Institutional Flexibility and Economic Growth

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Abstract

Economic historians commonly distinguish between institutional quality – the current set of property rights – and institutional flexibility – the propensity to develop new institutions in response to changing economic conditions. This paper incorporates this distinction into a model of economic growth. Our central result is that while high quality institutions are necessary to support high levels of labor productivity, it is institutional flexibility that determines the rate of economic growth. The model is also used to compare two types of institutional reform. An exogenous increase in institutional quality results in an immediate but transitory increase in economic growth, while an increase in institutional flexibility has a delayed but permanent effect on the equilibrium growth rate. The analysis suggests that the current work on institutions places too much emphasis on property rights and too little on the determinants of institutional change.

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Section 1: Introduction

If there is an overarching lesson to be taken from the work on the empirics of economic growth, it is the fundamental role played by institutions. Early growth regressions such as Barro's (1991) that included a few political variables were extended and refined in studies by Knack and Keefer (1995) and Mauro (1995) to examine a range of measures of contemporary institutional quality. These results were buttressed by later analyses that addressed concerns regarding the endogeneity of institutions (Hall and Jones, 1999, Acemoglu, Johnson and Robinson, 2001) and argued that institutions were important to explaining observed differences in variables that could be considered the proximate determinants of economic growth, like investment rates and growth-oriented policies (Easterly and Levine, 1997 and 2003).

In motivating this line of investigation, many researchers have cited the inspiration of economic historians who place institutions at the center of their analysis, most prominently Douglas North (North and Thomas, 1973, North, 1981, 1990a). It is puzzling, then, that the empirical and historical literatures focus on such different aspects of a country's institutional framework. Typical of the empirical literature are Acemoglu, Johnson and Robinson's (2001, p. 1370) "focus on private property and checks on government power" and Keefer and Knack's (1995, p. 207) emphasis on "the security of property and contractual rights." In contrast to this inherently static notion of what constitutes good institutions, historians of economic growth tend to stress the importance of dynamic characteristics of institutional structure.

Indeed, North (1995, p. 26) goes out of his way to draw attention to the distinction between static and dynamic aspects of institutional structure: "Allocative efficiency is a static concept with a given set of institutions; the key to continuing good economic performance is a flexible institutional matrix that will adjust in the context of evolving technological and demographic changes." Abramovitz (1986, p. 388) makes a similar point regarding a country's ability to adopt foreign technologies, noting that while a country's institutions "may be well designed to exploit fully the power of an existing technology; they may be less well fitted to adapt to the requirements of change." In the historical perspective, having a good set of economic policies or commercial laws at any one point in time matters less for growth than having political and legal systems that are capable of responding to the changing institutional demands of a growing economy.

We address the gap between the empirical and historical treatments of institutions by developing a simple model of institutional change that links the quality of existing institutions and the ability to generate new institutions. Like most of the literature on institutions, we adopt a hierarchical view of institutions, distinguishing between the relatively mutable set of economic institutions and a more enduring set of meta-institutions.[1] Economic institutions consist of the policies and laws that constrain economic interactions and thus determine the current level of protection of property and contractual rights. Economic institutions are proximate determinants of economic performance; examples include labor regulations and commercial law. In contrast, meta-institutions have no direct impact on economic behavior or outcomes. Meta-institutions consist of the highly persistent legal, social and political arrangements that constrain behavior in the design and selection of economic institutions, such as the common law legal tradition and the US Constitution.[2] In this framework, economic institutions determine institutional quality – the set of property rights defined by regulations and commercial law – while meta-institutions

[1] For example, Acemoglu, Johnson and Robinson (2004) make a distinction between economic and political institutions that is very similar to the one made here. North (1990b) stresses the relative endurance of political institutions.

[2] Of course, changes in meta-institutions do occur and often define dramatic historical episodes such as the French Revolution or Protestant Reformation. This kind of institutional change requires a different kind of theorizing, e.g. Acemoglu and Robinson (2000, 2001).

determine institutional flexibility – the propensity to develop new economic institutions in response to changing economic conditions.

This institutional structure is incorporated into a model in which the engine of growth is the evolution of the division of labor. The accumulation of specialized skills raises the gains to labor specialization. To realize these gains, however, workers must adopt more extensive and complex patterns of interpersonal exchange. Increases in the complexity of transactional relations raise market transaction costs, reducing the incentive for further specialization and growth and increasing the return to new institutions. By exposing agents to new transactions and relationships, increases in the division of labor also provide an opportunity for institutional learning. Institutional learning raises institutional quality, lowering market transaction costs and permitting further expansion of the division of labor. The interplay between market expansion and institutional learning formalized in the model below is central to North's (1991, p. 107) account of European growth: "The increasing volume of long distance trade raised the rate of return to merchants of devising effective mechanisms for enforcing contracts. In turn, the development of such mechanisms lowered the costs of contracting and made trade more profitable, thereby increasing its volume."

Exposure to a more challenging transactional environment is only a permissive source of institutional learning. While new transactional relationships provide an opportunity for institutional development, it is the flexibility of a country's institutional structure that determine how rapidly new institutions are created and adopted. Countries with a well-functioning set of meta-institutions generate a higher rate of institutional learning for a given gap between transactional complexity and current institutional quality. To draw on a market analogy, the division of labor determines the demand for institutional quality, while institutional flexibility determines the rate at which new institutions are generated to meet this demand.

The model predicts that countries with more flexible institutional structures will experience faster steady state growth. In contrast, higher institutional quality generates level effects, leaving the rate of growth unchanged. In the extreme case in which institutions are completely inflexible, per capita income converges to a level proportional to institutional quality. We also consider the impact of two types of institutional reform. We find that an increase in institutional quality has an immediate but temporary impact on economic growth, while an increase in institutional flexibility has a delayed but permanent impact on growth.

