How Dictators Forestall Democratization Using International Trade Policy

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ABSTRACT: This paper examines how dictatorships use international trade policy to forestall democratization. The theory predicts that a world agricultural price shock can provoke the threat of revolution in dictatorships, who then aim to neutralize this threat and so forestall democratization by raising export taxes. No such clear-cut predictions exist for import tariffs. Focusing on export taxes, the paper finds support for these predictions in the data for dictatorships, but not for ‘liberal’ democracies whose behavior is consistent with Grossman and Helpman (1994). We also find that export tax setting behavior by ‘illiberal democracies’ is indistinguishable from that of dictatorships.

KEYWORDS. Development failure, dictatorship, institutions, social conflict, trade policy.

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1 Introduction

There is broad agreement that while dictatorship can be good for economic growth, it is often detrimental to equality and welfare broadly defined. At the same time, it is agreed that while democracy is no panacea, it is generally associated with a greater likelihood of economic development and improved well-being across society. Democracy, when it functions well, is an inclusive political institution that underpins good economic institutions because they tend to be inclusive as well, and hence more effective in supporting economic development. Conversely, dictatorship enables an ‘elite’, a relatively small set of individuals or social groups, to monopolize political power and hence structure economic institutions not to support economic development but instead to maximize the rents that they capture (Acemoglu, Johnson and Robinson 2005).

While the prior literature tends to focus on democratization, much of the world remains under dictatorship. Freedom House (2018) report that 49 countries are dictatorships, representing 25 percent of the world’s polities, or nearly 2.7 billion people, which is 37 percent of the global population. Moreover, Freedom House (2015) document that, at the time of publication, there had been no democratic forward progress for over a decade. Therefore, having understood the benefits of democratization, the most pressing challenge now is to deepen our understanding of how countries remain entrenched in dictatorship. That is the challenge taken up in the present paper.

The literature on democratization concentrates on the role of domestic taxation. The main point made by Acemoglu and Robinson (2000, henceforth AR) is that democratization represents a credible commitment by the elite to make transfers to the rest of society (ROS) using domestic

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3 These numbers are for the Freedom House category of ‘Not Free’, as opposed to their two other categories of ‘Free’ and ‘Partly Free’. The Freedom House measure of Not Free corresponds closely to Polity IV scores indicating dictatorship. The use of Polity IV scores to measure dictatorship will be discussed further below.

4 The literature on democratization spans the fields of economics, history, philosophy, and political science. Research in economics has identified two broad approaches to understanding democratization. The first approach stresses the importance of constraining government, through democratic institutions, to initiate the process of economic development (Montesquieu 1748, Smith 1776, North and Thomas 1973, North 1981). Within this approach, the leading explanation is one of expansion under threat: the disenfranchised group gains enlargement by effectively threatening the social order and hence the position of the enfranchised group (Acemoglu and Robinson 2000, 2006, Conley and Temimi 2001). A second explanation from this approach regards democratization as a solution to a commitment problem that the elite have, to refrain from expropriation if the rest of society undertake investment (Olson 2000). A third explanation is based on the idea that distortions can arise when redistributive policies targeted to favored groups crowd out policies with more widespread benefits (Buchanan and Tullock 1962, Bates 1981, Lizzeri and Persico 2004). The second approach emphasizes the need for human and physical capital to start the process of development, with democracy and other institutional improvements arising as consequences of increased education and wealth (Lipset 1960, Barro 1999, Alvarez et al 2000, Glaeser et al 2004, Campante and Chor 2012, 2014).
taxation, on a sufficient scale to defuse a threat of revolution. When the elite are in power, they can only credibly commit to make transfers while they face the threat of a revolution. And any threat of revolution will dissipate over time. If the elite do not have sufficient resources at hand to compensate the rest of society for what they could obtain through revolution, then society will choose to mount a revolution while they can. But through democratization the elite hand over the power to set taxation to the ROS, and in doing so make a credible commitment to continue payments to the ROS even after the threat of revolution has dissipated, thus neutralizing the threat of revolution.

Although AR provide a path-breaking insight into the purpose of democratization, they do not account for an empirical regularity that has come to light in subsequent research. This regularity is that the capacity for domestic progressively redistributive taxation is not installed until after democratization. Aidt and Jensen (2009) show this in the data for a sample of seventeen countries from western Europe, North America, Oceania and Japan between 1815 and 1939. Besley and Persson’s (2009) framework provides the logic. If the capacity for domestic redistributive taxation provides a relatively efficient mechanism to tax the elite’s wealth, then this undermines their incentive to install it. Consequently dictatorships (among other developing countries) tend to rely instead on relatively inefficient trade taxes for the purposes of redistribution (Besley and Persson 2011).

Responding to this point, Zissimos (2017) combines AR’s model of democratization with Mayer’s (1984) Heckscher-Ohlin model of international trade policy to produce a new theory of how trade policy is operated under dictatorship and democratization. The logic of democratization is based on AR, but the redistributive instrument is international trade policy as opposed to domestic taxation. The paper characterizes when a dictator will have to democratize as a way to neutralize the threat of revolution, and when they will be able to use trade policy to forestall democratization.\(^5\)

The purpose of the present paper is to extend Zissimos (2017) to provide a framework that generates testable predictions over how dictators operate trade policy, and take these predictions to the data. The key innovative step that we take is to tractably endogenize the threat of revolution to a world agricultural price shock. The innovation exploits the separability of agents’

\(^5\)Acemoglu and Robinson (2006) present a model of globalization and trade liberalization (see Chapter 10). But, since globalization is exogenous in their model, they do not consider the choice by the ruling elite over trade policy that is central to our analysis.
value functions between states of high and low world prices, and an assumption of homotheticity
of preferences.

This is a significant innovation, since the prior literature (AR, Zissimos 2017) assumes that
the threat of revolution arises exogenously, offering no way to link world price shocks to the
threat of revolution. Yet throughout history agricultural price shocks, especially when they
are driven by shocks to food staples, have been a key trigger of political unrest. As Brown
(2011) notes, “for the planet’s poorest 2 billion people, who spend 50 to 70 percent of their
income on food, soaring prices may mean going from two meals a day to one. Those who are
barely hanging on to the lower rungs of the global economic ladder risk losing their grip entirely.
This can contribute - and it has - to revolutions and upheaval.” As we will describe below, our
extension of the existing theory captures exactly this logic.6

Our data cover the two main agricultural price shocks that have occurred in the post-World
War II era: one in 1973-75 and the other in 2006-08. Between 2006-08, world prices of grains
increased by 97%, driven mainly by droughts in some major grain-producing countries (Food and
Agriculture Organization 2011). Over that time frame, an estimated 33 agricultural-exporting
countries resorted to restrictions on exports in response to the initial increase in agricultural
prices (Sharma 2011). Moreover, a number of these countries were dictatorships such as Egypt
and Jordan. Interpreted using our model, the ruling landed elites in these countries stood to
gain significantly from leaving export markets open during the period, by selling their exports
at higher prices on the world market. But violent protests fueled by rising prices prompted the
ruling regimes to respond by introducing export restrictions in order to keep the agricultural
produce at home, thus keeping prices low and neutralizing the threat to their rule.7

The 1973-75 shock was the first sharp increase in agricultural prices in the post-war era
that was sustained over consecutive years. The shock coincided with a period of macroeconomic
shocks, first with the collapse of the Bretton Woods system of fixed exchange rates, followed by oil
price shocks initiated by the OPEC cartel. Although the set of countries that were dictatorships
in the 1970s was different to that of the 2000s, their response to the world agricultural price
shock was the same: to sharply increase export taxes.

6See Carter, Rausser and Smith (2011) for a review of the literature showing that commodity price volatility
can provoke political as well as economic instability.
7It is worth noting that the dictatorships we are focusing on were not much affected by the global financial
crisis of 2008 because their banking systems were largely insulated from those of the West.
The structure of the underlying economic model can be understood as follows. The ruling elite own land that is used intensively in the production of agriculture. The ROS are landless but receive income from their labor, which is used intensively in the production of manufactures. According to the Stolper-Samuelson theorem, whichever group own the relatively abundant factor prefer a relatively open trade regime, while those who own the scarce factor would prefer a relatively closed one. For example, if the country has a comparative advantage in agriculture, as many developing countries do, elite income from land is maximized when the dictatorship adopt a free trade regime while the ROS would benefit from the taxation of exports because this raises the real return to labor.

In our model, over an infinite time horizon, the world relative agricultural product price (henceforth the ‘world price’) can take one of two levels: ‘low’ and ‘high’. A real income shock comes in the form of a transition to a high world price. If and when the shock happens, free trade becomes particularly attractive to the ruling elite because returns to land are increased. But the ROS will suffer a negative real income shock under the high world price, as captured in the quote by Brown (2011) above. If the world price is sufficiently high then at free trade it is worth the ROS mounting a revolution to overthrow the dictatorial regime so that they can assume power and recover (some of) their lost income by raising export taxes. We assume that when the ROS seize power through revolution they democratize, whereby the median voter is a member of the ROS. On this basis, while world prices are high, the dictatorial regime have an incentive to raise export taxes, bringing down local agricultural prices, raising ROS real incomes and thereby forestalling democratization. This basic logic drives the predictions over the operation of trade policy that we test and find support for in the data.

If the country imports the agricultural product then, as standard in trade theory, the predictions of the model are reversed: ROS gain from a relatively open trade regime while the elite gain from protection. A transition to a high world price creates pressure for the ruling elite to reduce domestic protection in order to counter the decline in real wages. Surprisingly, as we will show, our model does not provide clear-cut predictions about whether a world price shock will give rise to an increase or decrease in import tariffs, and the econometric results we have obtained for import protection reflect this. Consequently, the econometric results we report in the paper focus only on export taxes.\footnote{Our econometric results for import protection are available upon request.}
It is worth comparing the predictions of our model to those of Grossman and Helpman (1994, henceforth GH), which is the leading model in trade policy formation. GH assume a stable institutional environment where democracy has already been consolidated, as in a (classical) liberal democracy. In that paper, interest groups are able to lobby the government in order to try to sway policy in the direction they would like to see it go. In their model, for a democracy with a comparative advantage in agricultural products, agricultural producers have an incentive to lobby for an export subsidy. Consequently, if governments intervene in export markets, they will do so using an export subsidy. This contrasts markedly with our model, which predicts that a dictatorship with a comparative advantage in agricultural products levies an export tax. Based on this difference, the GH prediction of how liberal democracies will respond to world price shocks is different from our prediction of how dictatorships will respond as well. Because a high world price raises the incomes of land owners, in a liberal democracy a world agricultural price shock reduces the incentive at the margin to lobby for export subsidies and so they fall. Therefore, the GH model would predict a fall in export subsidies in response to a world price shock, and not the increase in export taxes that our model predicts for dictatorships.

Our empirical implementation covers the period 1969-2010. This period is broken down into two sub-periods, of 1969-1978 and 2003-2010. We then think of the world price shocks that occurred in each of these sub-periods, 1973-74 and 2006-08 respectively, as quasi-experiments, where dictatorships are predicted to behave differently from democracies in the way that they respond to these shocks. In line with the predictions of our model, we find that dictatorships respond to the world price shocks by raising export taxes. We also find that, in contrast to dictatorships, liberal democracies respond to the world price shocks by reducing export subsidies, as would be predicted by GH.

In our dataset, if countries are not classified as dictatorships or liberal democracies then they are classified as ‘middle democracies’. Our working hypothesis at the outset is that dictatorships behave differently from democracies broadly defined. However, our results show that middle democracies respond to the world agricultural price shocks of 1973-4 and 2006-08 in a way that is indistinguishable from dictatorships: they too increase export taxes. Thus our results show that, from an export-policy standpoint, middle democracies have more in common with dictatorships than they have with liberal democracies.

It is worth pausing to consider how we might interpret this result, since our working hy-
ypothesis reflects the natural expectation that all democracies respond in a similar way. In part our results might be driven by the fact that in some middle democracies the ballot box does not represent an effective means through which power changes hands, in which case threats to the power of the ruling regime might be addressed in a way that more closely resembles the behavior of dictatorships. Zakaria (1997) discusses the rise of ‘illiberal democracies’ over recent years. In illiberal democracies, even though power may notionally change hands at the ballot box, to the extent that incumbents are able to curtail such liberties as political representation, they may in fact preserve their power by manipulating policy in much the same way that dictatorships do. An association of middle democracies in our dataset with Zakaria’s illiberal democracies would be consistent with our observation that export policy outcomes in middle democracies are indistinguishable from those in dictatorships.

It is also worth noting that the predictions of our model and the patterns in the data that we examine are not consistent with a terms-of-trade motivation for export policy (Johnson 1953-4, Broda, Limão and Weinstein 2008). The clearest distinction arises for the case of prohibitive export taxes, or ‘export bans’. While a large exporter could leverage a world price shock to the good that it exported, by increasing its export taxes to increase world prices further still, the terms-of-trade gains would necessarily have to be realized through a positive trade volume. That is, any terms of trade gain could only be realized through each unit exported to the world market. Accordingly, an export ban cannot be optimal. Yet numerous studies of the 2006-08 price shock identify export bans as the modal policy response, shutting down exports completely. (See for example Mitra and Josling 2009, Sharma 2011, Estrades, Flores and Lezama 2017.) Our model can motivate an export ban as a way to defuse the threat of revolution, and so it can be used to rationalize the export bans that were widely observed throughout the 2006-08 world price shock.9

Our paper contributes to the literature in four ways. At a theoretical level, as mentioned above, we are the first to endogenize the threat of revolution to world price shocks; the prior literature assumes that the opportunity to mount a revolution arrives with an exogenous probability. Endogenizing the threat of revolution to world price shocks is important for two reasons.

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9The above argument that an optimal export tax cannot be prohibitive is an application of the logic set out by Johnson (1953-4), which he develops for import tariffs, to the present setting of export taxes. Johnson’s argument can be carried over to the present setting because the Lerner symmetry theorem applies both in Johnson’s framework and in ours. The argument could fail for export quotas: an application of Tower (1977), combined with the Lerner symmetry theorem. But Estrades et al (2017) show that export quotas were relatively little used in practice in response to the world price shock of 2006-08.
First, it opens the door to our empirical investigation. Second, it contributes to our understanding of how challenges to dictatorial regimes arise in practice, and in turn provides a more nuanced understanding of how these challenges may be addressed.

Our second contribution is to the literature seeking to test Acemoglu and Robinson’s (2000) theory of the form of government, which has tended to focus on democratic transitions (Brückner and Ciccone 2010, Burke and Leigh 2010, Chaney 2013, Aidt and Franck 2015, Dasgupta and Ziblatt 2015, Franck 2016, Aidt and Leon 2016). This work has been critically important in verifying the theory empirically. However, this work focuses on the region of the parameter space where the elite face a commitment problem. Our work focuses on the region where the elite do not face a commitment problem, and so can use policy to forestall democratization. In establishing that trade policy can be used for this purpose, we also make the point that prior research may not have been able to establish positive results for this region of the parameter space because it followed the literature in focusing on domestic taxation.

Our third contribution is to the literature on economic development. Our focus is on understanding why it is that some countries fail to progress from dictatorship to democracy, on the understanding that democracy tends to support institutions that do a better job of promoting economic development. Our paper presents evidence supportive of the idea that a ruling elite’s use of trade policy to forestall democratization plays an important role. Others have explored related ways that ruling elites have manipulated institutions to their own advantage but to the detriment of economic development. Acemoglu and Robinson (2008) show how the elite manipulate political institutions to maintain the division of economic rents in their favor even through the process of democratization. This explains how in practice, contrary to expectations, in some cases democratization may do little to improve the welfare of the ROS. Besley and Persson’s (2009) paper discussed above is also relevant in that it explains why a ruling elite may not have an incentive to install domestic fiscal capacity, even if it would be beneficial for public good provision that facilitates economic development. While the prior literature has sought to understand development failure in terms of how a ruling elite manipulate institutions in their own interests using domestic economic policy, our contribution is to make the case that trade policy may be instrumental in this regard.

Our fourth contribution is to provide a new theory and evidence of how dictators operate trade policy, and show that this is distinct from the way that liberal democracies operate trade
policy, but may explain how ‘illiberal democracies’ do so. The implications of this new theory are quite far reaching. Ricardo (1817) argues that opening to trade serves as an insurance mechanism against crop failure at home, because the resulting high domestic prices induce an increase in supply through imports. This logic forms part of the foundations of our thinking about the benefits of trade liberalization. In turn, it informs policy recommendations made by multilateral institutions such as the World Bank, in advocating that developing countries remove economic distortions including those introduced by trade policy. Accordingly, the World Bank’s reaction to countries who raised their export taxes in response to the food price shocks of 2006-08 was to urge the perpetrators to remove these measures (e.g. World Bank 2008). However, an implication of our analysis and findings is that dictatorial regimes are unlikely to heed calls to remove export-restrictive measures if they are instrumental in their political survival. Moreover, their introduction of export restrictions may actually increase the volatility of world agricultural prices, undermining or even reversing the insurance-based gains from trade that Ricardo described. If so, this suggests the need for a reevaluation of our expectations regarding the gains from trade, and the way that multilateral institutions such as the World Bank should respond to world price shocks.

The paper proceeds as follows. Section 2 sets out the basic economic model, which is taken from Zissimos (2017). Section 3 explains how the basic model is extended to incorporate ongoing world price shocks. Section 4 then introduces the dynamic game, formalizing the way that a world price shock can endogenously create a threat of revolution, and how the elite will attempt to forestall democratization using international trade policy. Section 5 characterizes equilibrium of the game. Section 6 then uses the equilibrium characterization to develop testable predictions of trade policy. Section 7 introduces the data, econometric design and models. Section 8 discusses our econometric results. Conclusions are drawn in Section 9. Further details of our quasi-experimental design, and robustness checks, are discussed in the appendixes.

2 The Basic Model

Consider a single small country that takes world prices as given. The model has an infinite time horizon to capture the commitment problem faced by a ruling elite under the threat of revolution. Variation in economic outcomes over time comes entirely from variation in policy choices, determined by the group that holds power: the ruling elite under dictatorship or the
ROS under democracy. To abstract from issues of domestic taxation, assume there is no domestic fiscal capacity and trade taxes are the only fiscal policy instruments available.

There is a continuum of risk neutral agents in the economy, allocated either to the ruling elite, ε, or the ROS, ρ. Populations of the elite and the ROS are fixed, and the elite are assumed to be in a minority. The elite are land owners, while the ROS only have labor. All members of each group are identical to one another, and each group differs from the other only by its factor endowment.

The production structure is basic $2 \times 2$ Heckscher-Ohlin, where agriculture and manufactures are intensive in land and labor respectively. Agriculture is referred to as good ε because the elite own the land. Manufactures are referred to as good ρ accordingly. The price of good ε relative to good ρ in period $t$ is denoted by $p_t$, where $t = 0, 1, ..., \infty$. Autarky and world prices of good ε relative to ρ are denoted by $p^a$ and $p^w$ respectively. If the economy is open then goods may be traded internationally. Factors are not mobile internationally.

