A Theory of Trade Policy Under Dictatorship and Democratization

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Paper number 14/03

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June 28th, 2014

ABSTRACT: This paper develops a new model of trade policy under dictatorship and democratization. The paper makes two contributions. One is to provide a deeper understanding of the relationship between political institutions and economic efficiency by studying the endogenous interaction between the form of government and trade policy. The paper's second contribution is to show how a dictatorship can manipulate trade policy to maintain the status quo in the face of world price shocks, thus opening the door to a re-examination of trade policy responses to technology shocks. The model is used to explain an interesting episode of trade policymaking between 1815 and 1846, during which time Britain substantially liberalized trade while Prussia, on the other side of the grain market, significantly increased protectionism. The model is also used to shed light on the wide-spread imposition of export restrictions in response to the 2007-08 food crisis.

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1. Introduction

Classical scholars recommend that democratization and trade liberalization go hand in hand on efficiency grounds. Building on the point that international trade is efficiency enhancing, Smith (1776) argues that democracy helps to support harmonious international economic relations, of which free international trade is a central pillar. However, more recent work in political science has argued that democracy may also empower distributional coalitions with intense interests, making higher levels of protectionism more likely (Garrett 2000: 973). Both possibilities have found support in empirical research (O'Rourke and Taylor 2006, Decker and Lim 2009, Aidt and Gassebner 2010). Yet to the best of my knowledge there is no well-accepted theoretical framework or set of basic results on the relationship between the form of government (dictatorship or democracy), trade policy, and economic efficiency.[3]

This paper's first contribution is to provide such a framework and to analyze its main implications. Using this framework, we will be able to show that it is only when a ruling elite own a relatively scarce factor that democratization can be expected to go hand in hand with trade liberalization and an increase in economic efficiency. When the elite own a relatively abundant factor, the advice of classical scholars will go unheeded in that democratization will be accompanied by an increase in protectionism. Hence the paper presents a clear testable prediction as to when democratization can be expected to result in an increase, and when it may actually result in a decrease, of economic efficiency through resultant changes in trade policy. A third possibility revealed by the framework is that the ruling elite may be able to use trade policy to forestall democratization.

The paper's second contribution, made possible by the new framework developed, is to examine the trade-policy responses by dictatorial regimes to price shocks. Throughout history the advent of price shocks, especially food price shocks, has been one of the main triggers of unrest provoking challenges to dictatorships. Yet price shocks cannot be analyzed in most of the models that endogenize the form of government since these

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[3]In their path-breaking work, Acemoglu and Robinson (2006) do present a model of globalization and trade liberalization which offers important insights into some aspects of this relationship (see Chapter 10). But, since globalization is exogenous in their model, they do not consider the choice by government over trade policy and they do not consider the economic efficiency implications.

tend to be based on single-sector macro models and so have been overlooked in the prior literature. Since our model has the underlying structure of an international trade model with two sectors, price shocks can be analyzed in a natural way. Given that price shocks can be triggered by technology shocks, the implication of technology shocks for political stability can and will be analyzed as well.[4]

The model that we will develop combines a standard 2×2 Heckscher-Ohlin (H-O) model of international trade and trade policy with Acemoglu and Robinson's (2000) model of the form of government (henceforth referred to as AR). The AR framework is extended to provide a new motivation for trade policy. But the AR framework, being a single-sector model, cannot be used to consider economic efficiency while the international trade policy framework features clear efficiency implications. Thus, the combination of these two models extends each in a non-trivial way to provide a new political-economy model of trade policy-making, which yields new insights that would not be available from either of the original models on their own.

The underlying economic model is of a country at the relatively early stages of development. Initially a ruling elite controls the national government outright, with the focus here being on their control over trade policy. In the stylized setting of a two-factor two-good model, we will assume that the elite own one factor while the rest of society own the other. This is a reasonable assumption for a less developed country, where factor ownership tends to be highly polarized and factor markets poorly functioning. Think for concreteness of the elite owning land or capital while the rest of society own only labor. Since the underlying production structure is given by the H-O model, the standard results of new classical trade theory apply. As predicted by the Stolper-Samuelson theorem, the owners of the abundant factor prefer a relatively open trade regime while the owners of the scarce factor prefer a regime that is more protectionist. We will consider situations where the elite own the scarce factor and the abundant factor respectively.

A natural question regarding the model's set-up is whether it would be more reasonable to incorporate income taxes as well as trade taxes. In seeking to isolate the relationship between the form of government, trade policy, and economic efficiency in the

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[4]See Williamson (2012) for a review of the literature showing that commodity price volatility can adversely affect economic performance and provoke political instability.

face of price shocks, it makes sense to assume that no other policies are available. In addition this assumption has firm foundations in the data, since countries at an early stage of development tend not to invest in domestic fiscal capacity. As Besley and Persson (2011: 41-43) state: "Arguably, trade taxes and income taxes are two polar opposite cases. To collect trade taxes requires being able to observe trade flows at major shipping ports. Although such tax allocations may encourage smuggling, it is a much easier proposition than collecting income taxes. The latter requires major investments in enforcement and compliance structures throughout the economy. ... High-income countries tend to depend more on income taxes, whereas middle- and, in particular low-income countries depend more on trade taxes."[5] Since our focus is on a country at a relatively early stage of development, it seems reasonable to assume in our stylized characterization that there is no domestic fiscal capacity and that only trade taxes are available.

The political economy structure is as follows. While the elite are assumed initially to have control over trade policy, the rest of society do not have sufficient resources or influence to affect trade policy. However, the rest of society may be able to exert influence over trade policy through the periodic opportunity to mount a revolution in which they could topple the ruling elite regime. If successful, a revolution would lead to democracy under which the rest of society assume control of trade policy. But revolution is costly. So the elite may decide voluntarily to extend the franchise to avoid the costs of revolution. If the rest of society own the relatively abundant factor then, since the median voter is a member of the rest of society, democratization will be accompanied by trade liberalization. However, if they own the relatively scarce factor then democratization will be accompanied by an increase in protectionism.

As an alternative to extending the franchise, the elite may be able to neutralize the threat of revolution and forestall democratization by making temporary concessions to the rest of society over trade policy. We refer to the price level arising from a trade policy concession that defuses a revolutionary threat as the 'status quo price'; conceding greater openness if the rest of society own the abundant factor and greater protection if it is the

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[5]This observation is also true for the earlier trade policy history of now-developed countries such as Britain. In their study of early taxation, Zolt and Bird (2005) point out that: "Personal income taxes started small. Few were taxed, and tax rates were low." Even though progressive income taxes were first adopted around the early and mid-1800s, it was not until World War II that they became a major source of tax revenue even in most developed countries (Aidt and Jensen 2009).

scarce factor that they own. The status quo price may be implemented by import tariffs and/or export taxes that lie between autarky and free trade.

Characterization of equilibrium lies at the heart of the paper's first contribution. This determines the conditions under which the elite have to extend the franchise in order to defuse a revolutionary threat or if they can forestall democratization by adopting the status quo price. A key feature of equilibrium is the efficiency implications. If the rest of society own the relatively abundant factor and democratization is accompanied by trade liberalization then democratization will involve an increase in economic efficiency. It is when the rest of society own the relatively scarce factor that democratization will lead to an increase in protection and a reduction in economic efficiency. The main insight from this aspect of the analysis is that any consideration of the efficiency implications of democratization must take comparative advantage and factor ownership into account. This insight may be useful in framing future empirical investigations.

Placing the paper's first contribution, the majority of the previous literature on institutions and economic efficiency has focused on the role not of political but of economic institutions in the determination of economic performance. Following North (1981), the main focus of attention has been on economic institutions that define and enforce contracts and property rights, although the regulation of entry, financial markets, technology and fiscal capacity are also regarded as important (La Porta, Lopez-de-Silanes, Shleifer and Vishny, e.g. 1997, Acemoglu, Johnson and Robinson, e.g. 2001, Rodrik, e.g. 2007, Besley and Persson e.g. 2011). This 'macroeconomic institutions literature' has shown that countries with better rule of law and more private property rights have on average grown faster, where faster growth is associated with better allocative efficiency. At the same time, Besley and Jayaraman (2010) point out that " ... there is clearly a great deal of heterogeneity in institutions as well as in outcomes associated with a given institutional metric." The literature on the interaction between economic institutions and international trade provides some insight into how such heterogeneity can arise. It does so by arguing that poor institutions can be a source of rent for some groups while institutions can also be a source of comparative advantage. Consequently, the welfare consequences arising from the interaction between economic institutions and international trade are shown to be ambiguous (Engerman and Sokoloff 1997, Levchenko 2007, 2013, Nunn 2007, Costinot

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2009). The present paper, by focusing on the interaction between political institutions and economic efficiency, shows how there can be a heterogeneity of efficiency outcomes associated with the institution of democracy. Furthermore it shows that this heterogeneity depends systematically on the endogenous interaction between comparative advantage and underlying factor ownership.

Turning to the paper's second contribution, in examining trade-policy responses by dictatorial regimes to price shocks, our framework opens the door to a deeper understanding of how trade policy evolved during some interesting episodes of history. One episode concerns the evolution of British trade policy during the period from the end of the Napoleonic Wars in 1815 to the eventual repeal of the Corn Laws in 1846. A great deal of research has focused on Britain's repeal of the Corn Laws in 1846, when tariffs of 7 percent were repealed to free trade. The framework developed in this paper additionally makes it possible to understand the prior period from 1815 until just before repeal (as well as repeal itself), during which tariffs were reduced from 70 percent to 7 percent. The explanation I propose is grounded in the fact that Britain's ruling elite owned land, used intensively to produce agriculture, while the country had a comparative advantage in manufactures which at that time were labor intensive. So the elite preferred a relatively closed regime, and at the end of the Napoleonic Wars put in place the Corn Laws to protect the income they made from land. During the 1800s there was a transport revolution that dramatically reduced the world prices of grain for importers such as Britain (O'Rourke and Williamson 1999: 33-36). The fall in prices made revolution more appealing to the rest of society in Britain since they would adopt a more open regime if they were able to depose the elite regime, facilitating access to cheap grain from the world market. This in turn mandated a gradual fall in the status quo price, which the elite brought about through trade liberalization.[6]

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[6]It may seem counterfactual to think of Britain as a dictatorship of the elite in the mid 19th Century when it already had a democratically elected chamber in the Houses of Parliament called the House of Commons. Indeed, much of the past literature on repeal of the Corn Laws focuses on lobbying by industrialists of the House of Commons in classic Grossman-Helpman fashion. However, recent work by Schonhardt-Bailey draws attention to the fact that at that time the unelected House of Lords, whose peers consisted of the landed aristocracy, held veto power over any policy passed by the House of Commons. This in turn meant that the tension that drove repeal was not so much between the industrialists and the House of Commons but more between the ordinary people who threatened revolution and the House of Lords who would lose political and economic power if a revolution occurred (Schonhardt-Bailey 2006: 2, 227). A longer discussion of this issue, with further supporting evidence, is presented in Appendix B.

This account would not be complete without considering the other side of the grain market. Prussia's aristocracy, like Britain's, held their wealth in large estates but, differently from Britain, Prussia had a comparative advantage in agricultural products such as grain which Britain imported. As owners of the abundant factor, again differently from Britain, Prussia's elite enacted low tariffs after the end of the Napoleonic wars. But as transport costs fell and world prices of grain rose, benefitting exporters but putting import-competing industries under pressure, the Prussian ruling elite came under pressure to raise protectionism and did so steadily between 1815 and 1846 (Kindleberger 1975). The most dramatic rise in protectionism came in 1847 when harvests failed throughout Europe and grain prices rose sharply. In the face of 'hunger riots', export taxes on grain were raised by 25 percent in an attempt to keep domestic grain prices from rising and thereby maintain the status quo, as would be predicted by our model (Solar 1997).[7]

A similar sequence of events in trade policy-making to those in mid-19th Century Prussia occurred in a number of countries in the 2007-08 world food crisis. Between 2007 and 2011 an estimated 33 food-exporting countries resorted to restrictions on exports of grains, rice, and other foodstuffs (Sharma 2011) in response to the initial increase in food prices. Moreover, a number of these countries were dictatorships such as Egypt and Jordan.[8] The ruling landed elites in these countries stood to gain significantly from leaving export markets open during the period. However, violent protests prompted the ruling regimes to respond by introducing export restrictions, in line with Prussia's response a century and a half earlier and in line with the predictions of our model.

Placing the paper's second contribution, most of the prior literature on trade policy focuses on a stable institutional environment where democracy has already been consolidated. In that literature, interest groups are able to lobby the government in order to try to influence the electoral outcome or sway policy in the direction they would like to

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[7]The 19th Century trade policy experiences of Britain and Prussia have not, to my knowledge, been linked previously in general political-economic equilibrium. Rogowski (1989) argues (non-formally but drawing on a broad range of historical accounts), by invoking the logic of the Stolper-Samuelson theorem, that the owners of abundant factors are likely to organize politically and push for trade liberalization while owners of scarce factors are likely to resist it, possibly resulting in the threat of a revolution. He considers Britain and Prussia separately, and does not link trade policy evolution in the two countries to changes in transport costs.