While we formalize the role of institutional flexibility in economic growth, we elide important questions regarding what meta-institutional arrangements generate institutional flexibility. This is a complex question with significant ongoing debates regarding the roles of constraints, incentives, information and cooperation in institutional choice. We survey this literature in the following section, but we do not expect to resolve these debates here. Instead, we focus on historical analyses that highlight the distinction between institutional quality and institutional flexibility and empirical studies of measurable meta-institutional structures and their role in determining institutional flexibility. While this literature does not allow us to draw strong conclusions regarding the determinants of institutional flexibility, it does suggest that it is the evolution of institutions, rather than any static set of rules, that matters for economic growth. As such, the literature review serves to motivate the theory developed in the following sections.

In modeling the division of labor, the paper builds on the models of Yang and Borland (1991), Becker and Murphy (1992) and Tamura (1992, 1995). Several models address the role of institutions in facilitating the division of labor, including the roles of government (Davis, 2003a), Coasean firms (Davis, 2003b), and informal institutions (Davis, 2006). This is the first paper, however, to formalize the distinction between institutional quality and institutional flexibility and relate these to economic growth. It is also the first paper to present evidence on the evolution of institutional quality and economic growth.

Section 2: Evidence on the Role of Institutional Flexibility

History affords many examples of the importance of institutional flexibility in a changing economic environment. North (1991, p. 105-6) argues that institutional evolution was critical to the economic development of early modern Europe, including advances in evasion of usury law, bills of exchange, the development of standard accounting practices and weights and measures, insurance contracts and the joint stock company. Milgrom et al. (1990) and Greif et al. (1994) respectively provide detailed accounts of the emergence of private judges and merchant guilds in the same period, examples of successful institutional innovations that allowed the exploitation of expanding trade opportunities. Turning to modern times, de Soto (2000) tracks the evolution of property rights in the US in support of evolving economic demands.

Conversely, a lack of institutional flexibility may hinder growth. Kuran (2004) argues persuasively that during the same period Islamic inheritance and contract law were not well designed to support collective commercial enterprises and, thus, had the effect of limiting the exploitation of scale economies in the Middle East. As Kuran (2004, p. 72) notes, “these institutions did not pose economic disadvantages at the time of their emergence. They turned into handicaps by perpetuating themselves during the long period when the West developed the institutions of the modern economy.”

In advanced economies, institutional inflexibility resulting from political paralysis may help to explain episodes of prolonged stagnation in countries with advanced economic institutions, such as some observers argue characterized Japan in the 1990s (Gimond, 2002) or Great Britain in the 1970s (Olson, 1982, 77-87). Good economic institutions may be sufficient to support high levels of income, but they do not necessarily generate high or even positive rates of economic growth.

Beyond the study of particular institutions and historical episodes, we may consider the ability of various systems of institutional choice to adapt to the challenges posed by economic growth. The available evidence suggests that informal institutional arrangements evolve very slowly and often do not survive the challenges of a changing economic environment (North, 1990a, Posner, 1980). Informal institutions are theorized as self-enforcing contracts in a repeated multi-player prisoner's dilemma game (Taylor, 1987, Kandori, 1992). As Davis (2006, p. 9) points out, collective enforcement mechanisms rely on "the creation and transmission of information regarding group members' past behavior, the costly sanctioning of cheaters, [and] the maintenance of social networks," public goods that become increasingly hard to sustain as group size increases. Informal arrangements may also prove inflexible as market expansion also undermines informal enforcement mechanisms by creating new opportunities for profitable exchange, e.g. Kranton (1996) and Greif (1994).[3]

In the legal arena, much of the analysis concerns the relative merits of the common and civil law traditions. In common law systems, judges play an active role in making new law by establishing legal precedents, whereas in civil law system law is made by legislators and judges play a more passive, interpretive role. An emerging empirical literature finds that common law countries tend to generate superior economic outcomes, e.g. Djankov et al. (2002) and Botero et

[3] Greif (2006) suggests that culture may serve as an informal meta-institution.

al. (2005). There is, however, some debate over why this might be so. The dominant line of thought argues that the primary strength of the common law traditional lies in its flexibility. For example, Hayek (1960) argues that the common law system is inherently evolutionary since it generates new laws directly in response to current legal conflicts, while Rubin (1982) suggests inefficient laws have a greater propensity to be litigated. A separate line of argument stresses the relative efficiency of the common law tradition, which arises because a civil law system favors the state over individuals rights, as argued by La Porta et al. (1999), or as argued by Posner (1977) because legislators willing to sacrifice efficiency for distributional objectives.

The evidence on this debate is not conclusive, but it appears to favor an emphasis on the flexibility of the legal system, rather than efficiency of any particular law. In a cross-country comparative analysis of the development of corporate law, Pistor et al. (2003, p. 678) conclude that "the capacity of legal systems to innovate is more important than the level of protection a legal system may afford to particular stakeholders at any point in time." A related study by Berkowitz et al. (2003. p. 167) finds that the success of transplanted legal systems depends most on the ability of judges and lawyers to "increase the quality of the law in a way that is responsive to local demand." Similarly, in a test of the flexibility and efficiency hypotheses, Beck et al. (2003) find it is importance of judge-made law, rather than its influence on the relative power of the state, that is most important for financial development.

The literature on comparative political economy generally finds that international political competition fosters flexibility. For example, North and Thomas (1973) and Rosenberg and Birdzell (1986) place international competition at the heart of institutional choice among Western European countries historically, and Tiebout (1956) makes a similar point regarding jurisdictional competition within a country.

In contrast, the impact of electoral competition is the subject of great debate, and indeed, the ability to respond to the stream of challenges posed by economic growth is claimed as an important asset by the proponents of both dictatorship and democracy (Przeworski and Limongi, 1993). In general, dictators may enjoy greater discretion in policy making, but they may lack the incentives or information necessary for successful for policy innovation and reform present in democracies.

