Centre Interuniversitaire sur le Risque,
les Politiques Économiques et l'Emploi

Cahier de recherche/Working Paper **10-36**

The Economic Foundations of Institutional Stagnation in Commodity-Exporting Countries

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Septembre/September 2010

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Abstract:
Many poor countries are plagued with growth-impeding institutions. We develop a three-sector general equilibrium model linking economic stagnation in these countries to poor export terms of trade. We examine the extent to which changes in the terms of trade affect private agents' incentive to coalesce to oppose the adoption of growth-promoting institutions. We show that under certain conditions, below a threshold terms of trade level, private agents gain from coalescing to oppose the adoption of growth-promoting institutions. Above this threshold, gains from coalescing disappear, fostering institutional change.

Keywords: Terms of trade, primary commodities, institutions, general equlibrium

JEL Classification: E02, F11, L12, O33

1. Introduction

Why do many commodity exporters tend to have poor economic institutions? This paper develops a theory that proposes poor terms of trade as an answer. Unlike industrialized countries—who are net exporters of manufactures— primary commodity exporters typically occupy the lower rungs of measures of institutional quality like the World Bank's *Doing Business Index* and Transparency International's *Corruption Perception Index.* At the same time the available evidence suggests that historically, primary commodities like other minimally processed products have poorer terms trade compared to manufactures (Ocampo and Parra 2006). The paper connects these two phenomena – poor terms of trade and weak institutions – by linking terms of trade to a country's ability to abolish business licensing systems that preempt competition and create inefficient monopolies.

The business licensing system has been a pervasive institution in many developing countries. For example, in his New York Times best-seller "Imagining India", Nandan Nilekani (2008) reveals that from the early 1950s to the early 1980s, India employed a "licensing model for doing business that turned economic competition into a crooked wheel, as bureaucrats who managed licences became the gatekeepers to industry" (p.63). Nilekani further argues that the licensing system created "lazy monopolies", leading to economic stagnation during that period. Although the adverse consequences of the licensing system have been thoroughly analyzed in a seminal work by Parente and Prescott (1999), there has been little discussion as to why it endures in some countries. We provide an explanation for commodity exporters.[4]

Imagine a small open economy comprising three sectors, a household sector, a primary sector and an intermediate good sector. Suppose the primary sector produces a cash crop solely for export (for example cocoa, coffee, cotton) while the intermediate good sector produces an intermediate good for the primary sector (for example herbicides, fertilizers, hybrid seeds). Suppose also that this economy uses foreign exchange to pay for imports of an essential industrial good (for example drugs, vaccines). Under balanced trade, the

[4] See Parente and Prescott (1999) for more detailed examples.

country's capacity to pay for its imports is limited by the value of its primary commodity export. Thus, expanding production in the primary sector becomes critical for improving living standards. This expansion may depend on the structure of the intermediate good sector, which produces the intermediate good for the primary sector. Indeed, technological change in the intermediate good sector can ensure an abundant supply of the intermediate good, leading to an expansion of the primary sector. Why then has the intermediate good sector of many commodity-exporting countries been plagued with institutions that impede technological change?

Using a three-sector model along the lines described above, we show that such institutional stagnation may be rooted in the terms of trade for primary commodities. Our model articulates the link between the terms of trade and entrepreneurs' incentive to coalesce – into what we refer to as the business elite – to oppose free enterprise in the intermediate good sector. In our model, only a self-seeking coalition of entrepreneurs blocking entry of technologically superior potential rivals can prevent technological change. An entrepreneur's net gain from joining the business elite is given by the difference between the benefit of membership (the sum of labor income and the monopoly rent from stifling competition) and its opportunity cost (entrepreneurial income under free enterprise). A negative net gain leads to free entry of technologically superior rivals. Otherwise, a business elite will exist and lobby for the adoption of a restrictive licensing system.

Our model exhibits both strategic and non-strategic elements. Strategic elements naturally create a game situation involving three stages. In the first stage – the elite game – each entrepreneur must decide non-cooperatively whether or not to commit to membership of the business elite, if invited to join. The decision rule is based on the net gain from opposing free enterprise. Only when this net gain is positive will a business elite opposed to free enterprise emerge. The outcome of this game will thus determine the size of the pool of prospective elite members. In the second-stage – the entry-deterrence game – provided entrepreneurs are willing to coalesce, the business elite strategically choose its size to deter entry, while prospective entrants into the sector decide whether or not to allocate resources to breaking the elite's resistance to free enterprise. The benefits from membership of the elite vary inversely with the elite size while the elite size required to deter entry varies directly with prospective entrants' technological power. In the third and final stage, a two-player, Cournot game ensues between the elite and the new entrant, provided entry occurred earlier in the second stage. We require that the Nash equilibrium of this institutional game be sub-game perfect, and derive necessary and sufficient conditions for the economy to reject the use of a licensing system in the intermediate good sector. We show that under certain conditions, below a threshold terms of trade level, a coalition of private agents will emerge and lobby against free enterprise. Above this threshold, no such coalition exists, permitting institutional change.

The paper contributes to the debate on the relative merits of developing countries specializing in export of primary commodities versus manufactures as a development strategy. This literature consists of two opposing groups. The first – to which our paper belongs – is pessimistic about the idea of a country basing its development strategy on export of primary commodities (Singer 1950; Prebisch 1950; Findlay and Kierzkowski 1983; Matsuyama 1992; Stokey 1996; Ocampo and Parra 2006). The other group is optimistic (Cartiglia 1997; Echers 1999; Ranjan 2001; Dessy, Mbiekop, and Pallage 2009). Our contribution is to link commodity terms of trade to the process of institutional change in a commodity exporting country.

Our paper also contributes to the literature on institutions and development which links economic stagnation to poor institutions. Parente and Prescott (1999) highlight monopoly-rights arrangements in poor countries as the main barrier to their long term prosperity. Baland and Francois (2000), Vicente (2006), and Robinson, Torvik and Verdier (2006) emphasize the institutional foundations of economic stagnation in resource-rich countries. Unlike the existing literature, we provide an explanation for the pervasiveness in some countries of institutions that impede technological change, seen by many as the vehicle to prosperity (Parente and Prescott 1999). On the whole, our main contribution is to integrate the trade and development literature with the institutions and development literature, by linking terms of trade to institutional quality in commodity-exporting countries.