[8]However, many of the countries that imposed export restrictions in order to maintain political stability were democracies. In the concluding section I will discuss how the framework of this paper could be extended to consider such policy responses to price shocks in a democracy.

see it go (Hillman 1982, Hillman and Ursprung 1988, Magee, Brock, and Young 1989, Grossman and Helpman 1994, Bagwell and Staiger 1999). Relating to a different branch of that literature, the use of democratization in our model to commit to a certain trade policy is similar to the commitment rationale for trade agreements espoused by Maggi and Rodriguez-Clare (1998, 2007). When the institutional environment in practice is closer to that characterized in the present paper, our model may be able to explain patterns in the data that are more difficult to explain using standard political economy models. Consider the decline in transport costs in the first half of the nineteenth century described above, that lead to a decrease in protectionism in Britain but an increase in Prussia. In a Grossman-Helpman model one would expect both countries to respond in the same way (either by increasing or reducing protection) under the assumption of symmetrical political structures across countries where the government responded to organized interests in import-competing sectors. The difference with the model developed in this paper is that it provides an explanation of the different British and Prussian reactions within a common model of the political constraints faced by governments.[9]

This paper is also related to a third branch of the literature that undertakes a positive analysis of the relationship between institutions and trade policy. Like the present paper, Galiani and Torrens (2014) explore the role of trade policy in maintaining the status quo in the face of a possible political transition, although their concern is not with economic efficiency or price shocks. Their model allows for three groups within society, namely two elite groups in the form of landlords and industrialists, and 'the people,' as well as two policy instruments: income taxes as well as trade taxes. While income can be taxed at any rate between zero and one hundred percent, trade policy can take one of only two values: autarky or free trade. Having two policy variables and three groups in society creates scope for two dimensions of conflict over policy: a rich-poor cleavage over the income tax and a landlord-industrialist cleavage over trade policy. Thus, their framework features a richer set of possible outcomes regarding the balance of power between competing elite groups and the people which our framework does not have. But our framework features the

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[9]This paper also provides a new explanation for how trade policy can fluctuate over time. Bagwell and Staiger (1990, 2003) model fluctuations in the level of protection over time but these arise as a result of temporary surges in import demand, or variations in total demand over the business cycle. In the present paper, trade policy fluctuations come about through endogenous changes in the weights on the government's objective function.

capacity to account for the revenue implications of changes in trade policy, which Galiani and Torrens' model does not have. This capacity enables us to examine incremental changes in trade policy over time, and is necessary to be able to carry out comparative statics on trade policy and hence analyze world price shocks.

The present paper is also related to two others from this branch of the literature. Liu and Ornelas (2014) study the relationship between participation in free trade agreements and the sustainability of democracy. Their model shows that free trade agreements can critically reduce the incentive of authoritarian groups to seek power by destroying protectionist rents, thus increasing the chances of democratic consolidation. Garfinkel, Skaperdas and Syropoulos' (2008) work is also related in that it considers the relationship between trade policy and political institutions, where their focus is on the possibility of conflict over a traded resource that can lead to civil war.

The paper is structured as follows. Section 2 develops the economic model based around the H-O model and uses this to characterize the levels of protectionism that would be preferred by the elite and the rest of society respectively. Section 3 then uses the economic model of Section 2 to determine the payoffs in a dynamic game through which the form of government and trade policy are determined. Section 4 examines the effects of world price shocks on trade policy and discusses these effects in the light of the historical and recent episodes of trade policy-making introduced above. Conclusions are drawn in Section 5. Proofs of results are presented in Appendix A where indicated; other proofs are in the main text. Appendix B presents longer discussions of trade policy in Britain and Prussia in the early 19th Century, and the recent wave of export-measure based protectionism in response to the world food crisis of 2007-08.

2. The H-O Model with Protectionism

The model is of a single small country, populated by a continuum of risk-neutral agents. Each agent is placed in one of two groups: the elite, e, or 'the rest of society,' r. The mass of each of these groups is normalized to θ and 1 respectively so that the total mass of the population is $1 + \theta$. The elite constitutes a minority of the population; $\theta < 1$.

The model has an infinite time horizon. A subscript t denotes the time period

$t = 0, 1, ..., \infty$. The economy is endowed with a unit each of two primary factors which we will refer to as v^e and v^r. Each member of the elite is endowed with an equal share of v^e while all of v^r is distributed evenly among members of the rest of society. For example, v^e could be land and v^r could be labor. All members of each group are identical to one another. Each group differs from the other only by its factor endowment.

2.1. Production

The economy is competitive, both in production and factor markets. Production of each good requires both factors v^e and v^r but, as standard in the H-O model, production of good i uses factor v^i relatively intensively. Both factors are supplied inelastically on aggregate. There is free mobility of each factor $i \in \{e, r\}$ between sectors, giving rise to a single factor price in period t, denoted by w_t^i, equated to the value of its marginal product. There are two sectors, each producing a different homogenous commodity. These commodities are referred to as goods e and r respectively, reflecting ownership of the factor that is used intensively in each of their production. Denote the price of each good in period t by p_t^e and p_t^r respectively, and let $p_t = p_t^e/p_t^r$. Since the country is small, the world relative price $p^w = p^{ew}/p^{rw}$ is taken as given. In a more general setting where externalities are possible, p^w would be regarded as the relative price that maximizes efficiency. It will also be helpful later to have notation for the autarky relative price, which we will denote by $p^a = p^{ea}/p^{ra}$. Choosing good r as the numeraire in the model, we can write $p_t = p_t^e$, $p^w = p^{ew}$ and $p^a = p^{ea}$. If the economy is open then goods may be traded internationally but factors are not internationally mobile.

Output of good $i \in \{e, r\}$ in period t is denoted by x_{it}. There is free entry into both sectors so that profits are driven to zero. Technology in each sector exhibits constant returns to scale and decreasing marginal returns to each factor. Under these assumptions, given initial endowments, population shares and production technology, outputs and factor prices are determined by p_t, so we may write $x_{it} = x_i(p_t)$ and $w_t^i = w^i(p_t)$ in period t, $i \in \{e, r\}$. Write the factor income of a member of group j in period t as y_t^j. Accordingly, we can express factor incomes of the two groups as functions of relative prices,

$$y_t^e = y^e(p_t) = w^e(p_t)/\theta \text{ and } y_t^r = y^r(p_t) = w^r(p_t). \tag{2.1}$$

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Since the structure of the economy is that of a standard 2×2 H-O model, the standard results hold. We are particularly interested in the Stolper-Samuelson theorem which demonstrates that if, in a given period, p_t is increased then the real return to v^e unambiguously increases while the real return to v^r unambiguously decreases. Following Jones (1965), we can express the main implication of the Stolper-Samuelson theorem as follows:[10]

$$w_t^{e*} > p_t^* > 0 > w_t^{r*}$$

where a superscript-$*$ on a variable z denotes proportional change; $z^* = dz/z$. Given our assumptions about endowments, this result translates directly into the effects of price changes on the respective groups. An increase in p_t will bring about an unambiguous increase in the real factor income of the elite and a reduction in the real factor income of the rest of society. A decrease in p_t has the opposite effect on the incomes of the respective groups. It follows from the Stolper-Samuelson Theorem that $y^{e\prime}(p_t) > 0 > y^{r\prime}(p_t)$ where a 'prime' denotes the first derivative of a function with respect to the argument in brackets.

2.2. Preferences

Agents $j \in \{e, r\}$ have identical preferences and the same discount factor, $\beta < 1$. The expected utility of agent j at time 0 is given by:

$$U_0^j = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u\left(c_{et}^j, c_{rt}^j\right)$$

where utility in each period is given by the function $u\left(c_{et}^j, c_{rt}^j\right)$, c_{it}^j is consumption of good i in period t by agent j, and $\mathbb{E}_t$ is the expectations operator conditional on information available at time t. The per-period utility function is given by

$$u\left(c_{et}^j, c_{rt}^j\right) = c_{rt}^j + u_e\left(c_{et}^j\right),$$

where the sub-utility function $u_e(\cdot)$ is differentiable, increasing, and strictly concave. With these preferences, assuming their income y_t^j is sufficiently high, an individual j in period t consumes $c_{et}^j = d_e^j(p_t)$ of good e, where the demand function $d_e^j(\cdot)$ is the inverse of $u'_e\left(c_{et}^j\right)$. At the same time, individual j consumes $c_{rt}^j = Y_t^j - p_t d_e^j(p_t)$ of good r, where Y_t^j is j's

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[10]The conditions required for this relationship to hold globally are established by Gale and Nikaido (1965) and Chipman (1969). These are assumed to hold throughout the analysis.

total income, comprising of factor income and any revenue raised by policy instruments. Throughout our analysis we will focus on outcomes where all consumers are at interior solutions and so $d_e(p_t) = c_{et}^e = c_{et}^r$.[11]

2.3. Policy Instruments

We will restrict the set of policy instruments to trade taxes.[12] These policies drive a wedge between the domestic price and the world price, both for consumers and for producers. For convenience, and without loss of generality, we will assume that trade policy is applied to good e. Note that we have not specified the country's comparative advantage so good e could be either the country's exportable or its import-competing good. A domestic price in excess of the world price implies an import tariff for a good that is imported (and an export subsidy for one that is exported). A domestic price that is below the world price corresponds to an export tax for a good that is exported (and an import subsidy for one that is imported). We will follow the international trade policy literature in assuming that any revenue collected from a trade policy is rebated to each individual j in lump sum. Then the net revenue function for an individual j, $tr^j(p_t)$, is determined as follows:

$$tr^j(p_t) = (p_t - p^w)\left(d_e(p_t) - \frac{1}{1+\theta}x_e(p_t)\right). \tag{2.2}$$

This approach facilitates our focus explicitly on the general equilibrium effects of changes in prices.[13] The total income of a member of group j is given by the sum of factor income and revenue collected from trade policy: $Y_t^j = y^j(p_t) + tr^j(p_t)$.

2.4. Welfare of the Groups and their Preferred Levels of Openness

The welfare of the representative member of group j can be expressed as follows:

$$W^j(p_t) = y^j(p_t) + tr^j(p_t) + s_e(p_t), \tag{2.3}$$

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[11] The quasi-linear preference function is tractable, and provides comparability to Grossman and Helpman (1994). Similar results are obtained with identical and homothetic preferences in all households.

[12] In principle, our model allows for a consideration of trade subsidies as well. But our assumption that there is no domestic fiscal capacity imposes the restriction that trade subsidies are not feasible.

[13] An alternative approach, taken by Acemoglu and Robinson (2000) for example, would be to assume that the elite keeps the revenue for itself except at times when it could be used to make direct transfers to the rest of society to try to avert a revolution. Introducing this possibility would not change our results qualitatively, but would affect the range of values of β for which the commitment problem becomes binding. See the discussion of the revolution constraint (3.3) below for details.

where $s_e(p_t) \equiv u_e[d_e(p_t)] - p_t d_e(p_t)$ is the consumer surplus derived from consumption of good e. The level of openness that is preferred by each of the groups e and r can be determined from (2.3). The level of p_t that maximizes the welfare of group j is given by the first order condition

$$W^{j\prime}(p_t) = y^{j\prime}(p_t) + tr^{j\prime}(p_t) + s'_e(p_t). \tag{2.4}$$

Given our assumptions about the structure of preferences, the second and third terms of (2.4) (and 2.3) are the same across groups $j \in \{e, r\}$. Therefore, differences in the preferred level of p_t across the respective groups will depend only on differences between $y^{e\prime}(p_t)$ and $y^{r\prime}(p_t)$. We know from the Stolper-Samuelson theorem that $y^{e\prime}(p_t) > 0 > y^{r\prime}(p_t)$. So $W^{e\prime}(p_t) > W^{r\prime}(p_t)$ for all p_t. Assuming that they exist, denote the level of p_t for which $W^{e\prime}(p_t) = 0$ by $\hat{p}^e$ and $W^{r\prime}(p_t) = 0$ by $\hat{p}^r$. Then under the assumption that $W^{j\prime\prime}(p_t) < 0$, we have $\hat{p}^e > \hat{p}^r$.[14]

Let us consider the implications of $\hat{p}^e > \hat{p}^r$ when the country has a comparative advantage in good e and good r in turn. With a comparative advantage in good e, $p^w > p^a$. This situation is illustrated in Figure 1. The downward sloping lines show $W^{e\prime}(p_t)$ and $W^{r\prime}(p_t)$, with the point where each crosses the horizontal axis determining $\hat{p}^e$ and $\hat{p}^r$ respectively. In this situation, the elite's welfare is maximized at a higher level of openness than is the rest of society's. This stands to reason since, when the country has a comparative advantage in good e, the elite own the factor used intensively in the production of the good for which the country has a comparative advantage. Therefore, the elite's factor income is increasing in the level of openness whereas the rest of society's is decreasing. With a comparative advantage in good r, $p^a > p^w$, as illustrated in Figure 2. In that case the rest of society's welfare is maximized at a higher level of openness than is the elite's. With a comparative advantage in good r, it is the factor income of the rest of society that is increasing in the level of openness. In general, the solutions for $\hat{p}^e$ and $\hat{p}^r$ could imply import and export subsidies, but given our assumption that trade policy must be self-financing (because there is no fiscal capacity) subsidies are ruled out. We will discuss the implications of this assumption for equilibrium in due course. Summarizing, the level of openness preferred by the respective groups will be determined by which group owns the factor used intensively in the good for which the country has a

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[14] A 'double prime' denotes the second derivative with respect to the argument in brackets.

comparative advantage.[15]

We will use the utilitarian notion of efficiency to determine the total surplus available for distribution to citizens, Ω:

$$\Omega(p_t) = \theta W^e(p_t) + W^r(p_t). \tag{2.5}$$

Appendix A.1 establishes that trade liberalization is associated with an increase in economic efficiency even without domestic fiscal capacity. It is of course well know that in a standard competitive trade model free trade maximizes efficiency. In our model, differently from the standard set-up, we rule out all redistributive policy except for trade policy itself. We are also considering incremental changes in trade policy rather than a move between autarky and free trade. So it may be helpful to know that trade liberalization does imply an increase in efficiency under these restrictions as well.

