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Institutional flexibility and economic growth

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ABSTRACT

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This paper develops a formal model to investigate the relationship between institutional quality – the current set of property rights – and institutional flexibility – the ability to develop new institutions – and relate these aspects of institutional structure to dynamic economic performance. The model is used to analyze two types of institutional reform. An increase in institutional quality lowers market transaction costs, producing an immediate but short lived increase in the rate of economic growth. In contrast, an increase in institutional flexibility results in a delayed but permanent increase in economic growth. 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. *Journal of Comparative Economics* **38** (3) (2010) 306–320. 211D Social Sciences Building, Union College, 807 Union Street, Schenectady, NY 12308, United States.

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 Philip (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 et al., 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, 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 et al. (2001, p. 1370) "focus on private property and checks on government power" and Knack and Philip'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 tech-

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nologies, 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 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 polar case in which institutions are completely inflexible, per capita income converges to a level proportional to institutional quality. Thus, countries with high quality but inflexible institutions will be rich and stagnant, while countries with low quality but flexible institutions will be poor and dynamic. This result contrasts with the literature that views institutional quality as the key to growth, which has trouble accounting for extended periods of stagnation in rich economies.

The model highlights the relationship between institutional quality and institutional flexibility, and their respective roles in economic growth. In particular, we investigate the difference implications of two types of institutional reform. We find that an increase in institutional quality raises income levels and has an immediate but temporary impact on economic growth. In contrast, an increase in institutional flexibility has no initial impact on variables related to the level of economic activity. Over time, however, it results in a gradual but persistent increase in the rate of economic growth.

The model also highlights the manner in which institutional evolution responds to changing economic conditions. In particular, we show that the introduction of a new technology, such as might characterize industrialization or the introduction of modern information technology, can induce a period of rapid institutional learning. Here again the model illustrates a key role for institutional flexibility. In a society with relatively flexible institutions a positive technology shock results in a permanent rise in the rate of economic growth, whereas in a society with less flexible institutions the inability to adapt to the new economic reality results in high market transaction costs that partly or fully choke off economic 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 insti-

[1] For example, Acemoglu et al. (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).

tutions, 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, 1996) and is closely related to Kremer (1993) and Tamura (2002, 2006), which are also based on the complementarity of specialized productive tasks.[3] Parente and Prescott (1994, 1999) also provide a formal model in which the presence of inefficient institutions inhibits economic development, in their case by protecting incumbent producers by raising the cost of technology adoption. Several models address the role of institutions in facilitating the division of labor in a growing economy, including the roles of government (Davis, 2003a), Coasean firms (Davis, 2003b), and informal institutions (Davis, 2006). This is the first paper, however, to present a formal model of the relationship between institutional quality and institutional flexibility and identify their separate and distinct roles in economic development.

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 the evasion of usury law and the development of bills of exchange, standard weights, measures and accounting practices, 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 both responded to and furthered the exploitation of expanding trade opportunities.

Similarly, turning to US history, de Soto (2000, Chapter 5) stresses not the security and stability of property rights but rather their dynamic properties. As de Soto argues, what matters in the US case is not "property rights per se but meta-rights – access or rights to property rights" (p. 106). Moreover, in de Soto's account, the key innovation is the interplay between formal and informal institutions, with key legislative advances such as the Preemption Act of 1841, the Homestead Act of 1862 or the General Mining Act of 1872 doing little more than legitimizing informal understanding in the form of squatters rights, cabin rights and the mining claims. In keeping with our general thesis, de Soto locates the impetus for the development of new institutions in rapidly changing economic opportunities and conditions, such as resulted from mass immigration, the Louisiana Purchase, and the California gold rush.

Conversely, historical accounts also document how a lack of institutional flexibility may hinder growth. Kuran (2004) argues persuasively that during the late middle ages 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). A similar emphasis is found in Ostrom's (1990, 2000) study of field work on informal institutions for managing common-pool resources. Ostrom cites group instability is a key factor in undermining the long run survival of informal resource-governance regimes. Among the factors that contribute to the survival of these regimes, both Ostrom and Bardhan (2001) cite a characteristics of their meta-institutional arrangements, local participation in rule-making and monitoring, that are plausibly associated with greater flexibility of institutional arrangements.