The rest of the paper is structured as follows. Section 2 gives an overview of the model. Section 3 discusses the model under a free enterprise institutional regime, while section 4 discusses it under a restrictive licensing system. Section 5 concludes while Section 6 contains proofs of the model's main results.

2. Overview of the Analysis

In this section, we lay out the basic structure of our model. Consider a small open economy with three sectors: a primary sector, an intermediate good sector, and a household sector. All the primary sector's output is exported. The intermediate good sector produces an intermediate good used as an input in the primary sector. The household sector comprises a continuum one of ex ante homogenous households. Each household is endowed with one unit of labor, and f units of a staple food. The staple food and a composite imported good are the only consumption goods in this environment. We take the imported good as the numeraire, and measure all other prices in units of this numeraire.

While the primary sector is perfectly competitive, the structure of the intermediate good sector is endogenous to households' choice of the institutional regime underlying entry into this sector. A household derives income from selling labor to firms in the primary or intermediate good sector; or from membership of the entrepreneurial class enjoying protected monopoly rights over the use of a particular technology in the intermediate good sector. There are two possible technologies for producing the intermediate good in this environment, namely π_0 and π_1, with $\pi_1 > \pi_0$. The initial state of the economy is characterized by the common use of the technology π_0 in the intermediate good sector. However new adopters may break into the industry by using the non-transferable superior technology π_1. We assume that entrepreneurs using the inferior technology π_0 are aware of this potential competition from new adopters, and may, in response, form a coalition using political leverage to block entry of these new adopters. For instance, the coalition can lobby the government to issue business licences only to its members, as was the case in India during the period 1960 to 1990 (Nilekani 2008). In this paper, we refer to such a coalition as the business elite or the elite for short.

The industrial organization of the intermediate good sector therefore depends on whether there is an elite who opposes free enterprise in this sector. Let $I_r \in \{0, 1\}$ denote a scale operator that takes the value $I_r = 0$ if the industrial organization of the intermediate good sector is characterized by a licensing system (hereafter referred to LS), and $I_r = 1$ if it is characterized by free enterprise (hereafter FE). Henceforth an asterisk ($*$) denotes FE, and variables with no asterisk denote LS.

2.1. The Intermediate Good Sector

All firms in the intermediate good sector are owned by households—who supply labor, the only marketed production factor in this sector. Total output by the representative firm using technology π_i is

$$Q_x^i = \pi_i N_x^i, \tag{2.1}$$

where $N_x^i \in [0, 1]$ denotes total labor used by the representative firm of type i, where

$$\sum_{i=0,1} N_x^i \leq N_x.$$

Under LS, a business elite, when it exists, will strategically choose its size to deter entry by any potential firm endowed with a superior technology π_1. If entry occurs, the industrial organization of this sector will correspond to a duopoly, with aggregate output of the intermediate good given by:

$$Q_x = \pi_0 N_x^0 + \pi_1 N_x^1. \tag{2.2}$$

Intersectoral labor mobility implies that firms in this sector will pay the primary sector wage ω, so that the profit of a representative firm of type i is

$$\Pi_i = \left(p_x \pi_i - \omega\right) N_x^i, \tag{2.3}$$

where p_x denotes the price of the intermediate good in units of the imported good. If entry is deterred, then the industrial organization will be a monopoly, with total supply of the intermediate good given by

$$Q_x = \pi_0 N_x, \tag{2.4}$$

and the monopoly rent will be given by

$$\Pi_0 = (p_x \pi_0 - \omega) N_x. \tag{2.5}$$

We assume that this rent is equally shared among the N_x members of the elite, so that the per capita monopoly rent, $r_c = \Pi_0 / N_x$, accruing to each member is

$$r_c = p_x \pi_0 - \omega. \tag{2.6}$$

By contrast, under the FE institutional regime, perfect competition will drive away low-technology firms, as an implication of the assumption of a constant return-to-scale production process. In this case, aggregate output will be given by

$$Q_x^* = \pi_1 N_x^*, \tag{2.7}$$

where $N_x^* = 1 - N_a^*$ is a measure of the size of the intermediate good sector under FE. The zero-profit condition under FE will thus generate the following pricing rule for labor services:

$$\omega^* = p_x^* \pi_1. \tag{2.8}$$

2.2. The Primary Sector

Firms in the primary sector are perfectly competitive. They combine the intermediate good (X_a) and labor (N_a) to produce A units of the primary product according to a CES technology given by

$$A = \left[\psi X_a^{\rho} + (1-\psi) N_a^{\rho}\right]^{1/\rho}, \tag{2.9}$$

where $\rho > 0$ denotes the elasticity of substitution between the two factors, and $\psi \in (0,1)$, the factor share parameter.

Let p_a denote the export price for the primary commodity measured in units of the imported good. Under the small-open economy assumption, p_a is exogenous and can be interpreted as the commodity terms of trade. Profit-maximization by perfectly competitive firms yields the following factor pricing rules:

$$\omega = (1-\psi) p_a \left(\frac{A}{N_a}\right)^{1-\rho} \tag{2.10}$$

$$P(I_r) = p_a \psi \left(\frac{A}{X_a}\right)^{1-\rho}, \tag{2.11}$$

where $P(I_r) \equiv I_r p_x^* + (1-I_r) p_x$, and I_r indicates the institution underlying the industrial organization of the intermediate good sector. Resource constraints in the primary sector are the following:

$$N_a \leq 1 - (1-I_r) N_x + I_r N_x^* \tag{2.12}$$

$$X_a \leq (1-I_r) Q_x + I_r Q_x^*. \tag{2.13}$$

Under market-clearing, the inverse demand function for the intermediate good is given by

$$P(I_r) = p_a \psi \left[\frac{A}{(1-I_r) Q_x + I_r Q_x^*}\right]^{1-\rho}, \tag{2.14}$$

$I_r \in \{0,1\}$.