A prominent line of argument holds that free-riding, lack of commitment mechanisms, and information problems lead to significant political market failure in democracies, e.g. Olson (1982), Coates and Morris (1995), North (1990b), Acemoglu (2003). Still, while populist pressures and political market failures may generate inefficient policies, democratic politics may still foster institutional flexibility. For example, Easterly (2005) argues that the combination of accountability and feedback in democracies leads to successful policy experimentation and implementation. Along similar lines, Rodrik (2000) makes the case for democracy as “a meta-institution for building good institutions” based on its superior ability to access and use local knowledge to tailor institutions to local needs. In a separate piece, Rodrik (1999) presents evidence of the flexibility of democratic decision making. In particular, he finds that democratic political institutions were a key determinant of a country’s ability to respond successfully to the economic shocks of the 1970s.

The economic success of both democratic Western states and dictatorial East Asian countries indicates that a focus on electoral competition is at most part of the story. Another line of research argues that political decentralization tends to foster policy experimentation and reform in both democracies and dictatorships, e.g. Bardhan (2002) and Qian, Roland and Xu

(2006). Qian and Xu (1993) attribute the success of Chinese reforms, relative to those Eastern Europe, to flexibility allowed by China's decentralized planning hierarchy.

In summary, the literature on institutional flexibility is notable for two things. First, there is an abundance of historical evidence pointing to the importance of institutional evolution for economic growth. Second, there has been comparatively little in the way of systematic empirical study regarding the determinants of institutional flexibility. Some tentative conclusions may be drawn. Informal institutions appear to be relatively inflexible, and the available evidence supports the flexibility of the common law tradition and democratic political systems, but this evidence is far from overwhelming.

Section 3: The Model

This section introduces the model. It discusses in some detail the economics of production with gains to labor specialization, the relationship between labor specialization, market transaction costs and per capita income, and the evolution of institutions. It also presents agent preferences and gives the first-order conditions for the representative agent's dynamic optimization problem. Our analysis of the role of institutions in growth is reserved for the next section.

3.1 Production with Gains to Labor Specialization

The model proceeds from "nano-economic" foundations, with production disaggregated to a continuum of individual tasks, each of which is associated with a specialized branch of knowledge. There are N identical individuals. Each is endowed with h units of human capital and one unit of time. There is a continuum of productive tasks, indexed by $a \in [0, 1]$, and each task is associated with an intermediate good of the same index number. Specialized workers produce a subset of the intermediate goods with measure $n \in (0, 1]$, and labor specialization s is inversely related to the number of intermediate goods an individual produces: $s \equiv 1/n$. An agent's time and human capital are allocated uniformly across her productive activities, so that intermediate good specific inputs of labor and human capital are given by $l_a = 1/n = s$ and $h_a = h/n = sh$.

Intermediate goods are produced using Cobb-Douglas technology: $z_a(l_a, h_a) = Al_a^{\varepsilon} h_a^{\beta}$, where $\varepsilon, \beta \in (0, 1)$ and are uniform across tasks. Per capita output is found by integrating z_a over the set of productive tasks, resulting in

$$(1) \qquad z(s,h) = \int_n z_a da = As^{\alpha} h^{\beta},$$

where $\alpha \equiv \varepsilon + \beta - 1$. Note that (1) differs from most production functions in that one of its arguments, s, is not a factor of production but rather an organizational variable. Production exhibits gains to specialization provided the exponent on labor specialization is positive, which is assumed to hold. Formally, gains to specialization arise due to increasing returns in the production of intermediate goods.

Note also that (1) exhibits a positive cross-partial, $z_{sh}(s,h) > 0$. By specializing, workers increase the time spent on each task, allowing them to utilize task-specific human capital more intensively, implying $\frac{dz_h}{ds} > 0$ (Rosen, 1983). Similarly, a rise in human capital increases the productivity of time allocated to each task, increasing the gains to specialization, $\frac{dz_s}{dh} > 0$. The interaction between labor specialization and the return to human capital provides the basis for a virtuous cycle of growth driven by the mutually reinforcing processes of accumulation and specialization.

One unit of each intermediate good is combined in Leontief fashion to produce one unit of the final good. The final good may be consumed or invested and is taken as the numeraire. Because she only produces a subset of the intermediate goods, a specialist producer must trade a portion of her output with other specialists in order to obtain those intermediate goods she does not produce.[4]

Exchange among specialists is costly. Let m denote "market size," defined to be the number of participants in a specialist trading group. It is assumed that the total cost of transactions incurred by a member of the group is given by $x(m) = \tau m$, where τ is the market transaction cost. Symmetry implies labor specialization is uniform across market participants, and it follows that labor specialization equals market size,

$$(2) \qquad s = m.$$

For example, in a market with ten members, each participant produces one-tenth of the intermediate goods and labor specialization is given by $s = 1/n = 10$. Ignoring integer problems, we may express per capita income, equal to output less transaction costs, as a function of labor specialization and human capital:

$$(3) \qquad y(s,h) = As^{\alpha}h^{\beta} - \tau s .$$

[4] Specialist production may also be coordinated within firms. See Davis (2003b) for a model in which the relationship between management costs and market transaction costs determines the trade-off between firms and markets in coordinating the division of labor.

To eliminate the complications introduced by the exercise of specialist monopoly power, it is assumed that trading proceeds according to contracts which are negotiated prior to specialization decisions. Since agents are *ex ante* identical, no individual producer has market power in the production of a particular set of intermediate goods at the time contracts are signed. As Yang and Borland (1991, p. 465) note, this assumption "is sufficient to ensure price-taking behavior by individual agents."