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 al. (2004). There is, however, some debate over why this might be so.

[3] A key formal difference is that we assume tasks enter production additively, whereas Kremer and Tamura incorporate a stronger form of complementarity in which tasks enter production multiplicatively.

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. 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.

Evidence on the relative flexibility of common law legal tradition is not, however, monolithic. A key exception to the evidence discussed above concerns the evolution of law governing business organization in the US and France during industrialization. Lamoreaux and Rosenthal (2005) find that the contractual forms available to firms in France were both more varied and more responsive to changing economic conditions. Not only did significant changes to business organization law in both countries require legislative action, but Lamoreaux and Rosenthal find that the reliance on precedent tended to act as a conservative force in the US common law system.

Like Lamoreaux and Rosenthal, other studies of comparative legal development also tend to stress the capacity for flexibility and innovation over the efficiency of the legal system. 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." Thus, while there is some disagreement as to relative flexibility of common and civil law systems, this work agrees on the central importance of flexibility to the long run performance of the legal system.

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 forms of political market failure in democracies, e.g. Olson (1982), Coate and Morris (1995), North (1990b) and Acemoglu (2003). However, while populist pressures and special interest may generate inefficient policies, democratic politics may still foster institutional flexibility. For example, Easterly (2006) 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.

Much of the empirical literature on democracy and development focuses on development outcomes and elides the intermediate step relating democratic politics to economic policies and institutions. For example, Persson and Tabellini (2009) find that both the existence and expectation of democracy increase economic growth, but they do not address whether this occurs due to greater responsiveness of democratic polites in addressing changing institutional demands. Similarly, Giavazzi and Tabellini (2005) find that democracy increases growth and that this effect is larger in more open economies. While Persson and Tabellini (2006) interpret this relationship as evidence of the impact of liberalization on the demand for growth-inducing policies, none of these papers directly measures the impact of democracy on the evolution of institutional quality.

Moreover, most empirical work that does address the relationship between democracy and economic institutions, such as Rivera-Batiz (2002), tends to focus on static measures of institutional quality. Similarly, Acemoglu et al. (2001) are primarily concerned with an essentially static notion of institutional quality related to the protection of property rights. In spite of this focus, Acemoglu et al. also present evidence on the link between the degree of democracy in 1900 and the current level of institutional quality. This evidence is consistent with the idea that, over time, societies with more flexible early institutions, in the form of more competitive political markets, developed better property rights and higher levels of income.[4] The most direct evidence in favor of the greater flexibility of democratic decision making comes from Rodrik (1999), who finds that democratic political institutions were a key determinant of a country's ability to respond successfully to the economic shocks of the 1970s.

Citing the economic success of both democratic Western states and dictatorial East Asian countries, another line of research focuses on political decentralization, which it is argued tends to foster policy experimentation and reform, e.g. Bardhan (2002) and Qian et al. (2006). For example, Qian and Xu (1993) attribute the success of Chinese reforms, relative to those Eastern Europe, to flexibility allowed by China's decentralized planning hierarchy.

[4] More generally, the influence of colonization is difficult to parse into separate effects. Colonizers brought new legal and political systems as well as new laws and policies, thus affecting both institutional quality and flexibility. They also influenced economic openness, increased access to advanced technology, political oppression and inequality.

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. Most empirical research has focused on how meta-institutional arrangements affect institutional efficiency or economic growth, rather than directly addressing how responsive an institutional system is to changing institutional demands.

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

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

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.[5]

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,

$$s = m. \tag{2}$$

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:

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

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.[6] Equilibrium labor specialization is shown to be increasing in human capital and decreasing in market transaction costs:

[5] 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.

[6] 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.