2.3. The Household Sector

Each household has preferences over a staple food and an imported good m. The utility (u) representing these preferences is additively separable in both goods:

$$u = f + \gamma m, \qquad \gamma > 0 \tag{2.15}$$

where $\gamma > 0$ denotes the common utility weight households assign to the imported good.

A household's earned income depends on (i) the industrial organization of the intermediate good sector, and (ii) the sector of employment. Let y_c denote the income of a member of the elite, y_{nc}, the income of a non-member, and y^*, the income of a typical household under FE. Let $I_c \in \{0, 1\}$ denote a scale operator that takes the value $I_c = 1$ if a household is a member of the elite, and $I_c = 0$ if not. Each household's budget constraint is thus given by:

$$m \leq y\left(I_c, I_r\right), \tag{2.16}$$

where

$$y\left(I_c, I_r\right) = \left(1 - I_r\right)\left[\left(1 - I_c\right) y_{nc} + y_c I_c\right] + y^* I_r, \tag{2.17}$$

with

$$y_c = \omega + r_c \tag{2.18}$$

$$y_a = \omega \tag{2.19}$$

$$y^* = \omega^*. \tag{2.20}$$

ω and ω^* are the labor wages under LS and FE respectively, and r_c, the per capita elite rent under LS, conditional on being a member of the elite operating in the intermediate good sector.

Given (I_c, I_r), we can therefore write a typical household's indirect expected utility as follows, using (2.15) and (2.16):

$$V\left(I_r, I_c\right)=\left\{\begin{array}{cc} f+\gamma y\left(I_c, 0\right) & \text{if } I_r=0 \\ f+\gamma y^* & \text{if } I_r=1 \end{array}\right., \tag{2.21}$$

where

$$y\left(I_c, 0\right)=\left\{\begin{array}{cc} \omega & \text{if } I_c=0 \\ \omega+r_c & \text{if } I_1=1 \end{array}\right.. \tag{2.22}$$

2.4. Gains from Elite's Membership

In this subsection we characterize the gains to a household from membership of the elite. Clearly, as shown in (2.22), there is a rent premium for belonging to the elite. However, at the economy-wide level, this rent has an opportunity cost under LS, as measured by the forgone utility from blocking free enterprise. Therefore opposing free enterprise is rational if and only if each elite member achieves a higher utility under LS than under FE.

Let us denote as $\vartheta\left(N_x\right)$ the net gain to a household from belonging to the elite opposing free enterprise in the intermediate good sector, when the optimal size of this elite club is N_x. This net gain is the difference between the value of belonging to the elite (i.e., $V(0,1)$) and the value of being a wage earner under FE (i.e., $V(1,1)$): $\vartheta\left(N_x\right) \equiv V(0,1)-V(1,1)$. From (2.21), substituting in, (2.6), (2.18) and (2.20), we can write this net gain as follows:

$$\vartheta\left(N_x\right)=\left(p_x \pi_0-\omega^*\right) \gamma. \tag{2.23}$$

Thus the condition $\vartheta\left(N_x\right)>0$ is necessary for LS to be supported as a general equilibrium, while $\vartheta\left(N_x\right) \leq 0$ is sufficient for free enterprise to be institutionalized. We are interested in the nature of factors that can cause the inequality $\vartheta\left(N_x\right) \leq 0$ to hold. For this purpose, we compute $\omega^*$and p_x. We adopt a general equilibrium approach to characterizing these variables, beginning with the determination of ω^*, the equilibrium labor wage under FE.

3. Equilibrium under Free Enterprise

In this subsection, we define and characterize a general equilibrium for this three sector-economy under FE, i.e., for $I_r = 1$. In this context, both the primary and the intermediate good sectors are perfectly competitive. Therefore, in the intermediate good sector, surviving firms are those using the superior technology π_1, so that total output is given by (2.7).

Perfect competition will eliminate all rents and thus all households will earn the same wage regardless of sector of employment. This common labor income satisfies the following wage equalization condition obtained by combining (2.10) with (2.8):

$$\omega^* = (1-\psi)\, p_a \left(\frac{A}{N_a}\right)^{1-\rho} = p_x^* \pi_1. \tag{3.1}$$

A direct implication is that all households will enjoy the same level of consumption of the imported good, which, from the budget constraint in (2.16), is given by $m = y^* = p_x^* \pi_1$.

Furthermore, under balanced trade, imports of the final good must be paid for by exports of the primary commodity. In other words, the following trade-balance condition must be met in equilibrium:

$$p_a A = p_x^* \pi_1. \tag{3.2}$$

The market for the intermediate good most also clear in equilibrium:

$$X_a = Q_x. \tag{3.3}$$

Given these equilibrium conditions as well as those pertaining to firms' choice of inputs, proving the existence and uniqueness of a general equilibrium under FE essentially amounts to proving that there exists a unique relative price p_x^* that clears the intermediate good market. We therefore prove the following proposition in the appendix section.

Proposition 1. *Under the FE, a general equilibrium exists and is unique:*

$$p_x^* = \left(\psi^{\frac{1}{1-\rho}} + \left[\frac{(1-\psi)}{\pi_1^\rho} \right]^{\frac{1}{1-\rho}} \right)^{(1-\rho)/\rho} p_a, \tag{3.4}$$

where p_a denotes the terms of trade for the primary commodity.

Observe that labor income under FE is given by $\omega^* = \pi_1 p_x^*$. Therefore Proposition 1 states that better terms of trade (i.e., a higher level of p_a) drive up the labor wage under FE. As an implication of Proposition 1, we can obtain the net gain to a household from membership of the elite as follows, by substituting (3.4) in (2.23):

$$\vartheta(N_x) = \left[p_x \pi_0 - \left(\psi^{\frac{1}{1-\rho}} + \left[\frac{(1-\psi)}{\pi_1^\rho} \right]^{\frac{1}{1-\rho}} \right)^{(1-\rho)/\rho} p_a \pi_1 \right] \gamma. \tag{3.5}$$

Expression (3.5) states that given p_x, the net gain to a household from from membership of the elite is a decreasing function of the terms of trade for the primary commodity p_a, implying that better terms of trade may discourage the emergence of an elite with a vested interest in opposing free enterprise in the intermediate good sector. However terms of trade also affect the monopoly price of the intermediate good p_x. Therefore, to obtain a complete characterization of this net gain, we next compute the equilibrium level of p_x under LS.