Agents $j \in \{\varepsilon, \rho\}$ are identical in terms of their preferences and discount factor, $\beta \in (0, 1)$. Agent $j$’s expected utility at time 0 is $U_0^j = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u \left( c_{\varepsilon t}^j, c_{\rho t}^j \right)$, where $\mathbb{E}_t$ is the expectations operator conditional on information available at time $t$. The instantaneous utility function, $u \left( c_{\varepsilon t}^j, c_{\rho t}^j \right)$, is strictly quasi-concave in each good, $c_{\varepsilon t}^j$ and $c_{\rho t}^j$. Demand functions are identical and homothetic. The assumption of homotheticity will play a useful role in endogenizing the threat of revolution to world price shocks.

As mentioned above, we will restrict the set of policy instruments to trade taxes. Since there is no domestic fiscal capacity, trade subsidies are not available. Without loss of generality, we will assume that trade policy is applied to good ε. This could be either the country’s exportable or its import-competing good, depending on its comparative advantage. For a comparative advantage in good ε, a domestic price below the world price implies an export tax. For a comparative advantage in good ρ, a domestic price above the world price implies an import tariff.

Aggregate income $Y_t$, measured in terms of the numeraire good ρ, is the sum of income from factors and trade policy revenue. Analogously, total income of a member of group $j$ in period $t$, $Y_t^j$, is the sum of their income from factors and trade policy revenue. Following Zissimos

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10. The assumption that domestic fiscal capacity is unavailable focuses attention on trade policy as the sole policy instrument for redistribution. It will also facilitate the characterization of equilibrium.
(2017), we will adopt Mayer’s (1984) assumption that trade policy revenue is distributed across individuals according to their factor income shares. Since in each period income from factors and trade policy can be written as a function of \( p_t \), we may write \( Y^j_t = Y^j(p_t) \).

The welfare of a member of group \( j \in \{ \varepsilon, \rho \} \) in period \( t \), \( W^j_t \), can be measured using the indirect utility function:

\[
W^j_t = W^j(p_t, Y^j(p_t)) = W^j(p_t), \quad j \in \{ \varepsilon, \rho \}.
\]

Assuming that \( W^j(p_t) \) is strictly concave in \( p_t \), which implies \( W_{p_t}p_t < 0 \), each group’s preferred trade policy can be determined from this equation and expressed as a unique value of \( p_t \). Following this approach, we will say that ‘group \( j \)’s preferred price level’, \( \hat{p}^j \), is the value of \( p_t \) that maximizes \( W^j_t \): \( W_{p_t} = 0 \) is the first order condition from which an interior solution for \( \hat{p}^j \) is obtained.\(^{11}\) The solution for \( \hat{p}^j \) trades off the factor income gain through the ‘Stolpher-Samuelson effect’ and trade policy revenue gain against individual \( j \)’s share of the aggregate distortion resulting from the policy. It may imply a trade tax or trade subsidy. If the interior solution implies a trade subsidy then, since we have assumed there is no domestic fiscal capacity, the solution will be at a corner, corresponding either to free trade or autarky. The outcome will be characterized fully in Proposition 1 below.

The characterization of equilibrium will involve comparing the payoffs of the elite and the ROS under the status quo of elite rule, extension of the franchise whereby the elite grant democracy peacefully, and revolution whereby the ROS gain democracy by force. A challenge with making these comparisons identified by Zissimos (2017) is that \( \hat{p}^j \) may be different under revolution than under the status quo and extension of the franchise. The reason is that revolution involves a cost not incurred under the other two scenarios, and the loss of income may in turn affect \( \hat{p}^j \). One solution is to set the model up in such a way that \( \hat{p}^j \) remains constant even in the event of a revolution. Proposition 2 of Zissimos (2017) shows that when preferences are homothetic, the cost of revolution can be modeled as a ‘disruption cost’ of revolution, whereby the allocation of factors to productive uses is disrupted by conflict.

Formally assume that if a revolution occurs then, in that period, only a share \( \psi \) of labor and land can be allocated to production, where \( \psi \in (0, 1) \). Given technology and world prices, this assumption implies a radial contraction of the production possibility frontier. Denoting

\(^{11}\)A single variable in a subscript of a function denotes the first derivative of the function with respect to that variable; two variables in a subscript denotes the second derivative.
the level of income under revolution by \( Y^j_R(\hat{p}_\rho) \), we then have \( Y^j_R(\hat{p}_\rho) = \psi Y^j(\hat{p}_\rho) \). In the period after revolution and thereafter, the allocation of full factor supplies is restored. Under this set-up, Proposition 2 of Zissimos (2017) shows that since a radial contraction of the production possibility frontier preserves the trade-offs at the margins in \( W^j(p_t) \), \( \hat{p}_\rho \) is unaffected by revolution.\(^{13}\)

Corresponding to our notation for income under revolution, \( Y^j_R(\hat{p}_\rho) \), we will write \( W^j_R(\hat{p}_\rho) \) as short-hand for the expected welfare for a member of group \( j \) under revolution, \( W^j_R(\hat{p}_\rho, Y^j_R(\hat{p}_\rho)) \). Making use of homotheticity once again, we may write \( W^j_R(\hat{p}_\rho) = \psi W^j(\hat{p}_\rho) \). This way of capturing payoffs under revolution will be useful in the characterization of equilibrium. This completes our summary of Zissimos (2017).

3 World Price Shocks

From this point, we will extend Zissimos (2017) to incorporate random world price shocks over time. We will say that \( p^w \) can take one of two values: low and high, or \( p^w_L \) and \( p^w_H \) respectively. With probability \( 1 - \kappa \), \( p^w = p^w_L \), while with probability \( \kappa \), \( p^w = p^w_H \), where \( \kappa \in [0, 1] \) and \( p^w_L < p^w_H \). The concept of equilibrium is Markov Perfection, where each agent’s strategy is conditioned on the outcome of the state \( s \in \{L, H\} \), which corresponds to the world price level \( p^w_s \in \{p^w_L, p^w_H\} \).\(^{14}\)

Our assumption that preferences are homothetic implies \( W^j(p_t, Y^j(p_t)) \) is quasi-convex in \( (p_t, Y^j_t) \), from which \( W^j(p_t, Y^j(p_t)) > 0 \). This is a natural property. To see why, first note that the only channel through which \( p^w \) affects \( W_p \) is through trade policy revenue and hence \( Y^j_t \). If the country has a comparative advantage in good \( \varepsilon \) then an increase in \( p_t \) tends to increase exports both by increasing domestic supply and reducing domestic demand. An increase in \( p^w \) increases this effect by raising the revenue \( p^w - p_t \) that the country makes on each unit exported, thus increasing \( W_p \). If the country has a comparative advantage in good \( \rho \) then an increase in \( p_t \) tends to reduce imports, thus reducing income. But an increase in \( p^w \) reduces this negative effect on income, thus also increasing \( W_p \).

\(^{12}\)Recall that when \( p_t = \hat{p}_\rho \), \( Y^j(\hat{p}_\rho) \) is agent \( j \)’s income under full factor supplies.

\(^{13}\)Collier (1999) characterizes the costs of conflict in terms of diversion costs, destruction costs and disruption costs. See Zissimos (2017) for further discussion of these costs in the present context. In the context of quasi-linear preferences, Zissimos (2015) models the cost of revolution as ‘lump sum’ destruction costs to obtain the same invariance of \( \hat{p}_\rho \) to the occurrence of revolution.

\(^{14}\)Each agent’s strategy will also be conditioned on the form of government, as explained below.
Since the focus of our analysis is on the implications of $p^w$ fluctuating over time between $p^w_L$ and $p^w_H$, we are interested in how a change in $p^w$ affects each group’s preferred price level, $\hat{p}^j$. Define $\hat{p}^j_s$ as the value of $\hat{p}^j$ corresponding to $p^w_s \in \{p^w_L, p^w_H\}$. We can think in terms of an implicit function $\hat{p}^j_s = \hat{p}^j(p^w_s)$, $j \in \{\varepsilon, \rho\}$, $s \in \{H, L\}$. First think of $\hat{p}^j_s$ being at an interior solution. By the implicit function theorem, we have $\partial \hat{p}^j / \partial p^w = -W^j_{p^w} / W^j_{p^w} > 0$, evaluated at $p_t = \hat{p}^j$, from which it follows that $\hat{p}^j_L < \hat{p}^j_H$. If $\hat{p}^j_s$ is at a corner solution of free trade, $\hat{p}^j_s = p^w_s$, then $\hat{p}^j_L < \hat{p}^j_H$ is immediate.\(^{15}\) For future reference, we will formalize this result as follows.

**Lemma 1.** Given state $s \in \{L, H\}$, with corresponding world price level $p^w_s \in \{p^w_L, p^w_H\}$, the preferred price level of a member of group $j \in \{\varepsilon, \rho\}$ is $\hat{p}^j_s$, such that $\hat{p}^j_L < \hat{p}^j_H$.

It will be helpful to impose some further structure on the relationship between world prices and group welfare. We will say that $W^j(p_t)$ is ‘Stolper-Samuelson consistent’ if two properties hold:

\[
\hat{p}^j_s \geq p^w_s \geq \hat{p}^j_{\rho}; \quad W^\varepsilon(\hat{p}^j_H) > W^\varepsilon(\hat{p}^j_L) \quad \text{while} \quad W^\rho(\hat{p}^j_H) < W^\rho(\hat{p}^j_L)
\]

Using inequalities in the first line simply allows for the possibility that $\hat{p}^j_s$ is a corner solution at $p^w_s$. To see what we have in mind by Stolper-Samuelson consistency, recall from Jones (1965) that we can express the main implication of the Stolper-Samuelson theorem as $r^*_t > p^*_t > 0 > w^*_t$, where $r_t$ and $w_t$ are the returns to land and labor respectively, and a superscript-$*$ on a variable denotes proportional change, e.g. $r^*_t = dr_t / r_t$.\(^ {16}\) Ignoring trade tax revenue and using $p^w_s$ as a benchmark, the Stolper-Samuelson theorem implies that group $\varepsilon$ gain an increase in their real factor income from an increase in $p_t$ above $p^w_s$ because $r_t$ increases relative to $p_t$, while it takes a decrease in $p_t$ below $p^w_s$ for group $\rho$ to gain an increase in their factor income. Therefore, if the Stolper-Samuelson theorem holds, a sufficient condition for $\hat{p}^j_s \geq p^w_s \geq \hat{p}^j_{\rho}$ is that trade policy revenue is a sufficiently small share of total income that its change in response to changes in $p_t$ does not overturn the Stolper-Samuelson effect on factor income. Note that trade policy revenue can always be made a sufficiently small share of total income. One way is to adjust technology

\(^{15}\)The situation where $\hat{p}^j_s$ goes from being at an interior solution initially to a corner solution after the world price shock, or vice versa, can be analyzed as a convex combination of the two cases just outlined. The outcome is qualitatively the same because the direction of change is the same in both cases.

\(^{16}\)The conditions required for this relationship to hold globally are established by Chipman (1969) and the literature to which he refers. These conditions are assumed to hold throughout our analysis.
so that the degree of comparative (dis)advantage, and hence trade policy revenue, is sufficiently small. This establishes the first property directly.

Turning to the second property, we established in Lemma 1 that $\hat{p}_H^j > \hat{p}_L^j$. Invoking the Stolper-Samuelson theorem again, factor income for group $\varepsilon$ will be higher under $\hat{p}_H^j$ than under $\hat{p}_L^j$ because $r_t$ is higher, while the reverse is true for group $\rho$ because $w_t$ is lower. $W^j(p_t)$ is monotonically increasing in factor incomes by homotheticity. Therefore, once again, providing factor income is a sufficiently large share of total income, its direction of change will determine the direction of change in group welfare. A feature of Stolper-Samuelson consistency is that the larger the difference between $p_w^L$ and $p_w^H$, the larger the difference between $W^i(\hat{p}_L^j)$ and $W^i(\hat{p}_H^j)$, $i, j \in \{\varepsilon, \rho\}$. This establishes the second property.

Taking $p_s^w$ as given, we will now provide a complete characterization of preferred price levels $\hat{p}_s^j$, under a comparative advantage in good $\varepsilon$ and $\rho$ respectively. This characterization will extend Proposition 1 of Zissimos (2017) to our present more general setting where the world price $p_w^s$ fluctuates between $p_w^L$ and $p_w^H$. We will discuss the case of a comparative advantage in good $\varepsilon$ in detail. The case of good $\rho$ is analogous.

With a comparative advantage in good $\varepsilon$, $p^\rho < p_w^s$. Thinking of free trade, $p_s^w$, as a reference point, the elite would ideally like to raise domestic prices above that level because their factor income is increasing in openness. But note that $p_s^w < \hat{p}_s^\varepsilon$ implies an export subsidy for the elite, which is not feasible in the absence of domestic fiscal capacity. Therefore, the solution to $\hat{p}_s^\varepsilon$ implies a corner solution $\hat{p}_s^\varepsilon = p_w^s$. Turning to $\hat{p}_s^\rho$, if this is at an interior solution, $p^\rho < \hat{p}_s^\rho < p_w^s$ then it implies the ROS would ideally like an export tax on good $\varepsilon$ that allows some openness. But, depending on their relative preferences for goods $\varepsilon$ and $\rho$, it could equally be that the ROS would prefer an export subsidy on good $\rho$, in which case in the absence of fiscal capacity the solution to $\hat{p}_s^\rho$ would imply a corner solution at autarky, $\hat{p}_s^\rho = p^\rho$. Therefore, for the ROS, in the absence of domestic fiscal capacity, $p^\rho \leq \hat{p}_s^\rho < p_s^w$. The analysis can be summarized as follows.

**Proposition 1.** Taking $p_s^w$ as given, in the absence of domestic fiscal capacity:

(i) with a comparative advantage in good $\varepsilon$, $\hat{p}_s^\varepsilon = p_s^w$ while $p^\rho \leq \hat{p}_s^\rho < p_s^w$;

(ii) with a comparative advantage in good $\rho$, $\hat{p}_s^\rho = p_s^w$ while $p_s^w < \hat{p}_s^\rho \leq p^\rho$.

From this result we can see that world prices, factor ownership, and comparative advantage co-determine the level of openness preferred by the respective groups. The conflict of interest
between groups over trade policy is of course more general than the framework we are using here, which is constructed to focus on trade policy. Moreover, the conflict of interest over trade policy would carry over to a situation where domestic fiscal capacity were available for trade subsidies.

4 Dynamic Game with World Price Shocks

The approach to characterization of equilibrium follows Zissimos (2017), but extends the approach to accommodate random world price shocks. To examine which outcome will arise in equilibrium, we will first formalize the payoffs to the respective groups under the various possible outcomes of elite rule, $E$, democracy through an extension of the franchise, $D$, or democracy through revolution, $R$. Note that the form of government, $F$, is either $D$ or $E$.

The concept of equilibrium is Markov Perfection, wherein each player’s strategy depends only on the state $(F, s)$ in a given period. The strategy played by the elite consists of a choice over whether or not to extend the franchise and how to set trade policy. The strategy of the ROS consists of whether or not to respond to the elite’s choices by mounting a revolution. A best response by the elite is their welfare-maximizing choice for all $F$, $s$, given the strategy of the ROS, and vice versa. Then a pure strategy Markov Perfect Equilibrium (MPE) is a set of mutual best responses.\(^{17}\)

4.1 Payoffs to Democracy, Revolution, and the Status Quo

First consider democracy. Let $V^j (D, \hat{p}_s^\rho)$ represent the value function under democracy for $j \in \{\varepsilon, \rho\}$ and $s \in \{L, H\}$, where $\hat{p}_s^\rho$ reflects the fact that the ROS determine trade policy under democracy and use this to set their preferred price level. For a member of group $j$, the payoff to democracy via an extension of the franchise takes the form:

$$V^j (D, \hat{p}_s^\rho) \equiv W^j (\hat{p}_s^\rho) + \frac{\beta \kappa}{1 - \beta} W^j (\hat{p}_H^\rho) + \frac{\beta (1 - \kappa)}{1 - \beta} W^j (\hat{p}_L^\rho).$$

The fact that the first term depends on $\hat{p}_s^\rho$ is an extension of the form used in Zissimos (2017) that allows for the possibility that in the current period $s$ is either $H$ or $L$. The weight on the second term, $\beta \kappa / (1 - \beta)$, provides the net present value of $W^j (\hat{p}_H^\rho)$, weighted by the probability

\(^{17}\)In this paper, we do not consider mixed strategy Markov Perfect equilibrium. The implications of allowing for mixed strategies will be discussed informally in the characterization of equilibrium.
that \( s = H \) in any future period, \( \kappa \). The weight on the third term, \( \beta (1 - \kappa) / (1 - \beta) \) provides the same thing for \( W^j (\hat{p}_L^s) \), given a corresponding probability of \( 1 - \kappa \) that \( s = L \) in any future period. Observe that this functional form allows \( p_s^w \) to vary randomly over time, because by Lemma 1 there is a unique mapping between \( p_s^w \) and \( \hat{p}_i^s \), and each term in the value function can be completely characterized in terms of \( W^j (\hat{p}_s^s) \), \( s \in \{L, H\} \). It is this feature that allows us to tractably extend the characterization of equilibrium in Zissimos (2017) to the present setting where world prices vary randomly.

Next, consider revolution. The value function for revolution is given by

\[
V^j (R, \hat{p}_s^s) \equiv W^j_R (\hat{p}_s^s) + \beta \kappa \frac{1}{1 - \beta} W^j (\hat{p}_H^s) + \beta \frac{(1 - \kappa)}{1 - \beta} W^j (\hat{p}_L^s) .
\]  

(2)

The first term captures agent \( j \)'s payoff in the period of revolution, given \( s \in \{L, H\} \). The second and third terms are the same as in (1), based on our assumption that in the period following revolution the full allocation of resources to productive uses is restored. Clearly, given that the continuation payoffs are the same under extension of the franchise and revolution, both groups would prefer an extension of the franchise because this avoids the cost of revolution. Therefore, extension of the franchise always has the potential to defuse revolution.

Finally, consider the status quo of elite rule. Let \( V^j (E, p^e_s; s) \) denote the value function for agent \( j \) under the status quo of elite rule. This is given by

\[
V^j (E, p^e_s; s) = W^j (p^e_s) + \beta \kappa \frac{1}{1 - \beta} W^j (p^e_H) + \beta \frac{(1 - \kappa)}{1 - \beta} W^j (p^e_L) .
\]  

(3)

This function is written to capture the value to agent \( j \) of elite rule under a stationary equilibrium where the elite set the same price \( p^e_L \) whenever \( s = L \), and the same price \( p^e_H \) whenever \( s = H \). We will use this expression to show that the elite can use trade policy to defuse the threat of revolution instead of extending the franchise if the ROS's expected payoff under trade policy set by the elite is at least as high as under revolution.