$s^e = [\alpha A/\tau]^{\frac{1}{1-\alpha}} h^{\frac{\beta}{1-\alpha}}$. 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

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

and

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

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

$$r = \overline{A}\tau^{\frac{-\alpha}{1-\alpha}}. \tag{6}$$

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 $\bar{m}$ and decreasing in the level of institutional quality q. In particular, we assume

$$\tau = \bar{m}/q. \tag{7}$$

Increases in market size raise transaction costs through their impact on transaction related infrastructure.[7] 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 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.[8]

The evolution of institutional quality takes the form

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

where the parameter $\sigma \geqslant 0$ captures a societies underlying facility for institutional evolution. That is, σ is our measure of institutional flexibility. Eq. (8) implies that learning only occurs when new transactional relations, as measured by market size, stretch or outstrip institutional capabilities, $\bar{m} > q$. By implication, simply repeating familiar transactions cannot 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 $\bar{m} < q$. To capture the idea of institutional persistence, Section 4.4 considers the implications of an alternative formalization of institutional evolution in which the change in institutional quality is non-negative. 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:

$$\frac{\dot{q}}{q} = \sigma[\tau - 1]. \tag{9}$$

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

[7] 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).

[8] 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.

$$\dot{h}_t = y_t - c_t, \tag{10}$$

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

$$\frac{\dot{c}}{c} = r - \theta, \tag{11}$$

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

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 transitional 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 Eq. (5) into (10) and (6) into (11), we have

$$g_h = \overline{A}\tau^{\frac{-\alpha}{1-\alpha}} - \theta, \tag{12}$$

which along with Eq. (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 Eqs. (2), (4), and (7), we can express transaction costs as a function of human capital and institutional quality:

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

Eq. (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,

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

As shown in Fig. 1, the steady state growth rate is determined by the unique level of transaction cost that equates (9) $g_q = \sigma[\tau - 1]$ and (12) $g_h = \overline{A}\tau^{\frac{-\alpha}{1-\alpha}} - \theta$. The steady state growth rate is positive provided the productivity parameter exceeds the discount rate, $\overline{A} > \theta$, or equivalently $\bar{\tau} = [\overline{A}/\theta]^{\frac{1-\alpha}{\alpha}} > 1$, which we assume to hold unless otherwise stated. The performance

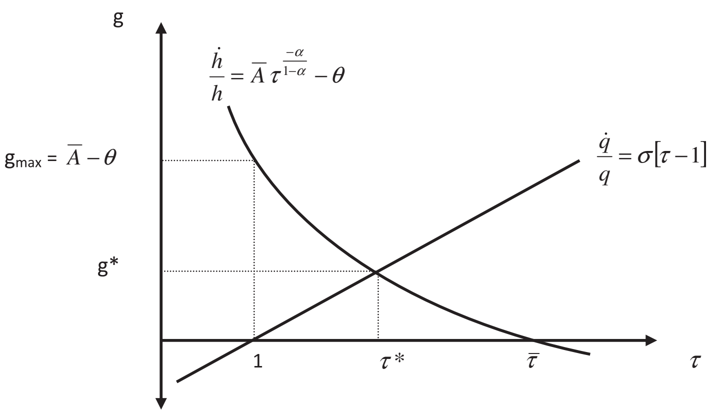

Fig. 1. Steady state growth rate and transaction cost level.

of low-productivity economies in which $\overline{A} < \theta$ is address in Section 4.4. Fig. 1 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 its steady state.

Fig. 1 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 Eq. (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,

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

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:

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

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

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

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,

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

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

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

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, $\tau^* = [\overline{A}/\theta]^{\frac{\alpha}{1-\alpha}}$, and accumulation stops, $g_h = 0$. The stationary levels of human capital and income are all proportionate to the level of institutional quality:

$$\begin{aligned} h^* &= [\overline{A}/\theta]^{\frac{\alpha}{1-\alpha}} q_0, \\ y^* &= c^* = \theta h^* = \theta^{\frac{1-2\alpha}{1-\alpha}} \overline{A}^{\frac{\alpha}{1-\alpha}} q_0 \end{aligned} \tag{20}$$

Eq. (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.

This result nicely captures a key aspect of Olson's (1982) analysis of the economic effects of political paralysis. In terms of the language used here, Olson's "sclerotic" society has high quality but inflexible institutions, a combination that results in rich but stagnant economies. The ability to account for the existence of such economies is one advantage of distinguishing between institutional quality and institutional flexibility. Development theories that focus on a single dimension of institutions – institutional quality – have a difficult time accounting for developed countries that experience prolonged periods of economic stagnation.