4. Equilibrium under A Licensing System

Recall that under LS, the elite uses its political leverage to obtain protected monopoly rights tied to the use of the inferior technology π_0 by all firms in the intermediate good sector. This coalition recruits its members among households—the labor suppliers. We stated above that a necessary condition for any household to benefit from membership of the elite is that the inequality $\vartheta(N_x) > 0$ holds. An important feature of our model is that the level of $\vartheta(N_x)$ depends on both strategic and non-strategic elements. Strategic elements underlie a game situation involving three stages. In the first stage— the elite game— each household decides non-cooperatively whether or not to commit to membership of the elite, if invited to join. This decision is based on the net gain $\vartheta(N_x)$. In the second stage game— the entry-deterrence game— the elite chooses its size N_x so as to deter entry by a technologically advanced potential competitor. The latter then decides whether or not to allocate a level of resource ϕN_x to breaking the elite's resistance to free enterprise. In the third and final stage, a two-player, Cournot game ensues between the elite and the new entrant, provided entry occurred earlier in the second stage. We require that the Nash equilibrium of this three-stage game be sub-game perfect. Therefore this game is solved by backward induction, beginning with the post-entry game. Therefore an allocation of households between the elite (with total population size N_x) and the non-elite (with total population size $1 - N_x$) is supported as a general equilibrium only if $\vartheta(N_x) > 0$. Violation of this condition will thus lead to free enterprise.

4.1. The Post-Entry Stage

This game is played in the third and final stage between the elite and the new entrant, given that entry occurred in the second stage. A player's payoff under Cournot competition is given by (2.3), where p_x is given by (2.14).

Using (2.1) and (2.14), we can thus write the payoffs of both players as follows:

$$\Pi_0\left(N_x^0; N_x^1\right) = \left[\left(\frac{A}{\pi_0 N_x^0 + \pi_1 N_x^1}\right)^{1-\rho} \pi_0 \psi p_a - \omega\right] N_x^0, \tag{4.1}$$

for the business elite, and

$$\Pi_1\left(N_x^1; N_x^0\right) = \left[\left(\frac{A}{\pi_0 N_x^0 + \pi_1 N_x^1}\right)^{1-\rho} \pi_1 \psi p_a - \omega\right] N_x^1 \tag{4.2}$$

for the new entrant, where N_x^i denotes the number of workers hired by player i $(i = 0, 1)$, which we take as a proxy for the quantity produced by player i. The new entrant's best response to the elite's hiring of N_x^0 workers can thus be defined as

$$B\left(N_x^0\right) = \arg\max_{N_x^1} \Pi_1\left(N_x^1; N_x^0\right), \tag{4.3}$$

which, by way of differentiation of (4.2), can be characterized as the value of N_x^1 that equates the marginal revenue and the marginal cost of the new entrant:

$$\left(\frac{A}{\pi_0 N_x^0 + \pi_1 B\left(N_x^0\right)}\right)^{1-\rho}\left[\frac{\pi_0 N_x^0 + \rho\pi_1 B\left(N_x^0\right)}{\pi_0 N_x^0 + \pi_1 B\left(N_x^0\right)}\right] \equiv \frac{\omega}{\psi p_a \pi_1}. \tag{4.4}$$

Given the above characterization of $B\left(N_x^0\right)$, we can re-write the new entrant's duopoly profit as follows using (4.2):

$$\Pi_1\left[B\left(N_x^0\right); N_x^0\right] = \left[\left(\frac{A}{\pi_0 N_x^0 + \pi_1 B\left(N_x^0\right)}\right)^{1-\rho}\pi_1\psi p_a - \omega\right] B\left(N_x^0\right). \tag{4.5}$$

Expression (4.5) will prove useful for solving the second stage game.

4.2. Entry-deterrence Stage

In this stage, the game is again played between the elite and the potential entrant, assuming that there are households willing to join the elite that opposes free enterprise in the intermediate good sector. Recall that firms in this environment are owned by workers. Therefore, for the elite firms, the total number of workers they employ is taken as a proxy for the elite size.

Since the potential entrant must incur a cost ϕN_x^0 to break the elite's opposition to free enterprise in the intermediate good sector, in this stage of the game, expression (4.5) above gives the elite all the information needed to ascertain the implications of their choice of size for the industrial organization of this sector. Indeed, to the extent that for the potential competitor, expending own resources to break barriers to entry is rational only when $\Pi_1\left[B\left(N_x^0\right); N_x^0\right] > \phi N_x^0$ after entry, the elite size $N_x^0 = N_x$ needed to effectively deter entry thus can be characterized as follows:

$$\Pi_1\left[B\left(N_x\right); N_x\right] \equiv \phi N_x, \tag{4.6}$$

where $B\left(N_x\right)$ satisfies (4.4). We refer to N_x as the optimal elite size.

We combine (4.4), (4.5), and (4.6) to prove the following proposition in the appendix section.

Proposition 2. *Given* (A, ω)*,*

(i) the potential entrant's best response is given by

$$B(N_x) = \Upsilon(\omega) N_x;$$

(ii) the optimal elite size is given by

$$N_x = \left[\frac{\psi \pi_1 p_a \Upsilon(\omega)}{\phi + \omega \Upsilon(\omega)}\right]^{1/(1-\rho)} \frac{A}{\pi_0 + \pi_1 \Upsilon(\omega)}, \tag{4.7}$$

and

$$\Upsilon(\omega) \equiv \frac{\phi}{2(1-\rho)\omega}\left[\rho + \left(\rho + \frac{4(1-\rho)\pi_0 \omega}{\phi \pi_1}\right)^{1/2}\right]. \tag{4.8}$$

Equation (4.7) gives us the critical level of elite size necessary for the adoption of LS in this environment. When that level obtains, the industrial organization of the sector takes the form of a monopoly.

