1.15]
Exports/Output	0.052	−0.172	0.215	0.006	0.376	0.007	0.891	**0.268**	0.053
	[1.15]	[0.83]	[1.29]	[0.01]	[1.71]	[0.37]	[1.09]	**[2.65]***	[0.13]
%Majority	0.617	−0.139	0.78	0.312	−0.201	0.129	0.007	0.406	0.111
	[3.60]**	[1.28]	[1.80]	[0.92]	[0.72]	[1.64]	[0.02]	[0.64]	[0.20]
EIEC	0.053	0.143	0.018	0.07	−0.078	0.487	0	0.093	−0.181
	[2.79]**	[5.02]**	[0.26]	[1.72]	[1.60]	[2.85]**	[.]	[0.62]	[1.13]
Undivided govt.	−0.055	−0.068	−0.209	0.216	0.205	0.017	−0.179	0.229	−0.645
	[0.90]	[1.56]	[1.30]	[1.52]	[1.50]	[0.70]	[0.51]	[0.39]	[1.19]
N	346	319	99	128	206	394	82	40	74
#countries	18	24	5	9	19	29	7	5	4
R-squared	0.15	0.34	0.48	0.49	0.22	0.12	0.53	0.63	0.63

Table 4 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

	pigmeat	*potato*	*poultry*	*rapeseed*	*rice*	*rubber*	*sheepmeat*	*sorghum*	*soybean*
%Arable Land	−4.76	1.153	1.2	**75.084**	3.615	2.444	4.705	16.01	3.855
	[0.81]	[0.87]	[0.94]	**[2.35]***	[0.89]	[0.58]	[0.97]	[0.75]	[0.48]
%Irrigated Land	−0.137	−0.191	0.207	1.504	−0.076	−0.392	0.43	0.048	**0.957**
	[0.39]	[0.86]	[1.65]	[0.70]	[0.33]	[1.34]	[0.91]	[0.02]	**[2.32]***
%Rural Population	−6.239	−0.536	0.147	−17.352	−2.979	3.844	0.224	2.68	−0.905
	[3.47]**	[0.84]	[0.14]	[1.71]	[1.88]	[1.83]	[0.13]	[0.46]	[0.38]
Rural pop. density	0.629	0.932	−0.216	297.269	0.045	0.499	1.525	12.698	−0.183
	[0.28]	[1.42]	[0.25]	[3.83]**	[0.08]	[1.03]	[0.27]	[0.90]	[0.08]
Exports/Output	−0.301	0.021	−0.041	−0.452	0.045	0.605	0.057	−0.128	0.244
	[1.08]	[0.24]	[0.45]	[5.00]**	[0.48]	[3.09]**	[0.31]	[0.95]	[0.61]
%Majority	−0.464	−0.184	−0.292	−1.028	−0.01	1.049	0.283	0.08	−0.606
	[2.18]*	[0.96]	[1.95]	[3.10]**	[0.04]	[2.39]*	[1.53]	[0.09]	[2.52]*
EIEC	0.313	0.038	−0.118	0.777	−0.003	0.185	0.024	0.077	−0.033
	[1.58]	[1.26]	[3.11]**	[3.85]**	[0.05]	[2.72]**	[0.59]	[1.05]	[0.65]
Undivided govt.	−0.137	0.025	0.093	−0.348	−0.053	0.13	−0.111	0.829	0.1
	[1.42]	[0.45]	[1.73]	[3.41]**	[0.46]	[0.67]	[1.27]	[1.69]	[0.88]
N	203	261	364	68	180	112	124	62	138
#countries	18	15	25	6	11	5	10	5	10
R-squared	0.34	0.47	0.18	0.8	0.17	0.45	0.3	0.54	0.38

Table 4 (continued): Exports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

	sugar	*sunflower*	*tea*	*tobacco*	*tomato*	*vegetables*	*wheat*	*wine*
%Arable Land	−1.528	2.964	0.49	−8.038	−17.082	−326.341	−0.301	2.071
	[0.42]	[0.91]	[0.15]	[0.82]	[1.18]	[0.92]	[0.23]	[0.14]
%Irrigated Land	−0.104	0.369	−0.229	1.165	0.494	6.225	0.159	−0.98
	[0.58]	[0.66]	[0.99]	[0.83]	[0.90]	[1.33]	[0.69]	[0.40]
%Rural Population	2.819	−1.114	1.237	−1.664	−1.502	145.309	0.437	6.435
	[2.20]*	[0.23]	[0.55]	[1.11]	[0.46]	[1.54]	[0.25]	[0.88]
Rural pop. density	−0.632	12.659	0.712	−2.076	3.957	−78.62	−0.875	−0.718
	[0.59]	[1.09]	[0.60]	[1.66]	[0.34]	[1.48]	[1.00]	[0.15]
Exports/Output	0.121	0.005	**0.185**	0.035	0.186	−0.077	−0.005	**0.344**
	[1.86]	[0.10]	**[2.86]****	[1.66]	[1.26]	[0.20]	[0.13]	**[2.86]****
%Majority	−0.143	0.108	0.142	−0.068	−0.043	−6.495	0.135	−0.594
	[0.98]	[0.34]	[0.48]	[0.13]	[0.11]	[1.45]	[0.86]	[1.35]
EIEC	0.093	0.074	−0.07	0.075	0.217	−0.544	0.24	0
	[3.23]**	[0.35]	[2.04]*	[1.48]	[3.69]**	[1.45]	[1.89]	[.]
Undivided govt.	0.059	**0.582**	0.02	−0.034	**0.587**	0	−0.036	0
	[0.55]	**[3.54]****	[0.17]	[0.40]	**[3.66]****	[.]	[0.67]	[.]
N	244	94	134	115	90	46	384	61
#countries	16	10	6	5	5	2	29	4
R-squared	0.43	0.54	0.36	0.47	0.58	0.92	0.38	0.55

Source: Authors' calculations

Table 5: Imports regressions for tax/subsidy choice (Binary NRA) and their levels (NRA), OLS with fixed effects

Dependent Variable →	Binary NRA		NRA	
%Arable Land	−1.1	−0.44	−2.379	−2.685
	[6.18]**	[1.23]	[5.23]**	[2.83]**
%Irrigated Land	−0.027	−0.092	−0.05	−0.153
	[1.24]	[2.32]*	[0.88]	[1.46]
%Rural Population	−0.713	−0.234	−3.01	−3.054
	[6.58]**	[1.17]	[10.79]**	[5.81]**
Rural population density	0.373	0.239	0.096	−0.371
	[5.98]**	[2.20]*	[0.60]	[1.29]
Imports/Output	0.003	0.001	−0.005	−0.002
	[3.62]**	[1.45]	[2.29]*	[0.86]
Exports/Output				
%Majority		−0.08		−0.299
		[2.09]*		[2.88]**
EIEC		0.043		0.06
		[6.62]**		[3.52]**
Undivided government		0.009		−0.075
		[0.52]		[1.67]
N	11409	6764	11111	6481
#countries	61	60	61	60
overall-R^2	0.01	0.03	0.02	0.01
Fraction of var due to FE	0.44	0.37	0.46	0.60
F-statistic for Ho: all FE=0	33.95	22.16	44.77	31.84

Notes:

1. Absolute *t*-values in brackets. ***, **, and * denote statistical significance at 1%. 5% and 10%, respectively.
2. Imports sample abridged at Imports/Output<50 (Exports/outut always below that).
3. Country-fixed effects and year dummies included but not reported.

Source: Authors' calculations

Table 6: Imports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

(full sample, OLS with fixed effects)

	barley	*bean*	*beef*	*cotton*	*egg*	*groundnut*	*maize*	*milk*	*oat*
%Arable Land	−1.632	−6.089	−1.482	−5.73	−1.501	20.52	−2.889	−2.992	0.257
	[3.05]**	[0.42]	[2.23]*	[0.08]	[1.14]	[1.13]	[4.34]**	[2.30]*	[0.42]
%Irrigated Land	0.005	1.031	−0.066	−1.259	**−0.701**	−124.374	**−0.324**	−0.015	**0.466**
	[0.06]	[1.42]	[0.97]	[0.40]	**[5.18]****	[1.99]	**[4.21]****	[0.16]	**[4.05]****
%Rural Population	0.138	9.042	−1.012	22.785	−3.316	−71.582	−3.201	−0.859	−1.641
	[0.29]	[0.90]	[2.83]**	[2.61]*	[5.95]**	[0.84]	[8.33]**	[1.99]*	[2.29]*
Rural pop. density	0.078	−3.045	1.024	−16.783	1.708	−1.179	1.195	0.694	1.014
	[0.19]	[0.42]	[5.70]**	[2.71]*	[3.73]**	[0.10]	[6.91]**	[3.24]**	[2.03]*
Imports/Output	0.012	−0.274	0.155	−0.2	0.214	11.718	0.004	0.076	0.01
	[2.42]*	[0.64]	[3.32]**	[1.50]	[1.93]	[2.75]*	[1.39]	[1.50]	[0.58]
N	617	68	845	65	328	45	1039	651	503
#countries	25	3	31	8	21	5	39	29	19
R-squared	0.24	0.77	0.23	0.74	0.33	0.83	0.21	0.15	0.54

Table 6 (continued): Imports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

	oilseed	*onion*	*palmoil*	*pigmeat*	*potato*	*poultry*	*rapeseed*	*rice*	*rye*
%Arable Land	−17.147	−0.224	−1297.309	0.1	−2.451	−2.009	−0.338	−0.591	−1.474
	[2.49]	[0.03]	[0.32]	[0.19]	[0.37]	[3.38]**	[0.93]	[0.89]	[0.39]
%Irrigated Land	103.07	0.194	−17.989	**0.149**	0.202	0.021	0.012	0.113	4.142
	[0.33]	[1.10]	[0.53]	**[2.08]***	[0.77]	[0.28]	[0.16]	[1.68]	[0.81]
%Rural Population	0.884	−3.449	100.137	0.081	2.037	0.938	−0.232	1.205	−31.737
	[0.02]	[1.05]	[1.26]	[0.20]	[2.33]*	[2.27]*	[0.54]	[2.84]**	[0.76]
Rural pop. density	−16.517	0.852	−2218.571	0.316	−1.05	−0.313	0.013	−1.206	−0.048
	[0.66]	[0.69]	[0.33]	[0.95]	[1.25]	[0.98]	[0.05]	[5.18]**	[0.00]
Imports/Output	−0.196	0.433	0.086	−0.027	−0.068	−0.002	0	0.018	0.068
	[1.69]	[2.25]*	[0.14]	[0.33]	[0.96]	[0.24]	[0.03]	[2.68]**	[0.25]
N	28	82	34	782	172	704	421	891	44
#countries	4	3	3	30	8	34	14	27	6
R-squared	0.89	0.66	0.99	0.12	0.33	0.08	0.63	0.24	0.64

Table 6 (continued): Imports regressions for tax/subsidy choice, by product, binary NRA dependent variable, without institutional variables, 1960-2004

	sheepmeat	*sorghum*	*soybean*	*sugar*	*sunflower*	*tobacco*	*wheat*
%Arable Land	0.482	6.892	−8.506	−0.754	−6.095	−184.559	−3.358
	[0.89]	[1.82]	[4.26]**	[1.52]	[3.34]**	[0.62]	[2.84]**
%Irrigated Land	−0.031	−0.334	**−0.991**	**−0.163**	**−0.583**	−1800.832	**−0.404**
	[0.37]	[0.70]	**[4.84]****	**[2.24]***	**[2.69]****	[0.68]	**[3.10]****
%Rural Population	2.139	0.204	−2.928	−1.033	−4.45	−26.922	−0.37
	[4.17]**	[0.22]	[3.82]**	[2.85]**	[8.34]**	[0.79]	[0.72]
Rural pop. density	−0.31	2.876	−0.535	0.737	−4.828	−16.28	0.508
	[0.99]	[2.74]**	[1.01]	[5.34]**	[2.18]*	[0.29]	[2.17]*
Imports/Output	0.015	0.016	−0.001	0.008	0	0.063	0.008
	[1.13]	[0.37]	[0.37]	[4.16]**	[0.19]	[0.07]	[3.82]**
N	492	196	386	1097	240	50	900
#countries	15	9	18	43	11	2	40
R-squared	0.15	0.28	0.25	0.23	0.48	0.75	0.14

Source: Authors' calculations

Table 7: Imports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

(truncated sample, OLS with fixed effects)

	barley	*bean*	*beef*	*cotton*	*egg*	*maize*	*milk*	*oat*	*onion*	*pigmeat*
%Arable Land	**−2.255**	−74.25	−0.836	−46.629	**−7.964**	−2.408	**−8.193**	−1.095	6.95	**−2.261**
	[2.02]*	[1.37]	[0.73]	[0.36]	**[2.61]***	[1.56]	**[2.98]****	[0.88]	[0.57]	**[2.04]***
%Irrigated Land	0.061	−2.542	0.063	−1.043	−1.069	−0.475	−0.494	0.372	0.009	−0.089
	[0.40]	[0.82]	[0.41]	[0.20]	[4.08]**	[2.49]*	[2.69]**	[1.72]	[0.03]	[0.68]
%Rural Population	**3.333**	−17.747	0.354	33.24	**−5.976**	**−2.946**	−0.709	2.3	−2.435	1.527
	[3.33]**	[0.47]	[0.50]	[1.67]	**[2.75]****	**[5.00]****	[0.89]	[1.73]	[0.25]	[1.72]
Rural pop. density	−1.653	−10.033	0.142	−22.292	2.679	0.692	1.557	−0.712	1.54	−0.544
	[2.47]*	[0.20]	[0.39]	[1.79]	[2.15]*	[2.11]*	[3.71]**	[0.86]	[0.62]	[0.88]
Imports/Output	0.002	**−1.093**	**0.278**	−0.26	0.086	0.005	**0.35**	0.022	0.403	0.081
	[0.33]	**[2.41]***	**[4.45]****	[0.35]	[0.33]	[1.63]	**[2.65]****	[1.15]	[1.74]	[0.63]
%Majority	−0.171	3.069	−0.246	−0.051	−0.284	−0.107	0.11	−0.02	−0.346	−0.215
	[1.18]	[2.29]*	[1.69]	[0.07]	[1.28]	[0.98]	[0.80]	[0.13]	[0.72]	[1.42]
EIEC	0.401	−0.219	−0.019	−0.768	−0.323	0.056	0.084	1.144	−0.013	0.002
	[4.57]**	[0.54]	[0.66]	[0.93]	[2.82]**	[3.65]**	[3.01]**	[6.36]**	[0.02]	[0.06]
Undivided govt.	−0.032	**−1.781**	−0.047	−5.391	−0.058	−0.039	−0.014	−0.027	−0.424	−0.094
	[0.48]	**[2.43]***	[0.69]	[1.46]	[0.50]	[0.86]	[0.20]	[0.41]	[1.00]	[1.43]
N	368	47	484	41	181	611	357	287	62	473
#countries	24	3	30	5	16	38	25	18	3	29
R-squared	0.16	0.85	0.22	0.75	0.35	0.17	0.22	0.74	0.68	0.1

Table 7 (continued): Imports regressions for tax/subsidy choice, by product, binary NRA dependent variable, with institutional variables, 1975-2004

	potato	*poultry*	*rapeseed*	*rice*	*sheepmeat*	*sorghum*	*soybean*	*sugar*	*sunflower*	*wheat*
%Arable Land	−6.679	0.79	0.238	**4.113**	0.585	13.824	**−12.983**	0.245	**−8.757**	0.62
	[0.55]	[0.61]	[0.60]	**[2.92]****	[0.67]	[1.80]	**[4.31]****	[0.26]	**[2.53]***	[0.34]
%Irrigated Land	0.33	0.327	−0.005	0.124	−0.297	−0.253	−1.037	−0.343	−0.32	−0.012
	[0.50]	[2.24]*	[0.07]	[0.97]	[1.89]	[0.27]	[3.57]**	[2.37]*	[0.65]	[0.05]
%Rural Population	**−22.829**	**3.02**	0.664	0.704	**2.345**	3.458	**−2.913**	**−1.338**	**−3.543**	0.57
	[3.96]**	**[3.71]****	[1.19]	[0.93]	**[2.84]****	[1.22]	**[2.69]****	**[2.07]***	**[4.52]****	[0.61]
Rural pop. density	0.718	−0.917	−0.2	−0.737	−0.075	3.455	−0.832	1.183	−4.148	−0.038
	[0.37]	[1.84]	[0.64]	[1.98]*	[0.16]	[1.87]	[1.17]	[4.26]**	[1.14]	[0.09]
Imports/Output	−0.18	−0.002	0	**0.024**	**0.034**	0.011	−0.003	0.004	−0.003	**0.013**
	[1.59]	[0.31]	[0.37]	**[2.07]***	**[2.02]***	[0.20]	[1.32]	[1.34]	[0.51]	**[1.99]***
%Majority	−0.777	0.124	−0.098	−0.214	0.137	0.002	0.201	−0.252	−0.301	−0.306
	[3.07]**	[1.03]	[1.84]	[1.58]	[1.10]	[0.01]	[1.28]	[2.21]*	[1.38]	[1.99]*
EIEC	0	0.03	−0.011	−0.005	0.087	−0.018	0.011	0.035	0.082	0.079
	[.]	[1.02]	[0.23]	[0.32]	[1.19]	[0.24]	[0.27]	[2.31]*	[2.37]*	[3.58]**
Undivided govt.	0	**0.14**	0.009	−0.112	0.064	−0.246	0.042	**0.135**	−0.079	0.107
	[.]	**[2.23]***	[0.47]	[1.88]	[1.37]	[1.78]	[0.50]	**[2.84]****	[1.32]	[1.47]
N	91	413	269	535	301	109	275	662	157	486
#countries	6	28	14	27	15	9	18	42	10	34
R-squared	0.59	0.11	0.14	0.2	0.2	0.37	0.25	0.19	0.46	0.16

Source: Authors’ calculations

Appendix Table A1: Descriptive statistics for output-based NRAs, pooled across all covered farm products and years,[a] 1961 to 2004

country	N	p50	p75	mean	sd
argentina	204	-0.14	-0.05	-0.16	0.14
australia	1056	0.00	0.08	0.10	0.26
austria	544	0.00	0.40	0.30	0.56
bangladesh	186	0.00	0.09	0.26	1.02
brazil	321	-0.03	0.06	-0.06	0.29
bulgaria	130	-0.06	0.12	-0.03	0.30
cameroon	343	0.00	0.00	-0.09	0.20
canada	439	0.02	0.05	0.18	0.57
chile	294	0.01	0.23	0.11	0.32
china	264	0.00	0.12	-0.02	0.34
colombia	484	0.06	0.29	0.14	0.33
czechrep	99	0.18	0.35	0.18	0.26
denmark	694	0.22	0.88	0.58	0.86
dominican	440	0.10	0.79	0.40	0.92
ecuador	418	0.01	0.35	0.17	0.69
egypt	308	-0.23	0.09	-0.08	0.62
estonia	120	0.14	0.28	0.12	0.28
ethiopia	140	-0.35	-0.13	-0.31	0.19
finland	444	0.03	0.59	0.39	0.70
france	703	0.42	1.03	0.72	0.94
germany	738	0.39	0.99	0.70	0.94
ghana	216	0.00	0.01	0.03	0.76
hungary	144	0.17	0.48	0.27	0.48
india	489	0.04	0.18	0.12	0.35
indonesia	349	0.02	0.24	0.13	0.41
ireland	682	0.24	0.94	0.62	0.92
italy	700	0.42	1.03	0.72	0.95
japan	466	0.65	1.58	1.11	1.34
kenya	305	-0.03	0.00	-0.05	0.26
korea	385	1.16	2.00	1.44	1.49
latvia	132	0.10	0.55	0.21	0.46
lithuania	132	0.11	0.38	0.20	0.51
madagascar	319	-0.12	0.00	-0.25	0.34
malaysia	169	-0.03	0.00	0.11	0.46

mexico	390	0.04	0.33	0.16	0.55
mozambique	227	-0.44	0.00	-0.31	0.49
netherlands	734	0.39	0.99	0.69	0.93
newzealand	484	0.04	0.23	0.16	0.28
nicaragua	167	-0.05	0.23	0.00	0.34
nigeria	396	0.00	0.63	0.33	1.02
norway	452	2.44	3.55	2.56	1.81
pakistan	256	0.05	0.46	0.27	0.74
philippines	344	0.13	0.41	0.20	0.39
poland	120	0.18	0.34	0.20	0.28
portugal	675	0.00	0.52	0.21	0.71
romania	169	0.25	0.68	0.40	0.57
rsa	585	0.00	0.14	0.05	0.28
russia	156	0.02	0.40	0.08	0.40
senegal	167	0.00	0.01	-0.05	0.39
slovakia	143	0.17	0.43	0.21	0.26
slovenia	120	0.77	1.01	0.76	0.43
spain	701	0.00	0.53	0.33	0.74
srilanka	260	-0.05	0.40	0.24	1.06
sudan	440	-0.22	0.08	-0.09	0.50
sweden	469	0.22	0.78	0.58	1.24
switzerland	546	2.29	3.05	2.43	2.10
tanzania	464	-0.34	0.00	-0.27	0.51
thailand	287	-0.04	0.14	0.00	0.22
turkey	559	0.07	0.43	0.15	0.56
uganda	479	0.00	0.00	-0.03	0.29
uk	687	0.32	0.95	0.71	1.15
ukraine	165	-0.05	0.16	0.04	0.53
us	440	0.02	0.25	0.21	0.40
vietnam	99	0.00	0.22	0.11	0.54
zambia	408	-0.32	0.00	-0.32	0.34
zimbabwe	345	-0.41	-0.13	-0.35	0.37
Total	24791	0.03	0.47	0.36	0.97

[a] p50 refers to median and p75 to the 75th percentile.