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. Quality shocks result from the adoption of new commercial laws and regulations, whereas flexibility shocks result from changes to the institutions that govern institutional choice, such as may result from changes to a country's constitution. Such reforms might result from international institutional transfers such as occurred during colonization (Acemoglu et al., 2001, Djankov et al., 2003), attempts to meet the membership requirements of an international organization such as the European Union or the World Trade Organization, or extra-constitutional violence including wars, revolutions and coups.

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 Fig. 2A by the jump from $\ln(y_{t_1})$ to $\ln(y'_{t_1})$. As seen in Fig. 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 Fig. 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 Fig. 3B, an increase in institutional quality rotates the g_q-function counter-clockwise around its hor-

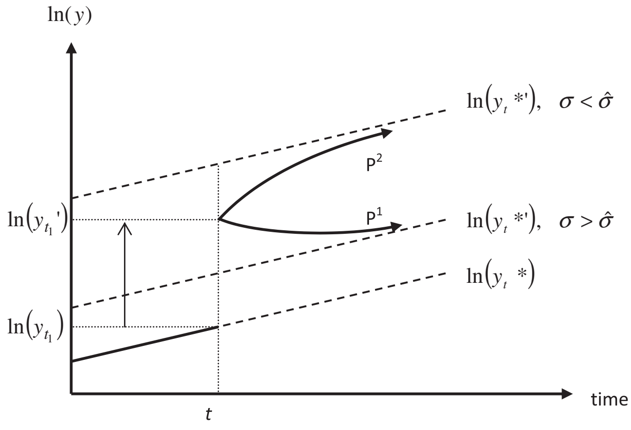

Fig. 2A. Income dynamics following a quality shock.

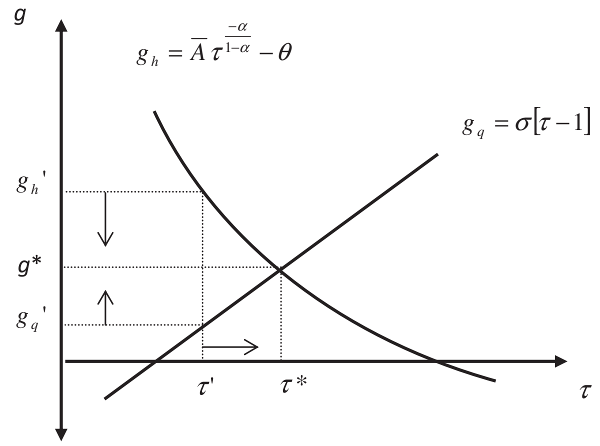

Fig. 2B. State variable dynamics following a quality shock.

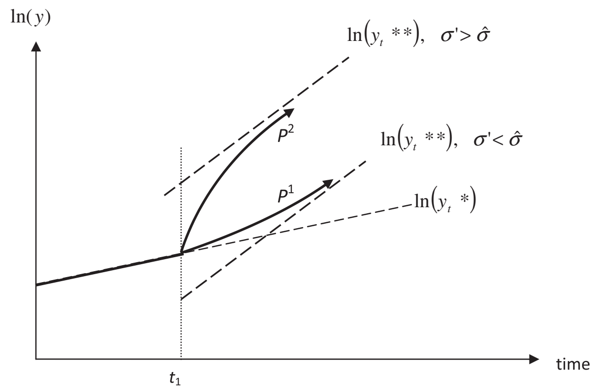

Fig. 3A. Income dynamics following a flexibility shock.