Given the transaction cost coefficient and human capital endowment, agents choose labor specialization to maximize income.[5] Equilibrium labor specialization is shown to be increasing in human capital and decreasing in market transaction costs: $s^e = [\alpha A/\tau]^{\frac{1}{1-\alpha}} h^{\frac{\beta}{1-\alpha}}$. Substituting this into (3), per capita income is given by $y(h) = \overline{A}\,\tau^{\frac{-\alpha}{1-\alpha}} h^{\frac{\beta}{1-\alpha}}$, where $\overline{A}$ is defined below. In these equations, the exponent on human capital may be either greater or less than one, depending on the relative strengths of gains to specialization and diminishing returns to human capital in intermediate good production. Hereafter, we assume $\alpha = 1-\beta$, implying that gains to specialization exactly offset diminishing returns. This assumption provides the production function with the familiar "AK" structure necessary for persistent endogenous growth, e.g. Romer (1994). It follows that equilibrium labor specialization and per capita income are given by

$$(4) \qquad s^e = [\alpha A/\tau]^{\frac{1}{1-\alpha}} h$$

[5] As in Becker and Murphy (1992), we assume that potential constraints on labor specialization are non-binding. In practice, this amounts to assuming that transaction costs are sufficiently low for equilibrium specialization to exceed one.

and

$$(5) \qquad y(h) = \overline{A}\,\tau^{\frac{-\alpha}{1-\alpha}} h$$

where $\overline{A} = (1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}} A^{\frac{1}{1-\alpha}}$. Equation (5) indicates that the return to human capital r is independent of the level of human capital and decreasing in market transaction costs:

$$(6) \qquad r = \overline{A}\,\tau^{\frac{-\alpha}{1-\alpha}}.$$

3.2 Institutional Learning and the Evolution of Market Transaction Costs

At any one point in time, the market transaction costs τ are increasing in average market size $\overline{m}$ and decreasing in the level of institutional quality *q*. In particular, we assume

$$(7) \qquad \tau = \overline{m} / q .$$

Increases in market size raise transaction costs through their impact on transaction related infrastructure.[6] Market size provides a rough measure of the transactional complexity of an economy. In a market with *m* participants, there will be $m(m+1)/2$ bilateral trades, so that the number of trades per person rises roughly linearly in market size. By increasing the number of trades per person, a rise in market size tends to reduce the effective quality of congestible

[6] The literature on labor specialization notes a number of additional reasons that transaction costs may depend on market size. For example, increases in market size may increase the distance between agents (Yang and Borland, 1991), monitoring costs (Becker and Murphy, 1992) and the number of relative prices (Coase, 1991). They may also decrease the role of informal constraints on opportunism (North 1990a, Davis 2006).

physical and institutional infrastructure such as roads, courts and police, increasing market transaction costs. By specifying that transaction costs depend on *average* market size, we stress that individual agents tend to take the level of transaction costs as given: It is the total number of bounced checks, not how many an individual agent happens to receive, that determines how over-burdened the courts are.

Institutional quality reflects the current stock of society's transaction-related knowledge. This stock of knowledge is accumulated gradually through past experience with market transactions. For example, in common law societies, the accumulation of precedents in cases that arise from transactional conflicts constitutes a form of social learning that results in the gradual evolution of the stock of commercial law. A similar process in the private sector may be seen in the evolution of bills of credit and credit rating firms. We assume that transaction-related knowledge is non-excludable, so that it is society's history of transactions, rather than an individual's, that is relevant for determining transaction costs.[7]

The evolution of institutional quality takes the form

(8) $$\dot{q} = \sigma(\overline{m} - q),$$

where the parameter $\sigma \geq 0$ captures a societies underlying facility for institutional evolution. That is, σ is our measure of institutional flexibility. Equation (8) implies that learning only occurs when new transactional relations, as measured by market size, stretch or outstrip institutional capabilities, $\overline{m} > q$. By implication, simply repeating familiar transactions cannot

[7] With transaction related knowledge non-excludable, individuals assume that the evolution of institutional quality is independent of their personal specialization decisions. As a result, optimal specialization is fully determined by contemporaneous variables, as in (4). In particular, agents do not engage in forward-looking contracting in an attempt to induce institutional learning and lower future transaction costs.

sustain persistent institutional learning. If market size is constant over time, the rate of institutional learning slows as institutional quality approaches market size. In addition, (8) allows for institutional atrophy if current institutional capabilities are underutilized: $\dot{q} < 0$ if $\overline{m} < q$. Dividing both sides of (8) by the level of institutional quality gives a useful equation for the rate of institutional learning in terms of current transaction costs:

$$(9) \qquad \frac{\dot{q}}{q} = \sigma\left[\tau - 1\right].$$

3.3 Utility and Dynamic Optimization

Agents maximize lifetime utility $U = \int_0^\infty e^{-\theta t} \ln(c_t)dt$ subject to the production technology (5), market transaction costs (7), the time-path of institutional quality (8), human capital accumulation

$$(10) \qquad \dot{h}_t = y_t - c_t ,$$

and initial values for human capital and institutional quality, h_0 and q_0. The first-order conditions for this maximization problem gives a familiar condition for consumption growth

$$(11) \qquad \frac{\dot{c}}{c} = r - \theta ,$$

where r is the marginal product of human capital. Along with initial conditions, differential equations (9), (10) and (11) determine the time paths of institutional quality, human capital and consumption and govern the dynamic performance of the economy.

Section 4: Institutional Structure and Economic Growth

This section analyzes the model developed above to investigate the dynamic implications of changes in institutional quality and institutional flexibility. We begin considering the determinants of steady state growth in an economy characterized by institutional learning. This is followed by a brief section on growth in the absence of institutional learning. Finally, we examine two types of institutional reform, an increase in institutional quality and an increase in institutional flexibility. We show that increases in institutional quality have an immediate but transitory effect on economic growth. In contrast, while an increase in institutional flexibility has no immediate impact on economic outcomes, it generates a permanent increase in the rate of economic growth.