### 4.2 The Sequence of Events

The game is initialized with the assumption that in period 0 there is elite rule. Within a period, \( t \), the sequence of events proceeds in the following stages. First, the world price level, \( p_s^w \in \{p_L^w, p_H^w\} \), is revealed. Second, the elite decide whether or not to extend the franchise: if they do then there is democracy; if they do not, they set trade policy, \( p_t = p^e_t \). Third, if the elite
have not extended the franchise then the ROS decide whether or not to mount a revolution: if they do so it is successful for sure, leading to democracy. Fourth, if there is democracy then trade policy $p_t$ is set by the median voter (a member of the ROS because they are in the majority). Fifth, production takes place, demands are realized, markets clear and consumption takes place.

If democracy does not arise in period $t$, then in period $t + 1$ the sequence of events starts again at the first stage, and proceeds through all stages. If in period $t$ democracy does arise then in $t + 1$, $p^w \in \{p^w_L, p^w_H\}$ is determined in the first stage as before, but the second and third stages are skipped, moving straight to the fourth stage where the median voter sets trade policy. The assumption that all members of each of group $j \in \{\varepsilon, \rho\}$ are identical to one another means that we can model the members of each group as a single player. So the game between the elite and the ROS can be modeled as a two-player game.

5 Characterization of Equilibrium

In our characterization of equilibrium, we will focus on the issue of whether the elite can forestall democratization using trade policy. At the heart of this issue is the question of whether the ruling elite can credibly commit to compensate the ROS using trade policy for what they could gain from a revolution. If not, we will say that they face a commitment problem. We will then show that, when the elite face a commitment problem, democratization offers the only way to avoid a revolution; when they do not, the elite can forestall democratization using trade policy.

To facilitate characterization, we begin by assuming that when $p^w_s = p^w_L$ the ROS cannot threaten to mount a revolution, while when $p^w_s = p^w_H$ they can. An interpretation of this assumption is that news of $p^w_s = p^w_H$, in and of itself, allows the ROS to resolve the collective action problem involved in mounting a revolution. Because $p^w_s = p^w_H$ with probability $\kappa$, this directly parallels the assumption made in the prior literature that the threat of revolution arises with exogenous probability $\kappa$. Having characterized equilibrium under this assumption we will then relax it, and show that the same characterization of equilibrium holds under the assumption that the threat of revolution depends endogenously on the world price level.

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18Democracy is assumed to be an absorbing state, enabling us to focus the analysis on whether or not it is possible to set trade policy to forestall democratization. Acemoglu and Robinson (2001) present a model where democracy may fail to consolidate, and the present model could straightforwardly be extended in that direction.
5.1 The Commitment Problem

As defined above, the elite face a commitment problem if, in state $s = H$, it is not even feasible for them to use trade policy to maintain the status quo. To examine whether or not it is feasible for the elite to use trade policy to maintain the status quo, let $\tilde{V}^\rho (E|\kappa; H)$ be the maximum expected welfare that they can induce for the ROS using trade policy (as an alternative to extending the franchise). This is induced by setting $p_{s}^* = \hat{p}_{H}^\rho$ in every period where $s = H$. Note that when $s = L$ the elite cannot credibly commit to set anything other than $p_{s}^* = \hat{p}_{L}^\rho$ because they do not face the threat of revolution. Formally, by setting $p_{s}^* = \hat{p}_{H}^\rho = \hat{p}_{H}^\rho$ in (3), $\tilde{V}^\rho (E|\kappa; H) \equiv V^\rho (E, \tilde{p}_L^\rho; H)$. Then, for given $\kappa$, the condition for the elite to face a commitment problem is $\tilde{V}^\rho (E|\kappa; H) < V^\rho (R, \hat{p}_{H}^\rho)$.

![Figure 1: Characterization of Equilibrium](image)

Figure 1 can be used to determine the range of $\kappa$ for which the elite face a commitment problem. The horizontal axis shows the value of $\kappa$. For $s = H$ and any value of $\kappa \in [0, 1]$, the vertical axis shows the present discounted value to the ROS from ‘democracy via extension of the franchise’ $V^\rho (D, \hat{p}_s^\rho)$ henceforth ‘democracy’, revolution, $V^\rho (R, \hat{p}_s^\rho)$, and the maximum level of expected welfare that the elite can feasibly induce for the ROS using trade policy, $\tilde{V}^\rho (E|\kappa; H)$.

The payoff to democracy, $V^\rho (D, \hat{p}_s^\rho)$, given by (1), is illustrated by the downward-sloping dashed line. The solid line below that with the same slope shows the payoff to revolution,
\(V^\rho (R, \tilde{p}_H^\rho),\) given by (2). The (constant) vertical difference between this and the payoff to democracy is proportional to the cost of revolution, \((1 - \psi) Y^\rho (\tilde{p}_H^\rho).\) The reason that the lines are downward sloping is because a higher value of \(\kappa\) increases the likelihood of a high world price, which implies lower expected welfare for the ROS. This is different to the framework developed in Zissimos (2017), where the world price is constant and so the equivalent lines are horizontal (see Figure 3 of Zissimos 2017). The solid line whose negative gradient is shallower than the other two lines shows \(\tilde{V}^\rho (E|\kappa; H),\) given by (3).

Now consider the elite’s options for \(s = H.\) For \(\kappa < \bar{\kappa},\) it is not feasible for the elite to use trade policy to maintain the status quo because they cannot feasibly induce a level of welfare for the ROS that is at least as great as from revolution: \(\tilde{V}^\rho (E|\kappa; H) < V^\rho (R, \tilde{p}_H^\rho)\) over this range. This is based on the fact that the expected number of periods in the future for which the elite can set \(\tilde{p}_H^\rho\) as opposed to \(\tilde{p}_L^\rho\) is not sufficiently large. For \(\kappa > \bar{\kappa},\) \(\tilde{V}^\rho (E|\kappa; H) > V^\rho (R, \tilde{p}_H^\rho)\) because the expected number of periods in the future for which the elite can set \(\tilde{p}_H^\rho\) is sufficiently large. Hence, the elite face a commitment problem for \(\kappa < \bar{\kappa},\) but not for \(\kappa > \bar{\kappa}.

Figure 1 shows two key features of \(\tilde{V}^\rho (E|\kappa; H)\) on which the existence of a commitment problem is based. First, when \(\kappa = 1,\) the elite can feasibly induce a level of welfare for the ROS equivalent to democracy: \(\tilde{V}^\rho (E|1; H) = V^\rho (D, \tilde{p}_H^\rho).\) This holds because if \(\kappa = 1\) then the elite could feasibly set \(p^\rho_s = \tilde{p}_H^\rho\) in every period, since in every period \(s = H,\) and that would replicate the outcome of democracy, where ROS set \(\tilde{p}_H^\rho\) in every period themselves. The second feature is that the intercept of \(V^\rho (R, \tilde{p}_H^\rho)\) is greater than the intercept of \(\tilde{V}^\rho (E|\kappa; H).\) As a result, there must exist a value \(\bar{\kappa} \in (0, 1)\) at which \(\tilde{V}^\rho (E|\kappa; H) = V^\rho (R, \tilde{p}_H^\rho),\) and hence ranges of \(\kappa\) for which \(\kappa \leq \bar{\kappa}.\)

The second feature entails a restriction either on \(\beta\) or on \(\tilde{p}_H^\rho.\) Formally, using (2) and (3), at the intercept \(\kappa = 0\) we have

\[V^\rho (R, \tilde{p}_H^\rho) > \tilde{V}^\rho (E|0; H)\]

or equivalently

\[W^\rho_R (\tilde{p}_H^\rho) + \frac{\beta}{1 - \beta} W^\rho (\tilde{p}_L^\rho) > W^\rho (\tilde{p}_H^\rho) + \frac{\beta}{1 - \beta} W^\rho (\tilde{p}_L^\rho).\]  

(4)

From (4), we can see that since \(W^\rho_R (\tilde{p}_H^\rho) < W^\rho (\tilde{p}_H^\rho)\) because revolution is costly, and \(W^\rho (\tilde{p}_L^\rho) > W^\rho (\tilde{p}_L^\rho)\) by Stolper-Samuelson consistency, we only have to make \(\beta\) sufficiently large to ensure that the intercept of \(V^\rho (R, \tilde{p}_H^\rho)\) is greater than \(\tilde{V}^\rho (E|0; H).\) In the absence of this restriction
on $\beta$, we would have $\tilde{V}^\rho (E | \kappa; H) > V^\rho (R, \hat{p}^\rho_H)$ for all $\kappa \in [0, 1]$, and the elite could always feasibly induce a higher level of welfare for ROS using trade policy, and so they would never face a commitment problem.

What is the significance of this restriction on $\beta$? Intuitively, a relatively high value of $\beta$ means the ROS care enough about the future that the higher welfare implied by $\hat{p}^\rho_L$ relative to $\hat{p}^\rho_L$ is worth the cost of revolution in the short run. We will refer to (4) as the revolution constraint, and note that there exists a value of $\beta$ sufficiently large for the revolution constraint to bind. This parallels the set-up in Zissimos (2017).

A useful feature arises from the fact that $p^w_s \in \{p^w_L, p^w_H\}$ that goes beyond Zissimos (2017). Recall that, by Stolper-Samuelson consistency, $W^\rho (\hat{p}^\rho_H)$ is decreasing in $\hat{p}^\rho_H$, and by the argument that established Lemma 1, $\hat{p}^\rho_H$ is increasing in $p^w_H$. So an increase in $p^w_H$ effectively reduces the relative benefit of living with the status quo. Therefore, for fixed $\beta$, we can always choose a value of $p^w_H$ sufficiently large that the revolution constraint will bind.

From the foregoing discussion, there are three exogenous parameters affect $\pi$. A decrease in either $\psi$, and/or $\beta$, and/or $p^w_H$ will reduce the gap between the intercepts of $\tilde{V}^\rho (E | \kappa; H)$ and $V^\rho (R, \hat{p}^\rho_H)$, thus shifting $\pi$ to the left. The difference is that while a change in $\psi$ simply shifts $V^\rho (R, \hat{p}^\rho_H)$, a change in $\beta$ or $p^w_H$ changes the slopes of all three curves as well as their intercepts.

### 5.2 The Status Quo Price

Having established the range of $\kappa > \pi$ over which it is feasible for the elite to use trade policy to maintain the status quo, we will now examine the trade policy that the elite actually set in equilibrium. Over this range of $\kappa$, all the elite need to do to maintain the status quo is to set a value of $p^\omega_H$ that leaves the ROS just indifferent between mounting a revolution and maintaining the status quo. We call this value of $p^\omega_H$ the status quo price, and denote it by $p^{\omega q}$. Formally, for a given $\kappa > \pi$, the elite set $p^\omega_H = p^{\omega q}$ such that $V^\rho (E, \hat{p}^\omega_L, p^{\omega q}; H) = V^\rho (R, \hat{p}^\rho_H)$.

We can now establish the conditions for $p^{\omega q}$ to exist. The set-up is qualitatively the same as in Zissimos (2017), so the same approach can be used to prove the following result on the existence of $p^{\omega q}$.
Proposition 2. Assume that, with probability $\kappa$, $s = H$ and so the elite face the threat of revolution; with probability $1 - \kappa$, $s = L$ and so they do not. Also, assume a combination of values of $\beta$ and $p^w_H$ sufficiently large that the revolution constraint binds for $s = H$. In state $s = H$, for $\kappa > \bar{\kappa}$, there exists a unique status quo price, $p^{sq}$, that entails a compromise between the two groups in the sense that: (i) $\hat{p}^e_H > p^{sq} > \hat{p}^\rho_H$; (ii) $W^\rho(\hat{p}^\rho_H) > W^\rho (p^{sq}) > W^\rho (\hat{p}^e_H)$; and (iii) $W^\varepsilon (\hat{p}^e_H) > W^\varepsilon (p^{sq}) > W^\varepsilon (\hat{p}^\rho_H)$.

This result extends Proposition 3 of Zissimos (2017) to the present setting where the world price $p^w_s$ fluctuates between $p^w_L$ and $p^w_H$. It shows that we can characterize the status quo price strictly in terms of the world price, $p^w_H$, and corresponding preferred price levels, $\hat{p}^e_H$ and $\hat{p}^\rho_H$; that is, strictly in terms of outcomes in state $s = H$. The fact that $p^w_s$ varies gives us an extra degree of freedom relative to Proposition 3 of Zissimos (2017) that we can introduce to ensure that the revolution constraint binds. This will be useful in endogenizing the threat of revolution to a world price shock.

Proposition 2 says that $p^{sq}$ involves a compromise in the following sense. Feasibility establishes that over $\kappa > \bar{\kappa}$ the elite could induce an even higher level of welfare for the ROS than they could attain under revolution, by setting $p^e_H = \hat{p}^\rho_H$. But in fact the elite only have to set $p^e_H = p^{sq}$ to make the ROS just indifferent between living with the status quo and mounting a revolution. Moreover, these two alternatives leave the ROS better off than if the elite simply set trade policy at their own preferred level, $p^e_H = \hat{p}^e_H$. Hence $\hat{p}^e_H > p^{sq} > \hat{p}^\rho_H$ and $W^\rho (\hat{p}^\rho_H) > W^\rho (p^{sq}) > W^\rho (\hat{p}^e_H)$. And, by Stolper-Samuelson consistency, any improvement in ROS welfare through lower agricultural prices comes at a cost to the elite. Hence $W^\varepsilon (\hat{p}^e_H) > W^\varepsilon (p^{sq}) > W^\varepsilon (\hat{p}^\rho_H)$.

5.3 Endogenizing the Threat of Revolution to a World Price Shock

We will now relax the assumption that news of the world price shock, in and of itself, enables the ROS to resolve their collective action problem and mount a revolution. Let us revert to our original assumption that ROS can mount a revolution in any period, and if they do so then it will be successful for sure. Our aim in reverting to our original assumption is to attain conditions for the same characterization of equilibrium as already established, while endogenizing the threat of revolution to $p^w_s \in \{p^w_L, p^w_H\}$. Our approach will be to attain conditions under which the revolution constraint binds only if $p^w_s = p^w_H$, and not if $p^w_s = p^w_L$. 
We already know that the condition for the revolution constraint to bind when \( s = H \) is given by \( V^\rho (R, \hat{p}_H^\rho) > \tilde{V}^\rho (E|\kappa; H) \): see (4). At the same time, for the revolution constraint not to bind for \( s = L \), we require that for all \( \kappa \in [0,1] \),

\[
V^\rho (E, \hat{p}_L^\rho, p^{sq}; L) > V^\rho (R, \hat{p}_L^\rho)
\]

or, equivalently,

\[
W^\rho (\hat{p}_L^\rho) - W^\rho_R (\hat{p}_L^\rho) > \frac{\beta}{1-\beta} (\kappa (W^\rho (\hat{p}_H^\rho) - W^\rho (p^{sq})) + (1 - \kappa) (W^\rho (\hat{p}_L^\rho) - W^\rho (\hat{p}_L^\rho))).
\]

Here we are using the fact that for \( \kappa > \bar{\kappa} \), if the state were to switch to \( s = H \), in equilibrium the elite set the status quo price, \( p^{sq} \). (If on the other hand \( \kappa < \bar{\kappa} \), the elite would extend the franchise and ROS would set \( \hat{p}_H^\rho \).

Two parameter restrictions ensure that the inequality in (5) holds, whether \( \kappa < \bar{\kappa} \) or \( \kappa > \bar{\kappa} \). First, consider what would be required to make the left hand side positive. Although \( W^\rho (\hat{p}_L^\rho) > W^\rho (\hat{p}_L^\rho) \), we can ensure \( W^\rho (\hat{p}_L^\rho) > W^\rho_R (\hat{p}_L^\rho) = \psi W^\rho (\hat{p}_L^\rho) \) by making \( \psi \) sufficiently small. That is, the cost of revolution must be sufficiently high. Second, while the terms on the right hand side are positive, they are pre-multiplied by \( \beta/(1-\beta) \) so we can assume that \( \beta \) is sufficiently small that the inequality holds. This is, in effect, the opposite condition to the one we assumed for \( s = H \). We are assuming that when \( p^w_s = p^w_L \), the ROS are not sufficiently patient for the gains from revolution to be worthwhile, partly because the costs are relatively high, and partly because the ROS discount the future at a relatively high rate.

The next question is, can we establish that (5) will hold for \( s = L \), while simultaneously (4) holds for \( s = H \)? Recall from our discussion of the revolution constraint that, fixing \( \beta \), we can always find a value of \( p^w_H \) sufficiently large that (4) holds. So (4) will hold at the same time as (5) providing the world price shock is sufficiently large. Our analysis can be summarized as follows.

**Lemma 2.** Fix a value of \( \psi \) sufficiently small that the left hand side of (5) is positive. Then there exists a value of \( \beta \) sufficiently small that (5) holds, and a value of \( p^w_H \) sufficiently large that (4) holds.

Now equilibrium can be characterized, as in the next result.
Proposition 3. Assume values for $\beta$, $\psi$, and $p^w_L < p^w_H$, such that (4) and (5) hold. For $\kappa \neq \overline{\kappa}$ there exists a unique pure strategy MPE with the following characteristics. For any value of $\kappa \neq \overline{\kappa}$:

(i) If $p^w_\kappa = p^w_L$, the elite face no threat of revolution and so adopt their preferred price level, $\hat{p}^\epsilon_L$;

(ii) If $p^w_\kappa = p^w_H$ then the elite do face a threat of revolution and

(a) if $\kappa < \overline{\kappa}$ then the elite face a commitment problem, and so will respond by extending the franchise;

(b) if $\kappa > \overline{\kappa}$ then the elite do not face a commitment problem, and so will respond to the threat by temporarily setting the status quo price, $p^{sq}$, using trade policy.