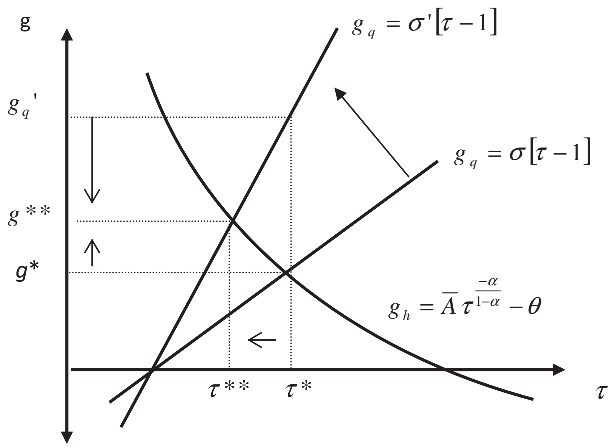

Fig. 3B. State variable dynamics following a flexibility shock.

izontal 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 Fig. 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 immediate 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.

4.4. Institutional persistence versus institutional atrophy

A potential drawback of the manner in which we model institutional change is that it permits institutional atrophy. As indicated by (9), for low levels of transaction costs, institutional quality falls over time, and moreover, it falls faster in societies with more flexible institutions. This is troubling on two levels. First, both historical and empirical work tends to emphasize institutional persistence, e.g. North (1991) and Acemoglu et al. (2001). Second, Eq. (9) is meant to formalize the idea that institutional evolution responds to the demand for greater institutional quality. However, even in an economy in which the demand for institutional quality is exceptionally low, it is unclear why economic agents would demand *lower* institutional quality.[9]

Given these concerns, it is useful to consider the implications of replacing (9) with an alternative formalization of institutional evolution that does not permit decreases in institutional quality:

$$\frac{\dot{q}}{q} = \max\{\sigma(\tau - 1), 0\}. \tag{21}$$

The key distinction between (9) and (21) is that for low levels of transaction costs, $\tau < 1$, Eq. (21) generates institutional persistence $\dot{q} = 0$, rather than institutional atrophy $\dot{q} < 0$.

First consider the case of an economy with steady state level of transaction costs consistence with positive growth, $\tau^* > 1$, that experiences a significant negative transaction cost shock, for example due to a fall in the level of human capital, such that $\tau < 1$ temporarily. In this case, institutional persistence affects the economy's transition dynamics. Relative to an economy characterized by institutional atrophy, Eq. (18) indicates that following a significant negative transaction cost shock an economy with institutional persistence will initially experience faster income growth. After the initial shock this difference in income growth rates will increase, since institutional persistence implies that transaction costs will grow more slowly, from (14), resulting in more rapid rates of human capital growth as indicated by (12).

These results indicate that institutional persistence increases the rate at which an economy recovers from a significant negative human capital shock. In spite of these differences, the assumption of institutional persistence does not dramatically alter the qualitative predictions of the model. In either case, a negative human capital shock will result in a fall in income, transaction costs and market size, and an increase in the rate of human capital accumulation. The primary qualitative difference regards whether institutional quality stagnates or actually declines.

Institutional persistence matters more for a low productivity economy in which $\overline{A} < \theta$. If we permit institutional atrophy, then this condition implies $\tau^* < 1$ and $g^* < 0$, such that a low productivity economy experiences persistently falling levels of income, human capital and institutional quality. Replacing (9) with (21) implies that rather than declining, institutional quality remains constant at its original level, the case analyzed in Section 4.2. As a result, with institutional persistence a low productivity economy converges to a stationary state with levels of human capital and income indicated by (20). Casual observation suggests this result is more in keeping with the historical experience of less developed countries, which has been marked by long periods of relative stagnation rather than persistent decline.

4.5. Technology shocks and induced institutional change

The results above indicate how changes in the institutional structure of a society influence it's economy. Here, we turn our attention to the opposite side of this relationship by considering how economic changes may initiate a process of induced institutional change. In particular, we consider the impact of an exogenous shock to the technology parameter A, such as might result from the introduction of modern industrial or information technologies, on the evolution of the institutional, organizational and economic variables. Critically, we find that institutional flexibility plays a key role in determining the strength and speed of this impact.