4.3. Existence of an Equilibrium under LS

Let us now characterize the non-strategic elements of this environment. Observe that since entry is deterred under LS, the market for the intermediate good is a monopoly so that total supply of the intermediate good is $Q_x = \pi_0 N_x = X_a$, under market clearing. Furthermore, in equilibrium, the human resource constraint must be satisfied: $N_a + N_x = 1$. Therefore combining (2.11) and (4.7), using $Q_x = \pi_0 N_x$ we can write the monopoly price of the intermediate good p_x as follows:

$$p_x = \frac{\phi + \omega \Upsilon(\omega)}{\pi_1 \Upsilon(\omega)} \left(\frac{\pi_0 + \pi_1 \Upsilon(\omega)}{\pi_0}\right)^{1-\rho}. \tag{4.9}$$

Observe that p_x depends on ω which is endogenous. To complete the characterization of the equilibrium level of the intermediate good price p_x, it therefore remains to determine the equilibrium level of ω under LS. We start with the determination of the equilibrium level of exports of the primary commodity A.

Since $\pi_0 N_x = X_a$ and $N_a = 1 - N_x$, in equilibrium, we can use (2.9) to establish that total exports of the primary commodity are given by:

$$A = \left[\psi\left(\pi_0 N_x\right)^{\rho} + (1-\psi)\left(1-N_x\right)^{\rho}\right]^{1/\rho}. \tag{4.10}$$

Therefore, from (2.10), substituting in (4.10), rearranging terms yields the equilibrium primary sector wage as follows: $\omega = W\left(p_a, N_x\right)$, where

$$W\left(p_a, N_x\right) \equiv (1-\psi)\, p_a \left(\frac{\left[\psi\left(\pi_0 N_x\right)^{\rho} + (1-\psi)\left(1-N_x\right)^{\rho}\right]^{1/\rho}}{1-N_x}\right)^{1-\rho} \tag{4.11}$$

Next, combining (4.7) and (4.10) yields the following fixed-point problem:

$$N_x = \left[\frac{\psi \pi_1 p_a \Upsilon\left[W\left(p_a, N_x\right)\right]}{\phi + \omega \Upsilon\left[W\left(p_a, N_x\right)\right]}\right]^{1/(1-\rho)} \frac{\left[\psi\left(\pi_0 N_x\right)^{\rho} + (1-\psi)\left(1-N_x\right)^{\rho}\right]^{1/\rho}}{\pi_0 + \pi_1 \Upsilon\left[W\left(p_a, N_x\right)\right]}, \tag{4.12}$$

where $W\left(p_a, N_x\right)$ is given by (4.11). For a large family of relevant parameters' values $\left(\gamma, \psi, \pi_0, \pi_1, \rho, p_a\right)$, the fixed-point problem in (4.12) is well-defined. Hence the following definition:

Definition 1. *A general equilibrium under LS is an elite size N_x such that*
(i) N_x solves (4.12)
(ii) and

$$\vartheta\left(N_x\right) > 0. \tag{4.13}$$

Conditions (i) and (ii) are necessary and sufficient for the LS to be supported as a general equilibrium. Given that the functions defining equilibrium variables are non-linear, proving the existence of a solution to (4.12) is bound to be complicated. To investigate sufficient conditions for the economy to reject the LS institutional regime blocking economic progress, it is more convenient to proceed through counterfactual simulations.

4.4. Model Simulation

To illustrate the effects of the primary commodity terms of trade on the quality of institutions, we simulate the model using numerical values derived from Parente and Prescott (1999), except for ρ, the elasticity of substitution between labor and the intermediate good in the production of the primary commodity. In our model, the level of ρ is chosen so as to ensure that the per capita monopoly rent r_c defined in (2.6) is always non-negative. Observe that by construction, the value of the parameter γ has no determining influence on our results. Therefore its value can be normalized to unity, without loss of generality. Table 1 below summarizes information about the levels or ranges of relevant parameters.

Table 1. Numerical values for relevant parameters

Preference parameters	intermediate good sector parameters	Farm sector parameters
$\gamma = 1$	$\pi_0 = 3.00$	$\psi \in \{0.15, 0.23, 0.45\}$
	$\pi_1 = 5.00$	$\rho = 0.31$
	$\phi = 0.14$	$p_a \in (0, 1)$

Counterfactual simulations thus yield a number of effects associated with a secular change in the terms of trade. We begin with the existence and uniqueness of the optimal business elite's membership size N_x.

4.4.1. Existence and Uniqueness of the Optimal Elite Size

In this subsection, we illustrate the existence and uniqueness of the optimal elite size N_x. Fig.1 below plots the solution to the fixed-point problem in (4.12) as a function of p_a and

ψ, respectively.