This result extends Proposition 4 of Zissimos (2017) to the present setting. It shares with the earlier result the feature that a high threat state requires the elite to respond in order to avoid a revolution. Since $W^p (p^{sq}) > W^p (\hat{p}^\epsilon_H)$, setting the status quo price has the potential to neutralize the threat of a revolution. But in case (ii a), $\kappa < \overline{\kappa}$ so the elite do face a commitment problem. Hence they must extend the franchise. In case (iib), $\kappa > \overline{\kappa}$ and so the elite do not face a commitment problem and hence can neutralize the threat of revolution by setting $p^{sq}$; they can use trade policy to maintain the status quo.\(^\text{19}\)

There is, however, a key difference between the present result and Proposition 4 of Zissimos (2017). In Zissimos (2017), policy is the only source of variation in welfare, and the low threat state is associated with a low level of welfare because in that state the elite can set with impunity a policy that is relatively bad for the ROS. In the present setting, differently from Zissimos (2017), there are two sources of variation: the world price level itself, and the policy response to the world price level. Here, differently from Zissimos (2017), the ROS’s welfare may be higher in $s = L$ than in $s = H$ because the world price level is more favorable to them. Surprisingly, the fact that the ROS’s welfare may be lower in $s = H$ than in $s = L$ turns out not to change

\(^{19}\)Acemoglu and Robinson (2017) show, in the same model as AR, that there also exists a mixed strategy MPE. They are perfectly up-front about the fact that they overlooked this possibility in AR; Zissimos (2017) overlooked it as well. The mixed strategy MPE relies on the possibility of a Markovian deviation from the pure strategy MPE whereby, when the elite are faced with the threat of revolution and a commitment problem, they renege on their promise to extend the franchise with some probability; promising instead to extend the franchise next time the threat of revolution arises. If the ROS can also play a mixed strategy, it is rational for them only to go through with the revolution with some probability. The same logic would carry over to the present setting as well. Then, there would exist a range of the parameter space immediately below $\overline{\kappa}$ over which a revolution could occur with some probability on the equilibrium path. However, if we assume that there is sufficient momentum behind the threat of revolution that, in the face of a commitment problem, revolution can only be stopped by an extension of the franchise, then the elite’s Markovian deviation does not arise on the pure strategy MPE path. We adopt this assumption to simplify the characterization of equilibrium because the main focus of our theoretical and econometric analysis is on the region of the parameter space above $\overline{\kappa}$.
the basic logic of the argument. The logic of the argument rests, instead, on how relative levels of welfare under democracy, revolution, and the status quo of elite rule vary with $\kappa$, and this relationship is found to be the same in the present setting as it is in Zissimos (2017) despite the variation in world prices.\footnote{To see this, compare Figure 1 above to Figure 3 of Zissimos (2017). This comparison shows that the relative relationships between ROS payoffs to democracy, revolution, and the level of welfare that the elite can induce for ROS are the same. The difference is that whereas here the payoffs to extending the status quo and revolution are decreasing in $\kappa$, in Zissimos (2017) they are constant. The reason is that here the payoffs to ROS of both outcomes are decreasing in $p^w_H$, the probability of which is increasing in $\kappa$, whereas in Figure 3 of Zissimos (2017) $p^w$ does not change. Moreover, Figure 1 shows that the maximum expected welfare that the elite can feasibly induce for the rest of society is decreasing in $\kappa$ while in Figure 3 of Zissimos (2017) it is increasing. In fact here it can be increasing or decreasing, depending on the relationship between $\hat{p}^\rho_L$ and $\hat{p}^\rho_H$.}

6 Comparative Advantage and Policy Responses

Observe that the above characterization of equilibrium says nothing about the good for which the country has a comparative advantage. Informed by the above characterization of equilibrium, in this section we first characterize equilibrium policy for the case of a comparative advantage in good $\varepsilon$. We will then discuss an ambiguity that arises with characterization of equilibrium policy for a comparative advantage in good $\rho$.

6.1 Comparative Advantage in Good $\varepsilon$

Recall that, without loss of generality, trade policy is applied to good $\varepsilon$. So with a comparative advantage in good $\varepsilon$, the trade policy is either an export tax or an export subsidy. We will obtain clear indicative predictions by restricting attention to a situation where there is no domestic fiscal capacity. Recall from Proposition 1(i) that, in the absence of domestic fiscal capacity, with a comparative advantage in good $\varepsilon$, $\hat{p}^\varepsilon = p^w$ while $p^\rho \leq \hat{p}^\rho < p^w$. In other words, the elite’s preferred price level implies free trade while that of the ROS implies an export tax. We will use this result in conjunction with the characterization of equilibrium that we obtained in Proposition 3. Also, because in our econometric implementation we want to examine elite policy responses to a world price shock, the discussion in this section will focus on the situation where the elite do not face a commitment problem and so they can use trade policy to maintain the status quo. Accordingly, we restrict the parameter space to the range where $\kappa > \pi$. 

Now let us consider how the equilibrium price levels predicted by Proposition 3 will translate
into trade policies. With group $\varepsilon$ in power, the formula for an ad valorem export tax set in state $s$ takes the form $\tau_{s}^{EX} = (p_{s}^{\varepsilon} - p_{s}^{w}) / p_{s}^{w}$. We know from Proposition 3 that: if $p_{s}^{w} = p_{L}^{w}$, the elite set $\hat{p}_{L}^{w} = p_{L}^{w}$; if on the other hand $p_{s}^{w} = p_{H}^{w}$ then while the elite’s preferred price level is $\hat{p}_{H}^{w} = p_{H}^{w}$, they must set the status quo price, $p^{sq}$, in order to prevent a revolution. And we know from Proposition 2 that $\hat{p}_{H}^{w} > p^{sq} > \hat{p}_{L}^{w}$. Using the equilibrium values determined above in the formula for an export tax, we therefore have $\tau_{L}^{EX} = 0$ and $\tau_{H}^{EX} = (p^{sq} - p_{H}^{w}) / p_{H}^{w} < 0$. This implies there will be free trade in the low threat state, and an export tax in the high threat state.

**Proposition 4.** Assume parameter values as in Proposition 3, $\kappa > \bar{\kappa}$, and a comparative advantage in good $\varepsilon$. There exists a unique pure strategy MPE with the following characteristics: if $p^{w} = p_{L}^{w}$, then the elite face no threat of revolution and so adopt their preferred trade policy of free trade, $\tau_{L}^{EX} = 0$; if $p^{w} = p_{H}^{w}$ then the elite do face the threat of revolution and prevent revolution by setting $p^{sq}$ using an export tax, $\tau_{H}^{EX} = (p^{sq} - p_{H}^{w}) / p_{H}^{w} < 0$.

We see from Proposition 4 that, with a comparative advantage in good $\varepsilon$, trade policy will switch between free trade and an export tax, according to whether $p_{s}^{w} = p_{L}^{w}$ or $p_{H}^{w}$.

It is worth noting a qualification to the prediction arising from Proposition 3 that will be relevant when we take our model to the data. The assumption we have been maintaining here is that the elite do not need to raise any fiscal revenues for public finance purposes. The model could easily be extended to accommodate the need to raise a fixed amount of revenue for these purposes. In that case, instead of $\hat{p}_{H}^{w}$ being at a corner solution of free trade as in Proposition 3, the prediction would be that $\hat{p}_{H}^{w}$ is at a corner solution that implies an export tax sufficient to raise just enough revenue to cover the public finance requirements. The solution for $\hat{p}_{H}^{w}$ would be adjusted correspondingly. Providing the fiscal revenue requirement was sufficiently small, the basic feature of Proposition 2 that $\hat{p}_{H}^{w} > p^{sq} > \hat{p}_{H}^{w}$ would be preserved. Accordingly, the prediction would be that, in the low threat state the export tax would be positive but relatively low (but not free trade as in Proposition 4), and there would be an increase in the export tax from that level in the high threat state. Thus, the basic prediction obtained from Proposition 4, that the elite increase export taxes in the high threat state to prevent a revolution, is preserved when the elite use export taxes to raise revenues for public finance purposes.
6.2 Comparative Advantage in Good $\rho$

With a comparative advantage in good $\rho$, the trade policy is either an import tariff or subsidy. To obtain clear cut predictions, we will continue to assume that there is no domestic fiscal capacity. Then by Proposition 1(ii), with a comparative advantage in good $\rho$, $p_s^w = p_{s}^{\rho}$ while $p_s^w < \hat{p}_s^\rho \leq p^a$. In this case, it is the ROS’s preferred price level that implies free trade, whereas that of the elite implies an import tariff. As in the previous subsection, our approach will be to combine this result with the characterization of equilibrium in Proposition 3, while restricting the parameter space to the range where $\kappa > \overline{\kappa}$.

From the characterization of equilibrium in Proposition 3: if $p_w^s = p_L^w$, the elite set the import tariff consistent with $\hat{p}_s^\rho$; if on the other hand $p_s^w = p_H^w$ then while the elite’s preferred price level is $\hat{p}_s^\rho$, they must set the status quo price, $p^{eq}$, in order to defuse the threat of revolution. And we know from Proposition 2 that $\hat{p}_s^\rho > p^{eq} > p_H^\rho$. With the elite in power, the formula for an ad valorem import tariff set in state $s$ takes the form $\tau_{sIM} = (p_s^\rho - p^w_s)/p^w_s$. Using the equilibrium values determined above, we therefore have $\tau_{LIM} = (\hat{p}_L^\rho - p_L^w)/p_L^w$ and $\tau_{HIM} = (p^{eq} - p_H^w)/p_H^w$, which in general implies positive import tariffs in both high and low threat states.

Note that, unlike for a comparative advantage in good $\varepsilon$, for a comparative advantage in good $\rho$ we cannot say anything about the relative sizes of import tariffs $\tau_{LIM}$ and $\tau_{HIM}$. Ambiguity is introduced because, although we know that $\hat{p}_s^\rho > p^{eq}$, we do not know the relationship between $\hat{p}_L^\rho$ and $p^{eq}$. And even if we did know this, we would need to know how $p^{eq}$ changes relative to $p_H^w$ and $p_L^w$ in order to determine the relationship between $\tau_{LIM}$ and $\tau_{HIM}$. Therefore, although the analysis provides us with an understanding of how $\tau_{LIM}$ and $\tau_{HIM}$ are determined, it cannot tell us about their relative magnitudes. The analysis is summarized as follows.

**Proposition 5.** Assume parameter values as in Proposition 3, $\kappa > \overline{\kappa}$, and a comparative advantage in good $\rho$. There exists a unique pure strategy MPE with the following characteristics: if $p_s^w = p_L^w$, then the elite face no threat of revolution and so adopt their preferred trade policy of $p_H^w$; by setting a positive import tariff $\tau_{LIM} = (\hat{p}_L^\rho - p_L^w)/p_L^w$; if $p_s^w = p_H^w$ then the elite do face the threat of revolution and defuse this by setting $p^{eq}$ using an import tariff, $\tau_{HIM} = (p^{eq} - p_H^w)/p_H^w$. The size of $\tau_{LIM}$ relative to $\tau_{HIM}$ is ambiguous.
As a result of the ambiguity in the size of $\tau_{LM}^I$ relative to $\tau_{HM}^I$ brought to light by this result, we do not have a clear cut testable prediction to take to the data for the case of import tariffs.

7 Data and Econometric Design

7.1 From Theory to Empirics

Our econometric implementation focuses on the range of the parameter space where the elite do not face a commitment problem. As discussed above, in this range, although a world price shock gives rise to the threat of revolution, the elite are able to use trade policy to defuse this threat and forestall democratization. In formal terms, we maintain the assumption from Section 6 that $\kappa > \pi$. As we learned from Propositions 4 and 5, the model’s predictions for how the elite set trade policy are distinctly different for a comparative advantage in good $\varepsilon$ and $\rho$ respectively. Proposition 4 dealt with good $\varepsilon$, and showed that the elite will respond to the threat of revolution in a clear cut way, by increasing export taxes. Proposition 5 dealt with good $\rho$, and showed that in this case the elite’s response using import tariffs is ambiguous. Therefore, our econometric implementation will focus on dictatorships that export primary products. Following Proposition 4 we will look for evidence in the data that, in response to a world agricultural price shock, these countries increase export taxes.21

7.2 Data

The dependent variable in our analysis is the nominal rate of assistance (NRA) afforded by governments to agricultural exports. This is apt for a study focused on export taxes in agriculture. The NRA for an agricultural product is the percent difference, due to policies, in gross returns to producers compared to what they would have been without the government’s intervention. Taking the world price as a reference, a product’s NRA is positive when a policy raises the product’s price above the world price and negative when a policy lowers the product’s price below the world price. For an exported good, a positive NRA amounts to subsidizing the export, while a negative NRA to taxing it.

21We have undertaken econometric analysis on import tariffs that parallels our analysis of export taxes. For import tariffs, we fail to obtain clear-cut results. We interpret this outcome as reflecting the ambiguity in the theoretical predictions concerning import tariffs exhibited in Proposition 5.
decades, 1960-2010, by Anderson and Valenzuela (2008) and Anderson et al. (2008). The NRA price distortion measures are theoretically encompassing, and include a range of instruments: domestic and trade policy instruments such as border price supports, exchange rate distortions, production subsidies and taxes, and input price distortions. However, the predominant distorting influences contained in the nominal rates of assistance (NRAs) are border distortions and not domestic distortions (Anderson et al. 2008).

Suppose the government of Egypt subsidizes its exports of rice with an ad valorem subsidy $s_x$. The subsidy would be precisely measured by the NRA, operationally defined as

$$NRA = \frac{E \times P(1 + s_x) - E \times P}{E \times P},$$  

where $E$ is the Egyptian pound (or Livre Égyptienne, shortened to LE) per US dollar (USD) rate and $P$ is the price in LE of Egyptian rice on the international market. Taking this formula to the field requires determining the domestic LE price received by the Egyptian rice producer at the farmgate, $P(1 + s_x)$. Anderson et al.’s (2008) NRA measures are the product of detailed field studies used to determine the domestic price of agricultural products at the farmgate. In our example, if the subsidy is the sole distortion, the NRA on rice exports computes to $s_x > 0$. If rice exports are taxed instead, then $s_x < 0$. The ad valorem equivalent of a government-imposed ban on exports of a commodity may be computed using (6) once field work determines the farmgate price $P(1 + s_x)$.

Anderson et al. carefully account for exchange rate distortions which have often been used by developing countries as a redistributive policy instrument. Domestic prices are converted to US dollars using market foreign exchange rates, or multi-tiered exchange rates, or shadow exchange rates estimated in other studies to take into account any distortions to the foreign exchange market.\footnote{Where a country has distortions in its domestic market for foreign currency, the exchange rate relevant for calculating the NRA for a particular tradable product depends, in the case of a dual exchange rate system, on whether the product is an importable or an exportable, while in the case of multiple exchange rates it depends on the specific rate applying to that product each year (Anderson et al. 2008, p. 684).} Input and other supply chain distortions are also taken into account in their computations. Details of the methodology are in Anderson (2009, Appendix A).

In sum, our dependent variable is a country’s overall export NRA, computed by Anderson et al. as the trade-weighted average of the country’s NRAs on products it exports. They represent the best available border measures imposed by countries on their exports of agricultural products. Table 1 presents statistics on export NRAs over the 2003-10 period for the countries...
in our sample.

Countries are organized into three categories according to their political institutions, as measured by their Polity IV score (Marshall, Gurr and Jaggers 2013). Polity IV scores measuring the quality of democracies and dictatorships were introduced by Marshall et al. (1992), and remain the most widely used measure of political institutions. A country is classified as belonging to one of these three regime types based on its mean Polity IV score over the ten years preceding the sample: for the 2003-10 sample, scores are averaged over 1993-2002. Polity IV scores vary from -10 to +10. A country is assigned to type DEM1 or dictatorship if its mean score lies between -10 and 0, to type DEM2 or ‘middle’ democracy if its mean is between 1 and 8, and to type DEM3 or liberal democracy if its mean is either 9 or 10. These categorizations are described in greater detail below. A feature of Table 1 is the substantial within-country variation in country NRAs.

Figures 2 and 3 anticipate the econometric results. Figure 2 depicts the time series of mean NRAs over the period 2002-2010, for dictatorships (DEM1) as the blue solid line, middle democracies (DEM2) as the red long-dashed line, and liberal democracies (DEM3) as the green short-dashed line. Figure 3 depicts the same thing for the period 1968-1978. As shown in Figure 2, dictatorships already had a negative mean NRA in the years immediately prior to the 2006-08 price shock, so they were setting export taxes. Yet, once the price shocks began, their mean NRA dropped sharply, indicating a sharp increase in export taxes. Liberal democracies had an export subsidy regime (NRA > 0) in place, and responded to the shock by reducing the subsidies on average, stopping short of taxing their exports. The response of middle democracies lay between those of the other two regime types. In the period immediately prior to the shock, they imposed export subsidies like the liberal democracies. In response to the price shock, the middle democracies began taxing exports in a way qualitatively similar to dictatorships, but the size of their export taxes was smaller.

The case of Pakistan’s export restrictions on cotton and rice is an illustrative example. In 2004, Pakistan’s exports of cotton and rice suffered few distortions. The 2006 world price shock led Pakistan to set low procurement prices for cotton and rice, thus heavily taxing the exports of these sectors (Dorosh and Salam 2009, and Salam 2009), just as predicted by Proposition 4.

Figure 3 shows that similar patterns were observed in the data in the 1970s, which is perhaps to be expected since more dictatorships existed at that time than in the 2000s. Moreover, the
export tax responses by the respective regimes to the shock of 1973-75 was similar to those for the 2006-08 shock. The interesting feature of Figure 3 is that export subsidies by liberal democracies declined much more sharply in response to the 1973-75 shock compared to the 2006-08 shock, and resumed more quickly afterwards. Therefore, the behavior of liberal democracies in response to the 1973-75 shock was more in line with what GH would predict, whereas there is an apparent discrepancy in their response to the 2006-08 shock. We interpret this difference in light of the Uruguay Round. As a result of the Uruguay Round, concluded in 1994, liberal democracies were mandated to remove their export subsidies. Once liberal democracies had removed export subsidies in the 2000s, they would have been unable to restore them, whereas they were not constrained in this manner in the 1970s. So they chose to reduce them more gradually in response to the 2006-08 shock.

7.3 Econometric Design

The quasi-experiment that we focus on is the policy reaction by dictatorships faced with the 2006-08 world agricultural price shock. The 3-year increase in the price of agricultural products started in 2006 (Sumner 2009, Figs. 2, and 3) when corn and wheat prices rose 30%, continuing into 2007, at which point rice prices began their rapid rise, peaking in 2008. The Food and Agriculture Organization (FAO) monthly cereals price index, a weighted average of the international price of corn, rice and wheat using 2002 exports as weights, rose 36% between 12/2005 and 11/2006, then another 36% until 11/2007, and yet another 27% during the six months ending 6/2008 before beginning its descent.\footnote{We maintain the small-country assumption, a viable assumption given the small size of agricultural exporting nations ruled by dictatorships relative to the world market. We therefore treat the price shock as exogenous and are interested in whether governments responded as our theory predicts.\cite{Janzen} Specifically, we think of the price shock as a treatment that occurs in the years 2006-08. We are interested in the population average effect of the price shock in the population of dictatorships in the first decade of the 2000s (stated in\cite{Janzen} These percentage increases are based on our calculations from the FAO’s monthly Food Price Index (FPI). Another reason why price shocks can be taken as exogenous (even if prices may not be) is that they are unpredictable. In a comprehensive study of wheat prices in the US market using monthly price data on wheat futures over 1991-2011, Janzen et al (2014) show that price shocks are driven by fundamentals, largely shocks to current supply. Supply is susceptible to weather-related shocks, and compounded by expectations about future shocks reflected in demand for inventories. They also find little evidence of a co-movement of wheat shocks with shocks in non-agricultural markets, specifically crude oil market shocks. An implication for our study is that predicting food price shocks requires predicting shocks to world market fundamentals – for example, the 2006-08 drought that greatly reduced Australian wheat output. Price shocks may therefore be treated as exogenous to domestic policy, which is a reaction to these shocks.}
We complement this with an analysis of a second quasi-experiment provided by the 1973-75 world food price shocks. Again, we are interested in the population average effect of that price shock in the population of dictatorships from 1969-78. The fact that the form of government in some countries changed between the end of the 1970s and the beginning of the 2000s (see e.g. Huntington 1991) makes the two populations fundamentally different. Consequently, the populations of countries from which, and circumstances during which, these samples are drawn could produce very different policy responses to the world price shocks. Remarkably, we find the average effect of the price shock treatments to be qualitatively similar in both populations, in line with the predictions of Proposition 4.