The effects of a positive technology shock are illustrated in Figs. 4A and 4B. Prior to this shock, the economy is assumed to be in the steady state at $(\tau_0^*,\ g_0^*)$. From Eq. (6) we see that a positive technology shock increases the gains to specialization, raising the return to human capital and, as indicated by (12), increasing the growth rate of human capital for any given level of transaction costs. This is illustrated in Figs. 4A and 4B by a shift in the human capital-growth curve upward and to the right. The economy converges to a new steady state at $(\tau_1^*,\ g_1^*)$ in which the primary institutional, organizational and economic variables grow at a higher common growth rate.

Expressions for the change in the steady state level of transaction costs and economic growth may be found by setting (9) and (12) equal to each other and differentiating with respect to τ and A:

$$\frac{d\tau^*}{dA} = \left[\frac{\sigma\tau^* - \sigma + \theta}{\sigma\tau^* - \alpha\sigma + \alpha\theta}\right]\frac{\tau^*}{A} > 0 \tag{22}$$

and

[9] This is particularly true in this model because institutional quality does not affect the distribution of income. Both Sokoloff and Engermann (2000) and Acemoglu and Robinson (2001) argue that institutions have important distributional consequences.

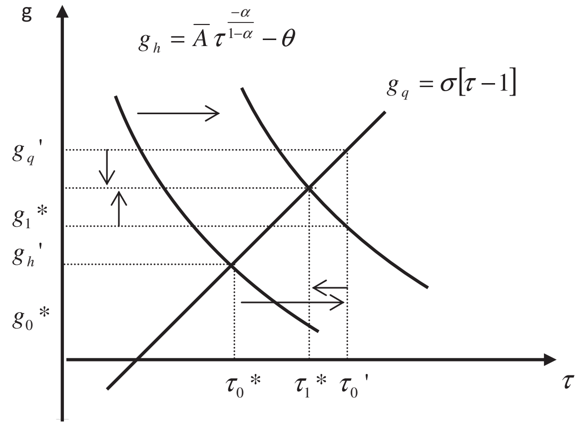

Fig. 4A. Technology shocks and induced institutional change with flexible institutions, $\sigma > \tilde{\sigma}$.

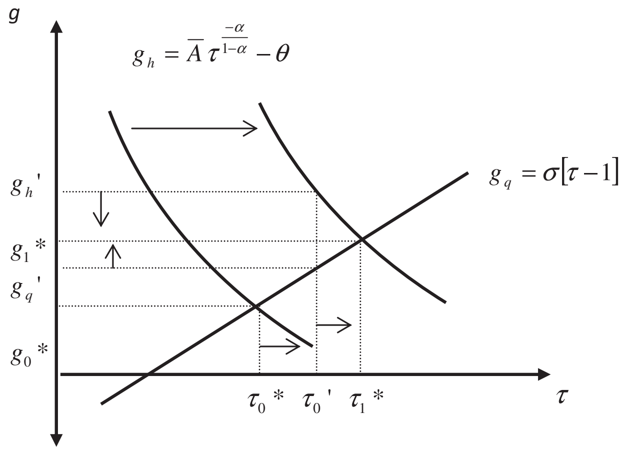

Fig. 4B. Technology shocks and induced institutional change with inflexible institutions, $\sigma < \tilde{\sigma}$.

$$\frac{dg^*}{dA} = \sigma \frac{d\tau^*}{dA} > 0. \tag{23}$$

As indicated by these expressions, and illustrated in Figs. 4A and 4B, the level of institutional flexibility determines the degree to which a technology shock translates into higher equilibrium growth versus higher market transaction costs. Recall that market transaction costs reflect the gap between actual and desired institutional quality, and thus the demand for institutional change. It follows that in an economy with less flexible institutions, higher market transaction costs are required to equate the growth rates of institutional quality and human capital.