3. Trade Policy and the Form of Government

We will endogenize p_t by combining the Hecksher-Ohlin model set out above with the model of social conflict and franchise extension developed by Acemoglu and Robinson (2000). Initially, (de jure) political power is held by the elite. The elite can exercise this power in the model through their control of trade policy. Under this specification, and for parsimony of notation, we will say that while the elite hold power they set p_t directly. Denote the value of p_t chosen by the elite as p^e.

Assume that, in any given period t, with probability ρ the rest of society are able to resolve their coordination problem and hence are in a position to mount a revolution (we will refer to this as the 'high threat state' or H). On the other hand, with probability $1-\rho$ the rest of society are unable to resolve the coordination problem involved in mounting a revolution and hence pose no threat to the elite (the 'low threat state' or L). The form of government is either elite rule, E, or democracy, D. Denote the state in a given period by

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[15] The conflict of interest between groups over trade policy is of course more general than the framework we are using here. The 2×2 H-O model is useful because it provides a particularly clean and tractable relationship between goods prices and factor prices. This will facilitate our analysis of the revenue considerations of trade policy. Our framework could be extended to a more general framework to consider any number of goods and factors along the lines developed by Jones and Scheinkman (1977). However, this would obscure the simple logic of the revenue considerations of trade policy that can be brought out in the 2×2 case.

the tuple (F, s), where $F \in \{E, D\}$ denotes whether there is a dictatorship of the elite or there is democracy, and $s \in \{H, L\}$ is the threat level to the elite regime if it is in power.

If the rest of society successfully mount a revolution that topples the ruling elite regime, they install a democracy through which the median voter determines trade policy, p_t. The same outcome of democracy can arise if the elite decide voluntarily to extend the franchise. Given that $\theta < 1$, under full democracy the median voter is a member of the rest of society. So democratization involves a transfer of power to set trade policy from the elite to the rest of society.

The game is initialized with the assumption that in period 0 there is rule by the elite. Within a period, t, the sequence of events is as follows.

1. The world price, p^w, and the state $s \in \{H, L\}$ are revealed.

2. The elite decide whether or not to extend the franchise. If they do not, they set trade policy, p^e.

3. If $s = H$ then the rest of society decide whether or not to mount a revolution. If $s = L$ then revolution is not an option.

4. If the rest of society decide to mount a revolution, the elite can repress it at cost μ (per elite member). If the elite repress, any revolution attempt is not successful and elite rule is maintained. If the elite do not repress, a revolution attempt is successful, but costs ψ to each member of society (including the elite and the rest of society), after which there is a transition to democracy. If the rest of society do not mount a successful revolution then elite rule is maintained.

5. If there is democracy then trade policy, p_t, is set by the median voter (a member of the rest of society).

6. Production takes place, demands are realized, markets clear and consumption takes place.

Some additional assumptions are needed to complete the specification of the model. Once a shock to p^w has been realized then it is expected to remain at its new level indefinitely. Democracy is an absorbing state; if the franchise is extended then, by assumption,

it cannot be rescinded; from $t+1$ onwards the sequence of events starts from stage 5. In that case the state s is no longer relevant. Otherwise the game starts again from stage 1.[16] The fact that all members of each of the two respective groups, the elite and the rest of society, are identical to one another (but obviously differ across groups by their endowments) makes the analysis of the game significantly easier because we can model the members of each group as a single player. So we can model the situation set out above as a two-player game between the elite and the rest of society.

3.1. Definition of Equilibrium and Preliminaries to Characterization

The concept of equilibrium we will use is that of Markov Perfection, wherein each player's strategy depends only on the state (F, s) in a given period.[17] The strategies played by the respective groups are as follows. Let $\sigma^e(F; s)$ be the strategy played by the elite when the state is $s = L$ or H and when the form of government is $F = D$, or E. Let $f = 0$ if they do not extend the franchise and $f = 1$ if they do. Regarding the choice over whether or not the elite will repress, in which case each member pays μ, let $q = 0$ if they do not repress and $q = 1$ if they do. Let $\sigma^r(F|(f, q, p^e); s)$ be the strategy played by the rest of society in response to the choices f, q and p^e of the elite. This consists of the decision as to whether or not to mount a revolution: $a = 1$ if they do (where a is a mnemonic for 'agitate') and 0 otherwise. Since by the timing of events determined above the elite move before the rest of society, the strategy of the rest of society in a given period is conditioned on that of the elite. Let $\widetilde{\sigma}^e(F; s)$ be a best response to $\sigma^r(F|(f, q, p^e); s)$ for all F, s, and let $\widetilde{\sigma}^r(F|(f, q, p^e); s)$ be a best response to all $\sigma^e(F; s)$ for all F, s. Then a pure strategy Markov Perfect equilibrium is a set of mutual best responses $\{\widetilde{\sigma}^e(F; s), \widetilde{\sigma}^r(F|(f, q, p^e); s)\}$.

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[16]Democracy is assumed to be an absorbing state in this model. This simplification enables us to focus the analysis on whether or not it is possible to set trade policy in such a way as to avoid democratization. Acemoglu and Robinson (2001) present a model where democracy may fail to consolidate, and the present model could straight-forwardly be extended in that direction. Galiani and Torrens (2014) allow for this possibility, with interesting policy implications.

[17]In our set-up, any Markov Perfect Equilibrium (MPE) coincides with Subgame Perfect Equilibrium (SPE). The reason is that the returns to the various strategies open to the elite are independent of history. MPE and SPE would only diverge if the elite were able to set trade policy after some kind of sunk investment were made by the rest of society, potentially making them vulnerable to a hold-up problem.

In our characterization of equilibrium, we will restrict attention to the region of the parameter space where the elite may have a commitment problem over trade policy. First note that it will not be rational to incur the cost of repression if μ is relatively large. If the elite do not repress, the elite may not be able to avert a revolution by (credibly) promising to set $p^e = \hat{p}^r$; but they will be able to avert revolution by extending the franchise and with it the power to set trade policy, thereby making a credible commitment to $\hat{p}^r$. Under certain circumstances, which we will determine, the elite may alternatively be able to use trade policy in order to maintain the status quo (i.e. not extend the franchise). Note that the elite would always prefer to maintain the status quo because this entails retention of the power to set trade policy to their advantage when the level of threat is low.

We will now formalize the payoffs to the respective groups under the various possible outcomes. Let $V^j (D, \hat{p}^r)$ represent the present discounted value under democracy for $j \in \{e, r\}$. For a member of group j, the payoff to democracy takes the form:

$$V^j (D, \hat{p}^r) \equiv \frac{W^j (\hat{p}^r)}{1 - \beta}. \tag{3.1}$$

where the term $1 - \beta$ provides the net present value when, under democracy, trade policy is chosen by the median voter. Denoting the occurrence of revolution by R, the payoff to revolution is given by

$$V^j (R, \hat{p}^r) \equiv \frac{W^j (\hat{p}^r)}{1 - \beta} - \psi. \tag{3.2}$$

Clearly, both groups would prefer democracy to revolution because, while both outcomes lead to democracy under which $p_t = \hat{p}^r$ for all t, both groups would prefer to avoid the cost ψ associated with revolution. Therefore, extension of the franchise always has the potential to defuse revolution.

Recall that we also want to restrict attention to a situation where the elite cannot always simply head off revolution by temporary redistribution using trade policy. Assume that in period t the state is H. The 'revolution constraint' is then given by the following:

$$\frac{W^r (\hat{p}^r)}{1 - \beta} - \psi > W^r (\hat{p}^r) + \beta \frac{W^r (\hat{p}^e)}{1 - \beta}. \tag{3.3}$$

This expression says that, for a member of the rest of society, the discounted payoff to revolution (on the left hand side) is greater than the immediate payoff from a single period with trade policy set according to the rest of society's preferred price level, $\hat{p}^r$, followed

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by a return to the elite's preferred price level in all periods thereafter. By construction, $W^r(\hat{p}^r) > W^r(\hat{p}^e)$. For given $\psi > 0$, the revolution constraint binds providing β is sufficiently large. That is, the rest of society must care enough about the future, and the lower payoff entailed by a return to the elite's preferred price level, that they cannot simply be bought off by a single period of prices set at $\hat{p}^r$. The commitment problem exists in this model if and only if the revolution constraint binds.[18]

3.2. Characterization of Equilibrium

We are now ready to proceed with our characterization of equilibrium. If in period t the state is L and the elite are in power, there is no threat of revolution. Therefore, in Markov Perfect Equilibrium, $f = 0$ and $p^e = \hat{p}^e$. Now consider the situation where in period t, with the elite in power, the state is H and so the threat of a revolution does exist. As outlined previously, the elite have three options as to how to address this threat. The first is to extend the franchise, $f = 1$. Under democracy the median voter, a member of the rest of society, will vote for their most preferred price level $\hat{p}^r$ and the payoff to a member of the rest of society will be $V^r(D, \hat{p}^r)$ as given by (3.1). The second option that the elite have is to repress the threat of revolution. Repression is denoted by Q and the payoff to the rest of society under repression by $V^r(Q, \hat{p}^r)$. While this option entails the cost μ only in periods when $s = H$, under repression the elite are able to set the price level $\hat{p}^e$ with impunity in every period. The third option is neither to extend the franchise nor to use repression but to instead redistribute income from the elite to the rest of society using trade policy. Their aim is to set trade policy in such a way as to maintain the status quo; that is, set p^e so that the rest of society are just indifferent between mounting a revolution and not doing so.[19] We will refer to this trade policy as the 'status quo price'. Thus,

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[18] If we allowed the elite to use some of their income, say from tariff revenue, to make direct transfers to the rest of society in the current period to defuse the threat of revolution, this would increase the value of β necessary to get the revolution constraint to bind. Relatedly, allowing the rest of society to seize the elite's assets in a revolution would increase the size of the left hand side of the revolution constraint, thus reducing the necessary size of β. But again, the analysis would not be affected in a qualitative way.

[19] In a deterministic perfect information environment there are no revolutions on the equilibrium path. One way for revolution to occur in equilibrium is if there is some uncertainty over whether or not the rest of society can resolve their coordination problem. This uncertainty would make a risk-neutral elite less generous towards the rest of society in their setting of p^s, meaning that the elite would do better when coordination fails but worse when it doesn't. Otherwise the basic logic of the policy choice would be the same.

given H, to set the status quo price the elite must choose strategies $f = 0$, $q = 0$ and $p^e = p^s$. Full details concerning the characterization of payoffs using a Bellman equation approach are presented in Appendix A.2.

Given any of these three actions by the elite, in principle the rest of socity may still prefer to respond by mounting a revolution. Thus a member of the rest of society's strategy solves the problem

$$\max \left\{ V^r \left(R, \hat{p}^r \right), f V^r \left(D, \hat{p}^r \right) + (1 - f) q V^r \left(Q, \hat{p}^e \right) + (1 - f)(1 - q) V^r \left(E, p^s; H \right) \right\}.$$

(3.4)

We have already determined above the payoffs to the rest of society from democracy, $V^r (D, \hat{p}^r)$, revolution, $V^r (R, \hat{p}^r)$, and repression, $V^r (Q, \hat{p}^r)$ respectively. The payoff to a member of the rest of society when the elite redistribute by setting p^s is

$$V^r \left(E, p^s; H \right) \equiv W^r \left(p^s \right) + \beta \left(\rho V^r \left(E, p^s; H \right) + (1 - \rho) V^r \left(E, \hat{p}^e; L \right) \right).$$

(3.5)

If (with probability ρ) in the following period the state of H is maintained then the elite will continue to set p^s and the rest of society's utility will be maintained at the same level. But if the state switches to L then the elite will (renege on any promise to maintain redistribution with p^s and) restore their preferred trade policy, bringing about the price level $\hat{p}^e$.