8 Econometric Models and Results

8.1 Baseline: Pre- versus Post-Shock

In this baseline model, we estimate the treatment effect, \( \tau \), to test the hypothesis that governments in dictatorships respond to a world agricultural price shock by raising export taxes. We employ the following model with fixed effects to estimate the treatment effect:

\[
NRA_{i,t} = \phi NRA_{i,t-1} + \tau I_{t}^{HIGH} + X_{i,t} B + \gamma_i + \epsilon_{i,t},
\]

where \( NRA_{i,t} \) is country \( i \)'s overall export NRA in year \( t \), \( \gamma_i \) are country fixed effects (FE), and panel dynamics are accounted for by the lagged dependent variable \( NRA_{i,t-1} \). The vector \( X_{i,t} \) includes three control variables: (log) per capita GDP, (log) exchange rates and a linear trend. The assignment indicator is \( I_{t}^{HIGH} \) which equals one for the years during which the price shock occurred. We are interested in its coefficient \( \tau \). With fixed effects, \( \tau \) equals the within-country mean difference between policy when the world price shock occurred versus when prices were normal, conditional on the regressors. As discussed, we analyze the effect of shocks in two distinct eras: the 2006-08 shock and the 1973-75 shock. Our hypothesis, based on Proposition 4, is that in both eras \( \tau < 0 \).

The within-country errors are assumed to follow a first lagged autoregressive, or AR(1), process, which we believe adequately characterizes panel dynamics in the model. With an AR(1)
error structure, including the lagged dependent variable (LDV) makes the errors plausibly iid. Ordinary least squares (OLS) is therefore efficient if sampling and assignment are unclustered (more on clustering below). Alternatively, without the LDV, feasible generalized least squares (FGLS) is efficient if sampling and assignment are unclustered. The model above reflects the former specification. Including the LDV raises issues about Nickell bias (Nickell 1981), but we find that dropping the LDV does not significantly change the estimate of the treatment effect. FGLS estimates (available from the authors) are also quantitatively close to estimates from the models with the LDV, indicating the need to account for first order serial correlation.

The design we have specified to measure treatment effects, even with FE, has been subject to the critique that it lacks a control group that captures the counterfactual. Since the world price shock was experienced by all countries, the counterfactual – dictatorships not subject to the shock – cannot be constructed. But since liberal democracies do not face a revolution constraint, and have well-developed institutions and fiscal capacity, they should not respond to the price shock in the manner predicted by the theoretical model, and therefore form a credible comparison group. On the other hand, democratic governments also fear the loss of political power at the polls, so we might see a similar response in the data. To account for these possibilities, we explicitly estimate the treatment effect $\tau$ for three forms of government: dictatorships, middle democracies and liberal democracies, from the model:

$$NRA_{i,t} = \phi NRA_{i,t-1} + \sum_{d=1}^{3} \tau_d (DEM_d \times I_{HIGH}^t) + X_{i,t}B + \gamma_i + \epsilon_{i,t}.$$ 

In the econometric model $DEM_1 = 1$ if country $i$ is a dictatorship, $DEM_2 = 1$ if $i$ is a middle democracy, and $DEM_3 = 1$ if $i$ is a liberal democracy. We posit that dictatorships are different from democracies in their response to a high price shock: $\tau_1 < 0$, $\tau_2 = \tau_3 = 0$. The robustness of these results to different definitions of democracy - based on the foundations upon which Polity IV scores are built - is further explored below. Summarizing the above description, we will refer to this specification as OLS-FE.

In addition to the model with explicit fixed effects, we test the theory’s predictions from the model in first differences (FD) to remove the unobserved effects. In every table we report estimates from the OLS-FE model together with estimates from the corresponding FD model. Appendix A describes the FD specification in detail and provides a rationale for the model beyond a robustness check on the fixed-effects model.
We cluster errors at the country level. This is not an ad hoc decision, but rather a fundamental aspect of the econometric model’s design. Our approach to clustering follows Abadie et al (2017) and its relevance to our model is fully described in Appendix B. To summarize, based on the predictions of Proposition 4, our main hypothesis posits that world agricultural price shocks incentivize dictatorships to raise export taxes on agricultural products, which use land intensively in their production. In doing so, their aim is to defuse the threat of revolution.

**Baseline Results**

Table 2 reports coefficient estimates from the OLS-FE and FD models of NRAs to exports from the 2003-10 sample. The first two columns restrict the sample to only dictatorships. The first column includes the lagged dependent variable, log per capita GDP, and a linear trend as regressors and controls for fixed effects. The second column includes the log nominal exchange rate (home currency per dollar indexed to 1995 as the base year). The average treatment effect – the difference between the price shock and non-price shock NRA, conditional on fixed effects and regressors – is negative and statistically significant in both columns. NRAs in the sample of dictatorships were lower by 9.3 percentage points (second column), on average, during the price-shock years. That is, export taxes were 9.3 percentage points higher than in non-shock years. The FD models in the right half of Table 2 reports a stronger response to the price shock by dictatorships. The export tax on agricultural products were 12.5 percentage points higher, on average, during the price shock years than in non-shock years (see second FD column).

OLS-FE estimates from the full sample of democracies and dictatorships in the third and fourth columns of Table 2 show that the treatment effect for middle democracies was no different from that for dictatorships. Specifically, the interaction of with the middle democracy indicator shows no statistically significant difference. Moreover, the interaction of with the liberal democracy indicator shows that here there is a statistically significant difference in export tax-setting behavior between dictatorships and liberal democracies. These differences are confirmed in the final two rows of Table 2, which show the total effects. The penultimate row shows that the shock resulted in a decrease in NRAs, or increase in export taxes, of approximately 8 percentage points for middle democracies, similar in magnitude to the dictatorial policy response. The final row shows that for liberal democracies there was no statistically significant response. This result goes against our working hypothesis that liberal democracies and middle democracies respond similarly, and that both respond differently from dictatorships. We find,
in fact, that middle democracies and dictatorships respond similarly to the world price shock by raising export taxes, significantly differently from the liberal democracy response.

Table 3 examines the dictatorial response to the world price shocks in 1973-75. The OLS-FE estimates in the second column indicate that dictators increased export taxes by 6.5 percentage points, on average, during the price shocks. The treatment effect for middle democracies affirms the 2006-08 price shock finding that their policy response was not significantly different from dictatorships. The behavior of liberal democracies was vastly different. Although their NRAs dropped substantially, by 19.1 percentage points, this was the result of reducing export subsidies, not increasing export taxes. The FD models in the right panel of Table 3 affirm the OLS-FE results.

8.2 The Effect of Land Inequality

In countries where landholding is highly unequal, the elite are landowners. Binswanger, Deininger and Feder (1995) find this is the case across Africa and Asia, Goldstein and Udry (2008) find this in Ghana, and de Ferranti et al. (2004 Ch. 6) document this to be the case across Latin America. While in our theoretical model all members of the elite have the same endowment of land, the model could naturally be extended to allow for the possibility that land endowments vary. In that extension of the model, the interests of all land-owners, even smallholders, are aligned with those of the elite: an increase in export taxes redistribute income from land owners collectively to those who do not own land. The incentive to increase export taxes to defuse the threat of revolution is then more pronounced in dictatorships with greater land inequality.

We specify a model to investigate whether, in response to price shocks, export taxes increase by more as landholding becomes more concentrated:

\[
NRA_{i,t} = \phi NRA_{i,t-1} + \alpha I_t^{HIGH} + \tau [I_t^{HIGH} \times LGINI_i] + X_{i,t}B + \gamma_i + e_{i,t}.
\]

The treatment effect we measure is the difference-in-differences \( \partial^2 NRA_{it}/(\partial I_t^{HIGH} \partial LGINI_i) < \)

---

26 Log per capita GDP was statistically and economically significantly associated with NRAs in the 1970s. While the positive cross-sectional correlation between income and NRA is well established – high-income countries can and do subsidize agricultural production (e.g. Anderson 2009) – it is a surprising finding in the restricted sample of dictatorships who do not subsidize exports. It implies that export taxes fall with GDP. A plausible explanation is that domestic taxation such as sales taxes grow with GDP, leaving governments less reliant on export tax revenue for fiscal requirements. Also, while log exchange rates did not appear to be a factor in the 2006-08 spike – perhaps because many countries had moved to less managed exchange rate regimes – devaluations were a feature of exchange rate regimes in the 1970s (Edwards and Santaella 1993).
0, where the first difference is taken with respect to the price shock and the second with respect to the land Gini. Countries that confer large landholdings to the elite have high land Gini measures. We use the seminal Deininger and Squire (1998) measures of land inequality. From the decennial censuses of the FAO, they use data on the total number and total area of holdings by size of holdings to estimate the Lorenz curve to calculate the land Gini for a number of countries. The Gini measures the distribution of operational landholdings within a country, and are therefore comparable across countries. Vollrath (2007) adds more countries to that database. Where neither Deininger and Squire nor Vollrath provide a measure, we complete the land Gini data with entries from the FAO’s compilation based on their landholdings surveys of 2007,\textsuperscript{27} and from individual sources documented in Appendix A. Appendix A also provides a full statement of the OLS-FE and FD land inequality models. Appendix Table A1 breaks out descriptive statistics for LGINI for the three regime types.

\textit{Results with Land Inequality}

Table 4 shows the results for the period 2003-10. There are two main messages from these results. The first is that the treatment effect of the price shock is large, indicating that the 2000’s price shock induced larger export taxes in countries with greater land inequality. The OLS-FE estimate of the treatment effect of $-0.442$ (column 2) implies an export tax that was 8.1 percentage points higher in dictatorships at the third LGINI quartile compared with dictatorships at the first LGINI quartile. The implied export tax differential in the most unequal dictatorship in our sample (Tanzania, LGINI=0.790) over the most equal one (Morocco, LGINI=0.344) is 18.7 percentage points! The FD model results in the right panel of Table 4 estimate the treatment effect precisely and, notably, imply export tax differentials that are twice the magnitude of their OLS-FE counterparts.

The second message is that, like for the single-difference estimates shown in Table 2, there is evidence to suggest that middle democracies respond to the shock in the same way as dictatorships, while the response of liberal democracies is notable for being non-existent. The OLS-FE results show that the estimate for middle democracies is not significantly different to that of dictatorships. However, the total effects presented at the bottom of Table 4 (column 4) show the treatment effect for middle democracies, while large in magnitude, is imprecisely estimated. Possibly, the variation in the land inequality in the sample of middle democracies, conditional

on income, is less than adequate for a precise estimate.

In liberal democracies, the absence of any such result validates the theory’s focus on trade policy as a means to stave off revolution in dictatorships. The fact that liberal democracies are not subject to the threat of revolution means their policy in the face of a price shock is not driven by land inequality. This is despite the fact that the sample of liberal democracies is characterized by significant land inequality: their interquartile range for LGINI is 0.240, compared with 0.167 for dictatorships (and 0.254 for middle democracies).

We carry out the same analysis for our 1969-78 sample to see whether or not the same policy responses were observed during the 1973-75 food price shock. We use the same land inequality measures as for the period 2003-10, because measures from the 1970s are unavailable for a significant proportion of countries in our sample. Using measures from the 2000s requires the assumption that land inequality is a persistent phenomenon. There were more dictatorships in this period, reflected in our sample of 24 dictatorships (compared to 16 in the 2003-2010 sample). The treatment effects in Table 5 affirm the theory for this new population. The OLS-FE model coefficient of \( -0.230 \) in the full model implies that in the face of the 1970s price shock, dictatorships in the top land inequality quartile taxed exports by 4.2 percentage points, on average, more than dictatorships in the bottom land inequality quartile. The difference between the countries with the highest and lowest land inequality was 9.8 percentage points. The affirmation of the theory should not be surprising. Many of these countries had become recently independent of their colonizers, had nascent institutions and little domestic fiscal capacity. They therefore satisfy the assumptions underlying the model.

A noteworthy feature of the results presented in Table 5 is the effect of land inequality on agricultural export policy of the 1973-75 price shock in liberal democracies. Table 5 (bottom row) reports this response at 0.512, which is precisely the opposite of the dictatorial response. We interpret this result as reflecting the fact that large landholders in liberal democracies with high land inequality were able to lobby their governments to maintain export subsidies in the

\[28\] A number of studies show that initiation of land reforms has had little impact on land inequality, where land reforms are rolled back under new governments. Binswanger et al. (1995) cover many regions; Deininger and Squire (1998) also indicate the stasis. Faguet et al. (2016) provide a survey of the South American experience with land reform, particularly Columbia.

\[29\] Arranged in ascending order of average Polity IV score over the sample period, the dictatorships are: Côte d’Ivoire, Cameroon, Chad, Indonesia, Kenya, Mali, Togo, Zambia, Egypt, Philippines, Sudan, Brazil, Senegal, Benin, Argentina, Ghana, Ecuador, Madagascar, Chile, Spain, Dominican Republic, Thailand, Bangladesh, Portugal.
face of the shock, while (less influential) landowners in more land-equal countries were not able to do so and their subsidies decreased. This is very much what we would expect from a GH mechanism, which we think underlies this liberal democratic response.

Since the 1973-75 agricultural price shocks were the first of this magnitude in the post-World War II era, governments were unfamiliar with policy instruments that could be used to alleviate the impact of the shocks on the public. There may have been a degree of learning in governments’ policy responses, and consequently a delayed response. If we build in a one-period lagged response of the NRA to the shock, the treatment effect is stronger – the dictatorial response (unreported, but available from authors) is a 6.7 percentage point differential in the export tax between the third and first inequality quartiles in the full OLS-FE model, and a 7.9 percentage point differential in the corresponding FD model.

8.3 Actual Price as Treatment

Until this point, following our theoretical model, the econometric implementation reflects the feature of equilibrium that there are just two levels of export policy: either free trade or a positive export tax. However, while for \( s = L \) the equilibrium policy will always be at the corner solution of free trade, an extension of the theoretical model would allow for the fact that in the high threat state, \( p^{sq} \) would respond to fluctuations in the world price level. In this subsection we discuss results that reflect fluctuations in world prices when \( s = H \). Using the FAO FPI, we replace \( I_{t}^{HIGH} \) with \( FPI_{t}^{HIGH} = FPI_{t} \times I_{t}^{HIGH} \) in the econometric specification.\(^{30}\) Table 6 presents results for the 2000s shock from comparable models in Table 4, while Table 7 does the same for the results in Table 5 reflecting the 1970’s shock. The results in Tables 6 and 7 parallel those of Tables 4 and 5 respectively. The discontinuity at the point of the shock in the way that the elite set policy reflects the threshold in the model, whereby the world price is sufficiently high that mounting a revolution becomes worthwhile for the ROS. The results show that this threshold effect is evident regardless of whether the discontinuity is measured as \( I^{HIGH} \) or \( FPI^{HIGH} \). The results of this exercise affirm that our results established with \( I^{HIGH} \) did not overstate the treatment effect in either 1973-75 or 2006-08.

\(^{30}\)FPI data are available at: [http://www.fao.org/prices/en](http://www.fao.org/prices/en). The FPI consists of the average of five commodity group price indices, weighted with the average export shares of each of the groups. In total, 73 price quotations – considered by FAO commodity specialists as representing the international prices of the food commodities – make up the overall index. Each of the five commodity group sub-indices is a weighted average of the price relatives of the commodities included in the group.
8.4 Democracy Measures

Are these results special to the particular measure of democracy we have adopted? We investigate this by exploring the robustness of our results to thinking of democracy in terms of three latent concepts. Polity IV scores are built around executive recruitment, executive constraints, and political competition. We use each of the three latent concepts of democracy instead of the overall Polity IV score to provide three further categorizations of countries into dictatorship, middle democracy and liberal democracy. Appendix C describes this exercise in detail.

The results for the period 2003-10 are reported in Table 8. (For brevity only the results on the interactions are presented). Reassuringly, our main result that during the years of the price shock export taxes are raised is robust to the use of these three alternative categorizations. The OLS-FE model estimates rely on pooling within-variation across countries. The land inequality difference-in-differences for dictatorships ranges between $-0.475$ and $-1.641$ across the democracy measures. The findings are robust to whether it is estimated from the OLS-FE or FD models. The two models exploit different sources of variation, which makes this a significant result. The FD model estimates are driven by first-differences taken at the inception of the shock and at the first period after the shock dissipates (see Appendix A for further details).

At the lower end the estimate implies that dictatorships in the third land inequality quartile impose an export tax (in response to the price shock) that is, on average, 8 percentage points higher than dictatorships in the first land inequality quartile. At the higher end the difference is 27.4 percentage points. We are properly aware that due to the small sample of dictatorships these statements are perhaps strong. But the robustness across models and democracy measures indicates the resilience of the finding that the elite in dictatorships do indeed use trade policy to maintain their grip on power. No such results are robustly evident in middle and liberal democracies, affirming the theory’s particular applicability to situations where the dictatorship feel threatened with revolution.

We also subject the results for 1969-78 to the same check. The results, shown in Table 9, are similar to those in Table 8. In unreported results, we tighten the definition of non-democracy, reducing the number of dictatorships. Our main result, that dictatorships respond to price shocks by increasing export taxes, remains robust throughout.
9 Conclusion

The purpose of this paper has been to explore, theoretically and empirically, how dictatorships use international trade policy to forestall democratization. The framework makes it possible to consider the role of world food price shocks in triggering a threat of revolution, and how dictatorships will respond to the threat using trade policy. This is a new contribution to the literature at two levels. In broad conceptual terms, we shift the focus of the prior literature from development success stories through democratization to development failures through the entrenchment of dictatorship. More specifically, the model predicts that when a dictatorship has a comparative advantage in agricultural products and the elite are land owners, they have an incentive to forestall democratization by increasing export taxes. Using data from 1960-2010, we find supportive evidence of these predictions for the world agricultural price shocks of 1973-75 and 2006-08.

As discussed throughout the paper, our predictions of how dictatorships will respond to world agricultural price shocks contrast with the GH predictions of how liberal democracies will respond to the same shocks. That is, we predict dictatorships will raise their export taxes while GH predict liberal democracies will lower their export subsidies. In addition, the theoretical predictions that we derive for dictatorships also seem to predict the actual trade policy responses to world agricultural price shocks of what we call ‘middle democracies’ as well. This suggests that middle democracies may have more in common with dictatorships than liberal democracies. In particular, it may be that at least some of the middle democracies in our dataset can better be characterized as so-called illiberal democracies. Specifically, it could be the case that although some middle democracies share superficial features with democracies such as elections, perhaps in fact power is more likely to change hands through political violence than at the ballot box. If that is the case, then political leaders in these middle, or illiberal, democracies may have an incentive to use trade policy in much the same way as dictators do in order to stay in power.