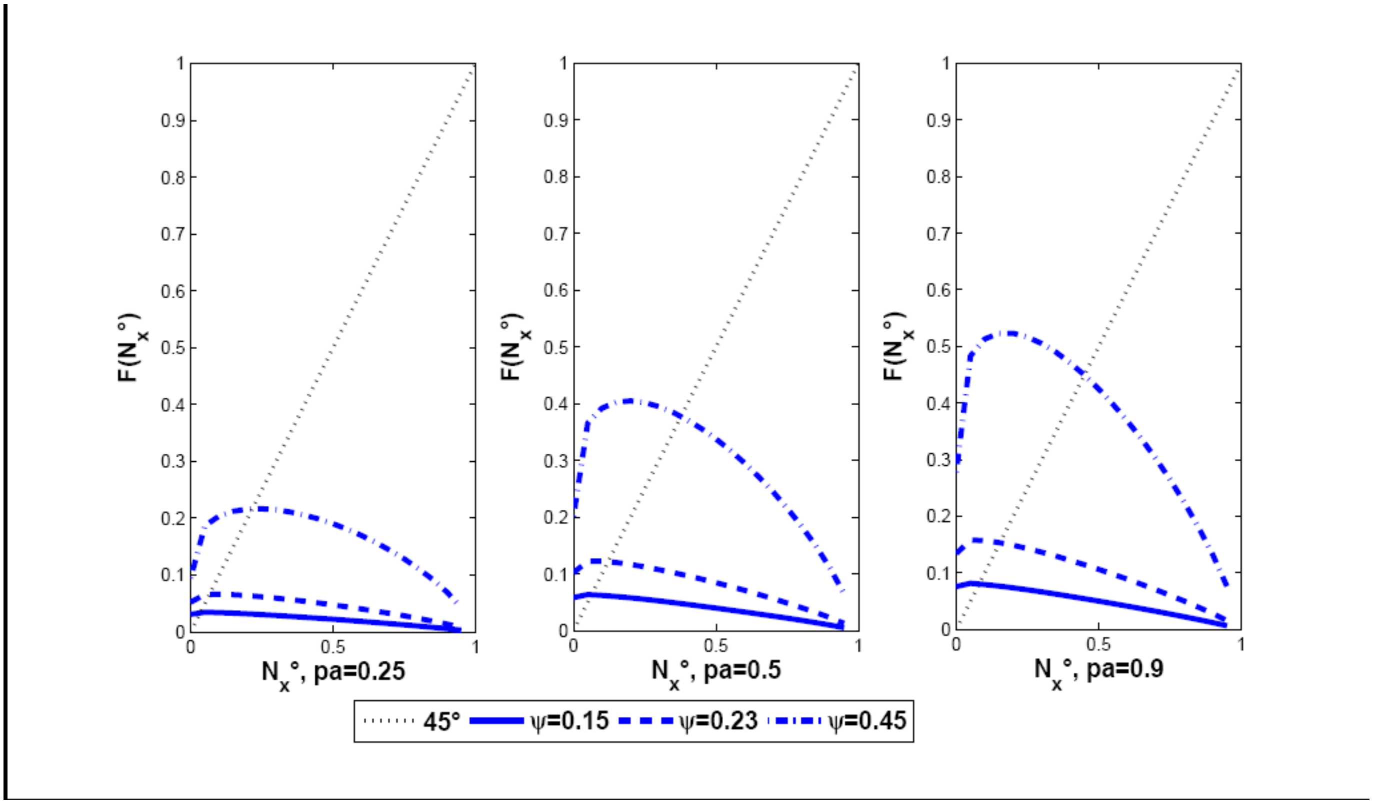

Fig. 1. Optimal Elite's Membership Size as a function of p_a and ψ

In each of the three graphs of Fig. 1, the diagonal dotted line represents the 45^o line. The existence of a unique fixed point for (4.12) is thus illustrated by the fact that each blue-colored curve crosses the 45^o line just once. Each of the three graphs in Fig.1 corresponds to a different value of the terms of trade p_a. For each of these graphs, there are three blue-colored curves; and each curve corresponds to a different value for the relative share, ψ, of the intermediate good in the production of the primary commodity.

Fig.1 suggests that increases in the commodity terms of trade (e.g., an increase from $p_a = 0.5$ to $p_a = 0.9$) raise the minimum size N_x needed to provide the elite with effective political leverage to secure the use of a licensing system that blocks entry of more technologically advanced competitors. Likewise, a higher (respectively, lower) relative share, ψ, of the intermediate good in the production of the primary commodity also raises (respectively, reduces) the minimum elite size N_x.

4.4.2. The Effects of Terms of Trade on Per Capita Monopoly Rents

In this subsection, we investigate the determinants of the level of per capita monopoly rent r_c. From (2.6), substituting in (4.9), using $\omega \equiv W(p_a, N_x)$, we obtain the per capita rent accruing to each elite member as follows:

$$r_c = \frac{\phi + W(p_a, N_x)\,\Upsilon[W(p_a, N_x)]}{\pi_1 \Upsilon[W(p_a, N_x)]}\left(\frac{\pi_0 + \pi_1 \Upsilon[W(p_a, N_x)]}{\pi_0}\right)^{1-\rho} \pi_0 - W(p_a, N_x), \quad (4.14)$$

where N_x is solution to (4.12). Fig. 2 below is obtained by plotting expression (4.14) as a function of the terms of trade for the primary commodity p_a and the factor share ψ.

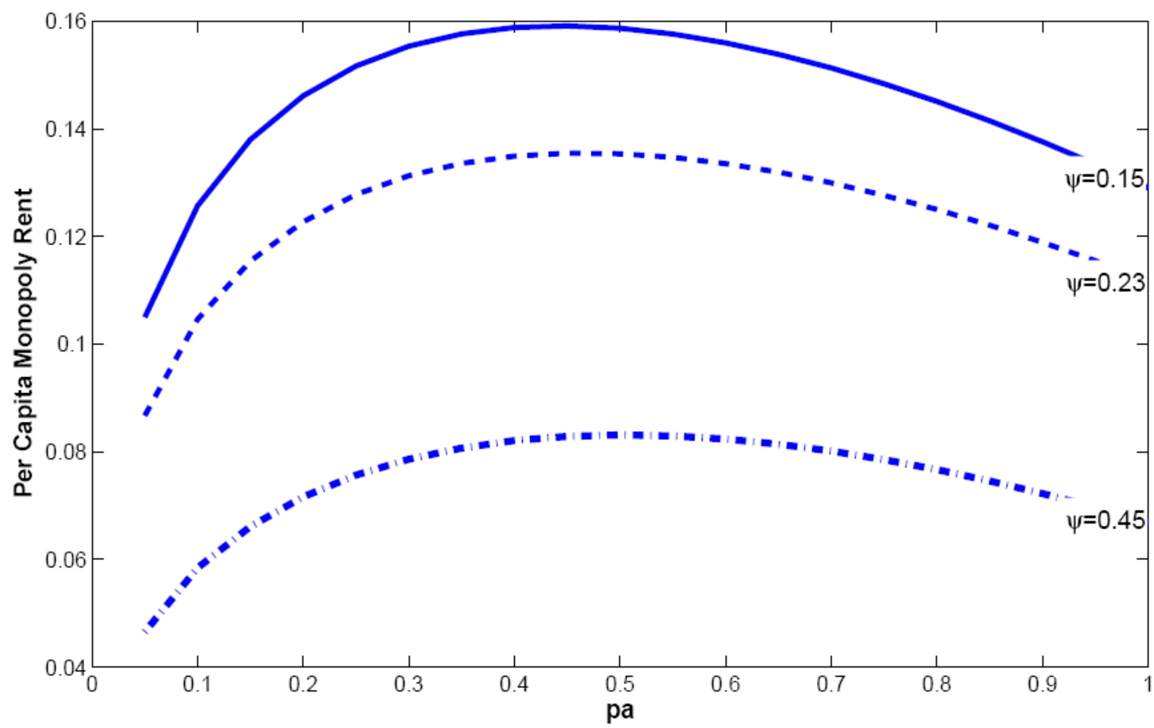

Fig. 2. Per capita monopoly rent r_c as a function of p_a and ψ

Fig. 2 shows that the per capita monopoly rent r_c has an inverted U-shape when measured as a function of the commodity terms of trade p_a. Indeed, there exists a threshold terms trade level below which the per capita rent rises as terms of trade improve, and above which it decreases with increases in the terms of trade. By contrast, per capita rent is a monotonically decreasing function of the relative share of the intermediate good in the output of the primary commodity ψ. This implies that, for each household, the incentive to join the elite that opposes free enterprise in the intermediate good sector decreases with the relative share of the intermediate good ψ.