Source: Authors' calculations, based on NRAs estimates compiled by Anderson and Valenzuela (2008).

Appendix Table A2: Descriptive statistics for output-based NRAs, pooled across all covered farm products and years, by trade status,[a] 1961 to 2004

Stat	Country	M	X	Country	M	X	Country	M	X
mean	argentina	.	-0.16	hungary	0.46	0.22	portugal	0.17	0.43
s.d.	.	0.14	0.14		0.59	0.43		0.69	0.79
N		0	204		27	117		574	101
mean	australia	0.12	0.07	india	0.37	-0.08	romania	0.63	0.00
s.d.		0.37	0.14		0.45	0.28		0.58	0.24
N		345	623		154	144		108	61
mean	austria	0.34	0.17	indonesia	0.33	-0.06	russia	0.16	-0.22
s.d.	.	0.61	0.27		0.46	0.22		0.41	0.19
N		417	127		171	178		123	33
mean	bangladesh	0.68	-0.23	ireland	0.58	0.70	senegal	0.30	-0.27
s.d.		1.31	0.16		0.86	1.03		0.53	0.23
N		93	62		473	209		44	79
mean	brazil	0.04	-0.12	italy	0.64	0.95	slovakia	0.28	0.14
s.d.	.	0.31	0.26		0.85	1.17		0.22	0.27
N		109	212		517	183		71	72
mean	bulgaria	0.09	-0.12	japan	1.13	0.31	slovenia	0.70	0.87
s.d.	.	0.36	0.20		1.35	0.10		0.44	0.37
N		56	74		457	9		80	40
mean	cameroon	.	-0.19	kenya	-0.02	-0.06	spain	0.34	0.27
s.d.		.	0.25		0.39	0.17		0.75	0.68
N		0	167		93	151		542	159
mean	canada	0.04	0.23	korea	1.45	1.30	srilanka	0.71	-0.18
s.d.	.	0.08	0.66		1.51	1.28		1.38	0.21
N		116	323		361	24		124	136
mean	chile	0.13	0.07	latvia	0.31	0.06	sudan	0.11	-0.18
s.d.	.	0.37	0.16		0.44	0.45		0.64	0.38
N		206	88		80	52		142	298
mean	china	0.16	-0.16	lithuania	0.30	0.12	sweden	0.69	0.40
s.d.	.	0.36	0.25		0.51	0.50		1.52	0.46
N		119	145		59	73		292	177
mean	colombia	0.23	0.09	madagascar	-0.07	-0.36	switzerland	2.40	2.58
s.d.		0.29	0.39		0.23	0.35		1.78	3.21
N		232	190		46	214		451	95
mean	czechrep	0.32	0.13	malaysia	0.64	-0.07	tanzania	-0.18	-0.46
s.d.	.	0.20	0.26		0.65	0.07		0.57	0.54
N		28	71		44	125		116	232
mean	denmark	0.51	0.73	mexico	0.25	-0.24	thailand	0.14	-0.03
s.d.	.	0.72	1.07		0.55	0.33		0.29	0.19

N		464	230		312	78		56	231
					-				
mean	dominicanrepublic	0.90	-0.08	mozambique	0.18	-0.47	turkey	0.46	-0.01
s.d.		1.01	0.57		0.54	0.36		0.67	0.42
N		210	186		127	100		197.00	362.00
mean	ecuador	0.38	-0.13	netherlands	0.60	0.97	uganda	0.31	-0.23
s.d.	.	0.79	0.34		0.83	1.15		0.27	0.32
N		246	172		549	185		82	177
mean	egypt	0.02	-0.33	newzealand	0.32	0.09	uk	0.65	0.94
s.d.	.	0.68	0.34		0.39	0.16		1.14	1.18
N		218	90		156	328		565	122
mean	estonia	0.16	-0.03	nicaragua	0.14	-0.11	us	0.92	0.13
s.d.		0.27	0.27		0.31	0.33		0.67	0.25
N		90	30		79	88		44	396
mean	ethiopia	.	-0.42	nigeria	0.90	-0.23	vietnam	0.95	-0.06
s.d.		.	0.14		1.16	0.71		0.75	0.27
N		0	92		179	129		17	82
mean	finland	0.41	0.36	norway	2.56	2.56	zambia	-0.37	-0.45
s.d.		0.69	0.72		1.82	0.94		0.37	0.28
N		284	160		449	3		167	153
mean	france	0.64	0.96	pakistan	0.48	-0.09	zimbabwe	-0.28	-0.46
s.d.		0.84	1.15		0.84	0.22		0.52	0.24
N		516	187		162	94		97	204
mean	germany	0.60	0.99	philippines	0.28	0.07			
s.d.		0.83	1.17		0.32	0.48	**Total**	**0.59**	**0.11**
N		561	177		221	123		**1.10**	**0.77**
mean	ghana	0.33	-0.38	poland	0.31	0.07		**13286**	**9929**
s.d.		1.11	0.31		0.26	0.26			
N		84	57		65	55			

[a] M=Import goods; X= Export goods.

Source: Authors' calculations based on NRAs estimates in Anderson and Valenzuela (2008).

Appendix Table A3: Panel ANOVA for *level* NRAs, 1960 to 2004

		IMPORT GOODS							EXPORT GOODS						
					Standard Deviation							Standard Deviation			
	COUNTRY	N	k	T=N/k	Within	Between	Overall	W/B	N	k	T=N/k	Within	Between	Overall	W/B
	FullSample	14862	43	346	0.98	0.56	1.05	1.74	11505	58	198	0.57	0.47	0.72	1.22
1	argentina	0	0	.	.	.	.	.	204	6	34	0.13	0.09	0.14	1.48
2	australia	433	12	36	0.29	0.27	0.37	1.06	711	20	36	0.15	0.11	0.19	1.34
3	austria	417	18	23	0.42	0.45	0.61	0.93	127	7	18	0.09	0.32	0.27	0.28
4	bangladesh	124	4	31	0.82	0.96	1.17	0.86	93	3	31	0.12	0.16	0.18	0.72
5	bulgaria	56	8	7	0.31	0.22	0.36	1.42	74	9	8	0.15	0.15	0.20	0.98
6	brazil	109	5	22	0.27	0.16	0.31	1.63	212	8	27	0.22	0.14	0.26	1.56
7	canada	116	4	29	0.07	0.03	0.08	2.48	323	8	40	0.43	0.51	0.66	0.85
8	switzerland	451	13	35	0.81	1.86	1.78	0.44	95	4	24	1.57	2.79	3.21	0.56
9	chile	206	5	41	0.32	0.19	0.37	1.67	88	2	44	0.16	0.00	0.16	38.45
10	china	119	6	20	0.29	0.28	0.36	1.04	145	7	21	0.22	0.11	0.25	2.03
11	cameroon	176	4	44	0.00	0.00	0.00	.	343	8	43	0.15	0.14	0.20	1.04
12	colombia	294	9	33	0.24	0.14	0.28	1.69	252	10	25	0.30	0.20	0.34	1.50
13	czechrep	28	7	4	0.13	0.20	0.20	0.65	71	9	8	0.15	0.25	0.26	0.58
14	germany	561	18	31	0.61	0.92	0.83	0.66	177	5	35	0.79	0.91	1.17	0.86
15	denmark	464	14	33	0.56	0.48	0.72	1.16	230	10	23	0.74	0.75	1.07	0.99
16	dominican	254	6	42	0.76	0.66	0.98	1.15	230	7	33	0.37	0.39	0.51	0.95
17	ecuador	246	8	31	0.59	0.52	0.79	1.13	172	8	22	0.27	0.28	0.34	0.96
18	egypt	218	5	44	0.65	0.20	0.68	3.21	90	3	30	0.33	0.19	0.34	1.77
19	spain	542	16	34	0.53	0.55	0.75	0.97	159	9	18	0.46	0.51	0.68	0.89
20	estonia	90	10	9	0.24	0.13	0.27	1.80	30	7	4	0.20	0.19	0.27	1.03
21	ethiopia	48	2	24	0.06	0.04	0.07	.	140	6	23	0.10	0.18	0.19	0.53

22	finland	284	17	17	0.49	0.42	0.69	1.17	160	8	20	0.43	0.63	0.72	0.69
23	france	516	15	34	0.63	0.55	0.84	1.14	187	12	16	0.77	0.75	1.15	1.02
24	uk	565	18	31	0.82	1.04	1.14	0.78	122	5	24	0.89	0.81	1.18	1.09
25	ghana	159	4	40	0.80	0.22	0.82	3.65	132	4	33	0.15	0.25	0.28	0.62
26	hungary	27	6	5	0.40	0.48	0.59	0.83	117	12	10	0.24	0.39	0.43	0.62
27	indonesia	171	6	29	0.28	0.39	0.46	0.73	178	7	25	0.22	0.08	0.22	2.74
28	india	345	13	27	0.25	0.23	0.34	1.13	335	12	28	0.18	0.12	0.21	1.50
29	ireland	473	14	34	0.66	0.54	0.86	1.24	209	9	23	0.86	0.58	1.03	1.49
30	italy	517	16	32	0.64	0.87	0.85	0.73	183	9	20	0.78	0.88	1.17	0.88
31	japan	457	14	33	0.89	0.94	1.35	0.95	9	3	3	0.01	0.13	0.10	.
32	kenya	154	4	39	0.31	0.11	0.33	2.87	212	5	42	0.17	0.06	0.18	2.80
33	korea	361	10	36	0.98	1.53	1.51	0.64	24	6	4	0.69	1.13	1.28	0.61
34	srilanka	124	4	31	1.32	0.42	1.38	3.12	136	5	27	0.19	0.32	0.21	0.57
35	lithuania	59	8	7	0.28	0.46	0.51	0.62	73	10	7	0.31	0.46	0.50	0.68
36	latvia	80	11	7	0.29	0.33	0.44	0.90	52	10	5	0.33	0.40	0.45	0.82
37	madagascar	105	4	26	0.14	0.07	0.15	1.88	273	8	34	0.24	0.25	0.34	0.98
38	mexico	312	12	26	0.39	0.40	0.55	0.96	78	3	26	0.27	0.24	0.33	1.14
39	mozambique	127	5	25	0.48	0.29	0.54	1.68	100	6	17	0.33	0.24	0.36	1.39
40	malaysia	44	1	44	0.65	.	0.65	.	125	3	42	0.05	0.05	0.07	1.09
41	nigeria	267	8	33	0.63	0.95	1.04	0.66	217	8	27	0.35	0.87	0.56	0.41
42	nicaragua	79	6	13	0.24	0.21	0.31	1.15	88	7	13	0.18	0.29	0.33	0.65
43	netherlands	549	14	39	0.61	0.68	0.83	0.89	185	9	21	0.77	0.68	1.15	1.13
44	norway	449	12	37	0.98	1.65	1.82	0.59	3	3	1	0.00	0.94	0.94	.
45	newzealand	156	5	31	0.24	0.33	0.39	0.75	328	11	30	0.10	0.17	0.16	0.59
46	pakistan	162	4	41	0.64	0.62	0.84	1.04	94	3	31	0.19	0.12	0.22	1.55
47	philippines	221	6	37	0.25	0.32	0.32	0.80	123	4	31	0.38	0.33	0.48	1.15
48	poland	65	10	7	0.13	0.24	0.26	0.53	55	9	6	0.20	0.17	0.26	1.13
49	portugal	574	17	34	0.60	0.38	0.69	1.59	101	6	17	0.58	0.56	0.79	1.03

50	romania	108	12	9	0.41	0.42	0.58	0.96	61	10	6	0.18	0.16	0.24	1.11
51	russia	123	12	10	0.33	0.28	0.41	1.16	33	6	6	0.16	0.12	0.19	1.31
52	sudan	142	6	24	0.60	0.58	0.64	1.04	298	7	43	0.32	0.21	0.38	1.55
53	senegal	88	2	44	0.37	0.21	0.40	1.76	123	3	41	0.18	0.16	0.23	1.12
54	slovakia	71	9	8	0.14	0.19	0.22	0.72	72	10	7	0.17	0.20	0.27	0.86
55	slovenia	80	8	10	0.28	0.35	0.44	0.80	40	5	8	0.25	0.30	0.37	.
56	sweden	292	16	18	0.62	1.24	1.52	0.50	177	8	22	0.25	0.40	0.46	0.63
57	thailand	56	4	14	0.26	0.31	0.29	0.86	231	8	29	0.15	0.13	0.19	1.13
58	turkey	197	7	28	0.54	0.45	0.67	1.18	362	13	28	0.32	0.35	0.42	0.92
59	tanzania	232	8	29	0.33	0.26	0.41	1.26	348	12	29	0.36	0.35	0.49	1.05
60	uganda	302	9	34	0.15	0.14	0.20	1.07	397	11	36	0.20	0.14	0.24	1.43
61	us	44	1	44	0.67	.	0.67	.	396	9	44	0.19	0.18	0.25	1.08
62	vietnam	17	2	9	0.66	0.75	0.75	.	82	5	16	0.22	0.17	0.27	1.30
63	zambia	255	9	28	0.28	0.24	0.34	1.15	241	8	30	0.20	0.22	0.31	0.90
64	zimbabwe	141	7	20	0.30	0.90	0.45	0.33	248	8	31	0.20	0.19	0.28	1.04

Source: Authors' calculations based on NRAs estimates in Anderson and Valenzuela (2008).

Appendix Table A4: Panel ANOVA for *Categorical* NRA measure: 1 (NRA>0), 0 (NRA=0) or -1 (NRA<0)

		IMPORT GOODS							EXPORT GOODS						
					Standard Deviation							Standard Deviation			
	COUNTRY	N	k	T=N/k	Within	Between	Overall	W/B	N	k	T=N/k	Within	Between	Overall	W/B
	FullSample	14862	43	346	0.74	0.36	0.78	2.07	11505	58	198	0.77	0.59	0.91	1.30
1	argentina	0	0	.	.	.	.	.	204	6	34	0.59	0.52	0.69	1.13
2	australia	433	12	36	0.44	0.33	0.55	1.31	711	20	36	0.47	0.33	0.53	1.42
3	austria	417	18	23	0.38	0.42	0.56	0.89	127	7	18	0.00	0.53	0.49	0.00
4	bangladesh	124	4	31	0.77	0.51	0.89	1.51	93	3	31	0.37	1.08	0.96	0.34
5	bulgaria	56	8	7	0.87	0.51	0.99	1.72	74	9	8	0.69	0.56	0.91	1.23
6	brazil	109	5	22	0.92	0.44	1.00	2.07	212	8	27	0.89	0.44	0.98	2.01
7	canada	116	4	29	0.30	0.47	0.50	0.64	323	8	40	0.21	0.37	0.41	0.57
8	switzerland	451	13	35	0.00	0.48	0.41	0.00	95	4	24	0.00	0.50	0.50	0.00
9	chile	206	5	41	0.87	0.48	0.96	1.83	88	2	44	0.91	0.03	0.91	28.21
10	china	119	6	20	0.80	0.71	0.94	1.12	145	7	21	0.62	0.35	0.70	1.78
11	cameroon	176	4	44	0.00	0.00	0.00	.	343	8	43	0.54	0.35	0.63	1.57
12	colombia	294	9	33	0.81	0.66	0.96	1.23	252	10	25	0.85	0.59	0.98	1.45
13	czechrep	28	7	4	0.00	0.76	0.38	0.00	71	9	8	0.62	0.71	0.94	0.87
14	germany	561	18	31	0.48	0.50	0.55	0.96	177	5	35	0.47	0.13	0.48	3.50
15	denmark	464	14	33	0.53	0.22	0.57	2.47	230	10	23	0.62	0.58	0.76	1.06
16	dominican	254	6	42	0.59	0.42	0.71	1.40	230	7	33	0.62	0.82	0.86	0.76
17	ecuador	246	8	31	0.87	0.38	0.94	2.26	172	8	22	0.74	0.71	0.89	1.04
18	egypt	218	5	44	0.91	0.33	0.96	2.80	90	3	30	0.68	0.18	0.68	3.72
19	spain	542	16	34	0.61	0.49	0.75	1.24	159	9	18	0.26	0.74	0.69	0.35
20	estonia	90	10	9	0.78	0.37	0.84	2.12	30	7	4	0.81	0.65	1.00	1.24
21	ethiopia	48	2	24	0.28	0.00	0.28	.	140	6	23	0.23	0.05	0.24	5.09