In light of this suggestion, an interesting direction for future research would be to extend our framework to encompass illiberal democracy. Bueno de Mesquita et al (2003) have a framework that could be adapted for this purpose. They have a model where the government must maintain the support of a ‘winning coalition’ in order to ensure their political survival. Their theory allows for the possibility that the winning coalition constitutes a relatively small group, even though
the group from which the winning coalition is drawn, what they call ‘the selectorate’, may be relatively large. This is exactly what we have in mind when we talk about illiberal democracy. Extending our model to incorporate theirs would provide a way to think about how trade policy could be used to ensure political survival in an illiberal democracy as well.

Another useful direction for future research would be to break our analysis down by commodity, focusing especially on the role of food staples such as maize, rice, and wheat. The reason we have not been able to do this in our present study is because our current dataset has data for only two or three countries for each commodity, whereas we would need data for at least ten countries per commodity to achieve statistical significance in our results. It would be valuable to collect sufficient data to explore the extent to which our results hold only for individual food staples, or whether they hold for fuel and cash crops as well.

The assumption underpinning the approach we have taken in the present paper is that the world price shock operates through agricultural products broadly defined. If in fact the shock operates through a specific good such as a food staple this may be because the staple constitutes a relatively large share of expenditure, so that a price shock to that good generates a sufficiently large real income shock to make revolution worthwhile. But could there be something special about food staples? Atkin (2013) has suggested that there is behavioral stickiness in peoples’ tastes with regard to food staples, due to habit formation during childhood. This implies that price shocks to staples may take on a special significance because people will be unable or unwilling to substitute away from them in the event of a shock. In turn, this would exacerbate the real income effects and thereby increase the likelihood of the political-economy ramifications that we explore here. It would be interesting to explore in future research whether world price shocks to food staples are particularly pernicious in generating threats of revolution.

The literature shows a deep appreciation for the difficulties of achieving economic development in countries where the interests of the ruling elite are not aligned with economic development but instead with rent extraction. Our contribution is to introduce a trade policy perspective to this literature. This is particularly important because, as argued above and elsewhere, most dictatorships lack domestic fiscal capacity but every one has access to the instruments of trade policy. While at one level our paper provides specific details about how dictatorial regimes use trade policy, at another level we provide a sharper focus than in the prior literature about exactly how dictators stay in power. In doing so, our aim is not to be
pessimistic about the prospects for development, but it is to provide a clearer picture about the incentives that dictatorships face when they form policy. These insights may be useful in setting the frame on future research that seeks to take into account the role of the form of government in the process of economic development.

Our work also suggests that the policy mechanisms used by dictators are used by illiberal democracies as well. More research is needed to establish the extent to which that is the case. A possible implication is that illiberal democracies may use trade policy to stay in power in preference to building domestic fiscal capacity that is normally associated with the process of economic development. Thus, our paper opens the door to an exploration of how a fledgling democracy may in fact stall on its path towards fully fledged liberal democracy, in part due to the availability of trade policy. This seems to be an important set of issues to address in thinking about the process of economic development.
References


[36] Edwards, S., and J. Santaella, (1993); “Devaluation Controversies in the Developing Countries: Lessons from the Bretton Woods Era”. In Bordo, Michael D. and Barry Eichengreen


Figure 2: NRA during 2006-08 Price Spike
Figure 3: Mean NRA during 1973-75 Price Spike
<table>
<thead>
<tr>
<th>Country</th>
<th>Non Democracies</th>
<th>Middle Democracies</th>
<th>Liberal Democracies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>8 0.009 0.34 -0.382</td>
<td>Argentina 8 -0.296 -0.382 -0.229</td>
<td>Australia 8 0.000 0.000 0.000</td>
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<tr>
<td>Cameroon</td>
<td>7 -0.082 -0.215 0.052</td>
<td>Bangladesh 7 -0.376 -0.494 -0.249</td>
<td>Austria 8 0.007 0.000 0.015</td>
</tr>
<tr>
<td>Chad</td>
<td>3 0.086 -0.262 0.369</td>
<td>Benin 3 0.023 -0.174 0.146</td>
<td>Belgium 8 0.013 0.000 0.023</td>
</tr>
<tr>
<td>China</td>
<td>8 0.051 -0.075 0.304</td>
<td>Brazil 8 0.017 0.002 0.045</td>
<td>Canada 8 0.005 0.000 0.014</td>
</tr>
<tr>
<td>Cote D Ivoire</td>
<td>7 -0.553 -0.578 -0.519</td>
<td>Bulgaria 8 -0.006 -0.162 0.076</td>
<td>Chile 8 0.016 -0.003 0.103</td>
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<tr>
<td>Egypt</td>
<td>8 -0.237 -0.464 -0.091</td>
<td>Colombia 8 0.243 0.086 0.386</td>
<td>Cyprus 6 0.023 0.005 0.052</td>
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<tr>
<td>Ethiopia</td>
<td>7 -0.160 -0.270 0.020</td>
<td>Dominican Re 8 -0.313 -0.524 -0.095</td>
<td>Czech Rep. 8 0.108 0.028 0.374</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>8 -0.033 -0.304 0.119</td>
<td>Ecuador 8 -0.353 -0.509 0.001</td>
<td>Denmark 8 0.004 0.000 0.017</td>
</tr>
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<td>Morocco</td>
<td>7 0.174 0.043 0.471</td>
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<td>Sudan</td>
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<td>Germany 8 0.005 0.001 0.015</td>
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<tr>
<td>Tanzania</td>
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<td>Kenya 8 -0.006 -0.137 0.096</td>
<td>Greece 8 0.025 0.003 0.053</td>
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<tr>
<td>Togo</td>
<td>8 -0.252 -0.543 0.060</td>
<td>Latvia 8 0.083 0.001 0.462</td>
<td>Hungary 8 0.136 0.038 0.322</td>
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<tr>
<td>Uganda</td>
<td>8 -0.158 -0.351 -0.002</td>
<td>Madagascar 8 0.027 -0.719 1.150</td>
<td>India 8 0.040 -0.174 0.380</td>
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<tr>
<td>Vietnam</td>
<td>3 0.178 0.084 0.266</td>
<td>Malaysia 7 -0.197 -0.555 0.051</td>
<td>Ireland 8 0.005 0.000 0.018</td>
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<tr>
<td>Zimbabwe</td>
<td>3 -0.484 -0.837 -0.224</td>
<td>Mali 8 -0.072 -0.491 0.432</td>
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<td>Mexico</td>
<td>8 0.001 -0.274 0.284</td>
<td>Mozambique 8 0.452 0.214 0.893</td>
<td>Italy 8 0.019 0.005 0.042</td>
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<td>Nicaragua 8 -0.287 -0.434 -0.134</td>
<td>Lithuanian 8 0.131 0.024 0.524</td>
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<td>Philippines 8 0.004 -0.051 0.087</td>
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<td>Norway 8 1.573 0.935 2.269</td>
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<td>Russia</td>
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<td>Portugal 8 0.022 0.004 0.059</td>
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<tr>
<td>Senegal</td>
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<td>Sri Lanka</td>
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<td>Thailand</td>
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<td>South Africa 8 0.076 -0.076 0.311</td>
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<td>Turkey</td>
<td>8 0.214 0.054 0.360</td>
<td>Spain 8 0.016 0.004 0.031</td>
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<td>Ukraine</td>
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<td>Sweden 8 0.004 0.000 0.017</td>
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<tr>
<td>Zambia</td>
<td>3 -0.289 -0.481 0.080</td>
<td>Switzerland 3 1.195 0.763 1.600</td>
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<tr>
<td>UK</td>
<td>8 0.005 0.000 0.018</td>
<td>USA 8 0.034 0.001 0.093</td>
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<tr>
<td>USA</td>
<td>8 0.034 0.001 0.093</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Non-Democracies: Mean Polity4 Score ≤ 0; Middle Democracies: Mean Polity4 Score between 1 and 8.
### Table 2: Agricultural Trade Policy During High-Price Periods: Exports, 2003-10.

**Dependent variable**: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th></th>
<th>OLS-FE Models</th>
<th>First-Differenced (FD) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td>NRA_{t-1}</td>
<td>0.174**</td>
<td>0.147</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.090)</td>
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<tr>
<td>Lagged Dep. Var.</td>
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<tr>
<td>I_{HIGH}</td>
<td>-0.088**</td>
<td>-0.093**</td>
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<tr>
<td></td>
<td>(0.031)</td>
<td>(0.035)</td>
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<tr>
<td>I_{Price Spike: 2006-08}</td>
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<tr>
<td>Middle Democracy × I_{HIGH}</td>
<td>0.005</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(0.047)</td>
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<tr>
<td>Log Per Capita GDP</td>
<td>0.299</td>
<td>0.302</td>
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<tr>
<td></td>
<td>(0.245)</td>
<td>(0.254)</td>
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<td>Log ExRate Index</td>
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<td>Year</td>
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<td></td>
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<td>within-R^2</td>
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<tr>
<td>#Countries</td>
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<tr>
<td><em>Total Effects:</em></td>
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<td></td>
</tr>
<tr>
<td>Middle Democracy</td>
<td>-0.078**</td>
<td>-0.077*</td>
</tr>
<tr>
<td>Liberal Democracy</td>
<td>-0.007</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.100)</td>
<td>(0.117)</td>
</tr>
</tbody>
</table>

|                  | Non-Democracies | Full Sample | Non-Democracies | Full Sample |
| NRA_{2003}       | -0.104          | -0.116       | -0.071**        | -0.072**    |
| Initial Period NRA | (0.065)       | (0.082)     | (0.031)         | (0.032)     |
| ΔI_{HIGH}        | -0.122**        | -0.125**     | -0.120***       | -0.119***   |
|                  | (0.046)        | (0.047)      | (0.044)         | (0.044)     |
| Δ(I_{Price Spike: 2006-08}) |             |               |                 |             |
| Middle Democracy × ΔI_{HIGH} | 0.054 | 0.055          | 0.140**         | 0.142**     |
|                  | (0.056)        | (0.056)      |                 |             |
| Middle Democracy × ΔI_{Price Spike: 2006-08} |             |               |                 |             |
| Log Per Capita GDP | 0.402          | 0.256        | 0.099           | 0.115       |
|                  | (0.449)       | (0.512)      | (0.184)         | (0.188)     |
| Δln(per capita GDP) | -0.081*      | 0.007        |                 |             |
|                  | (0.042)       | (0.010)      |                 |             |
| #Countries       | 16            | 16            | 76              | 75          |
| *Total Effects:*|               |                |                 |             |
| Middle Democracy | -0.066*        | -0.064*       |                 |             |
| Liberal Democracy| 0.021          | 0.022         |                 |             |

**Notes:**
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%.
2. In the full sample, the base category comprises non-democracies, so I_{HIGHPRICE} is the total effect for non-democracies, while (Middle Democracy × I_{HIGHPRICE}) and (Liberal Democracy × I_{HIGHPRICE}) are additional effects for middle and liberal democracies, respectively.
3. OLS-FE models are estimated with country-fixed effects by OLS. FD models are estimated using OLS. Errors are clustered at the country level.
4. In the FD model, Middle Democracy and Liberal Democracy indicators are included but not reported in the table.
### Table 3: Agricultural Trade Policy During High–Price Periods: Exports, 1969–78.

*Dependent variable*: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
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<th>OLS–FE Models</th>
<th>First–Differenced (FD) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non–Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td>$NRA_{t-1}$</td>
<td>0.298**</td>
<td>0.288**</td>
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<td>(0.108)</td>
<td>(0.107)</td>
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<tr>
<td>Lagged Dep. Var.</td>
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<tr>
<td>$I_{HIGH}$</td>
<td>−0.061***</td>
<td>−0.065***</td>
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<td>(0.014)</td>
<td>(0.014)</td>
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<tr>
<td>$I_{Price Spike: 1973-75}$</td>
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</tr>
<tr>
<td>Middle Democracy × $I_{HIGH}$</td>
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<td>−0.030</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>Liberal Democracy × $I_{HIGH}$</td>
<td>−0.130**</td>
<td>−0.129**</td>
</tr>
<tr>
<td></td>
<td>(0.056)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Log Per Capita GDP</td>
<td>0.365**</td>
<td>0.338*</td>
</tr>
<tr>
<td></td>
<td>(0.174)</td>
<td>(0.169)</td>
</tr>
<tr>
<td>Log ExRate Index</td>
<td>−0.038</td>
<td>−0.031**</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>Year</td>
<td>−0.017**</td>
<td>−0.015**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>$N$</td>
<td>205</td>
<td>205</td>
</tr>
<tr>
<td>within-$R^2$</td>
<td>0.257</td>
<td>0.268</td>
</tr>
<tr>
<td>#Countries</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

**Total Effects:**
- Middle Democracy
- Liberal Democracy

<table>
<thead>
<tr>
<th></th>
<th>Non–Democracies</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>$NRA_{1969}$</td>
<td>−0.038</td>
<td>−0.034</td>
</tr>
<tr>
<td>Initial Period NRA</td>
<td>(0.023)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>$\Delta I_{HIGH}$</td>
<td>−0.062***</td>
<td>−0.064***</td>
</tr>
<tr>
<td>$\Delta I_{Price Spike: 1973-75}$</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Middle Democracy × $\Delta I_{HIGH}$</td>
<td>−0.004</td>
<td>−0.003</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.041)</td>
</tr>
<tr>
<td>Liberal Democracy × $\Delta I_{HIGH}$</td>
<td>−0.149***</td>
<td>−0.149***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>$\Delta Log Per Capita GDP$</td>
<td>0.569**</td>
<td>0.531**</td>
</tr>
<tr>
<td>$\Delta Log ExRate Index$</td>
<td>−0.083</td>
<td>−0.091*</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.052)</td>
</tr>
</tbody>
</table>

**Notes:**
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%.
2. See Notes to Table 2.
### Table 4: Land Inequality, Price Shocks and Trade Policy: Difference-in-Differences. Exports, 2003-10.

**Dependent variable**: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th></th>
<th>OLS-FE Models</th>
<th>First-Differenced (FD) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td><strong>NRAₜ₋₁</strong></td>
<td>0.193** 0.118</td>
<td>0.273* 0.247*</td>
</tr>
<tr>
<td>Lagged Dep. Var.</td>
<td>0.063 (0.073)</td>
<td>(0.143) (0.138)</td>
</tr>
<tr>
<td>IₜHIGH</td>
<td>0.120 0.120</td>
<td>0.147 0.136</td>
</tr>
<tr>
<td>IₜPrice Spike: 2006-08</td>
<td>0.114 (0.133)</td>
<td>(0.108) (0.104)</td>
</tr>
<tr>
<td>Middle Democracy × IₜHIGH</td>
<td>−0.103 −0.061</td>
<td></td>
</tr>
<tr>
<td>(8≥Polity≥1)× IₜPrice Spike</td>
<td>(0.162) (0.179)</td>
<td></td>
</tr>
<tr>
<td>Liberal Democracy × IₜHIGH</td>
<td>−0.098 −0.097</td>
<td></td>
</tr>
<tr>
<td>(8≥Polity≥1)× IₜPrice Spike</td>
<td>(0.120) (0.116)</td>
<td></td>
</tr>
<tr>
<td>Land Gini × IₜHIGH</td>
<td>−0.424* −0.442*</td>
<td>−0.468** −0.442**</td>
</tr>
<tr>
<td>Land Gini × IₜPrice Spike: 2006-08</td>
<td>(0.199) (0.245)</td>
<td>(0.193) (0.182)</td>
</tr>
<tr>
<td>Land Gini × (Middle Democracy × IₜHIGH)</td>
<td>0.234 0.153</td>
<td></td>
</tr>
<tr>
<td>Log Per Capita GDP</td>
<td>0.226 0.262</td>
<td>0.289*** 0.308***</td>
</tr>
<tr>
<td>ln(per capita GDP)</td>
<td>(0.198) (0.193)</td>
<td>(0.092) (0.101)</td>
</tr>
<tr>
<td>Log ExRate Index</td>
<td>−0.069***</td>
<td>0.009</td>
</tr>
<tr>
<td>ln(Nominal FX rate index)</td>
<td>(0.015)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Year</td>
<td>−0.004 −0.010</td>
<td>−0.013** −0.012**</td>
</tr>
<tr>
<td>Trend</td>
<td>(0.012) (0.011)</td>
<td>(0.005) (0.005)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>92 91</td>
<td>463 452</td>
</tr>
<tr>
<td><strong>within-R²</strong></td>
<td>0.156 0.216</td>
<td>0.162 0.148</td>
</tr>
<tr>
<td><strong>#Countries</strong></td>
<td>12 12</td>
<td>60 60</td>
</tr>
</tbody>
</table>

**Total Land Gini Interaction Effects:**

<table>
<thead>
<tr>
<th></th>
<th>Non-Democracies</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Democracy</td>
<td>−0.234 −0.290</td>
<td></td>
</tr>
<tr>
<td>Liberal Democracy</td>
<td>−0.07 −0.054</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level.
2. Full sample: (Land Gini × IₜHIGH) is the total effect for non-democracies (base). The Middle and Liberal democracy interactions are additional effect.
3. In FD models, constant is included but not reported in the table.

**Dependent variable**: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th></th>
<th><strong>OLS-FE Models</strong></th>
<th><strong>First-Differenced (FD) Models</strong></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Non-Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRA_{t-1}</td>
<td>0.262*** 0.240**</td>
<td>0.258*** 0.242***</td>
</tr>
<tr>
<td>Lagged Dep. Var.</td>
<td>(0.073) (0.086)</td>
<td>(0.054) (0.057)</td>
</tr>
<tr>
<td>I_{HIGH}</td>
<td>0.097 0.092</td>
<td>0.088 0.081</td>
</tr>
<tr>
<td>I_{Price Spike: 1973-75}</td>
<td>(0.063) (0.063)</td>
<td>(0.063) (0.062)</td>
</tr>
<tr>
<td>Middle Democracy × I_{HIGH}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8≥Polity21) × I_{Price Spike}</td>
<td>(0.234) (0.237)</td>
<td></td>
</tr>
<tr>
<td>Liberal Democracy × I_{HIGH}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Polity29) × I_{Price Spike}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Gini × I_{HIGH}</td>
<td>−0.248** −0.246**</td>
<td>−0.233** −0.230**</td>
</tr>
<tr>
<td>Land Gini × (Middle Democracy × I_{HIGH})</td>
<td>(0.094) (0.095)</td>
<td>(0.095) (0.095)</td>
</tr>
<tr>
<td>Land Gini × (8≥Polity21) × I_{Price Spike}</td>
<td>(0.375) (0.381)</td>
<td></td>
</tr>
<tr>
<td>Land Gini × (Liberal Democracy × I_{HIGH})</td>
<td>0.745*** 0.748***</td>
<td></td>
</tr>
<tr>
<td>Land Gini × (Polity29) × I_{Price Spike}</td>
<td>(0.171) (0.176)</td>
<td></td>
</tr>
<tr>
<td>Log Per Capita GDP</td>
<td>0.603*** 0.537***</td>
<td>0.467*** 0.382**</td>
</tr>
<tr>
<td>Log ExRate Index</td>
<td>−0.022 −0.031**</td>
<td></td>
</tr>
<tr>
<td>In(Nominal FX rate index)</td>
<td>0.017 (0.015)</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>−0.022*** −0.018*** −0.016*** −0.013***</td>
<td></td>
</tr>
<tr>
<td>Trend</td>
<td>(0.006) (0.006) (0.005) (0.005)</td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>205 205 381 381</td>
<td></td>
</tr>
<tr>
<td>within-R²</td>
<td>0.354 0.367 0.388 0.402</td>
<td></td>
</tr>
<tr>
<td>#Countries</td>
<td>24 24 46 46</td>
<td></td>
</tr>
</tbody>
</table>

**Total Land Gini Interaction Effects:**

<table>
<thead>
<tr>
<th></th>
<th><strong>Non-Democracies</strong></th>
<th><strong>Full Sample</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Democracy</td>
<td>−0.274 −0.280</td>
<td></td>
</tr>
<tr>
<td>Liberal Democracy</td>
<td>0.512*** 0.518***</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>{#ndem, #mdem,#ldem}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Land Gini</td>
<td>{24, 9, 13}</td>
</tr>
</tbody>
</table>

**Notes:**

1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level.
2. Full sample: (Land Gini × I_{HIGH}) is the total effect for non-democracies (base). The Middle and Liberal democracy interactions are additional effects.
3. In FD models, constant is included but not reported in the table.
Table 6: Land Inequality, Food Price and Trade Policy. Exports, 2003-10.