The level of institutional flexibility also determines which of two qualitatively different time-paths obtains for the model's state variables during the transition to the steady state. Starting from the steady state at (τ_0, g_0), an exogenous increase in the technology parameter A increases the return to specialization, equilibrium market size and market transaction costs. The transition dynamics depend on the magnitude of the initial increase in market transaction costs relative to the increase in the equilibrium level of transaction costs, which is found by differentiating (13) with respect to A:

$$\frac{d\tau_0}{dA} = \left(\frac{1}{2-\alpha}\right)\frac{\tau_0}{A}. \tag{24}$$

Comparing this result with that in (22), we see that in an economy with sufficiently flexible institutions the initial increase in transaction costs "overshoots" its equilibrium level, in that $\frac{d\tau_0}{dA} > \frac{d\tau^*}{dA}$. In particular, we find that overshooting occurs provided $\tau^* > 2\left(\frac{\sigma-\theta}{\sigma}\right)$. Substituting this condition into our expression for equilibrium transaction costs, we have the following proposition:

Proposition 2. *Define the function* $\tilde{\sigma}(A,^{+}\theta^{+})$ *implicitly by* $(\tilde{\sigma}-\theta)\left(2\left[1-\frac{\theta}{\tilde{\sigma}}\right]\right)^{\frac{\alpha}{1-\alpha}} = \overline{A}$, *and consider an economy in the steady state with a positive rate of growth that experiences a positive technology shock:*

A. *If institutions are sufficiently flexible, as indicated by* $\sigma > \tilde{\sigma}(A,^{+}\theta^{+})$, *then*
1. *transaction costs "overshoot" their steady state level,* $\frac{d\tau_0}{dA} > \frac{d\tau^*}{dA}$,
2. *institutional quality grows more rapidly than human capital,* $\frac{\partial g_q}{\partial A} > \frac{\partial g_h}{\partial A}$, *and*

3. *the economy converges to its new steady state from above.*

B. *If institutions are insufficiently flexible, as indicated by* $\sigma < \tilde{\sigma}(A,^{+}\theta^{+})$, *then*

1. *transaction costs "undershoot" their steady state level,* $\frac{d\tau_0}{dA} < \frac{d\tau^*}{dA}$,
2. *institutional quality grows less rapidly than human capital,* $\frac{\partial g_q}{\partial A} < \frac{\partial g_h}{\partial A}$, *and*
3. *the economy converges to its new steady state from below.*

Overshooting in response to a technology shock is illustrated in Fig. 4A. With sufficiently flexible institutions, the function for institutional quality growth is relatively steep, such that the initial increase in transaction costs is exceeds the increase in the steady state level, $\tau_0' > \tau_1^*$. As a result, the initial jump in transactions costs raises the growth rate of institutional quality more than that of human capital, as indicated graphically by $g_q' > g_h'$. Following the initial shock, the level of transaction costs converges to the new steady state equilibrium from above. In contrast, as illustrated in Fig. 4B, when institutions are insufficiently flexible, transaction costs undershoot their equilibrium level, $\tau_0' > \tau_1^*$, the growth rate of institutional quality, $g_q' > g_h'$, and the economy converges to the new steady state from below.

In summary, the model captures the two-way relationship between institutional and economic evolution. Here, we see that a positive technology shock initiates a process of induced institutional change in which the rate of institutional quality rises in response to changing economic conditions. Moreover, the model suggests a central role for institutional flexibility in determining the nature of this response. In economies with more flexible institutions, the technology shock results in a greater initial increase in the rate of institutional evolution and a greater rise in the steady state rate of growth. This difference in outcomes suggests that institutional flexibility may play a key role in explaining the different abilities of societies to take advantage of access to modern productive technologies.

5. Conclusion

In recent decades, the economics profession has witnessed 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 economic 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 resulting model characterizes growth as the outcome of interdependent processes of economic and institutional evolution. The analysis suggests that institutional flexibility plays a central role in economic growth. Institutional flexibility allows a society 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, an aspect of the analysis that may prove useful as a way to understand prolonged periods of stagnation in developed countries and the fragility of some country growth experiences. It also suggests that institutional flexibility may be a key determinant of a society's ability to take advantage of access to modern technologies.