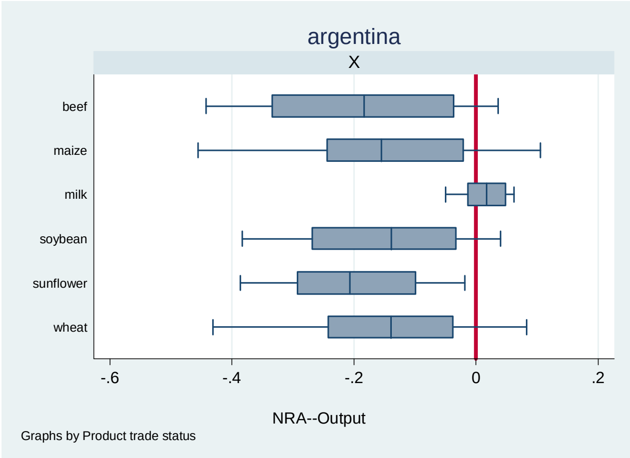
22	finland	284	17	17	0.44	0.42	0.63	1.04	160	8	20	0.40	0.46	0.58	0.86
23	france	516	15	34	0.50	0.27	0.57	1.84	187	12	16	0.47	0.57	0.51	0.83
24	uk	565	18	31	0.52	0.49	0.63	1.08	122	5	24	0.48	0.16	0.50	3.07
25	ghana	159	4	40	0.70	0.17	0.72	4.26	132	4	33	0.26	0.50	0.54	0.53
26	hungary	27	6	5	0.50	0.16	0.53	3.04	117	12	10	0.69	0.71	0.98	0.97
27	indonesia	171	6	29	0.79	0.36	0.84	2.19	178	7	25	0.92	0.62	0.96	1.48
28	india	345	13	27	0.43	0.33	0.56	1.31	335	12	28	0.77	0.35	0.84	2.20
29	ireland	473	14	34	0.51	0.21	0.55	2.37	209	9	23	0.58	0.38	0.64	1.54
30	italy	517	16	32	0.49	0.52	0.57	0.96	183	9	20	0.48	0.94	0.57	0.51
31	japan	457	14	33	0.46	0.23	0.52	1.95	9	3	3	0.00	0.00	0.00	.
32	kenya	154	4	39	0.80	0.30	0.84	2.68	212	5	42	0.76	0.25	0.78	3.05
33	korea	361	10	36	0.55	0.19	0.58	2.88	24	6	4	0.51	0.84	0.76	0.61
34	srilanka	124	4	31	0.69	0.18	0.71	3.93	136	5	27	0.53	0.87	0.61	0.60
35	lithuania	59	8	7	0.75	0.71	0.93	1.05	73	10	7	0.79	0.74	1.00	1.07
36	latvia	80	11	7	0.74	0.53	0.91	1.40	52	10	5	0.86	0.65	1.01	1.32
37	madagascar	105	4	26	0.63	0.29	0.68	2.20	273	8	34	0.58	0.37	0.68	1.57
38	mexico	312	12	26	0.85	0.51	0.98	1.67	78	3	26	0.76	0.47	0.85	1.62
39	mozambique	127	5	25	0.86	0.54	0.95	1.57	100	6	17	0.34	0.37	0.38	0.90
40	malaysia	44	1	44	0.69	.	0.69	.	125	3	42	0.39	0.19	0.41	2.08
41	nigeria	267	8	33	0.69	0.73	0.86	0.94	217	8	27	0.75	0.81	0.99	0.93
42	nicaragua	79	6	13	0.72	0.67	0.95	1.07	88	7	13	0.47	0.81	0.87	0.58
43	netherlands	549	14	39	0.48	0.54	0.55	0.89	185	9	21	0.47	0.13	0.49	3.56
44	norway	449	12	37	0.00	0.39	0.31	0.00	3	3	1	0.00	0.00	0.00	.
45	newzealand	156	5	31	0.46	0.36	0.57	1.28	328	11	30	0.34	0.30	0.47	1.14
46	pakistan	162	4	41	0.70	0.71	0.94	0.99	94	3	31	0.92	0.39	0.99	2.35
47	philippines	221	6	37	0.69	0.35	0.76	1.96	123	4	31	0.58	0.69	0.82	0.83
48	poland	65	10	7	0.39	0.42	0.48	0.93	55	9	6	0.70	0.59	0.93	1.19
49	portugal	574	17	34	0.73	0.46	0.83	1.59	101	6	17	0.50	0.56	0.75	0.89

50	romania	108	12	9	0.53	0.60	0.63	0.88	61	10	6	0.73	0.71	1.00	1.02
51	russia	123	12	10	0.84	0.62	0.98	1.36	33	6	6	0.67	0.39	0.73	1.71
52	sudan	142	6	24	0.97	0.49	1.00	1.99	298	7	43	0.69	0.49	0.82	1.40
53	senegal	88	2	44	0.57	0.42	0.65	1.37	123	3	41	0.49	0.46	0.62	1.06
54	slovakia	71	9	8	0.38	0.65	0.60	0.58	72	10	7	0.81	0.61	0.99	1.33
55	slovenia	80	8	10	0.22	0.06	0.22	3.66	40	5	8	0.00	0.00	0.00	.
56	sweden	292	16	18	0.37	0.61	0.78	0.61	177	8	22	0.51	0.36	0.61	1.43
57	thailand	56	4	14	0.83	0.87	0.97	0.95	231	8	29	0.76	0.60	0.95	1.28
58	turkey	197	7	28	0.80	0.33	0.86	2.40	362	13	28	0.81	0.73	1.00	1.12
59	tanzania	232	8	29	0.51	0.47	0.68	1.08	348	12	29	0.45	0.49	0.65	0.92
60	uganda	302	9	34	0.48	0.60	0.70	0.80	397	11	36	0.54	0.27	0.60	2.00
61	us	44	1	44	0.29	.	0.29	.	396	9	44	0.37	0.32	0.48	1.13
62	vietnam	17	2	9	0.00	0.00	0.00	.	82	5	16	0.83	0.56	0.97	1.47
63	zambia	255	9	28	0.54	0.42	0.67	1.28	241	8	30	0.36	0.41	0.57	0.87
64	zimbabwe	141	7	20	0.58	0.76	0.73	0.77	248	8	31	0.33	0.34	0.49	0.96

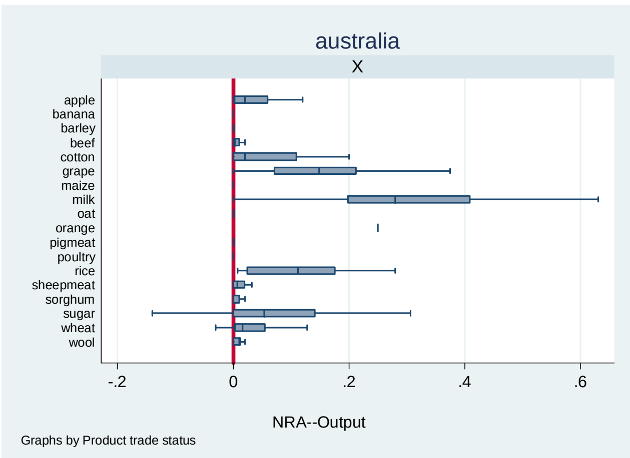
Source: Authors' calculations based on NRAs estimates in Anderson and Valenzuela (2008).

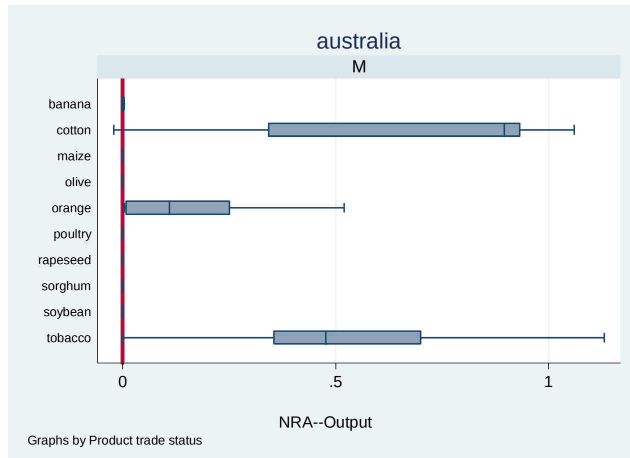
Appendix Figure A1:

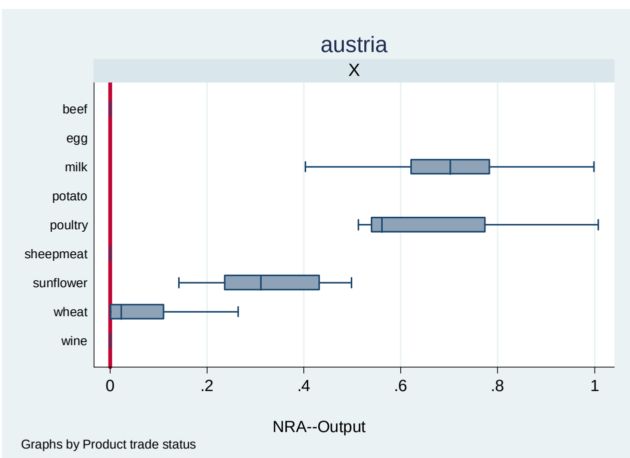
Distribution of agricultural product NRAs by trade status, selected countries, 1961 to 2004