*Dependent variable*: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th></th>
<th>OLS-FE Models</th>
<th>First-Differenced (FD) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td>NRA&lt;sub&gt;-1&lt;/sub&gt;</td>
<td>0.174** 0.096</td>
<td>0.264* 0.236*</td>
</tr>
<tr>
<td>Lagged Dep. Var.</td>
<td>(0.061) (0.078)</td>
<td>(0.141) (0.134)</td>
</tr>
<tr>
<td>FPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>0.097 0.097</td>
<td>0.119 0.111</td>
</tr>
<tr>
<td>Initial Period NRA</td>
<td>(0.090) (0.104)</td>
<td>(0.087) (0.083)</td>
</tr>
<tr>
<td>ΔFPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>-0.028 0.001</td>
<td>-0.052* -0.054*</td>
</tr>
<tr>
<td>Δ(8≥Polity≥1) × ΔPrice Spike</td>
<td>(0.125) (0.138)</td>
<td>(0.122) (0.124)</td>
</tr>
<tr>
<td>Liberal Democracy × FPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>-0.093 -0.092</td>
<td>-0.371** -0.353**</td>
</tr>
<tr>
<td>(Polity≥9) × ΔPrice Spike</td>
<td>(0.091) (0.088)</td>
<td></td>
</tr>
<tr>
<td>Land Gini × FPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>-0.339* -0.353*</td>
<td>-0.371** -0.353**</td>
</tr>
<tr>
<td>Land Gini × (Middle Democracy × FPI)</td>
<td>(0.159) (0.192)</td>
<td>(0.155) (0.147)</td>
</tr>
<tr>
<td>Land Gini × (8≥Polity≥1) × FPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>0.200 0.139</td>
<td></td>
</tr>
<tr>
<td>Land Gini × (8≥Polity≥1) × ΔFPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>(0.223) (0.251)</td>
<td></td>
</tr>
<tr>
<td>Land Gini × (Polity≥9) × FPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>0.332** 0.326**</td>
<td></td>
</tr>
<tr>
<td>Land Gini × (Polity≥9) × ΔFPI&lt;sub&gt;HIGH&lt;/sub&gt;</td>
<td>(0.162) (0.154)</td>
<td></td>
</tr>
<tr>
<td>Log Per Capita GDP</td>
<td>0.245 0.281 0.311*** 0.332***</td>
<td>0.213 0.145 0.220 0.241</td>
</tr>
<tr>
<td>ln(per capita GDP)</td>
<td>(0.204) (0.200) (0.096) (0.105)</td>
<td>(0.015) (0.010)</td>
</tr>
<tr>
<td>Log ExRate Index</td>
<td>-0.071*** 0.009</td>
<td></td>
</tr>
<tr>
<td>ln(Nominal FX index)</td>
<td>(0.015) (0.010)</td>
<td>(0.005) (0.005)</td>
</tr>
<tr>
<td>Year</td>
<td>-0.004 -0.010 -0.013** -0.012**</td>
<td></td>
</tr>
<tr>
<td>Trend</td>
<td>(0.012) (0.011) (0.005) (0.005)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>92 91 463 452</td>
<td></td>
</tr>
<tr>
<td>within-R²</td>
<td>0.174 0.238 0.166 0.153</td>
<td></td>
</tr>
<tr>
<td>#Countries</td>
<td>12 12 60 60</td>
<td></td>
</tr>
<tr>
<td>Total Land Gini Interaction Effects:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MiddleDemocracy</td>
<td>-0.171 -0.214</td>
<td></td>
</tr>
<tr>
<td>LiberalDemocracy</td>
<td>-0.0389 -0.0275</td>
<td></td>
</tr>
<tr>
<td>{#ndem, #mdem,#ldem}</td>
<td>{12, 21, 27}</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level. | 2. See Notes to Table 4.
Table 7: Land Inequality, Food Price and Trade Policy. Exports, 1969-78.

Dependent variable: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th></th>
<th>OLS-FE Models</th>
<th>First-Differenced (FD) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Democracies</td>
<td>Full Sample</td>
</tr>
<tr>
<td>NRA_{t-1}</td>
<td>0.261*** 0.238** 0.255*** 0.239***</td>
<td>0.298* 0.303*</td>
</tr>
<tr>
<td>Lagged Dep. Var.</td>
<td>0.073 0.086 0.056 0.059</td>
<td>0.077 0.074 0.070 0.066</td>
</tr>
<tr>
<td>FPI_{HIGH}</td>
<td>0.261*** 0.255*** 0.261** 0.255***</td>
<td>0.077 0.074 0.070 0.066</td>
</tr>
<tr>
<td>(FPI ×</td>
<td>Price Spike)</td>
<td>0.037 0.038 0.037 0.037</td>
</tr>
<tr>
<td>Middle Democracy × FPI_{HIGH}</td>
<td>-0.010 -0.005</td>
<td>-0.010 -0.005</td>
</tr>
<tr>
<td>(8 ≤ Polity ≥ 1) × (FPI ×</td>
<td>Price Spike)</td>
<td>0.142 0.144</td>
</tr>
<tr>
<td>Liberal Democracy × FPI_{HIGH}</td>
<td>-0.326*** -0.327***</td>
<td>-0.326*** -0.327***</td>
</tr>
<tr>
<td>(Polity ≥ 8) × (FPI ×</td>
<td>Price Spike)</td>
<td>0.080 0.081</td>
</tr>
<tr>
<td>Land Gini × FPI_{HIGH}</td>
<td>-0.160*** -0.158** -0.151** -0.148**</td>
<td>-0.169** -0.173** -0.158* -0.164**</td>
</tr>
<tr>
<td>Land Gini × (Middle Democracy × FPI_{HIGH})</td>
<td>-0.022 -0.027</td>
<td>-0.067 -0.043</td>
</tr>
<tr>
<td>Land Gini × (8 ≤ Polity ≥ 1) × (FPI ×</td>
<td>Price Spike)</td>
<td>0.229 0.233</td>
</tr>
<tr>
<td>Land Gini × (Liberal Democracy × FPI_{HIGH})</td>
<td>0.449*** 0.451***</td>
<td>0.368** 0.370**</td>
</tr>
<tr>
<td>Land Gini × (Polity ≥ 8) × (FPI ×</td>
<td>Price Spike)</td>
<td>0.101 0.104</td>
</tr>
<tr>
<td>Log Per Capita GDP</td>
<td>0.606*** 0.541*** 0.468*** 0.383***</td>
<td>0.691*** 0.573*** 0.362** 0.236</td>
</tr>
<tr>
<td>ln(per capita GDP)</td>
<td>0.145 0.156 0.150 0.152</td>
<td>0.156 0.147 0.171 0.159</td>
</tr>
<tr>
<td>Log ExRate Index</td>
<td>-0.022 -0.031**</td>
<td>-0.079* -0.096**</td>
</tr>
<tr>
<td>ln(Nominal FX rate index)</td>
<td>0.017 0.015</td>
<td>0.040 0.041</td>
</tr>
<tr>
<td>Year</td>
<td>-0.021*** -0.018*** -0.016*** -0.013***</td>
<td>-0.021*** -0.018*** -0.016*** -0.013***</td>
</tr>
<tr>
<td>Trend</td>
<td>0.006 0.006 0.005 0.005</td>
<td>0.006 0.006 0.005 0.005</td>
</tr>
<tr>
<td>N</td>
<td>205 205 381 381</td>
<td>205 205 381 381</td>
</tr>
<tr>
<td>within- R^2</td>
<td>0.354 0.367 0.381 0.395</td>
<td>0.107 0.133 0.095 0.119</td>
</tr>
<tr>
<td>#Countries</td>
<td>24 24 46 46</td>
<td>24 24 46 46</td>
</tr>
<tr>
<td>Total Land Gini Interaction Effects:</td>
<td>MiddleDemocracy -0.173 -0.176</td>
<td>MiddleDemocracy -0.225 -0.206</td>
</tr>
<tr>
<td></td>
<td>LiberalDemocracy 0.298* 0.303*</td>
<td>LiberalDemocracy 0.210 0.206</td>
</tr>
<tr>
<td></td>
<td>(#ndem, #mdem,#ldem) {24, 9, 13}</td>
<td>(#ndem, #mdem,#ldem) {24, 9, 13}</td>
</tr>
</tbody>
</table>

Notes:
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level.
2. See Notes to Table 4.
Table 8: Land Inequality Effect (Dif-in-Dif): Democracy Measured Using POLITY Sub-Dimensions. Exports, 2003-10.

Dependent variable : Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th>Countries partitioned into Non-Democracies and Democracies based on:</th>
<th>PARCOMP</th>
<th>POLCOMP</th>
<th>XCOMP</th>
<th>XCONST1</th>
<th>XCONST2</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Competitiveness of Participation</td>
<td>Political Competition</td>
<td>Compet. of Exec. Recruiting</td>
<td>Exec. Constraints Rules</td>
<td>Executive Constraints</td>
</tr>
<tr>
<td></td>
<td>OLS-FE</td>
<td>FD</td>
<td>OLS-FE</td>
<td>FD</td>
<td>OLS-FE</td>
</tr>
<tr>
<td>(I_{\text{HIGH}})</td>
<td>0.206**</td>
<td>0.494***</td>
<td>0.195***</td>
<td>0.508***</td>
<td>0.217*</td>
</tr>
<tr>
<td>(I_{\text{Price Spike: 2006-08}})</td>
<td>(0.085)</td>
<td>(0.088)</td>
<td>(0.060)</td>
<td>(0.103)</td>
<td>(0.129)</td>
</tr>
<tr>
<td>Middle Democracy (\times I_{\text{HIGH}})</td>
<td>−0.197</td>
<td>−0.555***</td>
<td>−0.283**</td>
<td>−0.697***</td>
<td>−0.135</td>
</tr>
<tr>
<td>((8\text{Polity}21)\times I_{\text{Price Spike}})</td>
<td>(0.151)</td>
<td>(0.144)</td>
<td>(0.110)</td>
<td>(0.168)</td>
<td>(0.163)</td>
</tr>
<tr>
<td>Liberal Democracy (\times I_{\text{HIGH}})</td>
<td>−0.181*</td>
<td>−0.325</td>
<td>−0.148</td>
<td>−0.374**</td>
<td>−0.141</td>
</tr>
<tr>
<td>((\text{Polity}29)\times I_{\text{Price Spike}})</td>
<td>(0.095)</td>
<td>(0.199)</td>
<td>(0.089)</td>
<td>(0.174)</td>
<td>(0.140)</td>
</tr>
<tr>
<td>Land Gini (\times I_{\text{HIGH}})</td>
<td>−0.529***</td>
<td>−1.142***</td>
<td>−0.475***</td>
<td>−1.198***</td>
<td>−0.633**</td>
</tr>
<tr>
<td>(\text{Land Gini} \times I_{\text{Price Spike: 2006-08}})</td>
<td>(0.168)</td>
<td>(0.146)</td>
<td>(0.117)</td>
<td>(0.184)</td>
<td>(0.240)</td>
</tr>
<tr>
<td>Land Gini (\times (\text{Middle Democracy} \times I_{\text{HIGH}}))</td>
<td>0.355</td>
<td>1.088***</td>
<td>0.471***</td>
<td>1.369***</td>
<td>0.293</td>
</tr>
<tr>
<td>(\text{Land Gini} \times (\text{8Polity}21)\times I_{\text{Price Spike}})</td>
<td>(0.276)</td>
<td>(0.234)</td>
<td>(0.175)</td>
<td>(0.260)</td>
<td>(0.287)</td>
</tr>
<tr>
<td>Land Gini (\times (\text{Liberal Democracy} \times I_{\text{HIGH}}))</td>
<td>0.494***</td>
<td>0.939***</td>
<td>0.336**</td>
<td>0.962***</td>
<td>0.457*</td>
</tr>
<tr>
<td>(\text{Land Gini} \times (\text{Polity}29)\times I_{\text{Price Spike}})</td>
<td>(0.181)</td>
<td>(0.255)</td>
<td>(0.160)</td>
<td>(0.259)</td>
<td>(0.254)</td>
</tr>
<tr>
<td>#Countries</td>
<td>59</td>
<td>59</td>
<td>58</td>
<td>58</td>
<td>58</td>
</tr>
</tbody>
</table>

Total Land Gini Interaction Effects:

| Middle Democracy | −0.174 | −0.054 | −0.004 | 0.157 | −0.340* | −0.820** | −0.304 | −0.358* | −0.276 | −0.219 |
| Liberal Democracy | −0.034 | −0.204 | −0.139 | −0.239 | −0.262 | −0.257 | −0.086 | −0.206 | −0.085 | −0.208 |

Notes:
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level.
2. Full model coefficients not reported for brevity (see appendix for complete estimates).
   --The OLS_FE and FD models are the same as the versions of Full Sample models reported in Table 4.
   --OLS-FE models in models are the same as the versions of Full Sample models reported in Table 4.
3. The FD models have \(\Delta I_{\text{HIGH}}\) in place of \(I_{\text{HIGH}}\). Both models attempt dif-in-dif estimate the same object: the effect of land inequality during a price spike on NRAX.
4. Sample partitioned into \{non-democracy\}, \{middle democracy\}, \{liberal democracy\} these Polity dimension as follows: PARCOMP: \{1,2\}, \{3,4\}, \{5\}
   POLCOMP: \{1,2,3\}, \{4,5,6,7\}, \{9,10\}
   XRCOMP: \{0,1\}, \{2\}, \{3\}
   XCONST1: \{1,2\}, \{3,4,5,6\}, \{7\}
   XCONST2: \{1,2,3\}, \{4,5,6\}, \{7\}

Dependent variable: Nominal Rate of Assistance to Exports (NRA)

<table>
<thead>
<tr>
<th>Countries partitioned into Non-Democracies and Democracies based on:</th>
<th>PARCOMP</th>
<th>POLCOMP</th>
<th>XCOMP</th>
<th>XCONST1</th>
<th>XCONST2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Competitiveness of Participation</td>
<td>Political Competition</td>
<td>Compet. of Exec. Recruiting</td>
<td>Exec. Constraints Rules</td>
<td>Executive Constraints</td>
</tr>
<tr>
<td></td>
<td>OLS-FE</td>
<td>FD</td>
<td>OLS-FE</td>
<td>FD</td>
<td>OLS-FE</td>
</tr>
<tr>
<td>I(_{\text{HIGH}})</td>
<td>0.086</td>
<td>0.106</td>
<td>0.086</td>
<td>0.106</td>
<td>0.070</td>
</tr>
<tr>
<td>I(_{\text{Price Spike: 1973-75}})</td>
<td>(0.063)</td>
<td>(0.080)</td>
<td>(0.063)</td>
<td>(0.080)</td>
<td>(0.065)</td>
</tr>
<tr>
<td>Middle Democracy × I(_{\text{HIGH}})</td>
<td>−0.063</td>
<td>−0.062</td>
<td>−0.027</td>
<td>−0.011</td>
<td>0.142</td>
</tr>
<tr>
<td>((8\geq\text{Polity}\geq1)) × I(_{\text{Price Spike}})</td>
<td>(0.189)</td>
<td>(0.199)</td>
<td>(0.119)</td>
<td>(0.124)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>Liberal Democracy × I(_{\text{HIGH}})</td>
<td>−0.542***</td>
<td>−0.439**</td>
<td>−0.513***</td>
<td>−0.422**</td>
<td>−0.457***</td>
</tr>
<tr>
<td>((\text{Polity}\geq9)) × I(_{\text{Price Spike}})</td>
<td>(0.133)</td>
<td>(0.192)</td>
<td>(0.132)</td>
<td>(0.181)</td>
<td>(0.126)</td>
</tr>
<tr>
<td>Land Gini × I(_{\text{HIGH}})</td>
<td>−0.241**</td>
<td>−0.255*</td>
<td>−0.240**</td>
<td>−0.255*</td>
<td>−0.198**</td>
</tr>
<tr>
<td>Land Gini × I(_{\text{Price Spike: 1973-75}})</td>
<td>(0.099)</td>
<td>(0.128)</td>
<td>(0.099)</td>
<td>(0.128)</td>
<td>(0.096)</td>
</tr>
<tr>
<td>Land Gini × (Mid Democracy × I(_{H}))</td>
<td>0.068</td>
<td>0.060</td>
<td>−0.028</td>
<td>−0.065</td>
<td>−0.313*</td>
</tr>
<tr>
<td>Land Gini × ((8\geq\text{Polity}\geq21)) × I(_{\text{Price Spike}})</td>
<td>(0.262)</td>
<td>(0.289)</td>
<td>(0.155)</td>
<td>(0.178)</td>
<td>(0.163)</td>
</tr>
<tr>
<td>Land Gini × (Lib Democracy × I(_{H}))</td>
<td>0.753***</td>
<td>0.596**</td>
<td>0.729***</td>
<td>0.589**</td>
<td>0.617***</td>
</tr>
<tr>
<td>Land Gini × ((\text{Polity}\geq9)) × I(_{\text{Price Spike}})</td>
<td>(0.175)</td>
<td>(0.259)</td>
<td>(0.171)</td>
<td>(0.244)</td>
<td>(0.167)</td>
</tr>
</tbody>
</table>

| N | 381 | 374 | 381 | 374 | 381 | 374 | 381 | 374 | 381 | 374 |
| within-\(R^2\) | 0.400 | 0.123 | 0.397 | 0.122 | 0.396 | 0.117 | 0.395 | 0.121 | 0.392 | 0.116 |
| #Countries | 46 | 44 | 46 | 44 | 46 | 44 | 46 | 44 | 46 | 44 |

Total Land Gini Interaction Effects:

| Middle Democracy | −0.173 | −0.195 | −0.268** | −0.320** | −0.511*** | −0.413*** | 0.0607 | 0.140 | 0.102 | 0.0486 |
| Liberal Democracy | 0.513*** | 0.341 | 0.489*** | 0.334 | 0.420*** | 0.271 | 0.417*** | 0.265 | 0.415*** | 0.266 |

\{\#ndem, \#mdem, \#ldem\} | \{24, 8, 14\} | \{24, 5, 17\} | \{22, 3, 21\} | \{17, 10, 19\} | \{24, 3, 19\} |

Notes:
1. *** denotes statistical significance at 1%, ** at 5% and * at 10%. Errors clustered at the country level.
2. Full model coefficients not reported for brevity (see appendix for complete estimates). See Notes to Table 5.
3. FD models have 1 fewer non-democracy and 1 fewer liberal democracy in the sample than in FE models.
Appendix

A Design with Land Inequality

With land inequality, we have a country- and time-varying assignment: land-unequal countries and price-shock years are assigned to treatment. The following regression model is used to estimate the treatment effect $\tau$ with this assignment:

$$NRA_{i,t} = \phi NRA_{i,t-1} + \alpha I_t^{HIGH} + \tau [LGINI_i \times I_t^{HIGH}] + X_{i,t} B + \gamma_i + e_{i,t}$$

Countries in which the elite have large landholdings have high land Gini measures. We use Deininger and Squire’s (1998) land inequality measures, supplemented by Vollrath (2007). Where their coverage is incomplete, the following individual sources provide land Gini estimates: China’s rural land Gini is from Griffin, Khan and Ickowitz (2002); Cameroon and Côte d’Ivoire from Frankema (2010); Kazakhstan from Deshpande (2006); Mozambique from Jayne et al. (2003); Ghana from Frankema (2010) and Narh et al. (2016).