4.1 Steady State and Transition Growth with Institutional Learning

The dynamic behavior of the model is determined by the differential equations that govern the evolution of institutions, human capital and consumption. However, as shown in the appendix, consumption and human capital grow at a common rate along all optimal trajectories, allowing us to eliminate one equation. Making use of this relationship, and substituting employing equations (5) into (10) and (6) into (11), we have

(12) $$g_h = \bar{A}\tau^{\frac{-\alpha}{1-\alpha}} - \theta,$$

which along with equation (9) gives us differential equations for the growth of human capital and institutional quality as in terms of the level of transaction costs. In addition, employing equations (2), (4) and (7), we can express transaction costs as a function of human capital and institutional quality:

(13) $$\tau(h,q) = [\alpha A]^{\frac{1}{2-\alpha}}[h/q]^{\frac{1-\alpha}{2-\alpha}}.$$

Equation (13) reflects the role of human capital in determining the gains to labor specialization and the extent of interpersonal trade. Log-differentiating equation (13), the growth of market transaction costs may be expressed as a function of the growth rates of the model's state variables,

(14) $$\frac{\dot{\tau}}{\tau} = \left[\frac{1-\alpha}{2-\alpha}\right]\left[\frac{\dot{h}}{h} - \frac{\dot{q}}{q}\right].$$

As shown in Figure 2, the steady state growth rate is determined by the unique level of transaction cost that equates (9) $g_q = \sigma[\tau - 1]$ and (12) $g_h = \bar{A}\tau^{\frac{-\alpha}{1-\alpha}} - \theta$. The steady state growth rate is positive provided the productivity parameter exceeds the discount rate, $\bar{A} > \theta$, or equivalently $\bar{\tau} = [\bar{A}/\theta]^{\frac{1-\alpha}{\alpha}} > 1$, which we assume to hold. Figure 2 indicates that the steady state is stable. If, for example, transaction costs are initially below the steady state level, then human capital will grow faster than institutional quality, which by (14) causes the level of transaction costs to rise, moving toward their steady state level.

Figure 2 may also be used to analyze the polar cases in which institutions are inflexible and infinitely flexible. With infinitely flexible institutions, institutional quality adjusts instantaneously to changes in market size. In this case, the condition $m = q$, shown as a vertical line at $\tau = 1$, replaces equation (9), and the steady state growth rate achieves its maximum value given production and preference parameters, $g_{\max} = \overline{A} - \theta$. Alternately, if $\sigma = 0$, the g_q function coincides with the horizontal axis and the steady state growth rate and transaction cost level are zero and $\bar{\tau}$, respectively.

Total differentiation of (9) and (12) gives the steady state growth rate and transaction cost level as functions of model parameters,

$$\begin{aligned} g^* &= g(\overset{+}{\overline{A}}, \overset{-}{\theta}, \overset{+}{\sigma}) \\ \tau^* &= \tau(\overset{+}{\overline{A}}, \overset{-}{\theta}, \overset{-}{\sigma}) \end{aligned} . \qquad (15)$$

As is common in endogenous growth models, the steady state growth rate is increasing in the productivity level and decreasing in the discount rate. In addition, the steady state growth rate is increasing in the level of institutional flexibility. Greater institutional flexibility increases the rate of institutional learning, lessening the gap between institutional quality and market size and lowering transaction costs. Lower transaction costs increase labor specialization, raising the return to specialized capital goods and increasing the rate of capital accumulation and income growth.

Steady state values of human capital and institutional quality grow at the common rate g* and maintain a fixed relationship defined by (13) and the steady state level of transaction costs:

$$(16) \qquad h_t* = [\alpha A]^{\frac{-1}{1-\alpha}} \tau *^{\frac{2-\alpha}{1-\alpha}} q_t *$$

Employing equations (5), (13) and (16), we may express steady state income in terms of the steady state levels of human capital and institutional quality:

$$(17) \qquad y_t* = [\alpha A]^{\frac{-\alpha}{(1-\alpha)(2-\alpha)}} \bar{A} q_t *^{\frac{\alpha}{2-\alpha}} h_t *^{\frac{2-2\alpha}{2-\alpha}}.$$

Transition dynamics are complicated by the presence of two state variables. Log-differentiating (17), we see that transitional income dynamics depend on the growth rates of human capital and institutional quality,

$$(18) \qquad g_y(\tau) = \left[\frac{2-2\alpha}{2-\alpha}\right] g_h(\tau) + \left[\frac{\alpha}{2-\alpha}\right] g_q(\tau).$$

The relationship between transaction costs and the rate of income growth expressed in (18) is ambiguous. For example, An increase in transaction costs reduces the first term while increasing the second. Linearizing (18) around the steady state, transitional income growth is approximated by

$$(19) \qquad g_y(\tau) \approx g^* - \left[\frac{\alpha}{2-\alpha}\right]\left[2\bar{A}\tau^{*\frac{-\alpha}{1-\alpha}} - \sigma\tau^*\right]\left[\frac{\tau}{\tau^*} - 1\right].$$

From (19), we see that the relationship between transaction costs and transitional income growth depends on institutional flexibility. In the appendix we prove the following proposition:

Proposition 1: For given values of the model's other parameters, there exists a unique positive value of institutional flexibility $\hat{\sigma}$ such that, near the steady state, the following statements hold:

A. If institutions are sufficiently flexible, $\sigma > \hat{\sigma}$, and transaction costs are below their steady state level, $\tau_t < \tau^*$, then
   1. income grows slower than its steady state rate, $g_t < g^*$, and
   2. income is above its steady state level, $y_t > y_t^*$, so that the economy converges to its steady state growth path from above.

B. If institutions are sufficiently flexible, $\sigma > \hat{\sigma}$, and transaction costs are above their steady state level, $\tau_t > \tau^*$, then
   1. income grows faster than its steady state rate, $g_t > g^*$, and
   2. income is below its steady state level, $y_t < y_t^*$, so that the economy converges to its steady state growth path from above.

C. If $\sigma < \hat{\sigma}$ and $\tau_t > \tau^*$, then A1-A2.
D. If $\sigma < \hat{\sigma}$ and $\tau_t > \tau^*$, then B1-B2.

The intuition behind Proposition 1, part A, is as follows. In an economy with highly flexible institutions, institutional learning is very sensitive to the level of transaction costs. Starting in the steady state assume transaction cost fall, causing human capital to grow faster and institutional learning to slow. If institutions are sufficiently flexible, then the fall in the growth rate of institutional quality is large, such that the net effect on income growth is negative. The logic of the other parts is parallel.