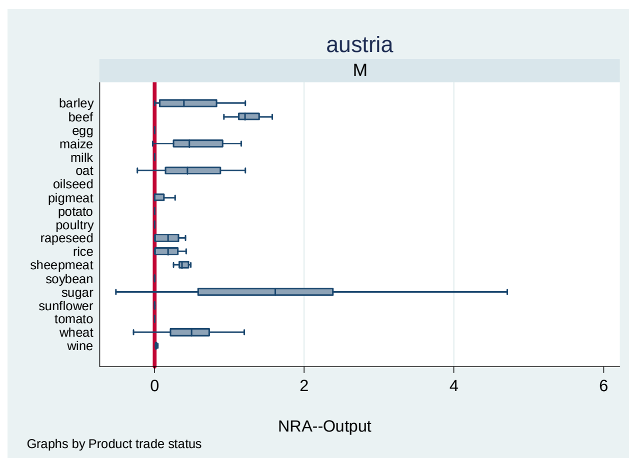


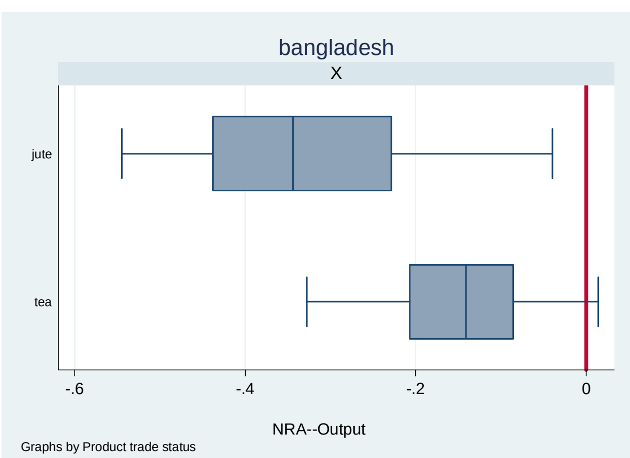
M not applicable

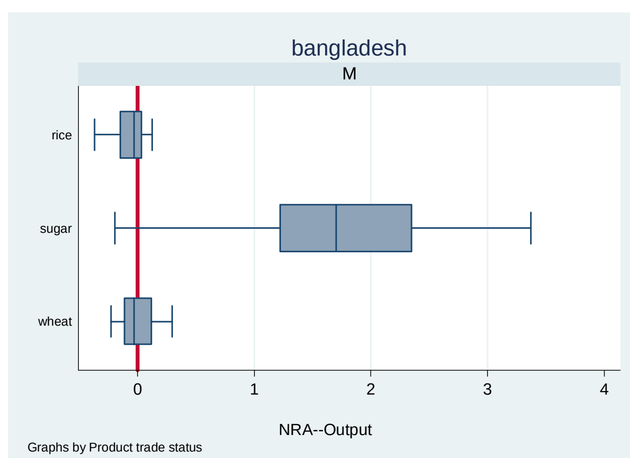


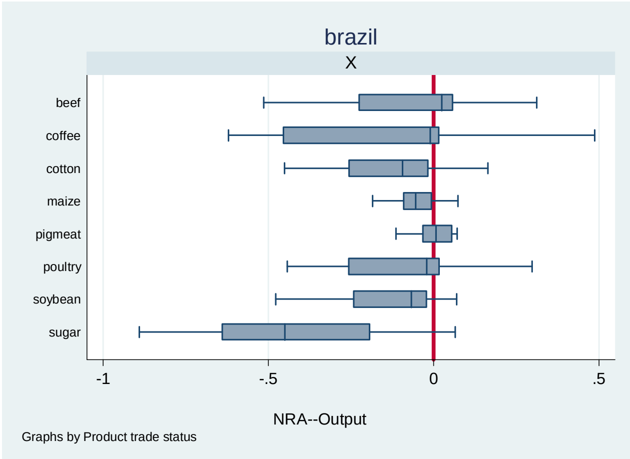


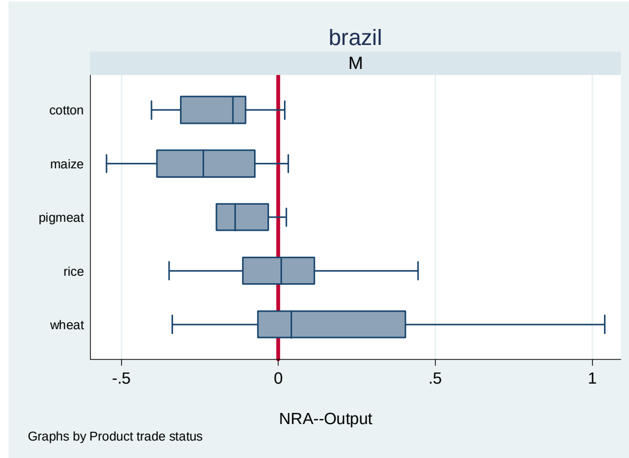


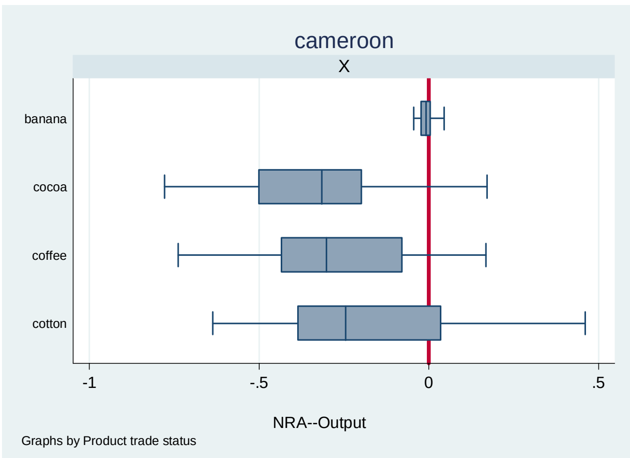




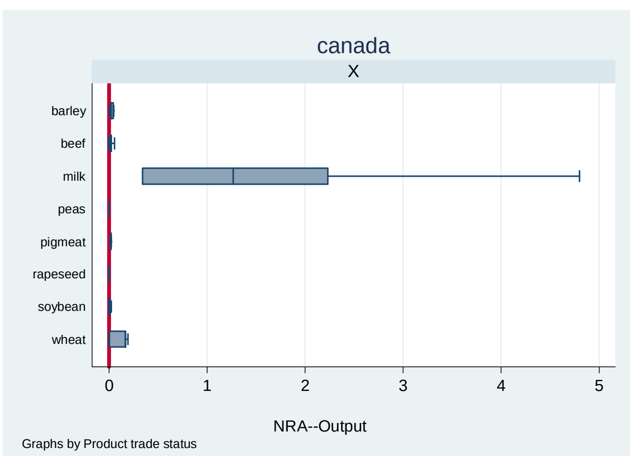


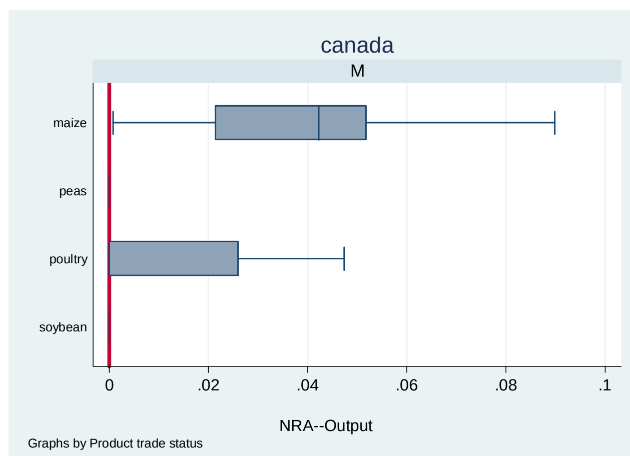


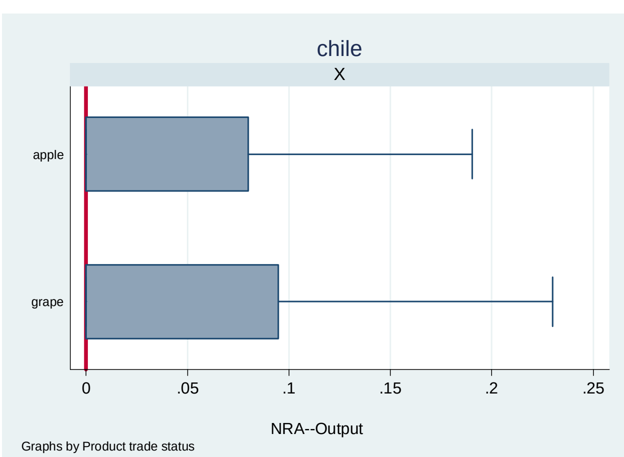


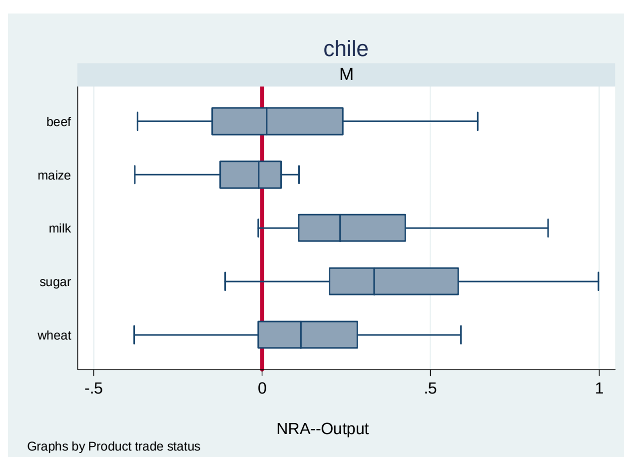


M not applicable

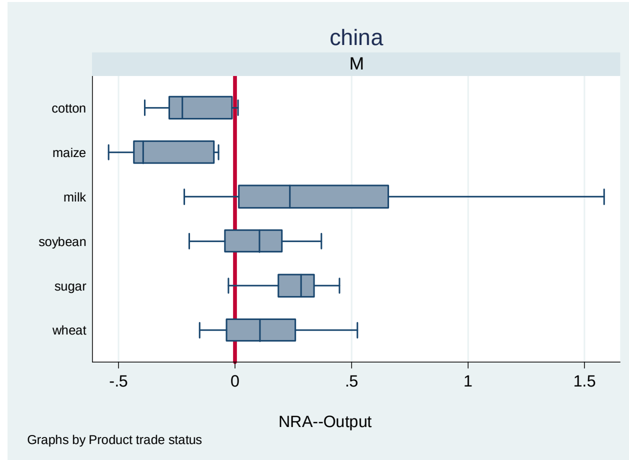


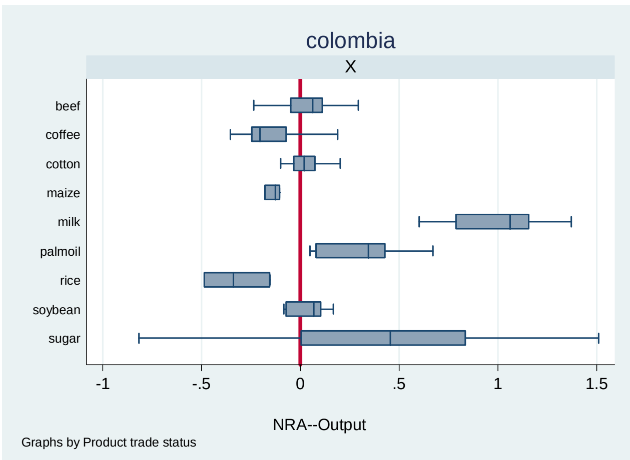


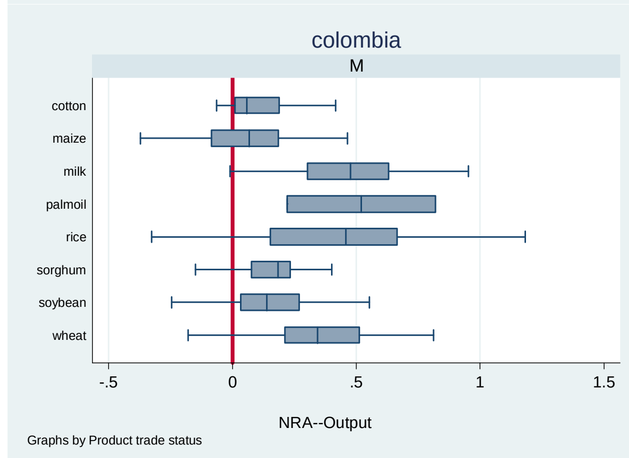


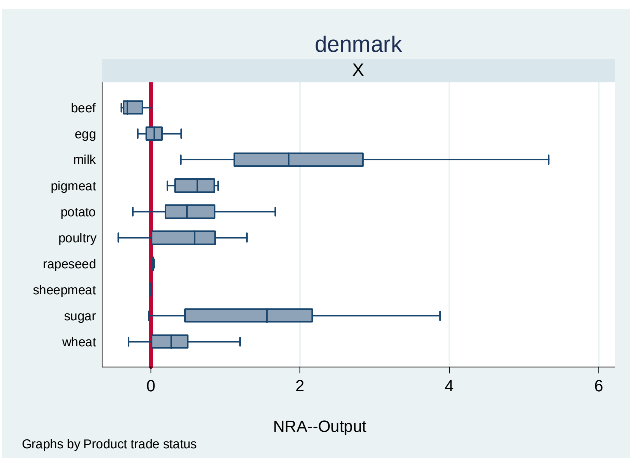


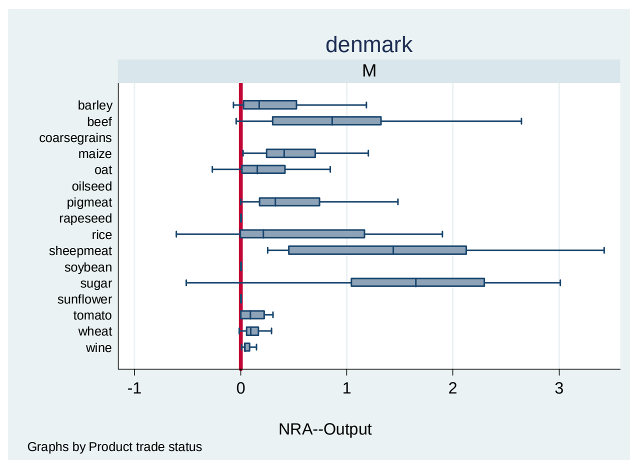
X not applicable

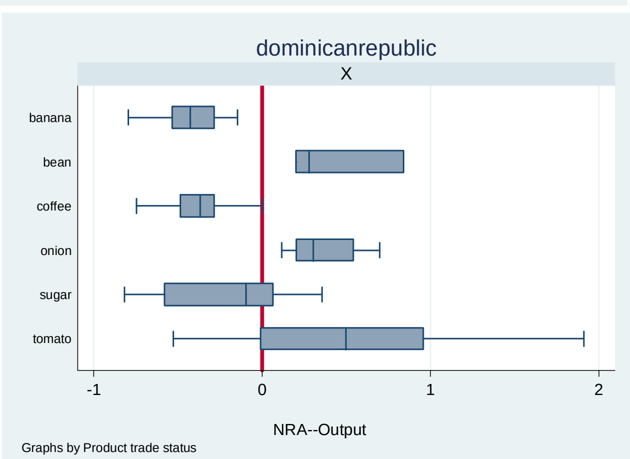


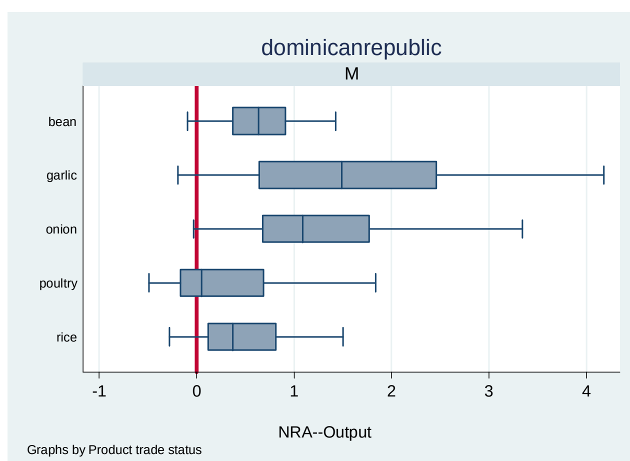


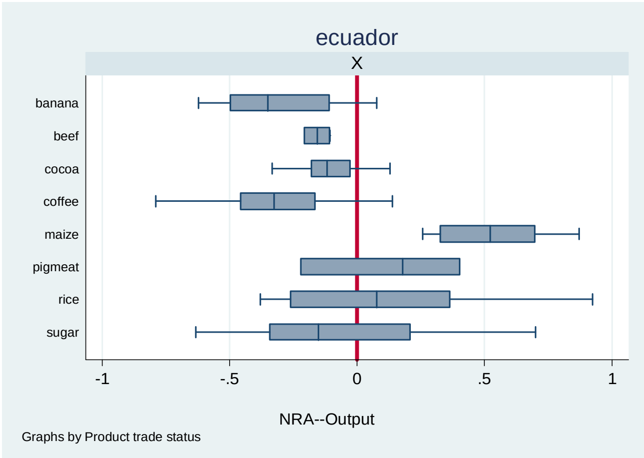


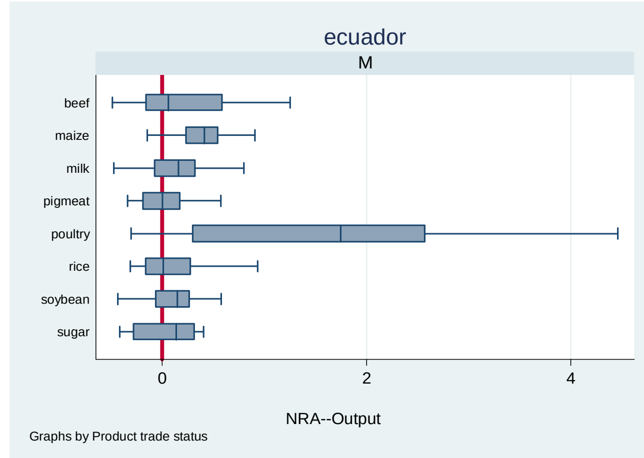


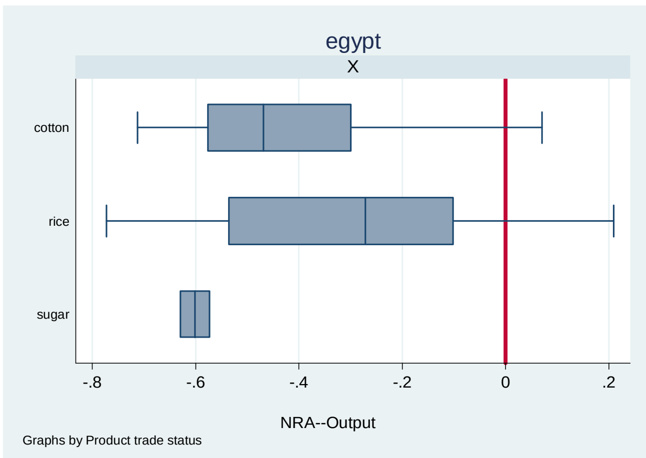


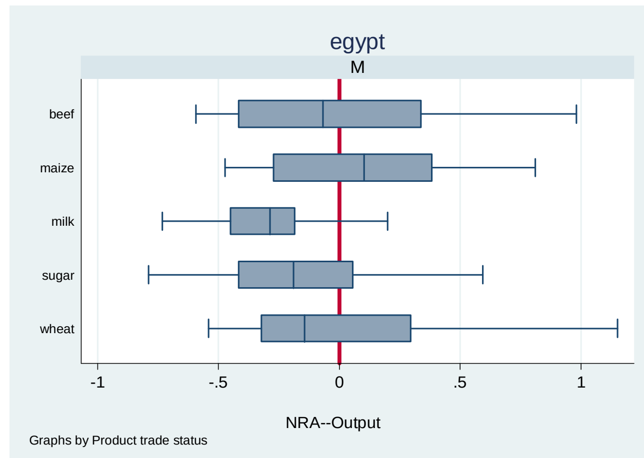


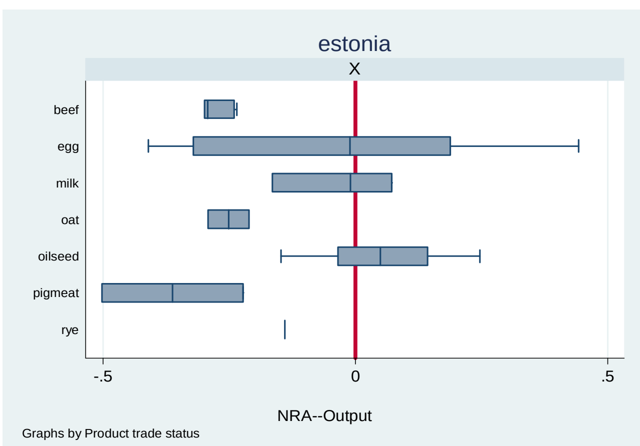


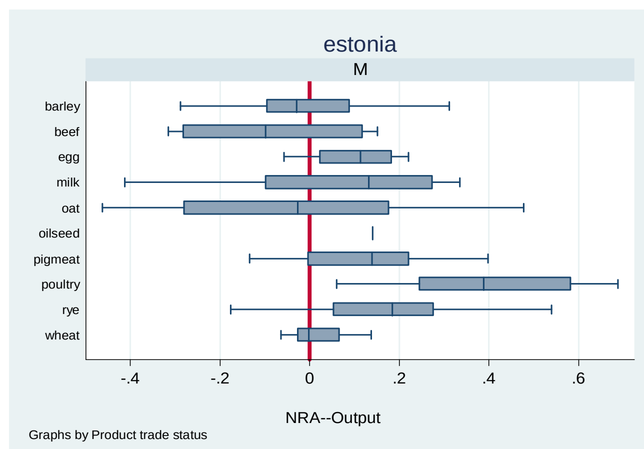

ecuador
X
banana
beef
cocoa
coffee
maize
pigmeat
rice
sugar
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

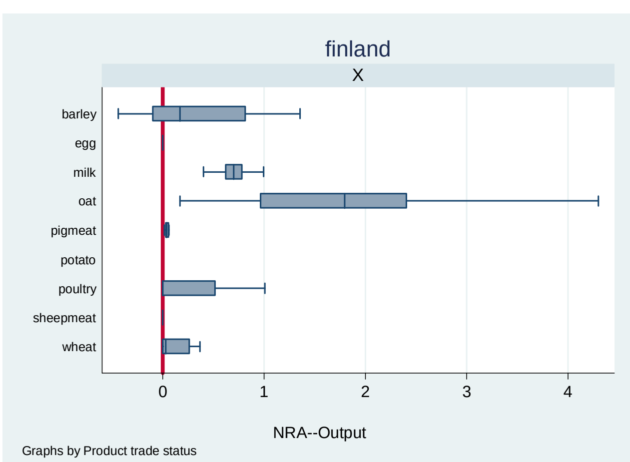

ecuador
M
beef
maize
milk
pigmeat
poultry
rice
soybean
sugar
0
2
4
NRA--Output
Graphs by Product trade status

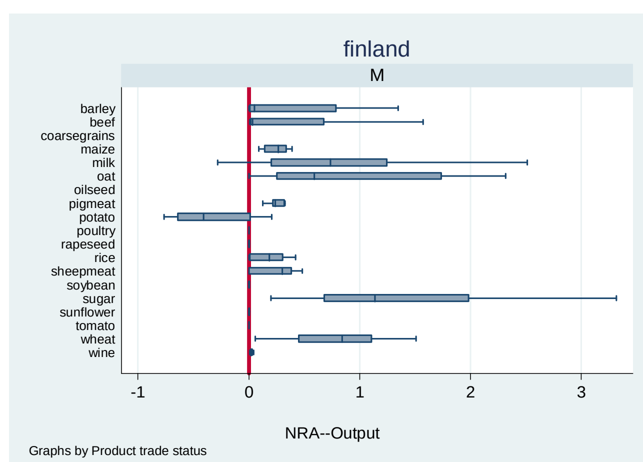

egypt
X
cotton
rice
sugar
-.8
-.6
-.4
-.2
0
.2
NRA--Output
Graphs by Product trade status

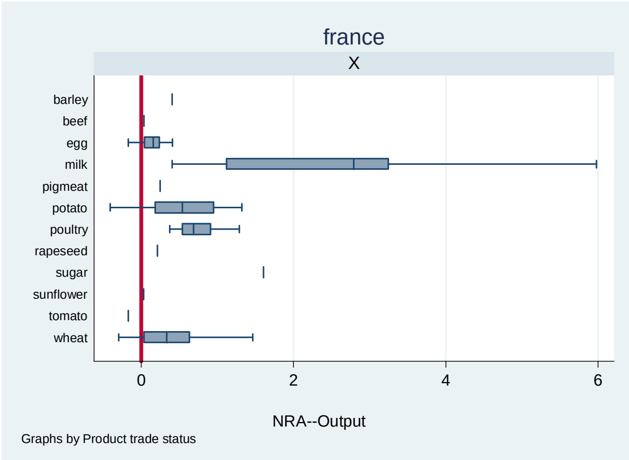

egypt
M
beef
maize
milk
sugar
wheat
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

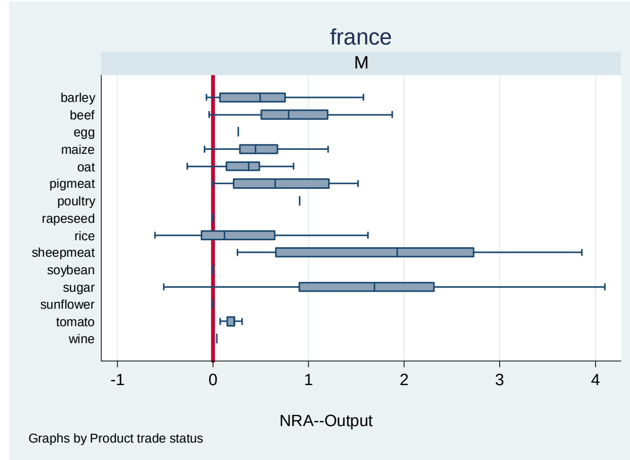

estonia
X
beef
egg
milk
oat
oilseed
pigmeat
rye
-.5
0
.5
NRA--Output
Graphs by Product trade status

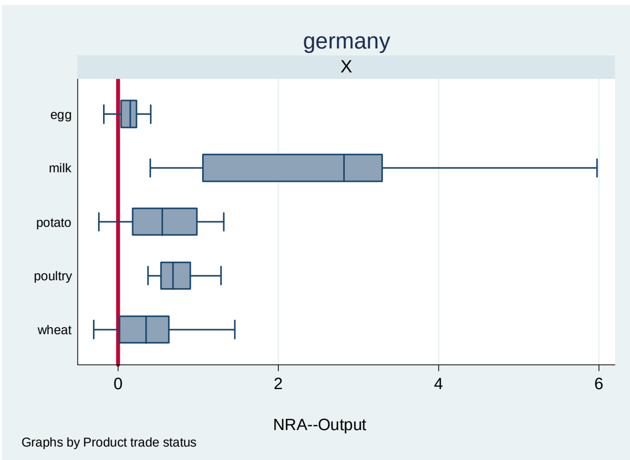

estonia
M
barley
beef
egg
milk
oat
oilseed
pigmeat
poultry
rye
wheat
-.4
-.2
0
.2
.4
.6
NRA--Output
Graphs by Product trade status

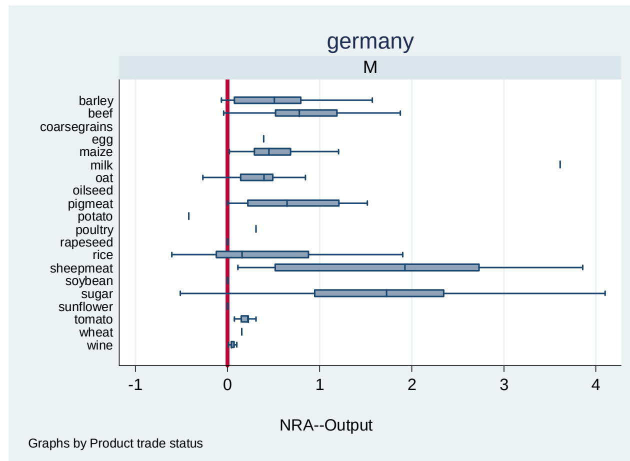

finland
X
barley
egg
milk
oat
pigmeat
potato
poultry
sheepmeat
wheat
0
1
2
3
4
NRA--Output
Graphs by Product trade status

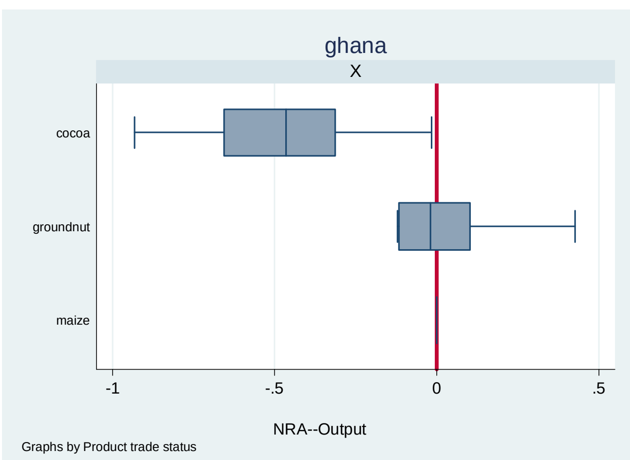

finland
M
barley
beef
coarsegrains
maize
milk
oat
oilseed
pigmeat
potato
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
wine
-1
0
1
2
3
NRA--Output
Graphs by Product trade status

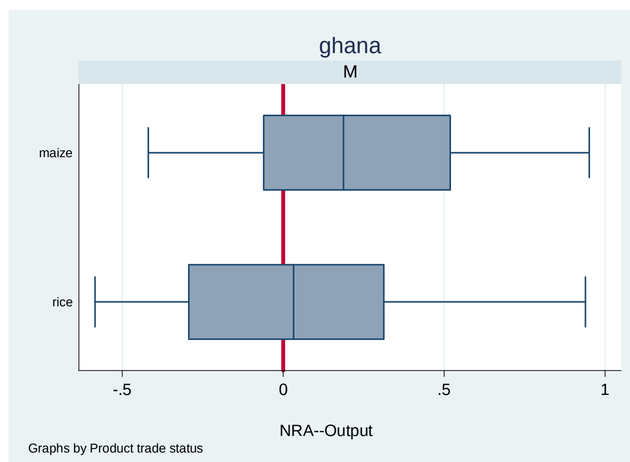

france
X
barley
beef
egg
milk
pigmeat
potato
poultry
rapeseed
sugar
sunflower
tomato
wheat
0
2
4
6
NRA--Output
Graphs by Product trade status