The treatment effect $\tau$ we measure is the difference-in-differences $\partial^2 NRA_{it} / (\partial I_t^{HIGH} \partial LGINI_i)$, where $LGINI_i$ is land inequality in country $i$. The first difference is taken with respect to the (binary) price shock and the second with respect to the (continuous) land Gini. The hypothesis we test is $\tau < 0$: dictatorships with greater land inequality, who stand to gain more from free trade, instead impose higher export taxes and restrict trade more during world price shocks than do dictatorships with more equal land holdings.

Although our theoretical model does not develop formal hypotheses about democracies, we estimate this treatment effect for all three political regimes from the regression model

$$NRA_{i,t} = \phi NRA_{i,t-1} + \sum_{d=1}^{3} \alpha^d (DEM_{d_i} \times I_t^{HIGH}) + \sum_{d=1}^{3} \tau^d (DEM_{d_i} \times [LGINI_i \times I_t^{HIGH}]) + X_{i,t} B + \gamma_i + e_{i,t}.$$  

(7)

The hypotheses we test are: (i) $\tau^1 < 0$, and (ii) $\tau^2 = \tau^3 = 0$. Since we would not expect the revolution constraint to be the driver of policy in democracies in the way it is in dictatorships, we might expect governments in middle and liberal democracies not to set export policy in the same way as dictatorships. Even if elected governments may be led to reduce subsidies on food exports (as would be predicted by the GH model), our theory makes no prediction about why that should be related to the inequality of landholdings in those countries.
**First Difference (FD) Model:**

In addition to the model with explicit fixed effects, we test the theory’s predictions from the model in first differences (FD) to remove the unobserved effects.\(^{31}\)

\[
\Delta NRA_{i,t} = \phi NRA_0 + \sum_{d=1}^{3} \alpha^d (DEM_d \times \Delta I_{t}^{HIGH}) + \sum_{d=1}^{3} \tau^d (DEM_d \times \Delta [LGINI_i \times I_{t}^{HIGH}]) \\
+ \Delta X_{i,t} B + \Delta e_{i,t},
\]

where \(\Delta z \equiv z_t - z_{t-1}\). The initial period (pre-shock) NRA, \(NRA_0\), captures the capacity of countries to change NRAs. If \(NRA_0 > 0\) (export subsidy) or \(NRA_0\) is negative but small (low export tax), this allows the government latitude to impose further taxes than if the pre-shock export tax was already high or prohibitive. Controlling for this latitude, we expect \(\tau < 0\). The OLS-FE and FD models with the land Gini interactions are distinct in the following sense. While the OLS-FE model uses within-variation, the FD model exploits exactly two first differences: one taken at the start of the price spike and one taken immediately after the shock terminates. Since neither \(DEM_d\) nor LGINI\(_i\) are time-varying, the source of variation in first differences is \(\Delta I^{HIGH}\), which is non zero at precisely these two points. The estimated difference in differences from the FD models are sensitive to the timing of the shock.\(^{32}\)

---

\(^{31}\)The FD counterpart to the model shown in equation (7) is: \(\Delta NRA_{i,t} = \phi NRA_0 + \tau \Delta I_{t}^{HIGH} + \Delta X_{i,t} B + \Delta e_{i,t}\)

\(^{32}\)This difference between the OLS-FE and FD models in our context is in addition to other reasons why both should be estimated. The FD model provides a useful check on whether errors from the OLS-FE model are in fact strongly serially dependent. If, for example, the errors \(e_{i,t}\) in the OLS-FE models followed a random walk (serial correlation is very high), it is more reasonable to assume that the differenced errors are homoskedastic and uncorrelated, making the FD estimates more efficient than OLS-FE estimates (Wooldridge, 2002 Ch 10). Also, if the OLS-FE and FD estimates differ significantly – say they have opposite signs – it may indicate that the exogeneity assumptions are violated. The strict exogeneity assumption that makes OLS-FE estimates unbiased is the same strict exogeneity assumption that makes FD estimates unbiased, and therefore they should not be very different. If the exogeneity assumption is satisfied, any difference in magnitudes of the estimates is ascribed to the fact that the FD model controls for trends in the error term that the OLS-FE model does not capture. We include the initial NRA as a variable in the FD model. The lagged dependent variable is dropped before differencing, on the assumption that the first differenced NRAs are not autocorrelated.
Additional References for Appendix A


Table A1: Land Gini: Descriptive Statistics for each Political Regime Type.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>mean</th>
<th>min</th>
<th>p25</th>
<th>p50</th>
<th>p75</th>
<th>p90</th>
<th>max</th>
<th>IQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dictatorship</td>
<td>91</td>
<td>0.518</td>
<td>0.366</td>
<td>0.423</td>
<td>0.467</td>
<td>0.606</td>
<td>0.616</td>
<td>0.790</td>
<td>0.183</td>
</tr>
<tr>
<td>Middle-Dem</td>
<td>160</td>
<td>0.660</td>
<td>0.419</td>
<td>0.547</td>
<td>0.640</td>
<td>0.801</td>
<td>0.850</td>
<td>0.932</td>
<td>0.254</td>
</tr>
<tr>
<td>Liberal-Dem</td>
<td>201</td>
<td>0.656</td>
<td>0.272</td>
<td>0.553</td>
<td>0.641</td>
<td>0.793</td>
<td>0.909</td>
<td>0.980</td>
<td>0.240</td>
</tr>
<tr>
<td>Total</td>
<td>452</td>
<td>0.629</td>
<td>0.272</td>
<td>0.480</td>
<td>0.584</td>
<td>0.789</td>
<td>0.858</td>
<td>0.980</td>
<td>0.309</td>
</tr>
</tbody>
</table>
B  The Quasi-Experimental Design and Clustering

Abadie, Athey, Imbens and Wooldridge (2017, AAIW henceforth) carefully draw the distinction between when there is a need to cluster standard errors and when clustering makes a difference in inference. Just because clustering errors is conservative does not mean we should cluster. Their main message is that the need for clustering must be assessed at the stage of the econometric design, rather than in any formulaic manner. Here we expand upon the study design and consider the role of clustering alongside.

Consider the population of country-years between 2003 and 2010. The population is partitioned into $C$ countries. For each country-year $i$-$t$ there are two potential outcomes, $NRA_{it}(0)$ and $NRA_{it}(1)$, corresponding to a control and treated outcome. Our interest lies in the population average effect of the treatment

$$
\tau = \frac{1}{CT} \sum_{c=1}^{C} \sum_{t=1}^{T} (NRA_{it}(1) - NRA_{it}(0)) \\
= \frac{1}{C} \sum_{i=1}^{C} (NRA_i(1) - NRA_i(0)) \\
= NRA(1) - NRA(0).
$$

There are equal number of years $T (=8)$ for each country in this population. The second equality takes the average of the mean counterfactual difference across countries. There is heterogeneity in individual treatment effects if, for one or more $i$-$t$, $NRA_{it}(1) - NRA_{it}(0) \neq \tau$. At the level of cluster $i$, heterogeneity in treatment effects further implies that $NRA_i(1) - NRA_i(0) \neq \tau$ for at least some $i$.\textsuperscript{33} The presence of heterogeneity at the cluster level is a key consideration in deciding whether one should cluster standard errors, especially in models with fixed effects.

The reason we expect heterogeneity in treatment effects at the country level is that different countries export different agricultural products. Atkin (2013), for example, shows habit formation as a basis for why food consumption baskets vary across countries. The extent of persistence\textsuperscript{34}

\begin{align*}
\epsilon_{it}(1) &= NRA_{it}(1) - \overline{NRA}(1), \\
\epsilon_{it}(0) &= NRA_{it}(0) - \overline{NRA}(0),
\end{align*}

and, at the cluster level,

$$
\tau_i(1) = \sum_{t=1}^{T} \epsilon_{it}(1), \\
\tau_i(0) = \sum_{t=1}^{T} \epsilon_{it}(0).
$$

For cluster $i$, heterogeneity in treatment effects implies that $\tau_i(1) - \tau_i(0) \neq 0$.

\textsuperscript{33} It is useful to define the residuals for treated and untreated as

\begin{align*}
\epsilon_{it}(1) &= NRA_{it}(1) - \overline{NRA}(1), \\
\epsilon_{it}(0) &= NRA_{it}(0) - \overline{NRA}(0),
\end{align*}

and, at the cluster level,

$$
\tau_i(1) = \sum_{t=1}^{T} \epsilon_{it}(1), \\
\tau_i(0) = \sum_{t=1}^{T} \epsilon_{it}(0).
$$

For cluster $i$, heterogeneity in treatment effects implies that $\tau_i(1) - \tau_i(0) \neq 0$. 

A4
in food habits may determine the extent to which consumption baskets remain the same even in the face of food price shocks. The impact on consumption, measured in calories, of the same price shock may be heterogeneous across countries due to their different food baskets, leading governments to use different (potential) policy responses to the shock (treatment effects).

In addition to heterogeneous treatment affects, AAIW show two sources of uncertainty in the estimated treatment effect, which are also important in determining whether to cluster errors: stochastic variation in sampling and in assignment. In the context of our study, every country-year $i$-$t$ in the population receives a stochastic binary treatment $W_{it} \in \{0, 1\}$. In addition, we observe a subset of the population, selected according to a stochastic sampling indicator $R_{it}$. Consider the sample first and then the outcome. In our sample we observe the triple $(NRA_{it}, W_{it}, C_{it})$, where $C_{it}$ indicates the country (cluster) to which observation $i$-$t$ belongs. The triple is observed only if $R_{it} = 1$, and the sample size $N = \sum_{i=1}^{C} \sum_{t=1}^{T} R_{it}$. For country-years that we observe in our data, we know the outcome to be $NRA_{it}(W_{it})$ and the residual to be $\epsilon_{it}(W_{it})$.

The sample process determining $R_{it}$ is independent of potential $NRA$ outcomes and assignments. It is done in two stages. In the first stage, countries are sampled with country sampling probability $P_i$. $P_i = 1$ implies all countries are in the sample, while $P_i$ closer to zero means the treatment effect is being inferred about countries (clusters) not in the sample. In the second stage we sample all years (2003-10) in the population from the sampled countries. In panel data parlance we have a balanced panel.

Assignment: Pre vs. Post design

We investigate two assignment processes, both consistent with our theory. In the pre-versus-post design, every country is subject to 3 years of price shocks. The assignment process determining $W_{it}$ is a year-specific assignment, or $W_{it} = I^{HIGH}_t$, so the world price shock is experienced simultaneously by all countries. In our population of countries spanning 8 years, assignment to treatment $W_{it}$ occurs with probability $q_i = 3/8$ in every country $i$.\(^{34}\)

\(^{34}\)Ours is a specific case of the more general assignment process in AAIW. There, $W_{it}$ is a draw from a two-stage process as follows: in the first stage, units (years, in our case) within cluster $i$ are assigned a probability of treatment $q_i \in [0, 1]$ drawn from a distribution $f(.)$ with mean $\mu$ and variance $\sigma^2$. For example, $\mu = 0.5$ implies that exactly half of the observations in the cluster are subject to treatment. Alternatively, $\sigma^2 = 0$ implies there is no within-cluster correlation in treatment, and assignment is random. This implies exchangeability, as well. When $\sigma^2 > 0$, clusters experience correlated treatment. In our case, we assume $\sigma^2 = 0$, implying that for each country, the three years of the treatment are exchangeable. That is, they could occur anywhere in the 8 year period with no change in potential outcomes. This is important because if there were no heterogeneity in treatment
the econometric model for the pre-post design is

$$NRA_{i,t} = \phi NRA_{i,t-1} + \sum_{d=1}^{3} \tau^d (DEM_{d} \times I^{HIGH}_t) + X_{i,t}B + \gamma_i + e_{i,t}.$$ 

In the AAIW framework, it is

$$NRA_{i,t} = \phi NRA_{i,t-1} \sum_{d=1}^{3} \tau^d (DEM_{d} \times W_{it}) + X_{i,t}B + \gamma_i + e_{i,t},$$

where \(W_{i,t} = I^{HIGH}_t\).

**Assignment: Design with Land Inequality**

Recall the land inequality model, (7)

$$NRA_{i,t} = \phi NRA_{i,t-1} \sum_{d=1}^{3} \alpha^d (DEM_{d} \times I^{HIGH}_t) + \sum_{d=1}^{3} \tau^d (DEM_{d} \times [LGINI_i \times I^{HIGH}_t]) + X_{i,t}B + \gamma_i + e_{i,t}.$$ 

This is a difference-in-differences design, which we interpret here in the AAIW framework as

$$NRA_{i,t} = \phi NRA_{i,t-1} \sum_{d=1}^{3} \alpha^d (DEM_{d} \times I^{HIGH}_t) + \sum_{d=1}^{3} \tau^d (DEM_{d} \times W_{it}) + X_{i,t}B + \gamma_i + e_{i,t},$$

where \(W_{i,t} = LGINI_i \times I^{HIGH}_t\).

The assignment process in this design is the product \(W_{it} = LGINI_i \times I^{HIGH}_t\) of a country-specific assignment \(LGINI_i\) and a year-specific assignment \(I^{HIGH}_t\). The country-specific assignment measures land inequality with the land Gini. \(L_i\) is discrete with as many categories as countries: a high land Gini, for example, indicates more land in the hands of the elite. A working assumption is that reassigning the level (or intensity) of the treatment leads to the same potential outcome; that is, we assume exchangeability. The assignment \(LGINI_i\) is therefore random, with \(LGINI_i\) drawn from the set of available land Ginis. With \(C\) countries, the probability that country \(i\) gets a specific treatment is \(1/C\). Since every country gets the same treatment for each year in the population, \(LGINI_i\) is a perfectly correlated treatment. The effects, then \(\sigma^2 = 0\) would imply no need to cluster errors (even if doing so would result in conservative standard errors). In our sample, the price shocks occur over three contiguous years, and if there is reason to believe that potential outcomes with contiguous shocks are different from potential outcomes with non-contiguous shocks, then assignment is correlated and \(\sigma^2 > 0\). In this case, there is a compelling reason to cluster errors, even without heterogeneous treatment effects.
year-specific assignment $I_{t}^{HIGH}$ is the binary price shock assignment described in the pre-post design. Because $LGINI_i$ is correlated within-country, the assignment $W_{it}$ is correlated as well. AAIW indicate that this requires us to cluster standard errors at the country level.

Since all our models have fixed effects, AAIW advise clustering in the presence of heterogeneity in treatment effects (as discussed in the shock-non-shock design). Beyond heterogeneity, two further features make clustering at the country level important. First, because $LGINI_i$ is correlated within-country, the assignment $W_{it}$ is correlated as well. AAIW indicate that correlated assignment requires clustering errors. Second, even though we have made every possible attempt to include all dictatorships, we may have missed some due to data limitations. Since not all countries in the population to which we wish to extend our inferences are in the sample ($P_i < 1$), we must be conservative in our inference by clustering errors. Along these same lines, if we wished to extend inferences about the model’s prediction beyond the current sample of dictatorships to other dictatorships, say democracies today that were past dictatorships, then clustering errors would be requisite. In all our models we therefore adopt cluster-robust variance adjustment at the country level (by the Liang-Zeger method indicated in AAIW).

C Political Regime Measures: Polity IV Pillars

The idea behind Polity IV scores is to map democracy into three latent concepts that have precise quantitative measures: executive recruitment, executive constraints, and political competition. The latent concept of executive recruitment, which seeks to measure how open and competitive is the process of selection and recruitment of people who will assume executive power, is then measured by the variables XRCOMP and XROPEN, respectively. XRCOMP scores countries on a 3-point scale based on whether executive recruitment is based on elections (score of 2) through to selection by a highly restricted group (score of 0). XROPEN is a binary measure of whether the executive is elected (=1) or determined by hereditary selection (=0). The latent concept of executive constraints seeks to measure checks and balances on the executive powers. The variable XCONST maps this concept to a 7-point scale based on whether the executive is subordinate to a parliament or the judiciary (=7), has greater power than but is constrained by parliament or judiciary (5,6), is subject to a few limited constraints (3,4), is unconstrained or has unlimited authority (1,2). The latent concept of political competition seeks to measure the degree to which political participation is competitive and open. Two variables, PARCOMP and PARREG are
operationalized and combined to form this measure. PARCOMP measures competitiveness on a 5-point scale based on whether formation of political parties is totally repressed (=1), restricted (=2), factional or represents an electoral transitional (=3,4) or unfettered (=5). PARREG uses a 5-point scale to measure openness based on whether formation of political parties is restricted or regulated (=4,5), sectarian or identity-based (=2,3) or unregulated (=1).\footnote{Countries are partitioned into \{dictatorship\}, \{middle democracy\}, \{liberal democracy\} as follows: PARCOMP: \{1,2\}, \{3,4\}, \{5\}. POLCOMP: \{1,2,3\}, \{4,5,6,7,8\}, \{9,10\}. XRCOMP: \{0,1\}, \{2\}, \{3\}. XCONST1: \{1,2\}, \{3,4,5,6\}, \{7\}. XCONST2: \{1,2,3\}, \{4,5,6\}, \{7\}. Note that POLCOMP is the latent concept that is measured on a 10-point scale on the basis of its components PARCOMP and PARREG.}