4.4.3. The Effects of Terms of Trade on The Net Gain From Opposing FE

In this subsection, we close our discussion by investigating the effects of terms of trade on the net gain from committing to being a member of the business elite that opposes free enterprise. From (4.11), we know that any equilibrium primary sector wage is given by $\omega = W(p_a, N_x)$. As a result, from (3.5), substituting in (4.9) yields the net gain from membership of the elite as follows:

$$\vartheta(N_x) = \left[P(p_a, N_x)\pi_0 - \left(\psi^{\frac{1}{1-\rho}} + \left[\frac{(1-\psi)}{\pi_1^{\rho}} \right]^{\frac{1}{1-\rho}} \right)^{(1-\rho)/\rho} p_a \pi_1 \right] \gamma, \tag{4.15}$$

where N_x is solution to (4.12) and $p_x = P(p_a, N_x)$, with

$$P(p_a, N_x) \equiv \frac{\phi + W(p_a, N_x)\Upsilon[W(p_a, N_x)]}{\pi_1 \Upsilon[W(p_a, N_x)]} \left(\frac{\pi_0 + \pi_1 \Upsilon[W(p_a, N_x)]}{\pi_0} \right)^{1-\rho}. \tag{4.16}$$

Equation (4.16) is obtained by substituting ω by $W(p_a, N_x)$ in (4.9).

Fig. 3 below is obtained by plotting expression (4.15) as a function of p_a and ψ respectively.

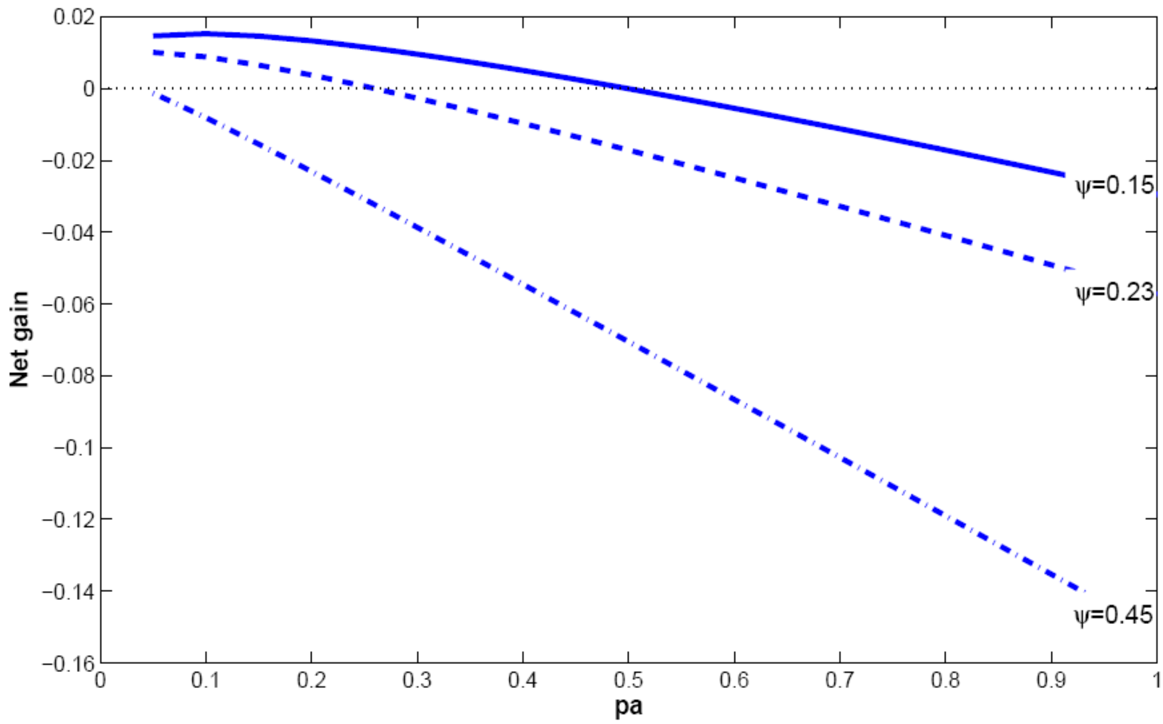

Fig. 3. Net gain as a function of p_a and ψ.

Fig. 3 shows that the net gain from membership of the elite is a monotonically decreasing function of both the primary commodity terms of trade p_a and the relative share of the intermediate good ψ. In particular, when this relative share is sufficiently small (i.e., $\psi \leq 0.23$), there exists a threshold terms of trade level below which the net gain from membership of the elite is positive (respectively negative). Above this level the net gain is positive.

In summary, Fig. 3 shows that two main conditions are necessary for a licensing system leading to protected monopoly rights to be supported as a general equilibrium of a primary commodity-dependent open economy:

(i) the economy must face poor commodity terms of trade (i.e., p_a is sufficiently low), and

(ii) the relative share of the intermediate good in the output of the primary commodity ψ must be sufficiently low.

Violation of conditions (i) and (ii) together or of condition (ii) alone would establish free enterprise as the institution underlying the industrial organization of the intermediate good sector. In other words, given the level of ψ, improvements in the terms of trade are sufficient for a commodity-dependent economy to reject LS in favor of FE, while a sufficiently high ψ will ensure political support for free enterprise irrespective of the commodity terms of trade.