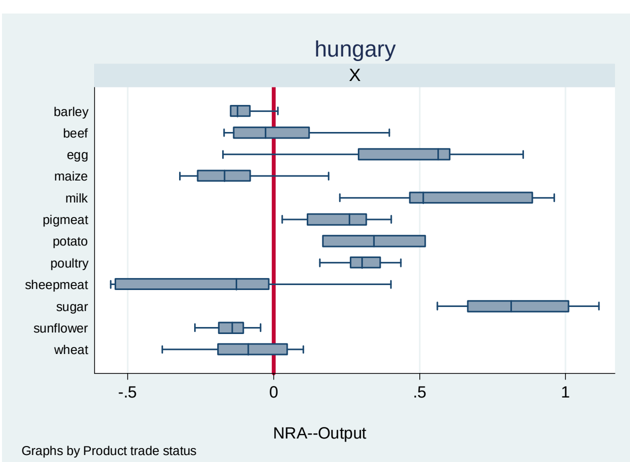

france
M
barley
beef
egg
maize
oat
pigmeat
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wine
-1
0
1
2
3
4
NRA--Output
Graphs by Product trade status

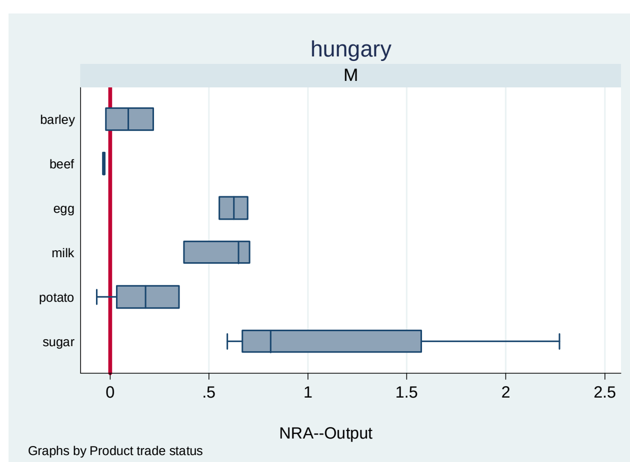

germany
X
egg
milk
potato
poultry
wheat
0
2
4
6
NRA--Output
Graphs by Product trade status

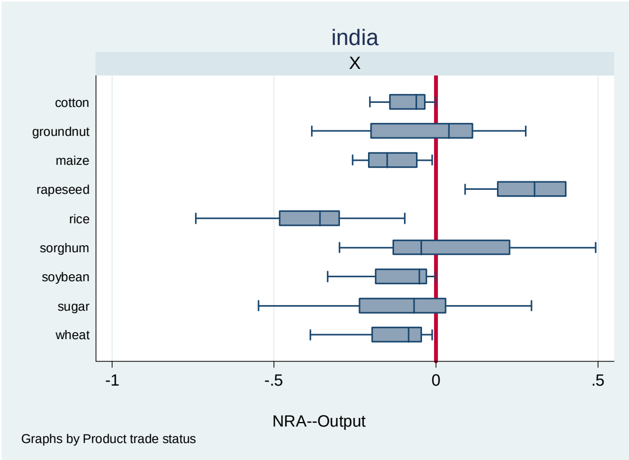

germany
M
barley
beef
coarsegrains
egg
maize
milk
oat
oilseed
pigmeat
potato
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
wine
-1
0
1
2
3
4
NRA--Output
Graphs by Product trade status

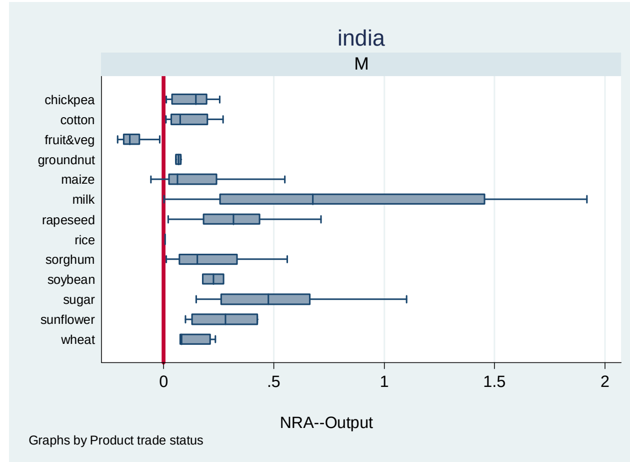

ghana
X
cocoa
groundnut
maize
-1
-.5
0
.5
NRA--Output
Graphs by Product trade status

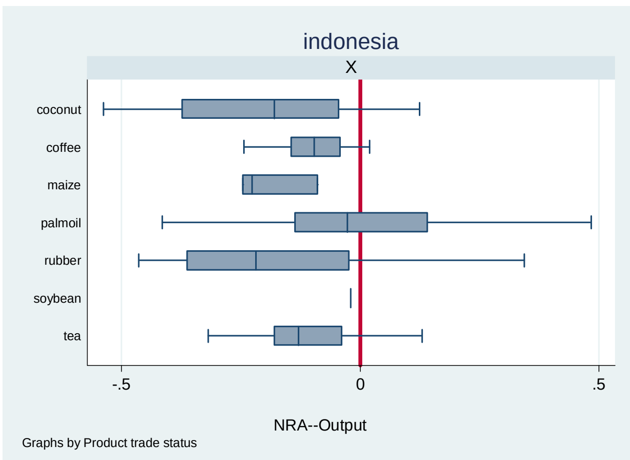

ghana
M
maize
rice
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

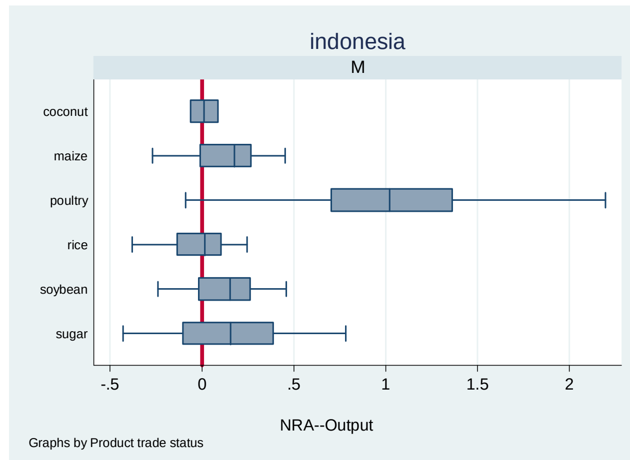

hungary
X
barley
beef
egg
maize
milk
pigmeat
potato
poultry
sheepmeat
sugar
sunflower
wheat
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

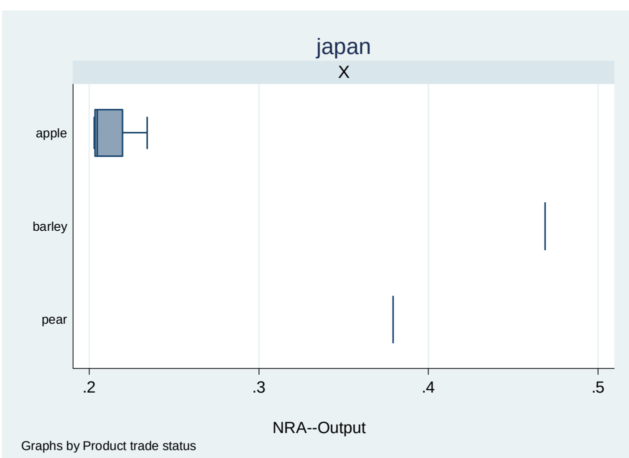

hungary
M
barley
beef
egg
milk
potato
sugar
0
.5
1
1.5
2
2.5
NRA--Output
Graphs by Product trade status

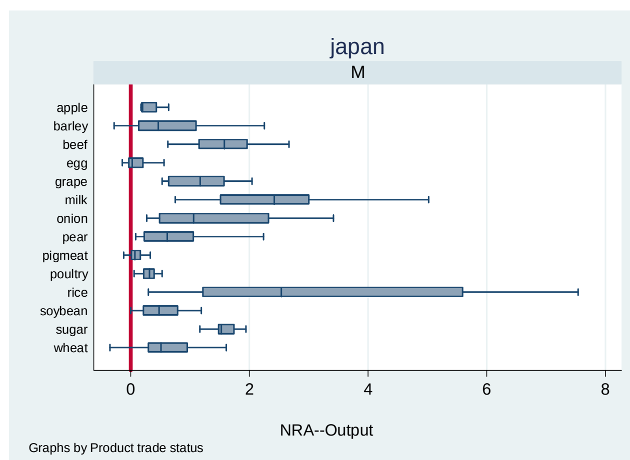

india
X
cotton
groundnut
maize
rapeseed
rice
sorghum
soybean
sugar
wheat
-1
-.5
0
.5
NRA--Output
Graphs by Product trade status

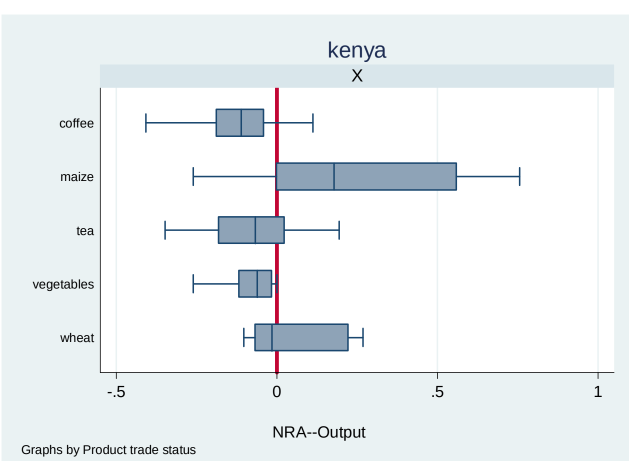

india
M
chickpea
cotton
fruit&veg
groundnut
maize
milk
rapeseed
rice
sorghum
soybean
sugar
sunflower
wheat
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

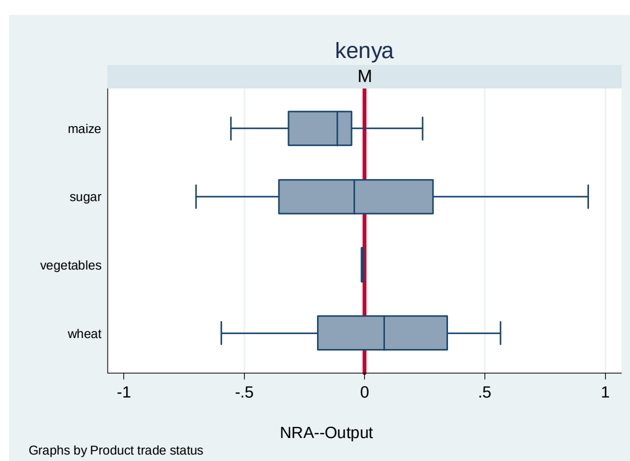

indonesia
X
coconut
coffee
maize
palmoil
rubber
soybean
tea
-.5
0
.5
NRA--Output
Graphs by Product trade status

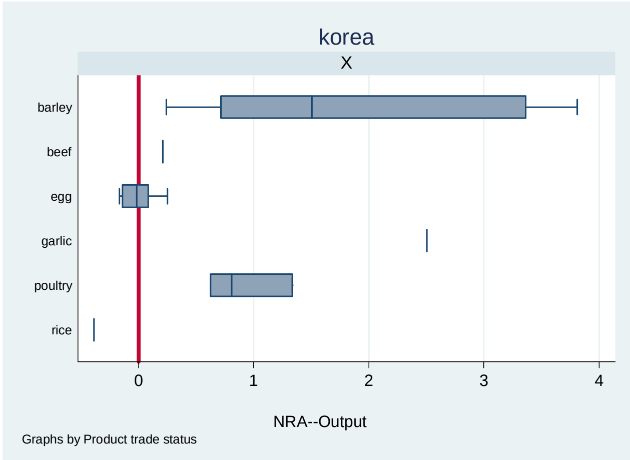

indonesia
M
coconut
maize
poultry
rice
soybean
sugar
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

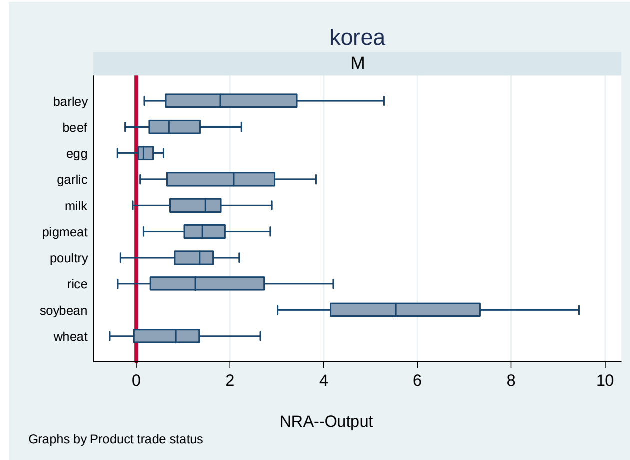

japan
X
apple
barley
pear
.2
.3
.4
.5
NRA--Output
Graphs by Product trade status

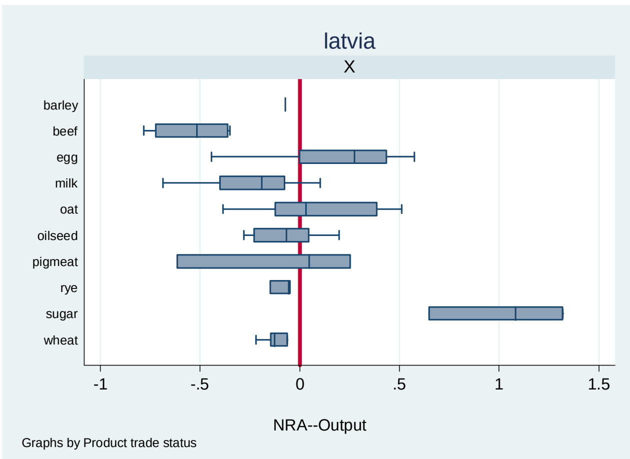

japan
M
apple
barley
beef
egg
grape
milk
onion
pear
pigmeat
poultry
rice
soybean
sugar
wheat
0
2
4
6
8
NRA--Output
Graphs by Product trade status

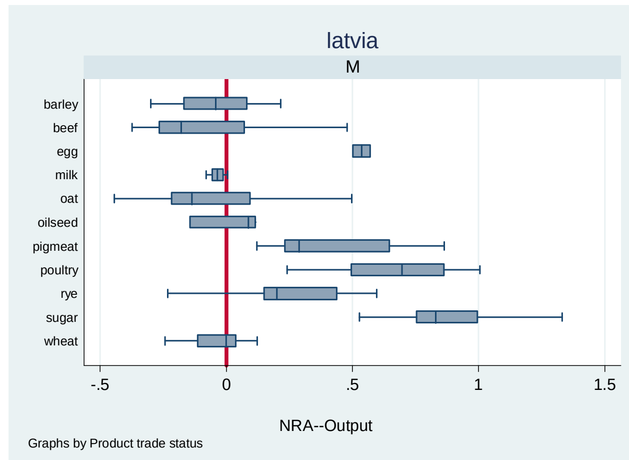

kenya
X
coffee
maize
tea
vegetables
wheat
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

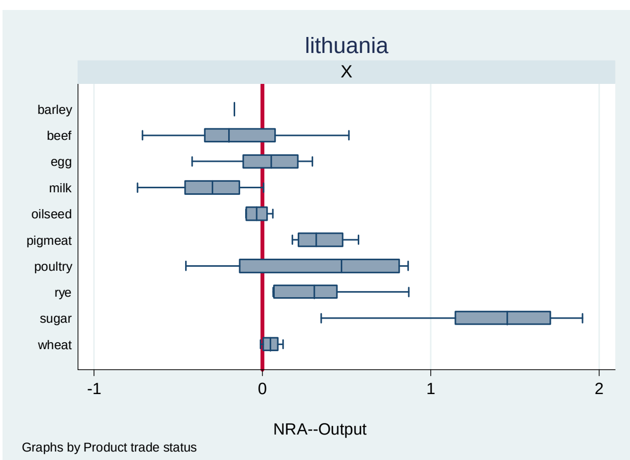

kenya
M
maize
sugar
vegetables
wheat
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

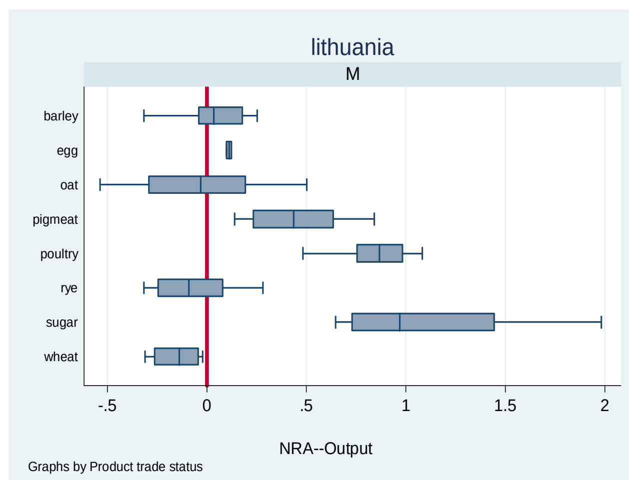

korea
X
barley
beef
egg
garlic
poultry
rice
0
1
2
3
4
NRA--Output
Graphs by Product trade status

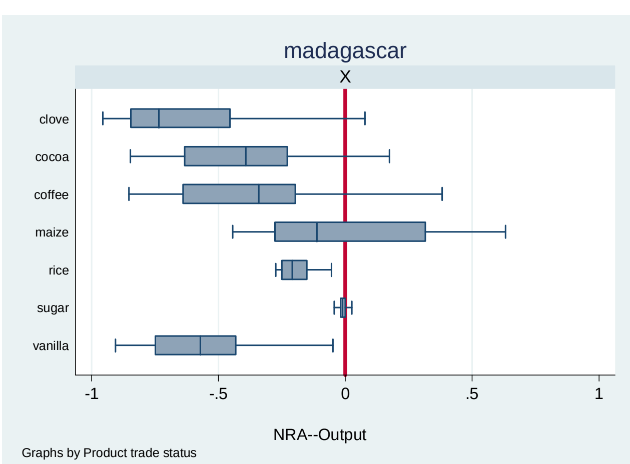

korea
M
barley
beef
egg
garlic
milk
pigmeat
poultry
rice
soybean
wheat
0
2
4
6
8
10
NRA--Output
Graphs by Product trade status