To find p^s, first define

$$G \left(p^e \right) \equiv \frac{1 - \beta (1 - \rho)}{1 - \beta} W^r \left(p^e \right) + \frac{\beta (1 - \rho)}{1 - \beta} W^r \left(\hat{p}^e \right) - \left(\frac{W^r \left(\hat{p}^r \right)}{1 - \beta} - \psi \right).$$

(3.6)

The first term measures the payoff to the rest of society from p^e weighted by the expected number of periods this will arise in the future under the status quo, and the second term similarly for $\hat{p}^e$. So the sum of the first two terms, obtained by solving (3.5) recursively but using $p^s = p^e$, gives the expected payoff from maintaining the status quo. We have already seen from (3.2) that the third term gives the payoff to revolution. Then by definition the status quo price, p^s, solves $G \left(p^s \right) = 0$.

We will now show that the status quo price entails a compromise between the two groups in the sense that the associated level of welfare lies between the welfare levels for the respective groups associated with $\hat{p}^e$ and $\hat{p}^r$. Letting $p^e = \hat{p}^e$ in (3.6), $G \left(\hat{p}^e \right) < 0$ by

the revolution constraint. Therefore, if a value p^s exists such that $G(p^s) = 0$, it must be because the payoff in the current period under p^s is $W^r(p^s) > W^r(\hat{p}^e)$. And by the optimality of the choice of $\hat{p}^r$, it must be the case that $W^r(\hat{p}^r) > W^r(p^s)$. Putting these observations together, $W^r(\hat{p}^r) > W^r(p^s) > W^r(\hat{p}^e)$. It also follows, by the fact that $\hat{p}^e > \hat{p}^r$ and the concavity of $W^j(p_t)$, that $\hat{p}^e > p^s > \hat{p}^r$. Note, again by the concavity of $W^j(p_t)$, that there is another value of p_t that would yield the same level of welfare for r as p^s, but the elite would never choose this because it is even further away from $\hat{p}^e$ than $\hat{p}^r$. We can therefore also say that $W^e(\hat{p}^e) > W^e(p^s) > W^e(\hat{p}^r)$. These results are summarized as follows:

Proposition 1. *The status quo price entails a compromise between the two groups in the sense that: (i) $\hat{p}^e > p^s > \hat{p}^r$; (ii) $W^r(\hat{p}^r) > W^r(p^s) > W^r(\hat{p}^e)$; and (iii) $W^e(\hat{p}^e) > W^e(p^s) > W^e(\hat{p}^r)$.*

The characterization of equilibrium proceeds in two further steps. The first is to examine the circumstances under which it would be feasible for the elite to use trade policy to prevent a revolution. For this to be feasible, the elite must be able to credibly commit to a trade policy that would give the rest of society a higher level of welfare than they could obtain from mounting a revolution. If so, then the second step is to consider whether it would be cheaper for the elite to use repression instead of trade policy. If the elite cannot credibly commit to use trade policy in this way, then the second step is to consider whether it would be cheaper to use repression or whether the elite would use up fewer resources by extending the franchise in order to avoid a revolution.

For the first step, let $\widetilde{V}^r(E|\rho; H)$ be the maximum utility that the elite can induce for the rest of society using trade policy (as an alternative both to extending the franchise and using repression). This maximum utility is induced by setting $p^s = \hat{p}^r$ in (3.5): $\widetilde{V}^r(E|\rho; H) = V^r(E, \hat{p}^r; H)$. Then the condition for the elite to feasibly use trade policy to maintain the status quo is $\widetilde{V}^r(E|\rho; H) \geq V^r(R, \hat{p}^r)$. Adapting the approach developed by AR, the next result establishes that there exists a critical level of ρ, denoted $\bar{\rho}$, at which the elite are just able to prevent a revolution using trade policy. We will then show that for $\rho > \bar{\rho}$ it is feasible to use trade policy to prevent revolution while for $\rho < \bar{\rho}$ it is not.

Lemma 1. *There exists a unique $\bar{\rho} \in (0,1)$ for which $\widetilde{V}^r(E|\rho;H) = V^r(R,\hat{p}^r)$.*

1. *For all $\rho < \bar{\rho}$, $\widetilde{V}^r(E|\rho;H) < V^r(R,\hat{p}^r)$ and so over this range of ρ it is not feasible to use trade policy to prevent a revolution.*

2. *For all $\rho > \bar{\rho}$, $\widetilde{V}^r(E|\rho;H) > V^r(R,\hat{p}^r)$ and so over this range of ρ it is feasible to use trade policy to prevent a revolution.*

See Appendix A.2 for a formal proof. The logic of Lemma 1 is illustrated in Figure 3, which shows the present discounted value of the rest of society's welfare when the state is H. For any value of $\rho \in [0,1]$, the figure compares the maximum level of welfare that the elite can induce for the rest of society using trade policy with the payoff the rest of society can get from democracy and from revolution. These comparisons can be used to determine whether the elite can credibly commit to use trade policy to head off a revolution or whether they must extend the franchise.

The value of ρ is shown in Figure 3 on the horizontal axis while the welfare level of the rest of society is on the vertical axis. The horizontal dashed line shows the payoff to the rest of society from democracy, as calculated by (3.1). The horizontal solid line shows the payoff to revolution, given by (3.2), where the vertical difference between them is given by ψ. The upward sloping line shows $\widetilde{V}^r(E|\rho;H)$. The intercept of $\widetilde{V}^r(E|\rho;H)$ with the vertical axis, where $\rho = 0$, corresponds to the payoff that the rest of society receive from a policy of $\hat{p}^r$ in the current period followed by reversion to $\hat{p}^e$ for all periods in the future. This is the payoff given by the right hand side of the revolution constraint, (3.3). Recall that, for the commitment problem to hold, we have chosen a value of β such that this payoff is less than that of revolution. $\widetilde{V}^r(E|\rho;H)$ slopes upwards from this point because an increase in ρ increases the expected number of periods in the future for which the elite can credibly set $\hat{p}^r$ as opposed to $\hat{p}^e$. When $\rho = 1$ the rest of society are able to resolve their coordination problem and mount a revolution with certainty in any future period. Then the elite can credibly commit to set $p^e = \hat{p}^r$ in every period in the future, inducing the same level of welfare as democracy.

Now consider the elite's options when they face the threat of revolution in the current period. For $\rho > \bar{\rho}$, it is feasible for the elite to use trade policy to maintain the status

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quo because they can credibly commit to induce a level of welfare in the rest of society that is at least as great as from revolution. For $\rho < \bar{\rho}$ this is not feasible.

Finally, we need to address the question of when the elite would use repression. Let us take each of the cases $\rho < \bar{\rho}$ and $\rho > \bar{\rho}$ in turn. Consider first the case where $\rho < \bar{\rho}$. If the difference to the elite in welfare under repression compared to democracy, $W^e(\hat{p}^e) - W^e(\hat{p}^r)$, is greater than the expected cost of repression $(1 - \beta(1 - \rho))\mu$, then the elite will respond to the threat of revolution by using repression. Otherwise they will extend the franchise. In the case of $\rho > \bar{\rho}$, we find that if $W^e(\hat{p}^e) - W^e(p^s) > \mu$ then $V^e(Q, \hat{p}^e; H) > V^e(E, p^s; H)$ and the elite will use repression. Otherwise they will use trade policy to maintain the status quo. See the proof of Proposition 2 in Appendix A.2 for full details. In summary, whether $\rho < \bar{\rho}$ or $\rho > \bar{\rho}$, the elite will use repression when the cost μ of doing so is relatively low. We can now characterize equilibrium.

Proposition 2. *For $\rho \neq \bar{\rho}$ there exists a unique pure strategy Markov Perfect Equilibrium with the following characteristics.*

1. *If $\rho < \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(\hat{p}^r) \leq (1 - \beta(1 - \rho))\mu$ then the elite will respond to the threat of revolution by extending the franchise: $\tilde{\sigma}^e(E; L) = (f = 0, q = 0, p^e = \hat{p}^e)$, $\tilde{\sigma}^e(E; H) = (f = 1, \cdot)$; $\tilde{\sigma}^r(E \mid f = 0, q = 0, \hat{p}^e; L) = (a = 0, \cdot)$, $\tilde{\sigma}^r(E \mid f = 0, q = 0, p^e; H) = (a = 1, p^r = \hat{p}^r)$, $\tilde{\sigma}^r(E \mid f = 1, \cdot; H) = (a = 0, p^r = \hat{p}^r)$ and $\tilde{\sigma}^r(D; H) = (p^r = \hat{p}^r)$.*

2. *If $\rho < \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(\hat{p}^r) > (1 - \beta(1 - \rho))\mu$, or if $\rho > \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(p^s) > \mu$ then the elite respond to the threat of revolution using repression: $\tilde{\sigma}^e(E; L) = (f = 0, q = 0, p^e = \hat{p}^e)$, $\tilde{\sigma}^e(E; H) = (f = 0, q = 1, p^e = \hat{p}^e)$; $\tilde{\sigma}^r(E \mid f = 0, q = 0, \hat{p}^e; L) = (a = 0, \cdot)$, $\tilde{\sigma}^r(E \mid f = 0, q = 0, p^e; H) = (a = 1, p^r = \hat{p}^r)$, and $\tilde{\sigma}^r(E \mid f = 0, q = 1, p^e = \hat{p}^e; H) = (a = 0, \cdot)$.*

3. *If $\rho > \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(p^s) \leq \mu$ then the elite will temporarily raise the rest of society's welfare using trade policy in response to the threat of revolution: $\tilde{\sigma}^e(E; L) = (f = 0, q = 0, p^e = \hat{p}^e)$, $\tilde{\sigma}^e(E; H) = (f = 0, q = 0, p^e = p^s)$ where $p^s \in (\hat{p}^e, \hat{p}^r)$ is defined by $V^r(E, p^s; H) = V^r(R, \hat{p}^r)$, and $\tilde{\sigma}^r(E \mid f = 0, q = 0, p^e; H) = (a = 0)$ for all $p^e \leq p^s$. Off the equilibrium path, $\tilde{\sigma}^r(E \mid f = 0, q = 0, p^e; H) = (a = 1, p^r = \hat{p}^r)$ for all $p^e > p^s$, $\tilde{\sigma}^r(E \mid f = 1, \cdot; H) = (a = 0, p^r = \hat{p}^r)$ and $\tilde{\sigma}^r(D; H) = (p^r = \hat{p}^r)$.*

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We can see from Proposition 2 that when resolution of the coordination problem is relatively unlikely (i.e. $\rho < \bar{\rho}$) the elite cannot credibly commitment to raise the rest of society's welfare above the level of revolution using trade policy. The reason is that in expectation the status quo price cannot credibly be promised in enough future periods. On the other hand, if resolution is relatively likely in any given period (i.e. $\rho > \bar{\rho}$), the number of future periods in which the elite can be held to account using trade policy is sufficiently high to raise the rest of society's payoff above that of revolution.

Our Proposition 2 extends Proposition 1 of AR to a trade policy setting. Building on (our) Proposition 2, we can now characterize in more detail the relationship between democratization, trade liberalization and economic efficiency. By the Stolper-Samuelson Theorem, owners of the scarce factor seek a relatively closed trade regime. If the country has a comparative advantage in good r then elite rule will entail a relatively closed trade regime while democracy will entail a relatively open regime. The converse preference over openness will hold across the groups if the country has a comparative advantage in good e. These observations can be combined with Proposition 2 in a straight forward way to yield the following result.

Proposition 3. *Consider the equilibrium characterized in Proposition 2.*

1. If $\rho < \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(\hat{p}^r) \leq (1 - \beta(1 - \rho))\mu$ and the country has a comparative advantage in good e (good r) then under elite rule the trade regime is relatively open (closed). Then the threat of revolution is met by extension of the franchise, trade protectionism (liberalization), and a decrease (increase) in economic efficiency.

2. If $\rho < \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(\hat{p}^r) > (1 - \beta(1 - \rho))\mu$, or if $\rho > \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(p^s) > \mu$ then the elite respond to the threat of revolution using repression. If the country has a comparative advantage in good e (good r) then the trade regime remains relatively open (closed) throughout.

3. If $\rho > \bar{\rho}$ and $W^e(\hat{p}^e) - W^e(p^s) \leq \mu$ then the elite will temporarily raise the rest of society's welfare using trade policy in response to the threat of revolution. If the country has a comparative advantage in good e (good r) then this involves temporary trade protectionism (trade liberalization) and a correspondingly temporary decrease (increase) in economic efficiency.