4.2 Growth in the Absence of Institutional Learning

Next consider the case in which institutional learning is absent and institutional quality is fixed at its initial level. In this case, growth may still occur due to human capital accumulation, but such growth is inherently self-limiting and cannot persist indefinitely. In the steady state, transaction costs are sufficiently high that postponing consumption is unattractive, $\bar{\tau} = \left[\bar{A}/\theta\right]^{\frac{\alpha}{1-\alpha}}$, and accumulation stops, $g_h = 0$. The stationary levels of human capital and income are all proportionate to the level of institutional quality:

$$
(20) \qquad \begin{aligned} h^* &= \left[\bar{A}/\theta\right]^{\frac{\alpha}{1-\alpha}} q_0 \\ y^* = c^* = \theta h^* &= \theta^{\frac{1-2\alpha}{1-\alpha}} \bar{A}^{\frac{\alpha}{1-\alpha}} q_0 \end{aligned} .
$$

Equation (20) captures one of the fundamental insights of the model: In the absence of ongoing institutional learning, an economy will eventually stagnate at an income level consistent with the quality of its institutions.

4.3 Institutional Reform and Economic Growth

Here we compare the effects of an institutional quality shock to those of an institutional flexibility shock. We interpret these shocks as different types of institutional reform, with a positive quality shock corresponding to an increase in the quality of economic institutions and a positive flexibility shock corresponding to more fundamental institutional reform involving political and legal institutions. Such reforms might result from international institutional transfers such as occurred during colonization (AJR, 2001, Djankov et al., 1999), attempts to meet the membership requirements of an international organization such as the European Union or the World Trade Organization, or under some form of pressure from the international community.

Consider an economy in the steady state that receives a positive exogenous shock to institutional quality at time t_1. The increase in institutional quality reduces market transaction costs, leading to an immediate increase in labor specialization, interpersonal trade and per capita income. This initial increase in income is illustrated in *Figure 2A* by the jump from $\ln(y_{t_1})$ to $\ln(y_{t_1}')$. As seen in *Figure 2B*, the rise in labor specialization increases the return to task-specific human capital, causing the rate of human capital growth to rise. Simultaneously, the rise in institutional quality reduces the gap between current institutional quality and market size, which lowers the rate of institutional learning, g_q. The joint impact of higher institutional quality and faster human capital growth is to permanently shift the state growth path upward. As noted in Proposition 1, the level of institutional flexibility determines whether the new steady state growth path lies above or below the level of per capita income immediately following the shock. With human capital growing faster than institutional quality, transaction costs rise and the economy gradually returns to its steady state growth rate and transaction cost level.

Next, consider the impact of a positive shock to institutional flexibility. As illustrated in Figure 3A, the increase in institutional flexibility has no immediate effect on the level of per capita income, which is fully determined by the state variables. However, as shown in *Figure 3B*, an increase in institutional quality rotates the g_q-function counter-clockwise around its horizontal intercept, resulting in an immediate increase in the rate of institutional learning and from (18), an immediate increase in the rate of income growth. The increase in institutional flexibility also results in a permanent rise in the steady state growth rate to g^{**} as illustrated in

Figure 3B. Again applying Proposition 1, the economy eventually converges to a new steady state growth path at the new rate of economic growth.

In summary, quality shocks have level but not rate effects. A positive quality shock produces an immediate increase in per capita income and a permanent upward shift in the steady state growth path, but it has no enduring effect on the rate of economic growth. In contrast, a positive shock to institutional flexibility has no impact on the level of economic activity as measured by the income level, market size, labor specialization, transaction costs and the human capital growth rate. Over time, however, an increase in the ability to develop and adopt new institutions permanently raises the economy's long run growth rate.

Section 5: Conclusion

In recent decades, the economics profession has witnessed an the emergence of a unified field of study concerned with long run economic performance that combines the formerly disparate areas of development economics, growth theory and growth history. As part of this process, the new growth economics has drawn considerably closer to themes that have long been emphasized by historians of economic growth, namely the centrality of technology and institutions. This paper attempts to further this convergence by developing a theory of growth that takes into account the economic historical distinction between institutional quality and institutional flexibility.

The analysis suggests that institutional flexibility plays a central role in economic growth. Institutional flexibility allows the economy to respond quickly to the demands of a changing economic environment, reducing market transaction costs and, thereby, facilitating the ongoing process of accumulation, labor specialization and market expansion that jointly drive growth. The need for continual institutional learning and adaptation suggests that no single set of institutions may be relied upon to accommodate persistent growth. The model is used to highlight the relatively temporary gains from reforms to institutional quality. This aspect of the analysis may prove useful as a way to understand prolonged periods of stagnation in developed countries and the fragility of some country growth experiences.

Appendix

Here we show that human capital and consumption grow at the same rate along optimal trajectories. Substituting (5) into (10) and (6) into (11) gives us $\frac{\dot{h}}{h} = \bar{A}\tau^{-\alpha/(1-\alpha)} - \frac{c}{h}$ and $\frac{\dot{c}}{c} = \bar{A}\tau^{-\alpha/(1-\alpha)} - \theta$. From this we have $g_c - g_h = \frac{c}{h} - \theta$, indicating that consumption and human capital grow at the same rate along the line $c = \theta h$. Consider a trajectory that begins at a point (c_0, h_0) such that $c_0 > \theta h_0$. Along such a trajectory, consumption growth is greater than human capital growth, implying $\frac{d\left(\dot{h}/h\right)}{dt} < 0$. Human capital accumulation eventually turns negative, leading to jump in consumption when $h = 0$. Since this violates (11), this trajectory cannot be optimal. Alternately, consider a trajectory that begins at a point (c_0, h_0) such that $c_0 < \theta h_0$. Along such a trajectory human capital growth outstrips consumption growth, leading to unbounded accumulation that violates the transversality condition. It follows that all optimal trajectories satisfy $c_t = \theta h_t$, such that consumption and human capital grow at a common rate.