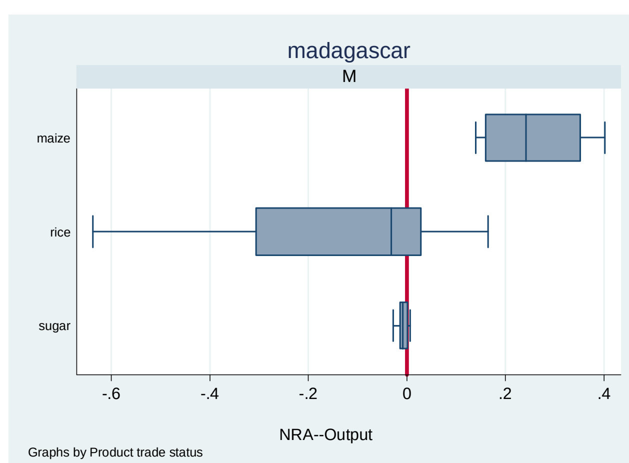

latvia
X
barley
beef
egg
milk
oat
oilseed
pigmeat
rye
sugar
wheat
-1
-.5
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

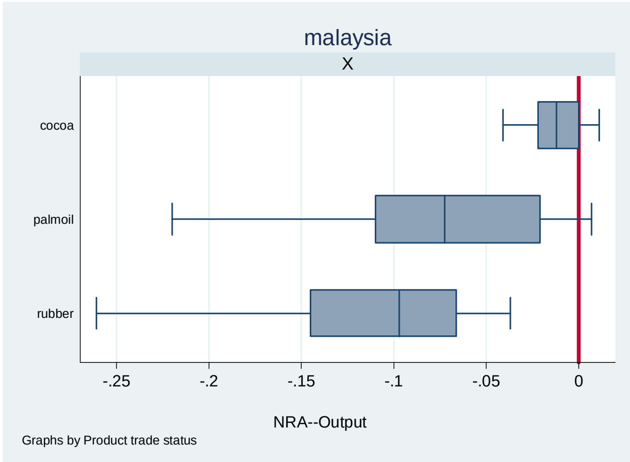

latvia
M
barley
beef
egg
milk
oat
oilseed
pigmeat
poultry
rye
sugar
wheat
-.5
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

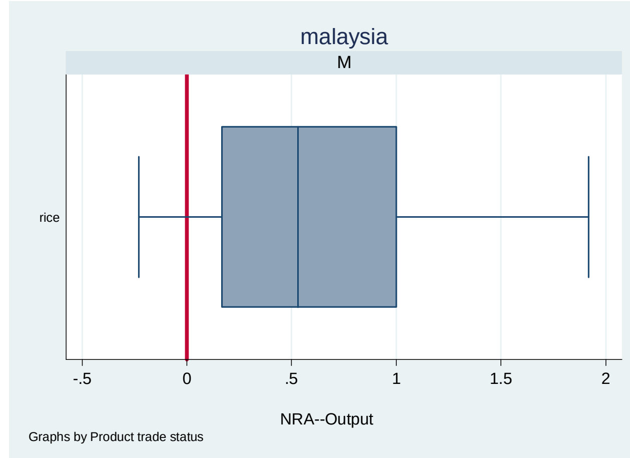

lithuania
X
barley
beef
egg
milk
oilseed
pigmeat
poultry
rye
sugar
wheat
-1
0
1
2
NRA--Output
Graphs by Product trade status

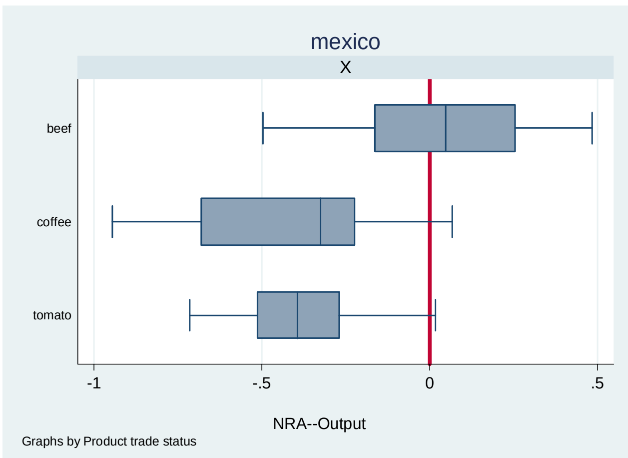

lithuania
M
barley
egg
oat
pigmeat
poultry
rye
sugar
wheat
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

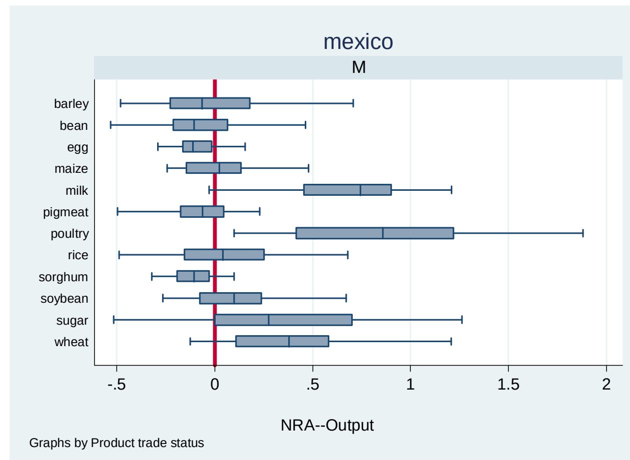

madagascar
X
clove
cocoa
coffee
maize
rice
sugar
vanilla
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

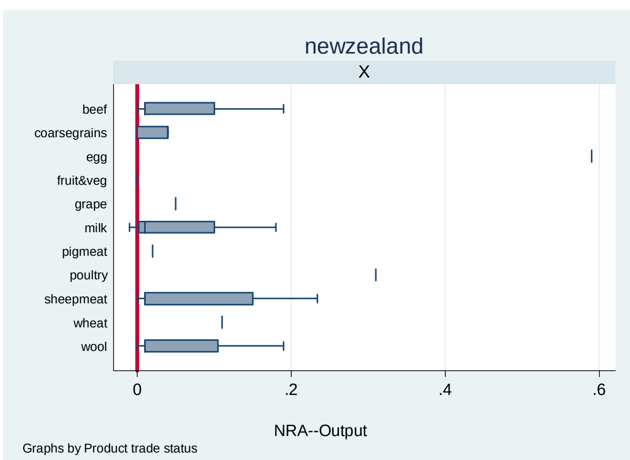

madagascar
M
maize
rice
sugar
-.6
-.4
-.2
0
.2
.4
NRA--Output
Graphs by Product trade status

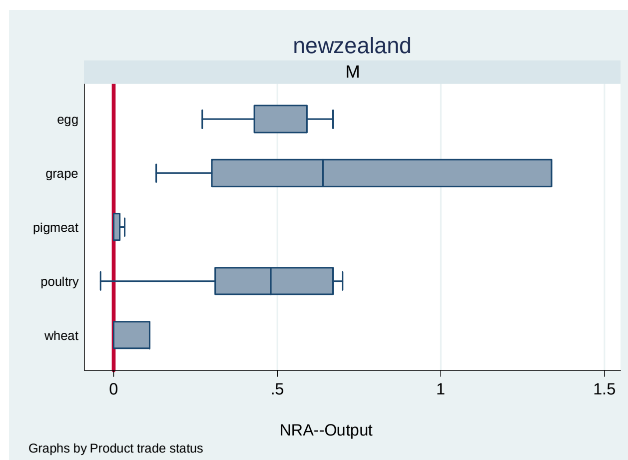

malaysia
X
cocoa
palmoil
rubber
-.25
-.2
-.15
-.1
-.05
0
NRA--Output
Graphs by Product trade status

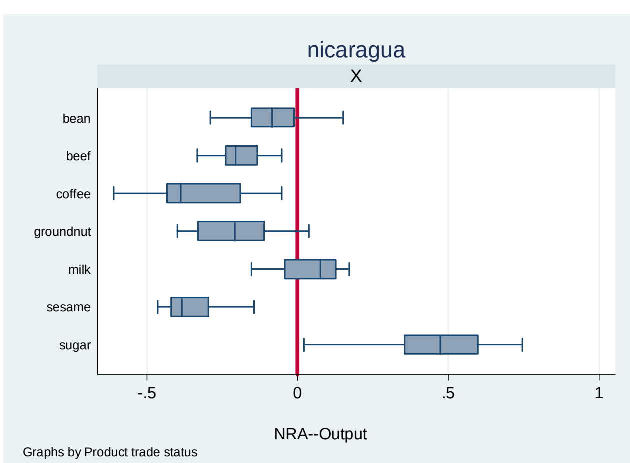

malaysia
M
rice
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

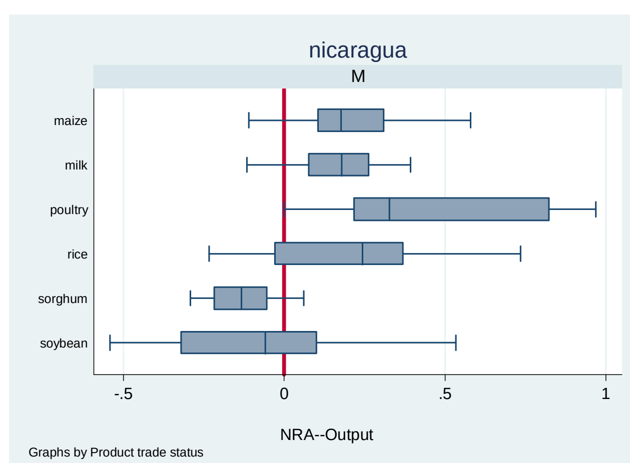

mexico
X
beef
coffee
tomato
-1
-.5
0
.5
NRA--Output
Graphs by Product trade status


mexico
M
barley
bean
egg
maize
milk
pigmeat
poultry
rice
sorghum
soybean
sugar
wheat
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

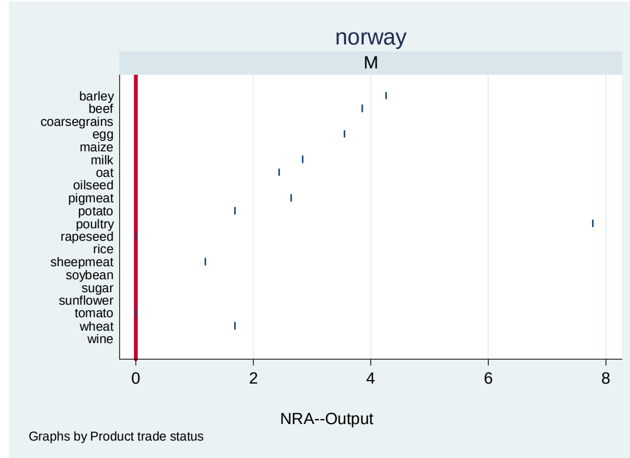

newzealand
X
beef
coarsegrains
egg
fruit&veg
grape
milk
pigmeat
poultry
sheepmeat
wheat
wool
0
.2
.4
.6
NRA--Output
Graphs by Product trade status

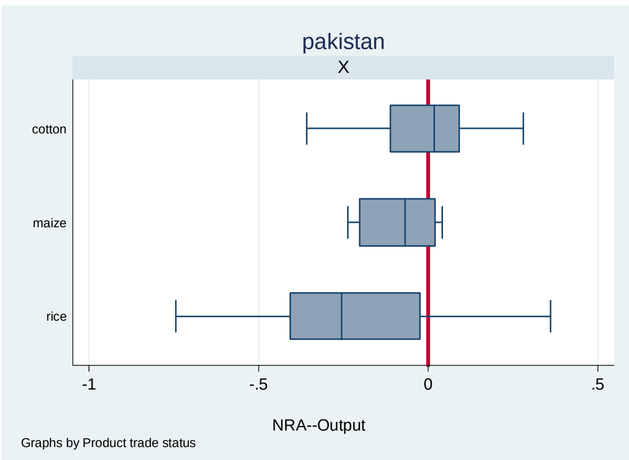

newzealand
M
egg
grape
pigmeat
poultry
wheat
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

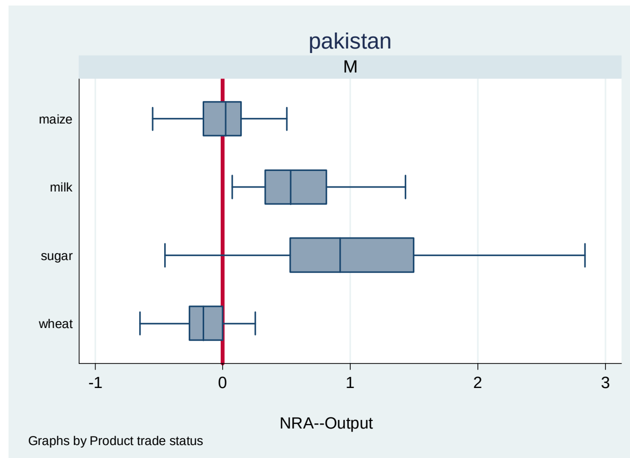

nicaragua
X
bean
beef
coffee
groundnut
milk
sesame
sugar
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

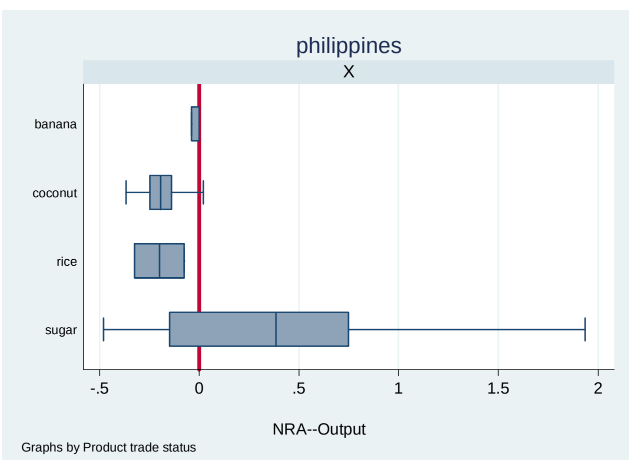

nicaragua
M
maize
milk
poultry
rice
sorghum
soybean
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