Proposition 3.1 shows that quite a stringent set of conditions are required for democratization to go hand in hand with trade liberalization and a corresponding increase in economic efficiency, as advocated by Smith (1776): Repression must be relatively expensive; the probability that the rest of society will resolve their coordination problem must be low; the elite must own the scarce factor. Indeed, if the elite own the relatively abundant factor then democratization will actually entail retrenchment to a relatively protectionist regime and a reduction in efficiency. Moreover, Proposition 3.3 shows that if the likelihood that the rest of society will resolve their coordination problem is high while repression is relatively expensive, then the elite will actually be able to use trade liberalization to forestall democratization. Therefore the model predicts quite a stringent set of conditions under which a ruling elite regime can actually be expected to follow the classical liberal advocations.

4. Dictatorial Trade Policy Responses to Price Shocks

We now undertake comparative statics on the equilibrium characterized in Proposition 2, with a specific focus on the response to price shocks. For the purposes of this exercise, we will restrict the parameter space to the region where $\rho > \overline{\rho}$ and $W^e\left(\hat{p}^e\right) - W^e\left(p^s\right) \leq \mu$. This puts us in the range where it is quite likely that the rest of society are able to resolve their commitment problem and suppression is relatively costly, so that equilibrium is characterized by Proposition 2.3. In this range, if $s = H$ then it is sufficient for the elite to set $p^e = p^s$ in order to maintain the status quo.

To analyze the implications of a world price shock, we can carry out comparative statics on $G\left(\cdot\right)$ in order to see how p^s is affected by a shock to p^w. We will first consider the case where the country has a comparative advantage in good r, so that $p^w < p^a$, and so the country imports good e if the economy is open to trade. Therefore, the trade instrument will be an import tariff. We will then consider the case where the country has a comparative advantage in good e and the trade instrument is an export tax.

Looking at (3.6), we can see that there are two effects through which a change in p^w must influence p^s. One is through the 'direct' effect of a change in p^w on $W^r\left(\hat{p}^e\right)$, $W^r\left(\hat{p}^r\right)$ and $W^r\left(p^s\right)$. The other is through the 'indirect' price effects whereby a change

in p^w affects $\hat{p}^e$ and $\hat{p}^r$. We will take each in turn, starting with the price effects because it will be useful to have these in hand for the subsequent analysis.

To see how $\hat{p}^e$ and $\hat{p}^r$ are affected by p^w, we need to return to group j's optimal price problem. Observe from (2.4) that the only route through which $W^{j\prime}(p_t)$ is affected by p^w is through the effect on $tr^{j\prime}(p_t)$. Differentiating $tr^{j\prime}(p_t)$ with respect to p^w, we obtain

$$\frac{\partial^2 tr^j(p_t)}{\partial p_t \partial p^w} = -d_e^{j\prime}(p_t) + \frac{1}{1+\theta}x_e^\prime(p_t) > 0,$$

since $d_e^{j\prime}(p_t) < 0$ and $x_e^\prime(p_t) > 0$. So we know that an increase in p^w shifts $W^{j\prime}(p_t)$ upward, and thus increases $\hat{p}^j$, the value of p_t for which $W^{j\prime}(p_t) = 0$. Therefore, $\hat{p}^e$ and $\hat{p}^r$ both increase as a result of an increase in p^w.

Now, using $p^e = p^s$ so that $G(p^s) = 0$, rearrange (3.6) to get $W^r(p^s)$ on the left hand side and differentiate the resulting expression with respect to p^w to obtain

$$\frac{dW^r(p^s)}{dp^w} = \frac{1}{1-\beta(1-\rho)}\frac{dW^r(\hat{p}^r)}{dp^w} - \frac{\beta(1-\rho)}{1-\beta(1-\rho)}\frac{dW^r(\hat{p}^e)}{dp^w} \tag{4.1}$$

where

$$\frac{dW^r(\hat{p}^r)}{dp^w} = \frac{\partial W^r(\hat{p}^r)}{\partial p^w} + \frac{\partial W^r(\hat{p}^r)}{\partial \hat{p}^r}\frac{\partial \hat{p}^r}{\partial p^w},$$

and

$$\frac{dW^r(\hat{p}^e)}{dp^w} = \frac{\partial W^r(\hat{p}^e)}{\partial p^w} + \frac{\partial W^r(\hat{p}^e)}{\partial \hat{p}^e}\frac{\partial \hat{p}^e}{\partial p^w}. \tag{4.2}$$

The direct effect $\partial W^r(\hat{p}^j)/\partial p^w$ is determinted using (2.2): $\partial tr^r(p_t)/\partial p^w = -\left(d_e^r(p_t) - \frac{1}{1+\theta}x_e(p_t)\right) < 0$ for any p_t. So $\partial W^r(\hat{p}^r)/\partial p^w < 0$ and $\partial W^r(\hat{p}^e)/\partial p^w < 0$. In addition, we have just established that $\partial \hat{p}^e/\partial p^w > 0$ and $\partial \hat{p}^r/\partial p^w > 0$. We also know by the optimality of $\hat{p}^r$ that $\partial W^r(\hat{p}^r)/\partial \hat{p}^r = 0$, and by the fact that $\hat{p}^e > \hat{p}^r$ that $\partial W^r(\hat{p}^e)/\partial \hat{p}^e < 0$. So we can conclude that $dW^r(\hat{p}^r)/dp^w < 0$ and $dW^r(\hat{p}^e)/dp^w < 0$. Using these results in (4.1), we see that without imposing further structure on the model, the effect of a shock to p^w on the right hand side of the equation is ambiguous, and so the effect on $W^r(p^s)$ and hence p^s must be ambiguous as well.

It is worth noting an implicit assumption on which the foregoing analysis rests. We are assuming that there are no funding constraints on the implementation of $\hat{p}^e$ and $\hat{p}^r$. However, a trade subsidy may in fact be required to implement either of these preferred prices. For example, if the country has a comparative advantage in good r (as we are

assuming) and $\hat{p}^r < p^w$ then an import subsidy on good e would be necessary to implement $\hat{p}^r$. In the absence of domestic fiscal capacity to raise the revenue required for such an import subsidy, implementation of $\hat{p}^r$ would not be possible. To abstract from this issue and summarize the analysis so far, we simply assume that $\hat{p}^e$ and $\hat{p}^r$ are interior to the interval of p_t bounded by p^a and p^w; that is, $\hat{p}^e, \hat{p}^r \in (p^w, p^a)$. Under this restriction, the policy required to implement $\hat{p}^e$ and $\hat{p}^r$ is an import tariff which is self-funding.[20] We can then summarize our analysis so far as follows.

Proposition 4. *Assume a comparative advantage in good r, that $\hat{p}^e \in (p^w, p^a)$ and $\hat{p}^r \in (p^w, p^a)$. A positive shock to the world price, p^w, brings about an increase in $\hat{p}^e$, $\hat{p}^r$, and a decrease in $W^r(\hat{p}^e)$ and $W^r(\hat{p}^r)$. Since decreases in $W^r(\hat{p}^e)$ and $W^r(\hat{p}^r)$ have opposite effects on $W^r(p^s)$, the effect of a shock to p^w on p^s is ambiguous.*

Note that this ambiguity carries over into an ambiguous effect on the corresponding ad valorem tariff as well. Using the variables introduced so far, the formula for an ad valorem tariff would be $t = (p^s - p^w)/p^w$. Since we do not know the direction of the effect of an increase in p^w on p^s, we cannot tell the effect on t either.

The ambiguity can be resolved simply by introducing the assumption that $\hat{p}^e > p^a$. This assumption seems quite reasonable in that it implies the elite would actually prefer an export subsidy on good e so large that it overwhelmed the country's natural comparative advantage in good r to the extent that it exported good e. This would yield great personal gain to the elite through their factor income, but would impose a substantial burden on the rest of society through domestic taxation to raise the revenue necessary for the subsidy. But under our assumption that there is no domestic fiscal capacity, such a subsidy is not possible and it follows that the elite's preferred price level is constrained to $\hat{p}^e = p^a$.

When $\hat{p}^e$ is constrained to $\hat{p}^e = p^a$, the effect of the shock to p^w on $dW^r(\hat{p}^e)/dp^w$ is neutralized. To see this, consider the terms in (4.2). First note that if $\hat{p}^e = p^a$ then $\partial W^r(\hat{p}^e)/\partial p^w = \partial tr^j(p_t)/\partial p^w = 0$ because at autarky tariff revenues are equal to zero. It is obvious that the second term of (4.2) must be equal to zero because if $\hat{p}^e = p^a$, a corner solution, then $\partial \hat{p}^e/\partial p^w = 0$. So the second term of (4.1) disappears. Rewriting

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[20]If the country has a comparative advantage in good e then $\hat{p}^e, \hat{p}^r \in (p^a, p^w)$ and the policy required to implement $\hat{p}^e$ and $\hat{p}^r$ would be an export tax. This case will be analyzed in due course.

(4.1) accordingly, but expanding the left hand side, we have

$$\frac{\partial W^r\left(p^s\right)}{\partial p^w} + \frac{\partial W^r\left(p^s\right)}{\partial p^s}\frac{\partial p^s}{\partial p^w} = \frac{1}{1-\beta\left(1-\rho\right)}\frac{dW^r\left(\hat{p}^r\right)}{dp^w}. \tag{4.3}$$

Now we have already established that $dW^r\left(\hat{p}^r\right)/dp^w < 0$. So the sum of the two terms on the left hand side must be negative as well. Turning to the left hand side, we already know that $\partial W^r\left(p^s\right)/\partial p^w < 0$ since the direct effect is negative for any j and p_t. And by the concavity of $W\left(p_t\right)$ in p_t, coupled with the fact that $\hat{p}^e > p^s > \hat{p}^r$ and $W^{r\prime}\left(\hat{p}^r\right) = 0$, we have that $\partial W^r\left(p^s\right)/\partial p^s < 0$ as well. Since the left hand side is negative, it must be the case that $\partial p^s/\partial p^w > 0$.

Finally, we can also establish a positive relationship between p^w and the ad valorem tariff. For a positive relationship between p^w and t, from the formula for the ad valorem tariff $t = \left(p^s - p^w\right)/p^w$, it must be the case that $\partial p^s/\partial p^w > 1$ (and not just $\partial p^s/\partial p^w > 0$). But for ρ sufficiently small, we can choose a value of β sufficiently close to 1 to ensure the increase in the right hand side is large enough to ensure that $\partial p^s/\partial p^w > 1$. This would be sufficiently large for the ad valorem tariff to rise as the result of an increase in p^w.[21] The analysis is summarized in the following result.

Proposition 5. *Assume a comparative advantage in good r, and that without domestic fiscal capacity $\hat{p}^e$ is constrained to $\hat{p}^e = p^a$. Then the result of a positive shock to p^w is an increase in $\hat{p}^r$ and p^s. Moreover, given ρ sufficiently small, it is possible to choose β sufficiently close to 1 so that there is a more-than-proportional increase of p^s in response to a shock to p^w, so that the response of an ad valorem tariff t to a shock to p^w would be positive as well.*

This result establishes the conditions for a positive response both of the status quo price, p^s, and of the ad valorem tariff, to a world price shock to p^w. This might more naturally be explained in terms of a reduction in p^w, as illustrated in Figure 4. As the world price of the imported good falls from p_0^w to p_1^w, openness becomes more appealing to the rest of society, increasing the payoff to democracy, and hence to a revolution. This in turn provokes the elite to move the status quo price and the tariff in the direction that the rest

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[21] The criterion that ρ be sufficiently small might appear to conflict with the criterion that $\rho > \bar{\rho}$ for the characterization of Proposition 2.3 to apply. But we can reduce the value of $\bar{\rho} > 0$ to an arbitrarily low level by increasing the value of ψ, which is otherwise unrestricted.

of society would like to see it go, namely towards free trade.

Turn now to the case where the country has a comparative advantage in good e, so that $p^a < p^w$, and the trade instrument is an export tax. It is easy to establish using the same approach as above that the relationship between p^w and p^s is ambiguous in general in this case as well. The introduction of a similar assumption resolves the ambiguity but in a more interesting way.

In this case it would be reasonable to assume that $\hat{p}^r < p^a$. This would imply an import subsidy so large that it overwhelmed the country's comparative advantage in good e to the extent that good e was imported. This would be highly beneficial to the rest of society but the revenue requirement would impose a substantial domestic tax burden. In the absence of the fiscal capacity required to raise such a subsidy, $\hat{p}^r$ would be constrained to $\hat{p}^r = p^a$ and this would be sufficient to remove the ambiguity. This restriction is also appealing because it parallels the one we introduced above ($\hat{p}^e = p^a$) when analyzing the case of the import tariff. As a result $\partial W^r(\hat{p}^r)/\partial p^w = 0$ and $\partial \hat{p}^r/\partial p^w = 0$ for the same reasons as the import tariff case above and so $dW^r(\hat{p}^r)/dp^w = 0$. Thus we have

$$\frac{\partial W^r(p^s)}{\partial p^w} + \frac{\partial W^r(p^s)}{\partial p^s}\frac{\partial p^s}{\partial p^w} = -\frac{\beta(1-\rho)}{1-\beta(1-\rho)}\frac{dW^r(\hat{p}^e)}{dp^w} \tag{4.4}$$

where the sign of $dW^r(\hat{p}^e)/dp^w$ can be determined with reference to (4.2). Since we now have an export tax, $\partial tr^r(p_t)/\partial p^w = -\left(d_e^r(p_t) - \frac{1}{1+\theta}x_e(p_t)\right) > 0$ and so the direct effect is positive: $\partial W^r(\hat{p}^e)/\partial p^w > 0$. But we still have $\partial W^r(\hat{p}^e)/\partial \hat{p}^e < 0$ (by the concavity of $W^r(p_t)$ in p_t coupled with $\hat{p}^e > \hat{p}^r$) and $\partial \hat{p}^e/\partial p^w > 0$ (established above to be independent of comparative advantage) so the indirect effect is negative, $\partial W^r(\hat{p}^e)/\partial p^w \times \partial \hat{p}^e/\partial p^w < 0$, and the sign of $dW^r(\hat{p}^r)/dp^w$ is ambiguous. Either possibility seems reasonable and the resolution of this ambiguity is an empirical matter.