Here we prove Proposition 1. We begin by linearizing (9) and (12) around the steady state, which gives us $g_q(\tau) \approx g^* + \sigma\tau^*\left[\frac{\tau}{\tau^*} - 1\right]$ and $g_h(\tau) \approx g^* + \left[\frac{-\alpha}{1-\alpha}\right]\bar{A}\tau^{*\frac{-\alpha}{1-\alpha}}\left[\frac{\tau}{\tau^*} - 1\right]$. Substituting these equations into (18) provides the linear estimate of the growth of income near the steady state that's reported in (19): $g_y(\tau) \approx g^* - \left[\frac{\alpha}{2-\alpha}\right]\left[2\bar{A}\tau^{*\frac{-\alpha}{1-\alpha}} - \sigma\tau^*\right]\left[\frac{\tau}{\tau^*} - 1\right]$.

Differentiating this expression, we find that near the steady state

$$g_y'(\tau) < 0 \Leftrightarrow \left[2\bar{A}\tau^{*\frac{-\alpha}{1-\alpha}} - \sigma\tau^*\right] > 0 \Leftrightarrow \tau^* < \tilde{\tau}(\sigma) \equiv \left[\frac{2\bar{A}}{\sigma}\right]^{1-\alpha}.$$

Recall that the steady state level of transaction costs is a function of institutional flexibility, $\tau^*(\sigma)$ implicitly defined by $F(\tau,\sigma) = \bar{A}\tau^{\frac{-\alpha}{1-\alpha}} - \theta - \sigma(\tau - 1) = 0$, such that $\tau^*(\sigma)$ is a decreasing function with $\tau^{*\prime}(\sigma) = -\frac{F_\sigma}{F_\tau} = -\frac{(\tau-1)}{\left[\frac{\alpha}{1-\alpha}\right]\bar{A}\tau^{\frac{-1}{1-\alpha}} + \sigma} < 0$, $\tau^*(0) = \bar{\tau}$ and $\lim(\sigma \to \infty)\tau^*(\sigma) = 1$.

Define $\Delta(\sigma) = \tau^*(\sigma) - \tilde{\tau}(\sigma)$. It follows that $\lim(\sigma \to 0)\Delta(\sigma) < 0$ and $\lim(\sigma \to \infty)\Delta(\sigma) > 0$. By the intermediate value theorem, there exists at least one value of σ for which $\Delta(\hat{\sigma}) = 0$, indicating $\tau^*(\hat{\sigma}) = \tilde{\tau}(\hat{\sigma})$. Let $\hat{\sigma}$ be such a value of σ. It follows that

$\Delta'(\hat{\sigma}) > 0$: $\Delta'(\hat{\sigma}) = \tau^*(\hat{\sigma}) - \tilde{\tau}(\hat{\sigma}) > 0 \Leftrightarrow \frac{-(\tau-1)}{\frac{\alpha}{1-\alpha}\bar{A}\tau^{\frac{-1}{1-\alpha}} + \sigma} > \frac{-(1-\alpha)\tau}{\sigma}$. Cross multiplying, collecting terms and adding and subtracting $\alpha\theta$ to the right hand side, we have:

$$\begin{aligned}&\Delta'(\hat{\sigma}) > 0 \Leftrightarrow \alpha\sigma(\tau-1) - (1-\alpha)\sigma < \alpha\bar{A}\tau^{\frac{-\alpha}{1-\alpha}} + (\alpha\theta - \alpha\theta)\\ &\Leftrightarrow \alpha g_q(\tau^*) - (1-\alpha)\sigma < \alpha g_h(\tau^*) + \alpha\theta \Leftrightarrow -(1-\alpha)\sigma < \alpha\theta\end{aligned}$$

where the last line follows from the equality of g_q and g_h in the steady state. Note that we have shown that $\Delta'(\hat{\sigma}) > 0$ for $\hat{\sigma}$ such that $\Delta(\hat{\sigma}) = 0$. Since $\Delta(\sigma)$ is continuous on $\Re^{++}$, it follows that $\hat{\sigma}$ is unique. Thus, we have shown that there exists a unique value of institutional flexibility $\hat{\sigma}$ such that for $\sigma < \hat{\sigma} \Leftrightarrow g_y'(\tau) < 0$. This establishes A1 and B1 of Proposition 1. Because income converges to its steady state, A2 and B2 follow from the difference in steady state and actual growth rates.

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Figure 1: Steady State Growth Rate and Transaction Cost Level