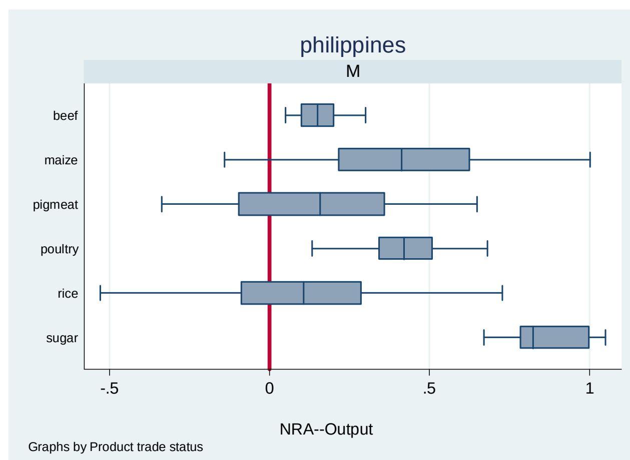
X not applicable

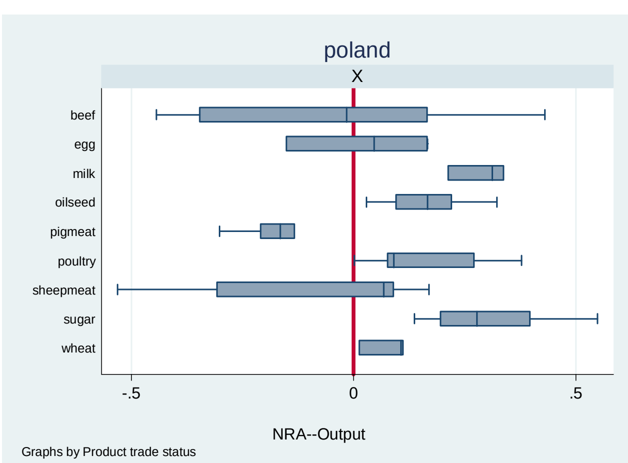


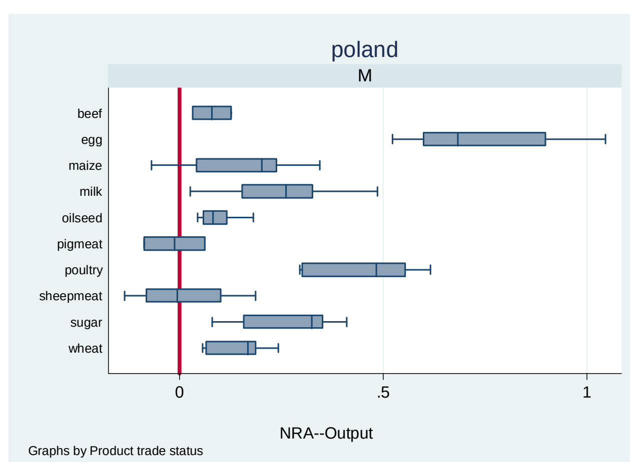


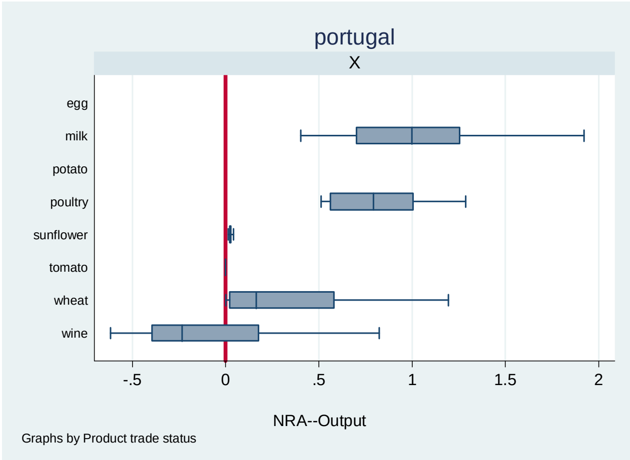


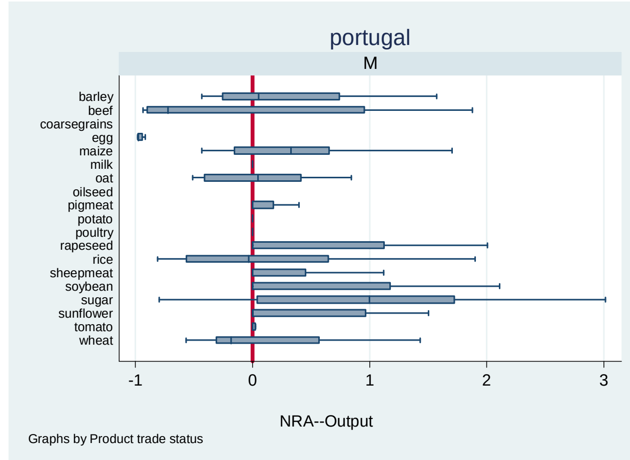


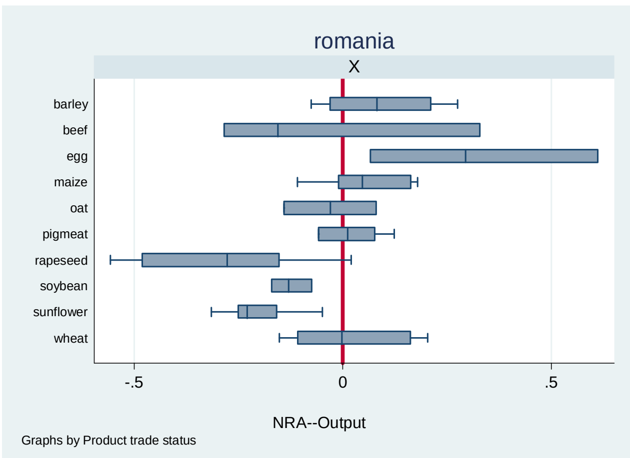


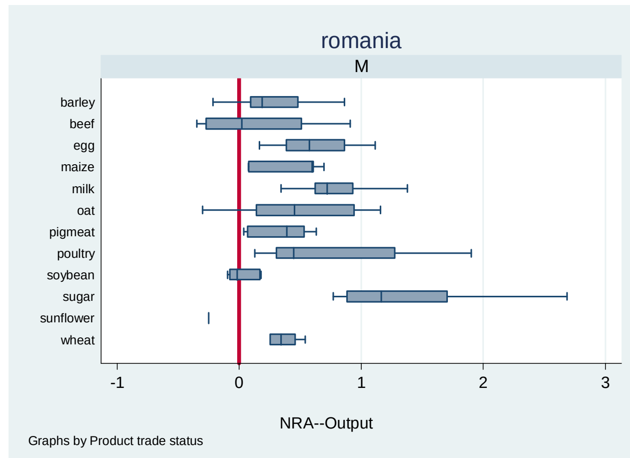


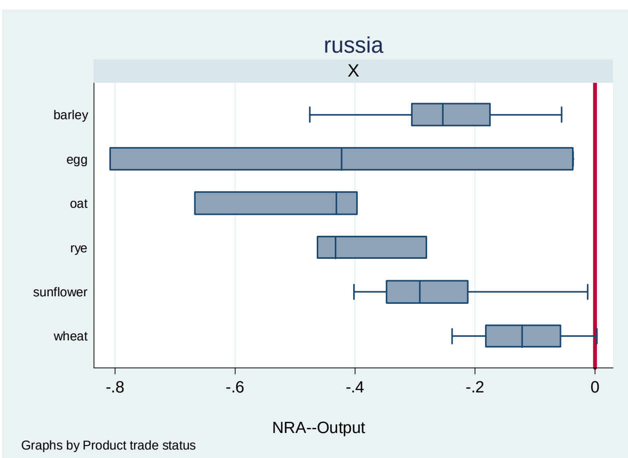


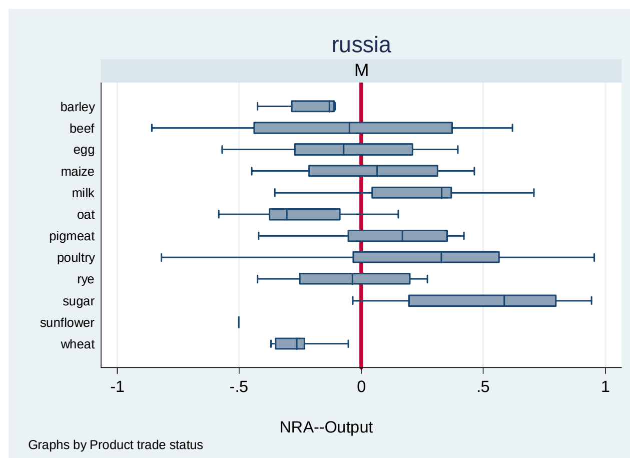

portugal
X
egg
milk
potato
poultry
sunflower
tomato
wheat
wine
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

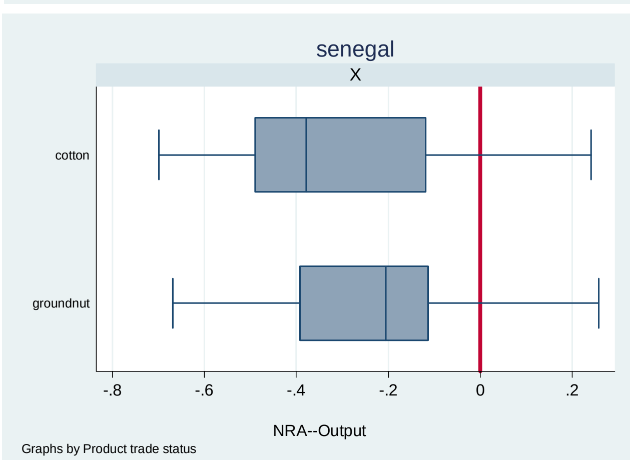

portugal
M
barley
beef
coarsegrains
egg
maize
milk
oat
oilseed
pigmeat
potato
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
-1
0
1
2
3
NRA--Output
Graphs by Product trade status

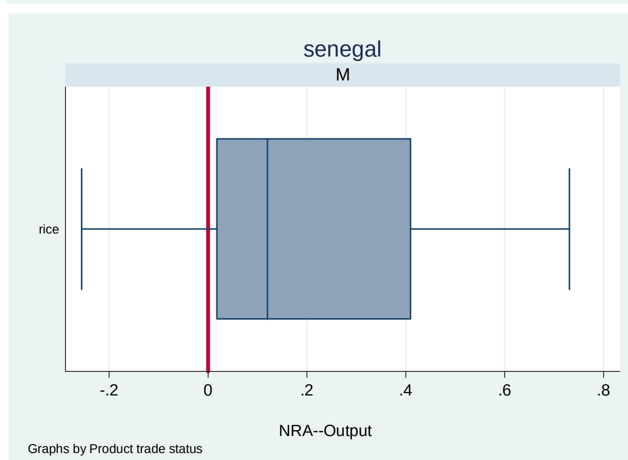

romania
X
barley
beef
egg
maize
oat
pigmeat
rapeseed
soybean
sunflower
wheat
-.5
0
.5
NRA--Output
Graphs by Product trade status

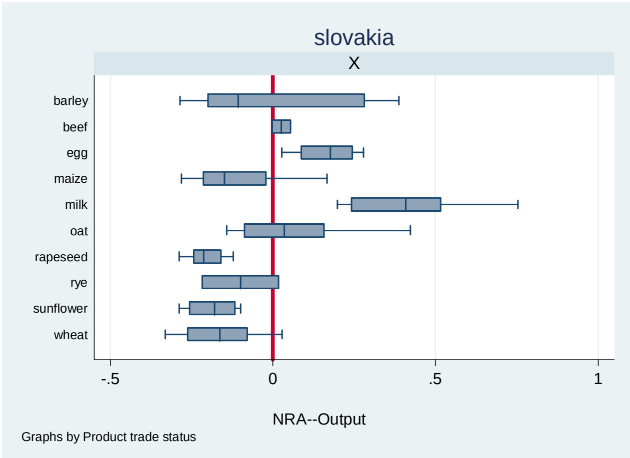

romania
M
barley
beef
egg
maize
milk
oat
pigmeat
poultry
soybean
sugar
sunflower
wheat
-1
0
1
2
3
NRA--Output
Graphs by Product trade status

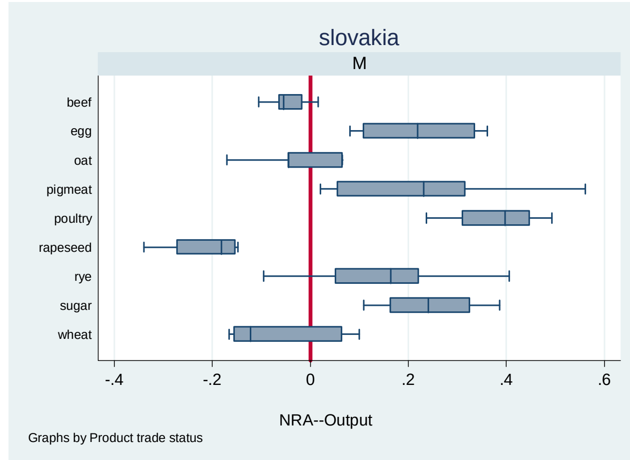

russia
X
barley
egg
oat
rye
sunflower
wheat
-.8
-.6
-.4
-.2
0
NRA--Output
Graphs by Product trade status

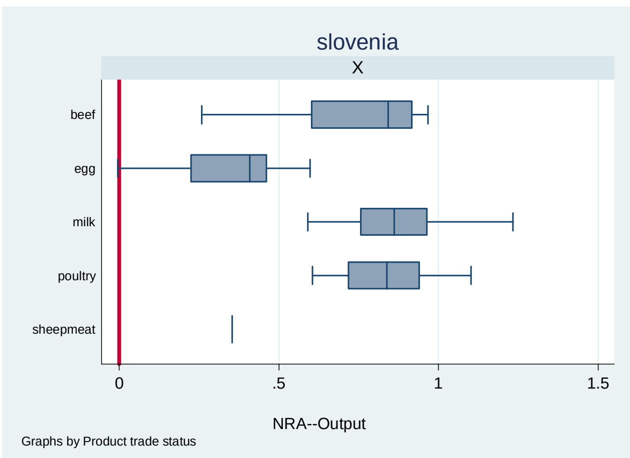

russia
M
barley
beef
egg
maize
milk
oat
pigmeat
poultry
rye
sugar
sunflower
wheat
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

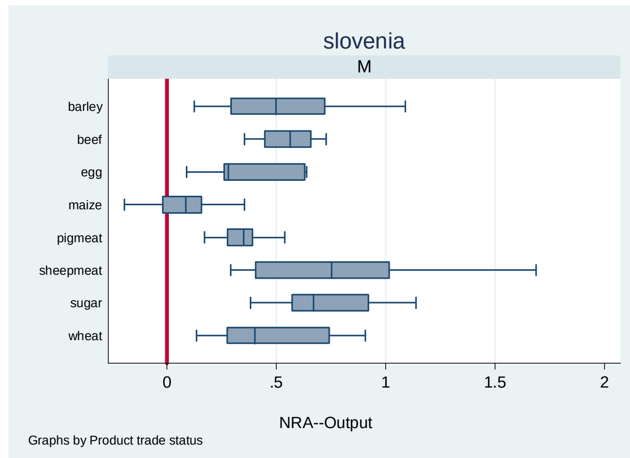

senegal
X
cotton
groundnut
-.8
-.6
-.4
-.2
0
.2
NRA--Output
Graphs by Product trade status

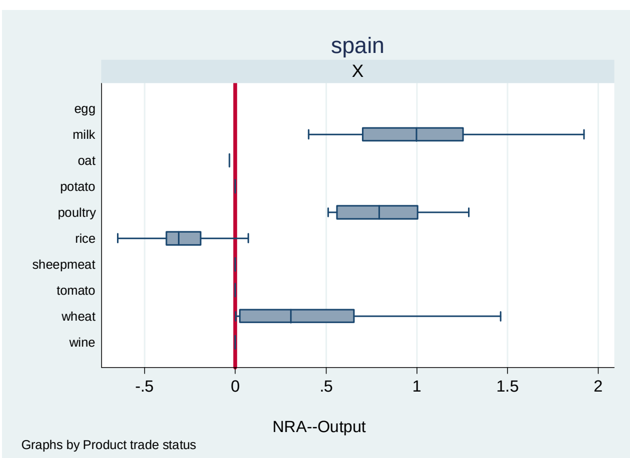

senegal
M
rice
-.2
0
.2
.4
.6
.8
NRA--Output
Graphs by Product trade status

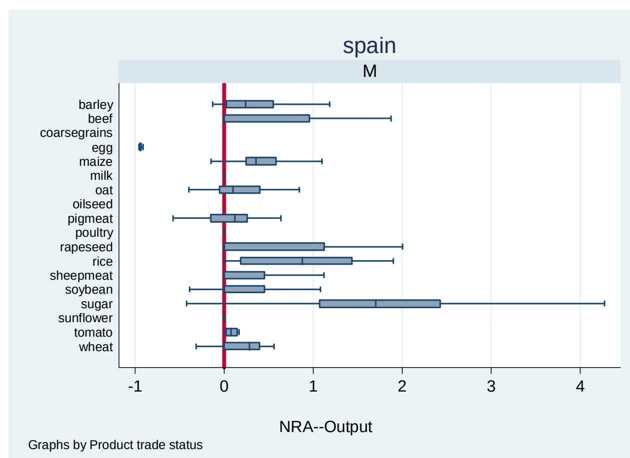

slovakia
X
barley
beef
egg
maize
milk
oat
rapeseed
rye
sunflower
wheat
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

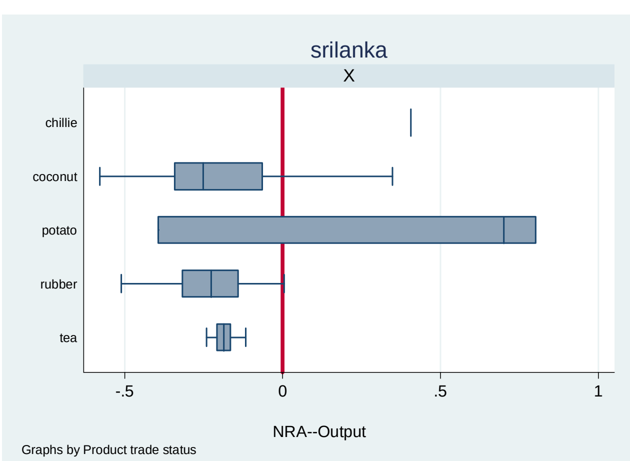

slovakia
M
beef
egg
oat
pigmeat
poultry
rapeseed
rye
sugar
wheat
-.4
-.2
0
.2
.4
.6
NRA--Output
Graphs by Product trade status

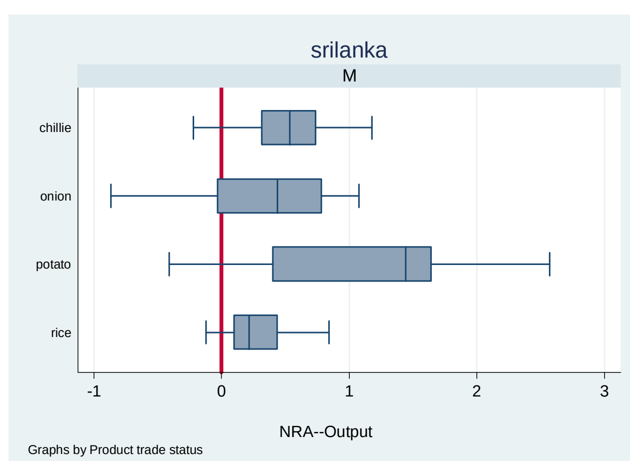

slovenia
X
beef
egg
milk
poultry
sheepmeat
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

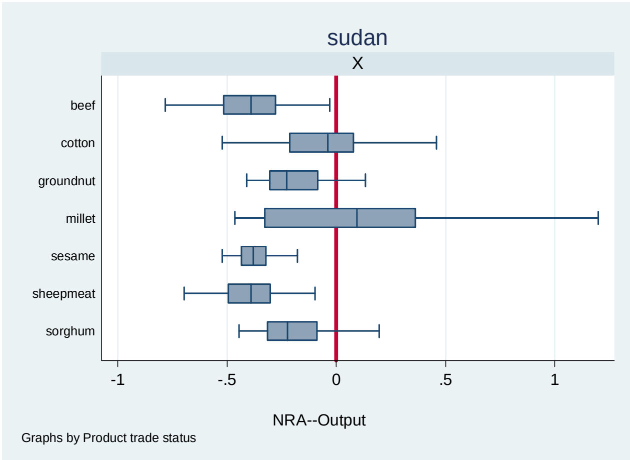

slovenia
M
barley
beef
egg
maize
pigmeat
sheepmeat
sugar
wheat
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

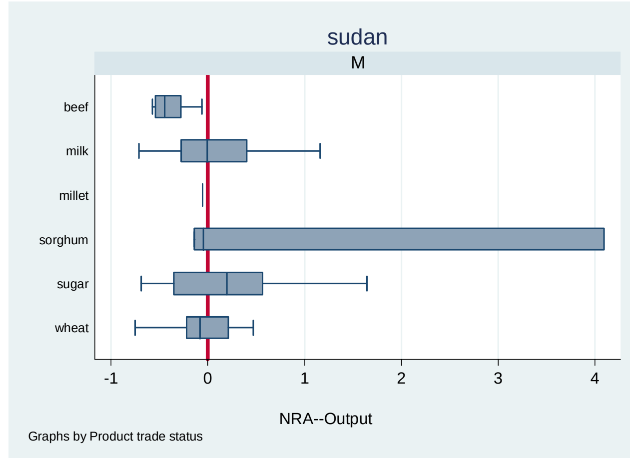

spain
X
egg
milk
oat
potato
poultry
rice
sheepmeat
tomato
wheat
wine
-.5
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status

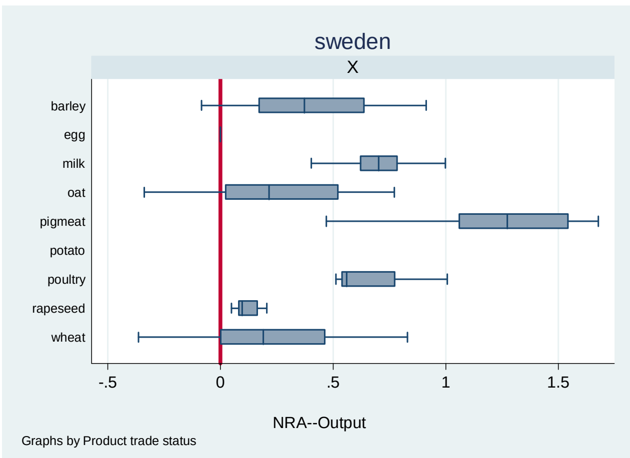

spain
M
barley
beef
coarsegrains
egg
maize
milk
oat
oilseed
pigmeat
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
-1
0
1
2
3
4
NRA--Output
Graphs by Product trade status

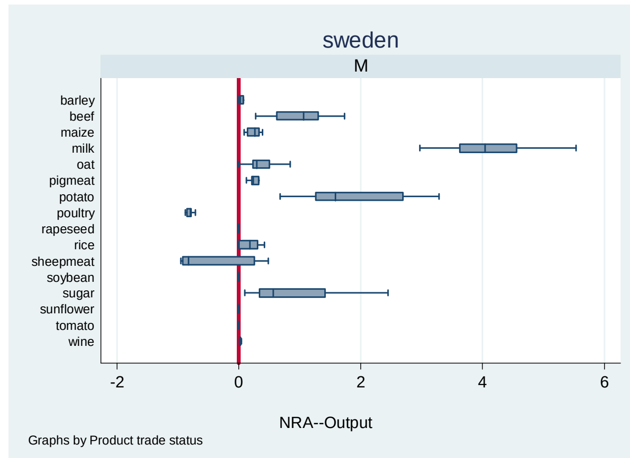

srilanka
X
chillie
coconut
potato
rubber
tea
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

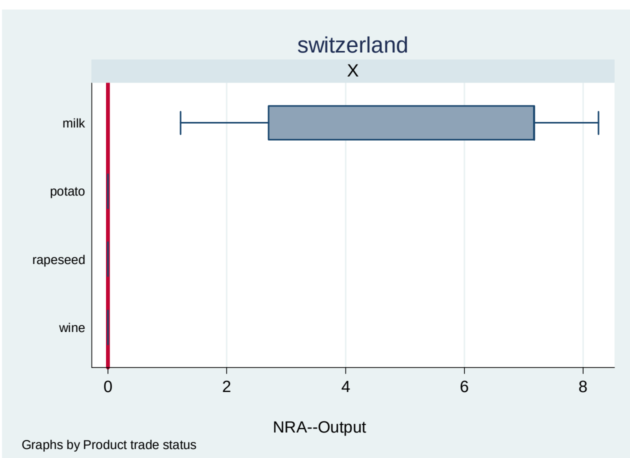

srilanka
M
chillie
onion
potato
rice
-1
0
1
2
3
NRA--Output
Graphs by Product trade status