The more interesting outcome from a theoretical perspective is the one where the indirect effect dominates because in that case p^s responds to a shock to p^w by moving in the opposite direction. When the indirect effect dominates, $dW^r(\hat{p}^r)/dp^w < 0$ and the right hand side of (4.4) must be positive. Turning to the left hand side, $\partial W^r(p^s)/\partial p^w > 0$ by the direct effect. And once again by the concavity of $W(p_t)$ in p_t, coupled with the fact that $\hat{p}^e > p^s > \hat{p}^r$ and $W^{r\prime}(\hat{p}^r) = 0$, we have that $\partial W^r(p^s)/\partial p^s < 0$. In order for the left hand side to be positive, it must therefore be the case that $\partial p^s/\partial p^w < 0$. The equation

for an ad valorem export tax, t^{ex}, is $t^{ex} = (p^s - p^w)/p^w$, where $p^s < p^w$ so that t^{ex} is negative. (The fact that p^s responds to a shock to p^w by moving in the opposite direction takes away the need for the response of p^s to p^w to be sufficiently large.) Therefore, any positive shock to p^w will lead to an increase in the size of the export tax and vice versa. The effect can be reversed if the direct effect dominates. The analysis is summarized in the following result.

Proposition 6. *Assume a comparative advantage in good e, and that without domestic fiscal capacity $\hat{p}^r$ is constrained to $\hat{p}^r = p^a$. If in addition the indirect effect of a positive shock to p^w dominates the direct effect then there is an increase in $\hat{p}^e$ but a decrease in p^s. Since p^w and p^s move in opposite directions, and since $p^s < p^w$, a positive shock to p^w results in an increase in the size of the ad valorem export tax $t^{ex} = (p^s - p^w)/p^w$. If the direct effect dominates, and given ρ sufficiently small, it is possible to choose β sufficiently close to 1 that the response of an ad valorem export tax to a shock to p^w would be to decrease the size of the export tax.*

This result is illustrated in Figure 5 under the assumption that the indirect effect dominates. As the world price of the export rises from p_0^w to p_1^w, openness becomes more appealing to the elite. But the rest of society would in this case prefer the economy to remain closed, so an increase in openness increases the payoff to democracy, and hence to a revolution. This in turn provokes the elite to move the status quo price and the export tax in the direction that the rest of society would like to see it go, in this case towards autarky.[22]

Interestingly the forces illustrated in Figures 4 and 5, of increased openness in the country with a comparative advantage in good r and increased protection in the country with a comparative advantage in good e, would be driven simultaneously by a fall in transport costs driven by an improvement in transport technology. Such a fall in transport costs would simultaneously reduce p^w as viewed from the former country while increasing

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[22]There is no significance to the fact that the indirect effect apparently plays a role for the export tax in Proposition 6 but not for the import tariff in Proposition 5. Proposition 5 exploits the envelope theorem to eliminate the indirect effect: $\partial W^r(\hat{p}^r)/\partial \hat{p}^r = 0$ so $dW^r(\hat{p}^r)/dp^w = \partial W^r(\hat{p}^r)/\partial p^w$. In the case of Proposition 6, $\partial W^r(\hat{p}^e)/\partial \hat{p}^e < 0$ and so the indirect effect plays a role in the determination of $dW^r(\hat{p}^e)/dp^w$. If we had chosen good e to be the numeraire then the results would be reversed: the indirect effect would play a role in the case of the import tariff but not in the case of the export tax.

p^w as viewed from the latter country, with resulting trade policy responses being predicted in the two countries by Propositions 5 and 6 respectively.

What would happen if the same argument as applied to $\hat{p}^e$ in Proposition 5 were also applied to $\hat{p}^r$ so that $\hat{p}^r = p^w$? What if in Proposition 6 we restricted $\hat{p}^e$ to $\hat{p}^e = p^w$? The results would still go through in exactly the same way because a positive shock to p^w would still imply an increase in $\hat{p}^r$ in the first case and an increase in $\hat{p}^e$ in the second. We can also see from this that the ambiguity of Proposition 4 would not be resolved if only the restriction $\hat{p}^r = p^w$ were imposed.

The extended discussion of historical trade policy episodes in Appendix B provides detailed evidence to suggest that Proposition 5 predicts British trade policy from 1815-1846 while Proposition 6 predicts the trade policy experience in Prussia over the same period. Britain with a comparative advantage in good r, in this case manufactures, reduced its import tariff on grain from 70 percent in 1815 to free trade in 1846. Prussia with a comparative advantage in good e, in this case grain, adopted 'the most liberal trade regime in Europe' at the end of the Napoleonic wars in 1815 but progressively increased protectionism, (both through tariffs and export taxes) over the same period Kindleberger (1975). This corresponded to what O'Rourke and Williamson (1999: 33) refer to as 'the amazing decline in international transport costs,' providing a plausibly exogenous technological impetus to observed changes in world prices and hence trade policy.

The sharp increase in export restrictions imposed by many commodity exporters during the food price crisis of 2007-8 is also predicted by Proposition 6 under the assumption that the indirect effect dominates. The causes of the increase in world prices of food on that occasion were an increase in oil prices, the diversion of food production to the production of bio-fuels, an increase in the demand for feed grains from Asia and poor weather in Australia (Johnston 2010). This case is discussed further in Appendix B as well.

5. Conclusions

It is generally agreed that democratization and trade liberalization are beneficial from a normative perspective. But we have seen in this paper that the conditions under which those with the power to democratize and liberalize might actually be expected to do so are quite stringent. Not only must the ruling elite own the relatively scarce factor. The opportunity to mount a revolution must arise infrequently. And military suppression must be relatively expensive. If the elite own the abundant factor and democratization does take place then the trade policy adopted by the newly formed democratic government will be more protectionist than that under elite rule and, all else equal, efficiency will be reduced.

The paper also characterized a set of circumstances under which the ruling elite could use trade policy to forestall democratization. The dynamics of this equilibrium outcome were then illustrated in terms of the improvements in transportation technology throughout the early 19th Century. It appears that the predictions of the model were borne out in policy practice over the period and these actions would not have been predicted by standard political economy models. The model also predicts the policy responses of food exporters to the recent food price shocks of 2007-08 in restricting exports.

Three main questions are provoked by the framework presented in this paper. Let us close by briefly discussing the scope for future research in each of these areas in turn. First, what does the framework tell us not just about how dictatorships respond to price shocks but how democracies respond as well? After all, in the recent food price shocks although some of the countries that restricted exports were dictatorships some were democracies. We can get an idea of how the model could be extended to consider the trade policy reaction of a democratically elected government by looking at equilibrium equation (3.6). Focusing on the third term (in brackets) on the right hand side first, in a democracy the costs of losing power are likely to be smaller and shorter lived. The time horizon as applied to the other two terms might also be shorter, say the normal expected life of a parliament. Having made these adjustments, maintaining the status quo using trade policy might nevertheless represent a reasonable way of thinking about the determination of policy in a democratic setting. To the extent that democracies have higher incomes they also tend

to have greater fiscal capacity, implying greater reliance on domestic policy instruments to address such shocks and less reliance on trade policy. But since we sometimes observe similar trade policy responses in practice from some democracies, the model might offer some rudimentary insight into the forces at work.

The second question is how this theory performs in its ability to explain patterns in the data. There is a literature, initiated by Goldberg and Maggi (1999), that tests the predictions of the standard Grossman-Helpman type framework against the data. But as discussed in the Introduction, the present paper offers a framework that may do a better job of explaining the patterns in the data under dictatorship. The testable predictions seem quite straightforward. If a ruling elite own the scarce factor then democratization and trade liberalization will be positively related. If they own the abundant factor then the relationship will be negative. My sense is that, before this model can be tested econometrically, further research is needed along the lines just outlined to determine whether dictatorships and democracies can be considered within a unifying framework or whether they should be considered separately. But once we have a clearer idea of the answer to that question, the empirical testing of this framework offers an interesting agenda for future research.

The third question concerns how multilateral agencies such as the International Monetary Fund, World Bank and World Trade Organization should manage the process of democratization and trade liberalization given that they may have an important bearing on one another. The response of the multilateral institutions to the export restrictions following the world food crisis of 2007-08 was to urge the perpetrators to remove the measures (e.g. World Bank 2008). However, a literature is emerging to argue that although the trade-based measures are second-best, they may represent the most practical redistributive policies that can be found under the constraints faced by many developing countries (Do, Levchenko and Ravallion 2013). The present paper makes a different but related point that dictatorial regimes are unlikely to heed calls to remove export-restrictive measures if they are instrumental in their political survival. Much work remains to be done in order to fully understand the motivation behind the recent wave of export-measure based protectionism and how it can effectively be addressed.

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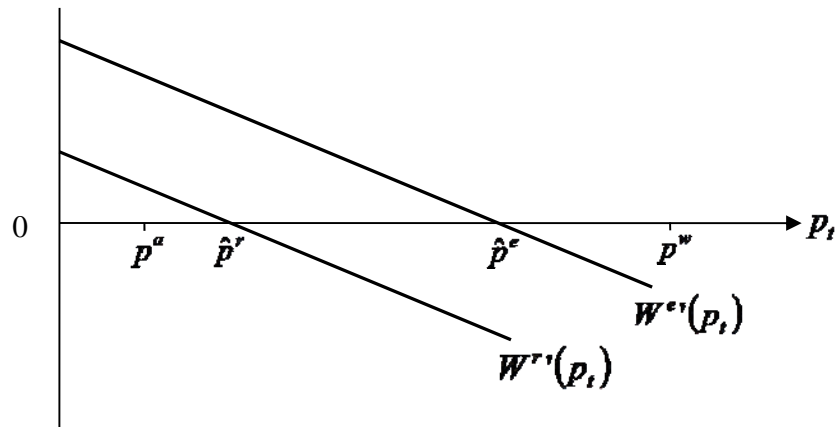
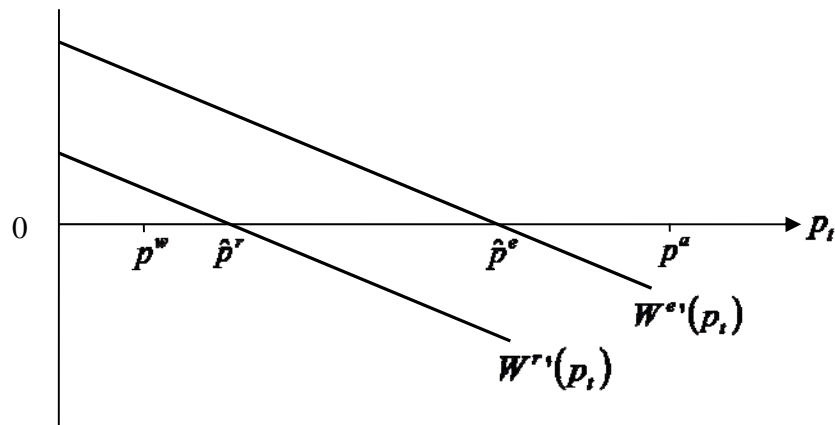Figure 1: Policy preferences with comparative advantage in good *e*