5. Concluding Remarks

We have used a three-sector general equilibrium model to explore the role of terms of trade in institutional stagnation in commodity-exporting countries. The main feature of our model is the analysis of the political economy of institutional change in a context of exogenous commodity terms of trade. Our analysis has articulated a three-stage game of institutional change involving households, and a business elite and their potential competitors. We have restricted institutional change to the intermediate good sector, and explored sufficient conditions for free enterprise to be institutionalized. Incorporating this political economy dimension in a three-sector general equilibrium model allows us to analyze the determinants of institutional change in the context of a small open economy specializing in the export of primary commodities. We have shown that poor terms of trade may be to blame for the inability of this type of economy to adopt institutions promoting technological progress. While institutions are important for all types of economic activity, we have focused on the intermediate good sector following Parente and Prescott 1999, and Acemoglu and Robinson 2000, because of the sector's critical importance to economic development.

Our aim has been to highlight poor terms of trade as an issue in the debate on the causes of economic stagnation in poor countries. Our paper complements the literature citing weak institutions as a cause of economic stagnation by focusing on the case of countries basing their development strategy on specialization in primary commodity export. Our analysis suggests that unless poor terms of trade are reversed, many such countries may continue to face institutional and economic stagnation.

6. Appendix

In this section, we provide proofs of the results stated in the main text.

6.1. Proof of Proposition 1

We provide the proof to proposition 1 stating the existence and uniqueness of a general equilibrium under FE. To show that an equilibrium exists and is unique, it suffices to compute the equilibrium relative price for the intermediate good p_x. All other equilibrium variables can then be computed using this value.

Let us begin with the determination of the equilibrium intersectoral allocation of households across sectors. As an implication of property (iii) of the general equilibrium, we determine N_a by solving the equation (3.1):

$$N_a = \left[\frac{(1-\psi)\,p_a}{p_x^*\pi_1}\right]^{\frac{1}{1-\rho}} A. \tag{6.1}$$

We next use (2.7) and (2.11) in conjunction with (3.3) to determine N_x as follows:

$$N_x = \left(\frac{p_a\psi}{\pi_1^{1-\rho}p_x^*}\right)^{\frac{1}{1-\rho}} A. \tag{6.2}$$

Next, use the balance trade condition in (3.2) to obtain A as follows:

$$A = \left(\frac{p_a}{\pi_1 p_x^*}\right)^{-1}. \tag{6.3}$$

Note that the labor resource constraint is satisfied when $N_a + N_x = 1$. Combining (6.1), (6.2), (6.3) with this resource constraint yields the following equation in one unknown:

$$(1-\psi)^{\frac{1}{1-\rho}}\left[\frac{p_a}{p_x^*\pi_1}\right]^{\frac{\rho}{1-\rho}}+(\pi_1^\rho\psi)^{\frac{1}{1-\rho}}\left(\frac{p_a}{\pi_1 p_x^*}\right)^{\frac{\rho}{1-\rho}}=1.$$

Solving this equation for p_x^* yields the result (3.4). Clearly, under FE, a general equilibrium exists and is unique.

6.2. Proof of Proposition 2

We compute the optimal coalition membership size N_x. By definition, it is the value of N_x^0 that solves the following equation:

$$\Pi_1\left[B\left(N_x^0\right);N_x^0\right]=\phi N_x^0. \tag{6.4}$$

Using (4.2), this equation becomes:

$$\left[\left(\frac{A}{\pi_0 N_x^0+\pi_1 B\left(N_x^0\right)}\right)^{1-\rho}\pi_1\psi p_a-\omega\right]B\left(N_x^0\right)=\phi N_x^0. \tag{6.5}$$

Next, observe that the first order condition in (4.4) can be written as follows:

$$\left(\frac{A}{\pi_0 N_x^0+\pi_1 B\left(N_x^0\right)}\right)^{1-\rho}\psi p_a\pi_1\equiv\omega\left[\frac{\pi_0 N_x^0+\pi_1 B\left(N_x^0\right)}{\pi_0 N_x^0+\rho\pi_1 B\left(N_x^0\right)}\right]. \tag{6.6}$$

Substituting (6.6) into step (6.5) yields

$$\left(\omega\left[\frac{\pi_0 N_x^0+\pi_1 B\left(N_x^0\right)}{\pi_0 N_x^0+\rho\pi_1 B\left(N_x^0\right)}\right]-\omega\right)B\left(N_x^0\right)=\phi N_x^0,$$

which, re-arranging terms, leads to

$$(1-\rho)\,\pi_1\left(\frac{B\left(N_x^0\right)}{N_x^0}\right)^2-\frac{\phi}{\omega}\rho\pi_1\left(\frac{B\left(N_x^0\right)}{N_x^0}\right)-\frac{\phi}{\omega}\pi_0=0. \tag{6.7}$$

Eq. (6.7) admits two roots

$$
\begin{aligned}
b' &= \frac{1}{2(1-\rho)\pi_1}\left[\frac{\phi}{\omega}\rho\pi_1 + \sqrt{\Delta}\right] > 0 \\
b'' &= \frac{1}{2(1-\rho)\pi_1}\left[\frac{\phi}{\omega}\rho\pi_1 - \sqrt{\Delta}\right] < 0,
\end{aligned}
$$

where

$$
\sqrt{\Delta} = \frac{\phi}{\omega}\rho\pi_1\sqrt{1 + 4\frac{(1-\rho)\pi_0}{\rho^2\frac{\phi}{\omega}\pi_1}} > \frac{\phi}{\omega}\rho\pi_1.
$$

Therefore,

$$
\frac{B(N_x^0)}{N_x^0} = b'
$$

is the unique solution, and the best response can be written as follows:

$$
B\left(N_x^0\right) = \Upsilon(\omega)\, N_x^0. \tag{6.8}
$$

where

$$
\Upsilon(\omega) = \frac{\phi}{2(1-\rho)\omega}\left[\rho + \left(\rho + \frac{4(1-\rho)\pi_0\omega}{\phi\pi_1}\right)^{1/2}\right].
$$

Finally, from (6.5), substituting in (6.8), and re-arranging terms yields N_x as given in (4.7). This completes the proof.

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