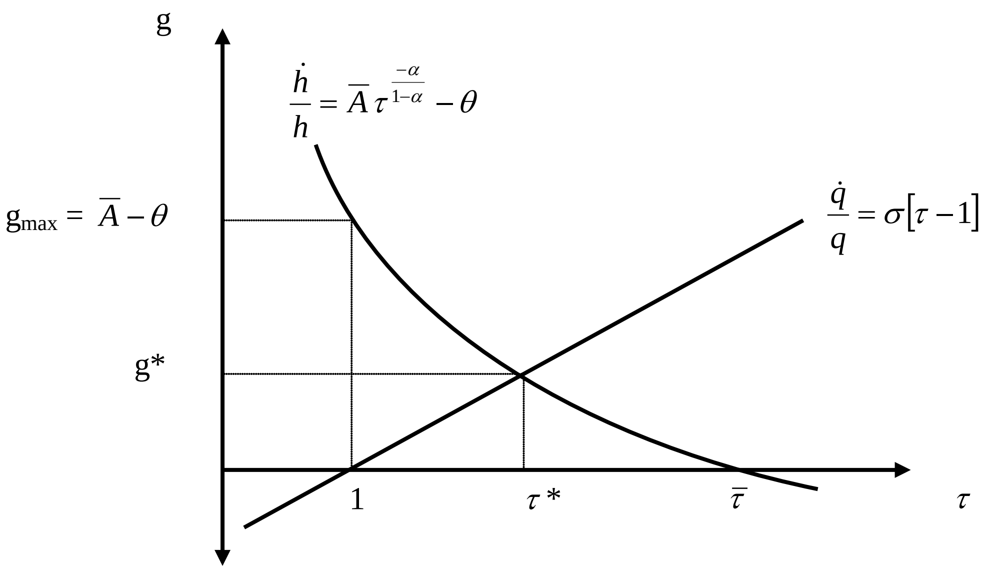

Figure 2A: Income Dynamics Following a Quality Shock

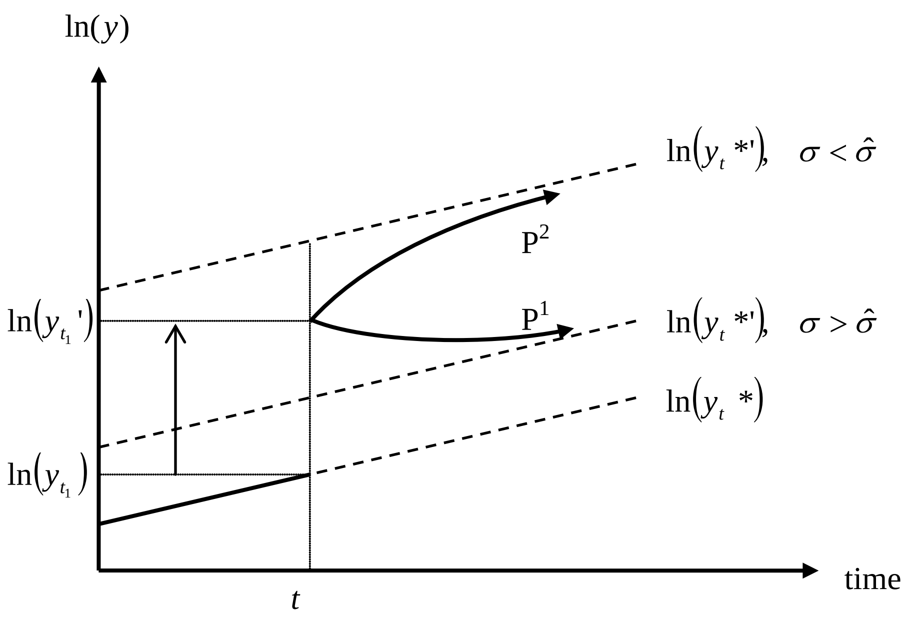

Figure 2B: State Variable Dynamics Following a Quality Shock

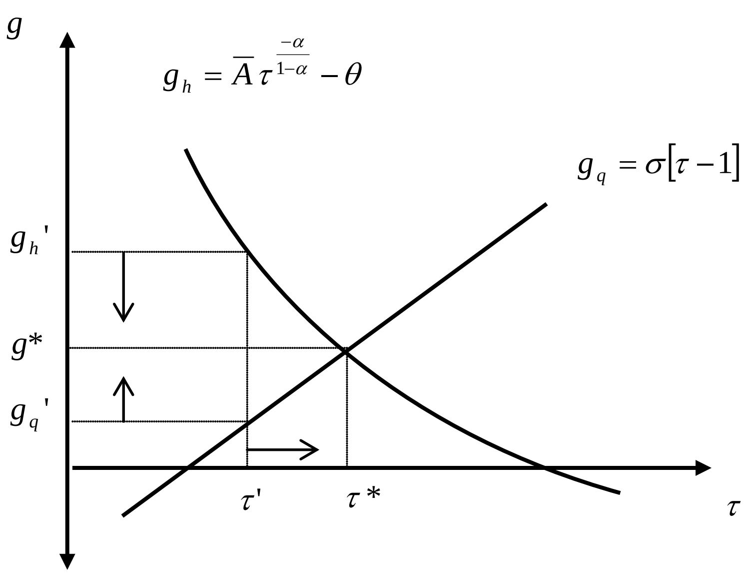

Figure 3A: Income Dynamics Following a Flexibility Shock

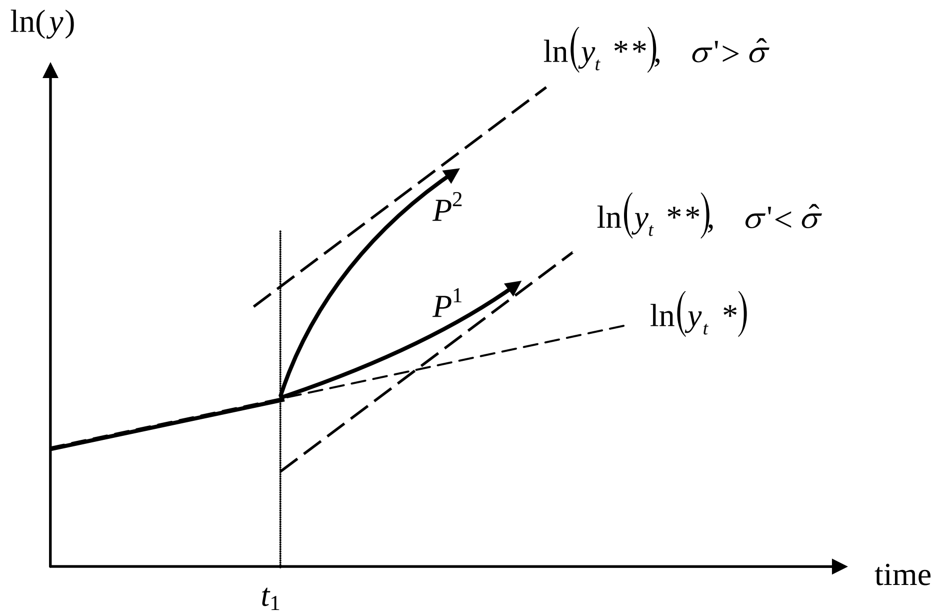

Figure 3B: State Variable Dynamics Following a Flexibility Shock