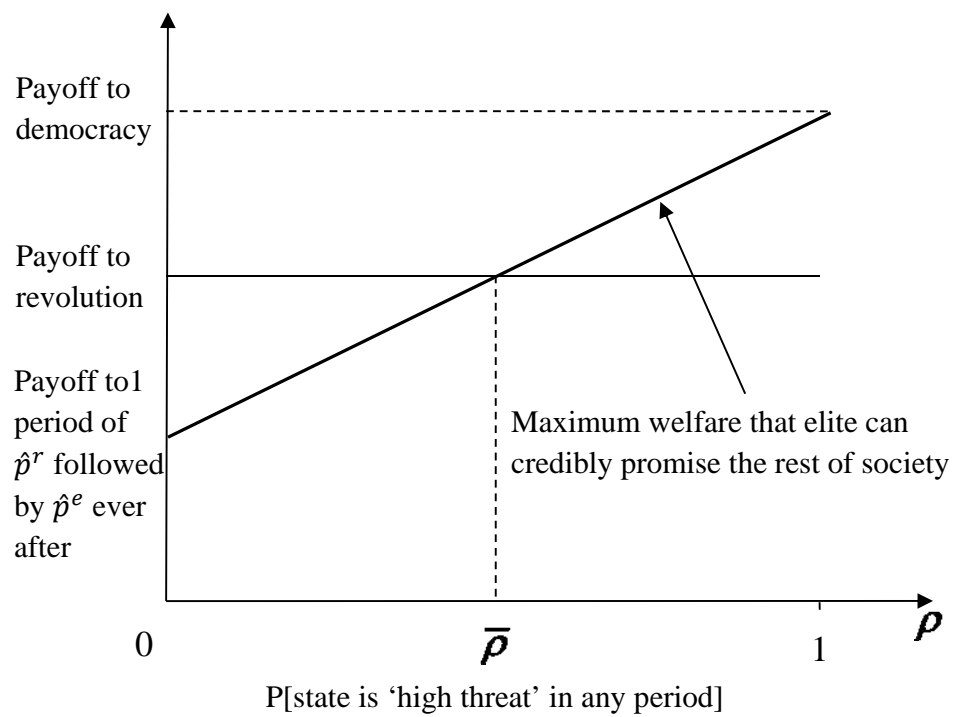Figure 2: Policy preferences with comparative advantage in good *r*

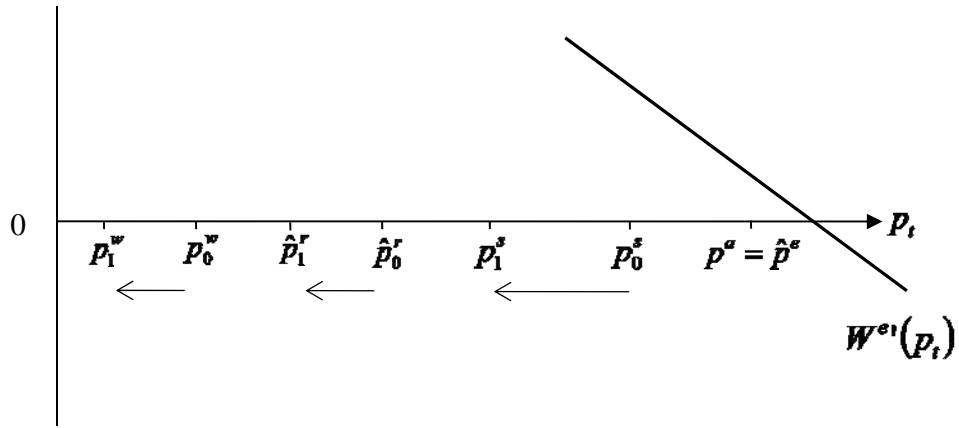Figure 3: Characterization of Equilibrium
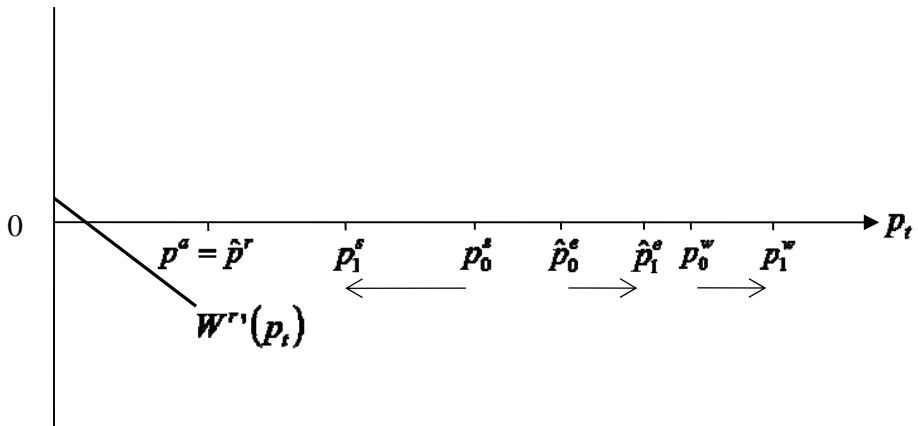
Figure 4: Illustration of Proposition 5

Figure 5: Illustration of Proposition 6 when Indirect Effect Dominates

A. Analytical Results

A.1. Confirmation that Trade Liberalization Increases Efficiency

Since factor prices are determined as functions $w^e(p_t)$ and $w^r(p_t)$ of p_t from the corresponding unit cost functions, we can write $rev(p_t) = w^e(p_t) + w^r(p_t)$ where $rev(p_t)$ is the revenue function. Using this fact, along with (2.1), we may rewrite (2.5) as

$$\Omega(p_t) = rev(p_t) + (1 + \theta) s_e(p_t) + tr(p_t). \tag{A.1}$$

Writing imports as $m(p_t) = (1 + \theta) d_e(p_t) - x_e(p_t)$, and taking the total derivative of (A.1), we have

$$d\Omega(p_t) = (rev'(p_t) + (1 + \theta) s'_e(p_t) + m(p_t) dp_t) dp_t + (p_t - p^w) dm(p_t)$$

Now using the fact that $rev'(p_t) + (1 + \theta) s'_e(p_t) = -m(p_t)$, this expression simplifies further to

$$d\Omega(p_t) = (p_t - p^w) dm(p_t).$$

Finally, since $d'_e(p_t) < 0$ and $x'_e(p_t) > 0$, we have that

$$dm(p_t) = (c'_2(p_t) - x'_e(p_t)) dp_t < 0$$

From this, whether trade liberalization involves a reduction of an import tariff in which case $(p_t - p^w) > 0$ and $dp_t < 0$, or a reduction of an export tax in which case $(p_t - p^w) < 0$ and $dp_t > 0$, we have that $d\Omega(p_t) > 0$. This implies an unambiguous increase in welfare. Therefore, any adjustment of trade policy that moves the price level p_t in the direction of free trade will increase economic efficiency.

A.2. Characterization of Equilibrium

In order to characterize equilibrium, we will represent the payoffs to the respective groups over time in Bellman-equation form. We can write the value function of a member of the elite as:

$$V^e(E, \hat{p}^e; L) \equiv W^e(\hat{p}^e) + \beta(\rho V^e(E, p^e; H) + (1 - \rho) V^e(E, \hat{p}^e; L)). \tag{A.2}$$

The value for a member of the rest of society is written analogously with V^r replacing V^e and W^r replacing W^e.

Now consider the situation where in period t, with the elite in power, the state is H and so the threat of a revolution does exist. As outlined previously, the elite have three options as to how to address this threat. The first is to extend the franchise, $f = 1$. The second option is to repress the threat of revolution, $q = 1$, entailing the policy $\hat{p}^e$ in every period and incurring the cost μ in the high threat state. The payoff to repression when $s = L$ can be written recursively as follows:

$$V^e(Q, \hat{p}^e; L) = W^e(\hat{p}^e) + \beta((1 - \rho) V^e(Q, \hat{p}^e; L) + \rho V^e(Q, \hat{p}^e; H)).$$

If the state is H, then

$$V^e(Q, \hat{p}^e; H) = W^e(\hat{p}^e) - \mu + \beta((1 - \rho) V^e(Q, \hat{p}^e; L) + \rho V^e(Q, \hat{p}^e; H)).$$

Combining these two expressions, we obtain

$$V^e(Q, \hat{p}^e; H) = \frac{W^e(\hat{p}^e)}{1 - \beta} - \frac{(1 - \beta(1 - \rho))\mu}{1 - \beta} \tag{A.3}$$

Since the elite continue to set the price $\hat{p}^e$ under H as well as L, the value to the rest of society from repression is the same under H and L:

$$V^r(Q, \hat{p}^e) = \frac{W^r(\hat{p}^e)}{1 - \beta}. \tag{A.4}$$

The third option is to set the status quo price by choosing strategies $f = 0$, $q = 0$ and $p^e = p^s$. Given any of these three actions by the elite, the rest of society will calculate their best response by solving (3.4)

Proof of Lemma 1. We will first show that for $\rho > \bar{\rho}$ it is feasible to use trade policy to prevent revolution while for $\rho < \bar{\rho}$ it is not. We will then establish that there exists a critical level of ρ, denoted $\bar{\rho}$, at which the elite are just able to prevent a revolution using trade policy.

To establish both parts of the result we can use the intermediate value theorem. First consider the maximum utility that can be induced among workers when $\rho = 1$: By (3.1)

$$\widetilde{V}^r(E| \rho = 1; H) = \frac{W^r(\hat{p}^r)}{1 - \beta} = V^r(D, \hat{p}^r).$$

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Recall that $V^r(D, \hat{p}^r) > V^r(R, \hat{p}^r)$, so for $\rho = 1$ the elite can credibly commit to use trade policy to make the rest of society better off than if they mounted a revolution.

Next consider the maximum utility that can be induced among the rest of society when $\rho = 0$:

$$\widetilde{V}^r(E| \rho = 0; H) = W^r(\hat{p}^r) + \beta \frac{W^r(\hat{p}^e)}{1 - \beta} < V^r(R, \hat{p}^r)$$

where the last inequality holds under the revolution constraint. So when $\rho = 0$ revolution yields a higher expected payoff than trade policy. In addition, $\widetilde{V}^r(E| \rho; H)$ is continuously and monotonically increasing in ρ because an increase in ρ shifts the weight in the value function (3.5) from $V^r(E, \hat{p}^e; L)$ to $V^r(E, \hat{p}^r; H)$ (where the latter term is $V^r(E, p^s; H)$ but with $\hat{p}^r$ substituted for p^s). Therefore, by the intermediate value theorem, there exists a unique $\overline{\rho} \in (0, 1)$ for which $\widetilde{V}^r(E| \rho; H) = V^r(R, \hat{p}^r)$. □

Proof of Proposition 2. With Lemma 1 in hand, it remains only to work out when the elite would use repression. Let us take each of the cases $\rho < \overline{\rho}$ and $\rho > \overline{\rho}$ in turn. When $\rho < \overline{\rho}$, by (3.1) the elite face a payoff of $W^e(\hat{p}^r) / (1 - \beta)$ if they extend the franchise and, by (A.3), $(W^e(\hat{p}^e) - (1 - \beta(1 - \rho))\mu) / (1 - \beta)$ if they repress. Rearranging, we have that if

$$W^e(\hat{p}^e) - W^e(\hat{p}^r) > (1 - \beta(1 - \rho))\mu$$

then the elite will respond to the threat of revolution by using repression. Otherwise they will extend the franchise.

To analyze $\rho > \overline{\rho}$, we need to calculate the value to a member of the elite from setting p^s when the state is H. This can be written recursively as

$$V^e(E, p^s; H) \equiv W^e(p^s) + \beta(\rho V^e(E, p^s; H) + (1 - \rho) V^e(E, \hat{p}^e; L))$$

Combining this with (A.2), we have

$$V^e(E, p^s; H) = \frac{\beta(1 - \rho)}{1 - \beta} W^e(\hat{p}^e) + \frac{(1 - \beta(1 - \rho))}{1 - \beta} W^e(p^s). \tag{A.5}$$

Comparing (A.5) to (A.3), we find that if $W^e(\hat{p}^e) - W^e(p^s) > \mu$ then $V^e(Q, \hat{p}^e; H) > V^e(E, p^s; H)$ and the elite will use repression. Otherwise they will use trade policy to maintain the status quo. □

B. Explanations of Historical and Recent Trade Policy Episodes

This section uses the model's predictions to first shed light on 19th Century trade policy making in Britain and Prussia from the end of the Napoleonic Wars in 1815 to the middle of the 19th Century. It will then consider the widespread imposition of export restrictions in response to the world food price shocks of 2007-08.

B.1. Early 19th Century Trade Policy

B.1.1. British Trade Liberalization, 1815-1846

Britain's repeal of the Corn Laws in 1846 has attracted perhaps more attention than any other single act of trade policy. This is arguably because of the decisive move that Britain made in unilaterally adopting free trade at a time when European trade policy was characterized as "an ocean of protectionism surrounding a few liberal islands" (Bairoch 1989: 7). Yet in terms of magnitudes, the period from the imposition of the Corn Laws in 1815 up until the years prior to repeal is actually more significant. The Corn Laws were enacted to replace the effective protectionism afforded to British agriculture by the naval blockades of the Napoleonic Wars that ended in 1815. Ad valorem tariff equivalents on grain fell from about 70 percent over the period 1815-1827, to about 50 percent over 1828-1841, and about 7 percent over 1842-1845, before repeal in 1846 (Williamson 1990: table 1, 128). The framework that we have set out above makes it possible to understand this sustained fall in tariffs over the entire period 1815-1846.