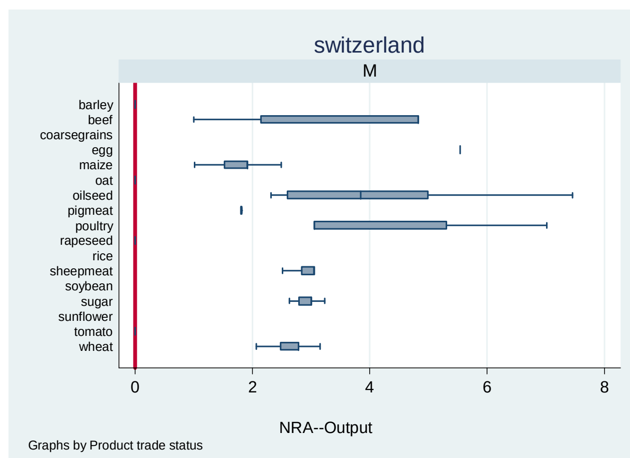

sudan
X
beef
cotton
groundnut
millet
sesame
sheepmeat
sorghum
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status

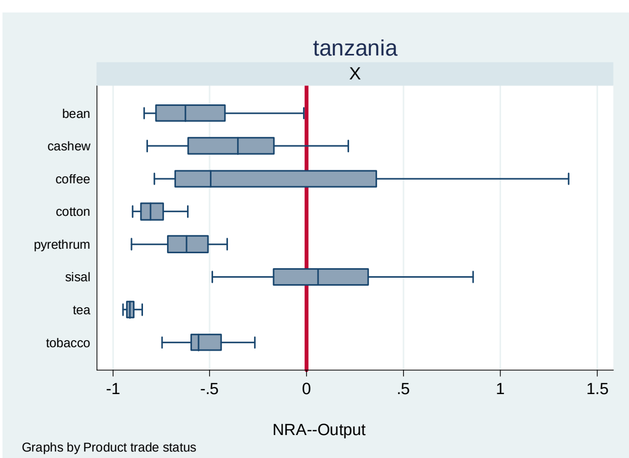

sudan
M
beef
milk
millet
sorghum
sugar
wheat
-1
0
1
2
3
4
NRA--Output
Graphs by Product trade status

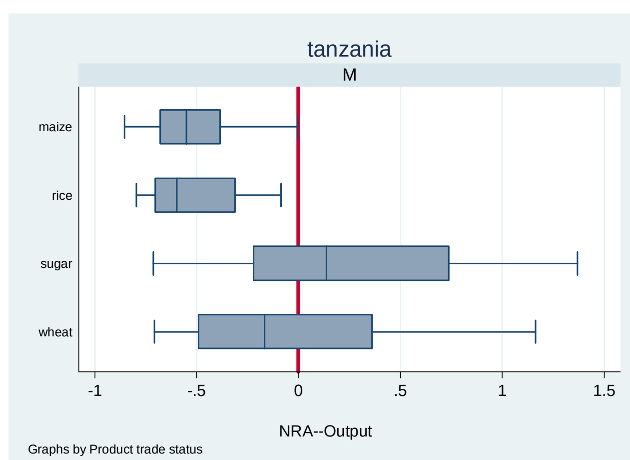

sweden
X
barley
egg
milk
oat
pigmeat
potato
poultry
rapeseed
wheat
-.5
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

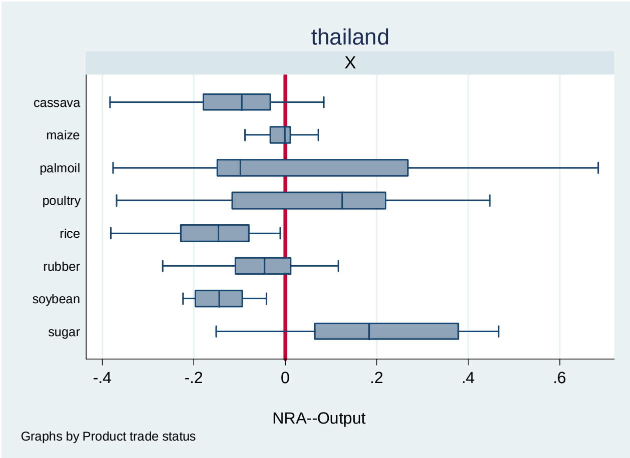

sweden
M
barley
beef
maize
milk
oat
pigmeat
potato
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wine
-2
0
2
4
6
NRA--Output
Graphs by Product trade status

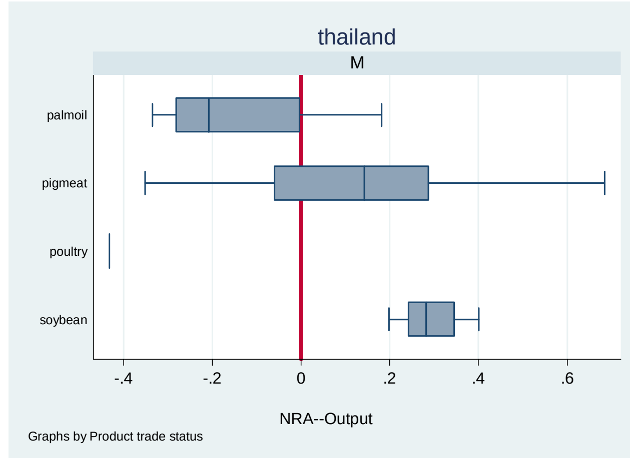

switzerland
X
milk
potato
rapeseed
wine
0
2
4
6
8
NRA--Output
Graphs by Product trade status

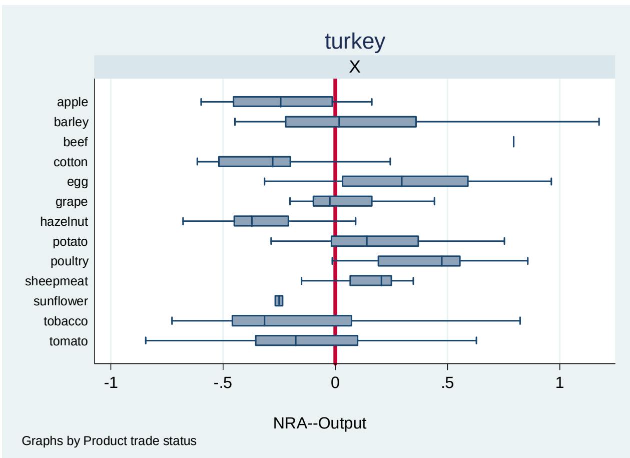

switzerland
M
barley
beef
coarsegrains
egg
maize
oat
oilseed
pigmeat
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
0
2
4
6
8
NRA--Output
Graphs by Product trade status

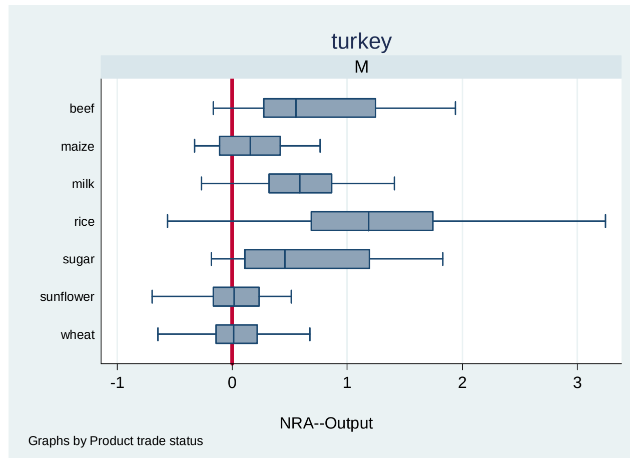

tanzania
X
bean
cashew
coffee
cotton
pyrethrum
sisal
tea
tobacco
-1
-.5
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

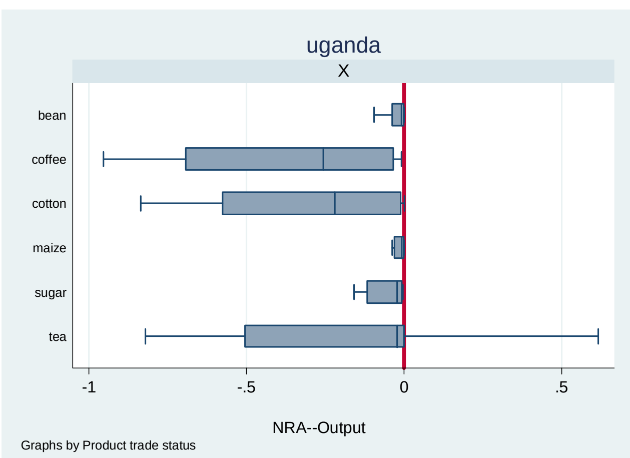

tanzania
M
maize
rice
sugar
wheat
-1
-.5
0
.5
1
1.5
NRA--Output
Graphs by Product trade status

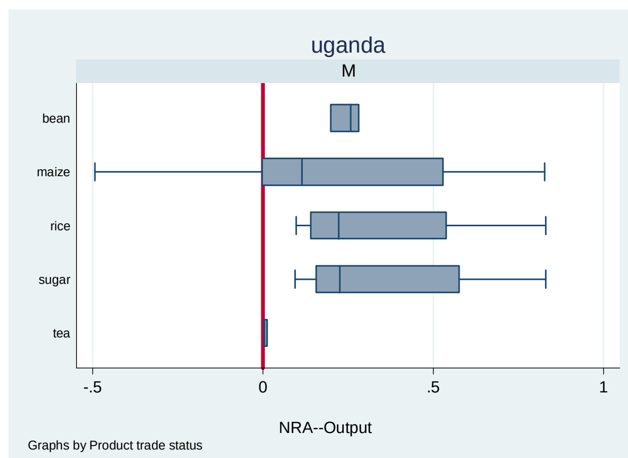

thailand
X
cassava
maize
palmoil
poultry
rice
rubber
soybean
sugar
-.4 -.2 0 .2 .4 .6
NRA--Output
Graphs by Product trade status

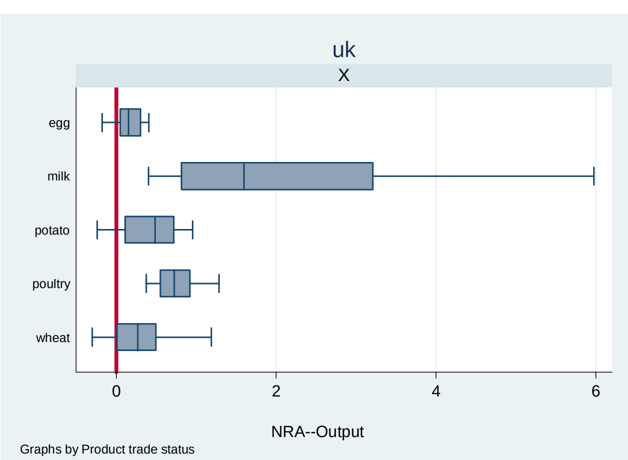

thailand
M
palmoil
pigmeat
poultry
soybean
-.4 -.2 0 .2 .4 .6
NRA--Output
Graphs by Product trade status

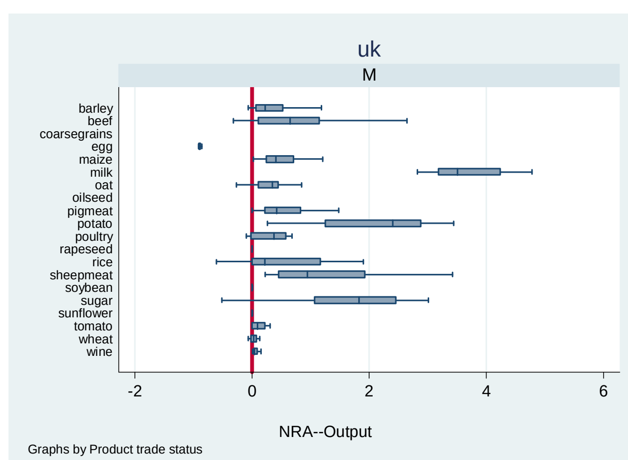

turkey
X
apple
barley
beef
cotton
egg
grape
hazelnut
potato
poultry
sheepmeat
sunflower
tobacco
tomato
-1 -.5 0 .5 1
NRA--Output
Graphs by Product trade status

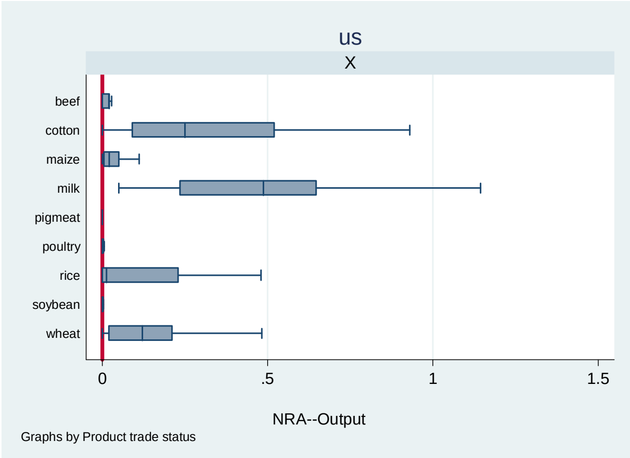

turkey
M
beef
maize
milk
rice
sugar
sunflower
wheat
-1 0 1 2 3
NRA--Output
Graphs by Product trade status

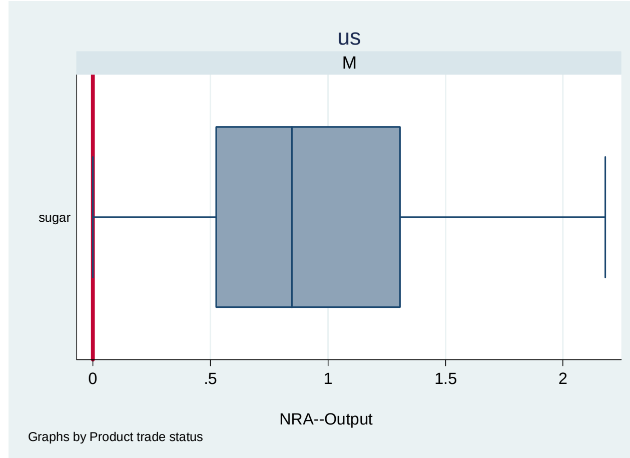

uganda
X
bean
coffee
cotton
maize
sugar
tea
-1 -.5 0 .5
NRA--Output
Graphs by Product trade status

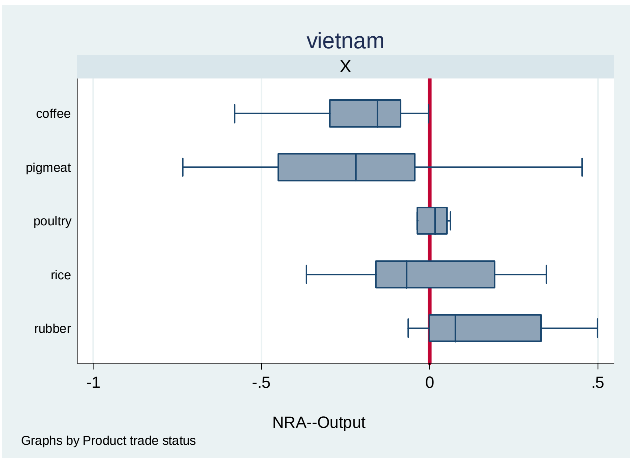

uganda
M
bean
maize
rice
sugar
tea
-.5 0 .5 1
NRA--Output
Graphs by Product trade status

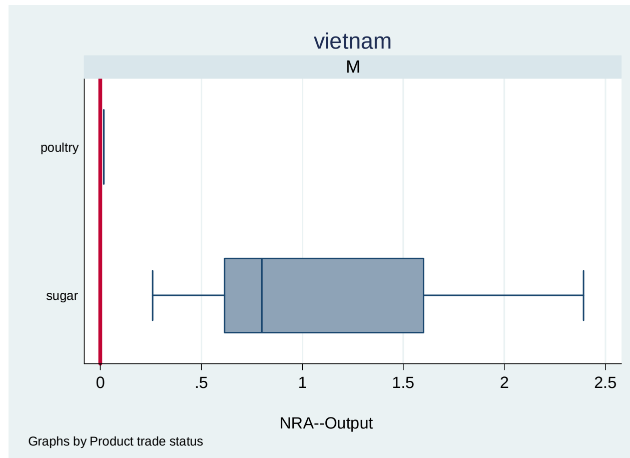

uk
X
egg
milk
potato
poultry
wheat
0 2 4 6
NRA--Output
Graphs by Product trade status

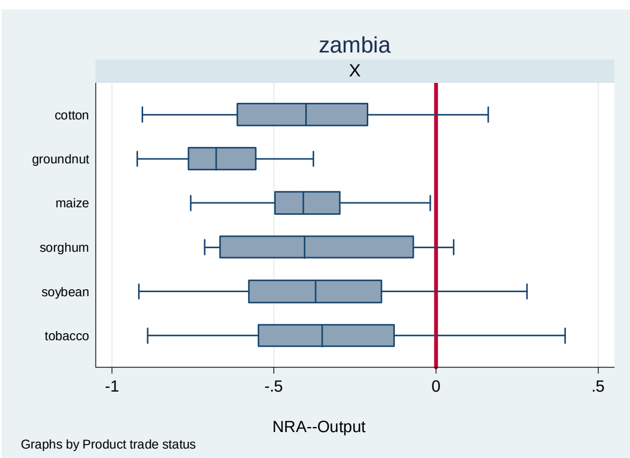

uk
M
barley
beef
coarsegrains
egg
maize
milk
oat
oilseed
pigmeat
potato
poultry
rapeseed
rice
sheepmeat
soybean
sugar
sunflower
tomato
wheat
wine
-2 0 2 4 6
NRA--Output
Graphs by Product trade status

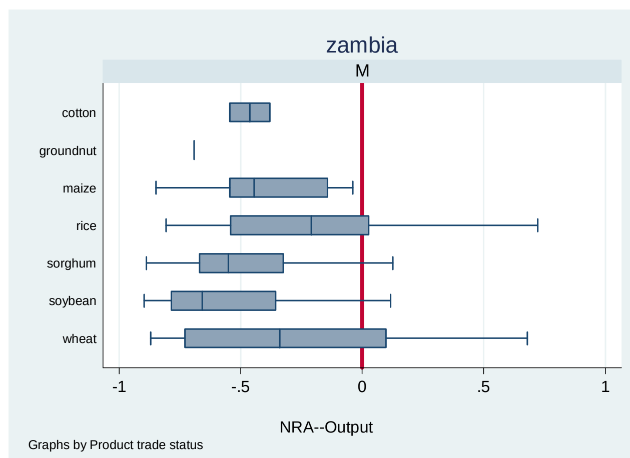

us
X
beef
cotton
maize
milk
pigmeat
poultry
rice
soybean
wheat
0
.5
1
1.5
NRA--Output
Graphs by Product trade status


us
M
sugar
0
.5
1
1.5
2
NRA--Output
Graphs by Product trade status


vietnam
X
coffee
pigmeat
poultry
rice
rubber
-1
-.5
0
.5
NRA--Output
Graphs by Product trade status


vietnam
M
poultry
sugar
0
.5
1
1.5
2
2.5
NRA--Output
Graphs by Product trade status


zambia
X
cotton
groundnut
maize
sorghum
soybean
tobacco
-1
-.5
0
.5
NRA--Output
Graphs by Product trade status


zambia
M
cotton
groundnut
maize
rice
sorghum
soybean
wheat
-1
-.5
0
.5
1
NRA--Output
Graphs by Product trade status