Let us begin by considering how the form of government, taxation, factor ownership, and comparative advantage in Britain during the first half of the 19th Century can be characterized in terms of our framework. Prior explanations for Britain's repeal of the Corn Laws itself have tended to focus on lobbying by special interests in industry of the elected chamber in the British Houses of Parliament, the House of Commons. The logic of these explanations adhere to the logic of lobbying, whereby industrialists petitioned the House of Commons in favor of reform. However, this approach ignores a crucial detail in the structure of government that significantly undermines the influence of the House of Commons in policymaking at that time. Schonhardt-Bailey (2006: 227) points out

that the House of Lords held veto power over any law that was passed in the House of Commons. On this basis, it seems fair to argue that the British aristocracy, from whose numbers all members of the House of Lords were drawn, still constituted the ruling elite at that time, and that the form of government in Britain could still essentially be characterized as one of elite rule.[23]

Is it reasonable to assume that trade taxes were the only tax instruments for the period under consideration? After all, it is well know that Britain adopted the first progressive income tax in 1799 to help finance the war against Napoleon (Zolt and Bird 2005). However, it was not until 1842 that the first peacetime income tax was introduced in Britain by Prime Minister Robert Peel, with all income tax revenue being used prior to that time for the purposes of military conflict rather than redistribution (Schonhardt-Bailey 1996). Therefore, given our focus on the entire period 1815-1846, our assumption that only trade taxes were available seems like a reasonable simplification.

Although factor diversification by land owners into capital did accelerate in the 1830s, members of the House of Lords held, on average, most of their wealth in land in the first half of the 19th Century (Schonhardt-Bailey 2006: 227-231). Since Britain was the first country to enter into the industrial revolution in the 18th Century, by the 19th Century it had a comparative advantage in manufacturing based in part on its abundance of labor relative to its European neighbors. This implies that the British aristocracy held most of their interests in the relatively scarce factor at that time. In accordance with the prediction of the Stolper-Samuelson theorem, the aristocracy sought protection for the returns from their relatively scarce factor, land, and obtained it in the form of the Corn Laws. Therefore, the House of Lords was staunchly opposed to repeal of the Corn Laws. Williamson (1990) estimates that the grain rents of land owners in grain producing areas of England would have fallen by 49 percent as a result of the complete removal of

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[23]The view that Britain was a dictatorship of the elite in the first half of the 19th Century may further be reinforced by the fact that the extension of the voting franchise was quite limited at that time. Prior to the Reform Act of 1832, only about 500,000 men in England and Wales were allowed to vote, with the reforms extending the franchise to a further 300,000 men in a total population of 14 million. Eligibility to vote was dependent upon property ownership or rental of above a threshold value. Moreover, despite these reforms, the House of Commons remained firmly under the control of landowners throughout the Parliament of 1841-1847, with about 80 percent of members consisting of the landowning aristocracy and gentry (Aydelotte 1967). "If landowners wished to halt the repeal legislation, as a group they possessed the votes to do so." (Schonhardt-Bailey 2006: 109).

tariffs as they stood in 1841. Non-grain rents would have fallen by a more modest 6.5 percent, but arguably sufficient to sustain a coalition of land owners in the House of Lords against trade reform. Why, then did the House of Lords not use its veto to prevent trade liberalization throughout this period? Schonhardt-Bailey (2006: 227-261) argues that the decisive factor centred on fears amongst the Lords that refusal to reform trade policy could give rise to far more sweeping reform driven by revolution. Agitation for repeal of the Corn Laws began as early as 1819 with the Peterloo Massacre. On that occasion, six thousand protesters pressed for repeal of the Corn Laws and democratization, and more than six hundred people were killed or wounded by the attempt to disperse the protestors. This evidence shifts the emphasis of repeal away from the efforts of industrialists who sought trade liberalization as a way to increase profits towards workers who saw this as a way to increase their real wages by obtaining cheaper imports of food. The political environment of early- to mid-19th Century Europe was one of great political agitation, and so the assumption that the threat of revolution was quite likely, i.e. that $\rho > \bar{\rho}$, throughout this period seems reasonable (Merriman 1996: 715). It also seems reasonable to argue that the threat level to the elite regime remained high throughout the period on two bases. Throughout the earlier part of the period 1815-1846, the vestiges of the military organization imposed on the population of British working men in the Battle of Waterloo would have carried over into civilian society. Later, in 1838, John Bright and Richard Cobden formed a pressure group called the Anti-Corn Law League whose specific purpose was to organize those in favor of repeal of the Corn Laws (Schonhardt-Bailey 2006: 11-18).

Against this backdrop, our framework can be used to explain the gradual reduction in trade liberalization over the period 1815-1846. Throughout the period, a revolution in transportation was under way (O'Rourke and Williamson 1999: 33-41). From around 1750 onwards, innovations in transportation dramatically reduced the costs of shipping. These are reflected in North's index (North 1958), which shows a steady decline in shipping rates from 1741-1917, the dawn of World War I (Harley 1988: figure 1). This index shows an overall decline in freight rates in excess of 70 percent over the period 1815-1846, leading to a convergence in grain prices between Europe where a relative scarcity of land made grain expensive and the New World where an abundance of land rendered grain production comparatively cheap.

From the perspective of Britain throughout the period 1815-1846, there was a sustained fall in the world price of grain, and indeed food more generally, relative to manufactures. If we choose the price of manufactures as numeraire, then we can represent the decline in world relative food prices as a decline in p^w. This is illustrated in Figure 4 by the fall in p^w from p_0^w to p_1^w. Assuming that there is a funding constraint on $\hat{p}^e$, Figure 4 shows how the elite's preferred price level is fixed at the autarky price level; $p^a = \hat{p}^e$. Figure 4 also illustrates the implication of the funding constraint that $W^{e\prime}(p_t) = 0$ at a level of p_t above $p^a = \hat{p}^e$. The rest of society's preference for a relatively open regime is shown by the fact that $\hat{p}^r$ is relatively close to p^w. In the figure, $\hat{p}^r$ is always greater than p^w but this is not necessarily the case and will be influenced by other factors that determine the rest of society's taste for openness. Proposition 5 predicts that the effect of the negative shock to p^w will be a decline in the rest of society's preferred price level, $\hat{p}^r$, and the status quo price, p^s, as illustrated in Figure 4. Proposition 5 goes further to predict that, given β and ρ sufficiently high, in response to the fall in p^w there will be a fall in the ad valorem tariff as well. This effect on the tariff is not depicted in Figure 4, but the relatively large underlying fall in p^s, from p_0^s to p_1^s, is shown. On this basis, the model can explain the decline in the ad valorem tariff equivalent over the period.

The assumption that there was a funding constraint on $\hat{p}^e$ seems justified on the grounds that the British aristocracy would have benefitted from subsidies to agricultural production that were so large as to allow Britain to export manufactures, but that such large subsidies were politically infeasible. It follows then that $\hat{p}^e = p^a$ as assumed in Proposition 5. At the same time, the feature that if the rest of society gained power they would not go all the way to free trade is underpinned by the assumption that by having some degree of protection in place they would benefit from access to tariff revenues.

The intuition of Proposition 5 matches the historical accounts of the motivation for Britain's trade policy over this period quite well. As transport costs fell, ordinary British people, especially those who had moved to the cities to work in the factories, became increasingly aware that their costs of living could be improved through access to cheaper imported food. This in turn increased the appeal of democracy, through which policies more favorable to the rest of society were anticipated. The British aristocracy recognized that some degree of trade liberalization served as a way to give workers what they wanted

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and thereby defuse the pressure on democratic reform. As argued by Schonhardt-Bailey (2006), at the same time as the Anti-Corn Law League was pressing for trade liberalization, there were also demands for parliamentary reform that would extend the franchise to the working classes. The demands for parliamentary reform were spearheaded by the Chartist movement. They were a working class pressure group who understood that full democratization would usher in trade liberalization as power was transferred through democratization from the aristocracy to the working classes, very much in the spirit of our modelling framework (Schonhardt-Bailey 2006: 13). This serves to reinforce the sense in which trade liberalization throughout the period 1815-1846 and ultimate repeal of the Corn Laws was an action undertaken by the ruling elite to forestall democratization.

B.1.2. Prussian Trade Policy and the Hunger Riots, 1815-1848

The history of Prussian trade policy offers an interesting counterpart to the history of British trade policy that we have just reviewed. Prussia at that time consisted of a number of states that are now in East and West Germany as well as parts of Poland. The Kingdom of Prussia was an absolute monarchy throughout this period, and spearheaded the unification of Germany in 1871. Similarly to Britain, Prussia had a landed aristocracy referred to as the 'Junker'. The process of industrialization was significantly further behind that of Britain at that stage, and the rest of society comprised largely of a landless peasantry who worked on the large estates, or latifundia, that belonged to the Junker.[24] The Prussian king and the Junker formed a dictatorial elite at that time, and were essentially free to set trade policy as they saw fit (Hagen 2002).

With transport costs still relatively high and the New World effectively cut off to trade in agricultural products, Prussia had a relative abundance of land and a comparative advantage in agricultural products which it exported to the rest of Europe, including Britain. The Prussian elite had a corresponding incentive to set tariffs on manufactures relatively low. The Prussian tariff of 1818 was regarded when it was enacted as the lowest in Europe, but was raised steadily over the period until 1846 (Kindleberger 1975).

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[24]Gerschenkron (1962) has characterized a more sophisticated structure of society in his 'marriage of iron and rye' which refers to the alliance between the Junkers and the fledgling industrial class. But this did not emerge until the latter half of the 18th century by which time Germany's process of industrialization had gained momentum.

In effect, Prussia was on the other side of the market to Britain for grain and other agricultural products. So from Prussia's perspective the fall in transport costs throughout the period 1815-1846 was seen as a rise in the world price of agricultural products and hence a rise in p^w. This is illustrated in Figure 5 by the rise in p^w from p_0^w to p_1^w. Assume this time that there is a funding constraint on $\hat{p}^r$. Figure 5 shows how in this case it is the rest of society's preferred price level that is fixed at the autarky price level, $p^a = \hat{p}^r$, because $W^{r\prime}(p_t) = 0$ at a level of p_t below $p^a = \hat{p}^r$. The elite's preference for a relatively open regime is shown by the fact that $\hat{p}^e$ is relatively close to p^w. The figure depicts a situation where $\hat{p}^e$ is always less than p^w, perhaps due to revenue raising considerations. Assuming that the indirect effect dominates, Proposition 6 predicts that the effect of an increase in the world price, p^w, will be an increase in the elite's preferred price level, $\hat{p}^e$, and a decrease in the status quo price, p^s, as shown in Figure 5. Here the prediction is that, given β sufficiently large, ρ sufficiently small, and that the indirect effect dominates in response to the rise in p^w, there will be a rise in the ad valorem export tax. This is not shown in Figure 5, but the fall in p^s, from p_0^s to p_1^s, is shown. Therefore, the model predicts a rise in the ad valorem export tax over the period.

Although Kindleberger (1975) documents a gradual increase in protectionism in Prussia over the first half of the 19th Century, the most interesting period concerns the events that occurred after 1846. Europe's 'last subsistence crisis' hit in 1847. A potato blight and a drought lead to sharply increased prices for agricultural products all over Europe (Solar 1997). Food production in Prussia was curtailed and significant quantities of the food that it did produce flowed out of the country, attracted by even higher prices elsewhere on the continent. This would be captured by a further rise in p^w, this time driven not by a fall in transport costs but by a reduction in supply abroad. The result was that many Prussians were unable to afford to feed themselves. This situation triggered the so-called 'hunger riots' in 1847. The ruling regime's response was to introduce export taxes of 25 percent on grain in that year, whose purpose was to prevent grain from leaving the country and food prices rising even further. This action reflects a further increase in p^s in response to the sharp rise in p^w, again as our model would predict. During the period prior to 1847 the increase in protectionism was brought about through increases in import tariffs. Note that, by the Lerner symmetry theorem, an increase in an import tariff on manufactures would have the same distributional consequences as an increase in

an export tax on grain.

B.2. World Food Price Shocks 2007-08 and Export Restrictions

A striking feature of the world food price shock of 2007-08, initiated by population growth and urbanisation especially in the developing world, was the widespread imposition of measures to restrict exports by food exporting countries. Eight different types of policy measure were used to restrict exports. All of these measures entail holding local prices below world prices as in our model. In many cases these measures were introduced in response to social unrest triggered by steeply rising food prices. As Sharma (2011) explains, of the 105 countries in his sample, 33 introduced policies to reduce exports. Of these, 9 countries were in Africa, 15 in Asia and 5 were in Latin America and the Caribbean. While only some of these countries are outright dictatorships like Jordan, a significant number of them such as Pakistan, Russia and Ukraine would be regarded as countries where the democratic process is significantly compromised by the poor functioning of institutions such as free speech and free political representation. To the extent that the ruling regime is able to manipulate trade policy to extend their time in office, our model may presents a useful way of understanding the tendency in all of these countries to restrict exports.

Food exporting countries generally have a comparative advantage in food because they have a relative abundance of land. A simple characterization of many food exporting developing countries is one where the ruling elite own the land used intensively in the production of primary products, as in early-19th Century Prussia. So the model would predict that in these countries the ruling elite would prefer a relatively open trade regime, and that under the threat of revolution they could implement the status quo price through export restrictions.

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