Appendix A

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 $\frac{\dot{h}}{h} = \overline{A}\tau^{-\alpha/(1-\alpha)} - \frac{c}{h}$ and $\frac{\dot{c}}{c} = \overline{A}\tau^{-\alpha/(1-\alpha)} - \theta$. 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 $\frac{d(\dot{h}/h)}{dt} < 0$. 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

$$g_q(\tau) \approx g^* + \sigma\tau^*\left[\frac{\tau}{\tau^* - 1}\right] \quad \text{and } g_h(\tau) \approx g^* + \left[\frac{-\alpha}{1-\alpha}\right]\overline{A}\tau^{*\frac{-\alpha}{1-\alpha}}\left[\frac{\tau}{\tau^* - 1}\right].$$

Substituting these equations into (18) provides the linear estimate of the growth of income near the steady state that's reported in (19):

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

Differentiating this expression, we find that near the steady state

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

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

$$\tau^{*\prime}(\sigma) = -\frac{F_\sigma}{F_\tau} = -\frac{(\tau-1)}{\left[\frac{\alpha}{1-\alpha}\right]\bar{A}\tau^{\frac{-1}{1-\alpha}} + \sigma} < 0, \tau^*(0) = \bar{\tau} \quad \text{and } \lim(\sigma \to \infty)\tau^*(\sigma) = 1.$$

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

$$\Delta'(\hat{\sigma}) > 0 : \Delta'(\hat{\sigma}) = \tau^*(\hat{\sigma}) - \tilde{\tau}(\hat{\sigma}) > 0 \iff \frac{-(\tau-1)}{\frac{\alpha}{1-\alpha}\bar{A}\tau^{\frac{-1}{1-\alpha}} + \sigma} > \frac{-(1-\alpha)\tau}{\sigma}.$$

Cross multiplying, collecting terms and adding and subtracting $\alpha\theta$ to the right hand side, we have:

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

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 $\sigma < \hat{\sigma} \iff g_y'(\tau) < 0$. 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.

References

Abramovitz, Moses, 1986. Catching up, forging ahead, and falling behind. Journal of Economic History 46 (2), 386–406.
Acemoglu, Daron, 2003. Why not a political coase theorem? Social conflict, commitment, and politics. Journal of Comparative Economics 31, 620–652.
Acemoglu, Daron, Robinson, James A., 2000. Why did the west extend the franchise? Democracy, inequality, and growth in historical perspective. Quarterly Journal of Economics 115 (4), 1167–1199.
Acemoglu, Daron, Robinson, James A., 2001. A theory of political transitions. American Economic Review 91 (4), 938–963.
Acemoglu, Daron, Johnson, Simon, Robinson, James A., 2001. The colonial origins of comparative development: an empirical investigation. American Economic Review 91 (5), 1369–1401.
Acemoglu, Daron, Johnson, Simon, Robinson, James A., 2004. Institutions as the fundamental cause of long run growth. NBER Working Paper #10481.
Bardhan, Pranab, 2001. Water community: an empirical analysis of cooperation on irrigation in South India. In: Aoki, Masahiko, Hayami, Yujiro (Eds.), Communities and Markets in Economic Development. Oxford University Press, New York.
Bardhan, Pranab, 2002. Decentralization of governance and development. Journal of Economic Perspectives 16 (4), 185–205.
Barro, Robert J., 1991. Economic growth in a cross section of countries. Quarterly Journal of Economic 106 (2), 407–443.
Beck, Thorsten, Asli, Demirguec-Kunt, Ross, Levine, 2003. Law and finance: why does legal origin matter? Journal of Comparative Economics 31 (4), 653–675.
Becker, Gary S., Murphy, Kevin M., 1992. The division of labor, coordination costs, and knowledge. Quarterly Journal of Economics 57 (4), 1137–1160.
Berkowitz, Daniel, Pistor, Katharina, Richard, Jean-Francois, 2003. Economic development, legality, and the transplant effect. European Economic Review 47, 165–195.
Botero, Juan, Djankov, Simeon, La Porta, Rafael, Lopez-de-Silanes, Florencio, Shleifer, Andrei, 2004. The regulation of labor. Quarterly Journal of Economics 119 (4), 1339–1382.
Coase, Ronald H., 1991. The nature of the firm. In: Williamson, Oliver E., Winter, Sidney G. (Eds.), The Nature of the Firm. Oxford University Press, New York.
Coate, Stephen, Morris, Stephen, 1995. On the form of transfers to special interests. Journal of Political Economy 103 (6), 1210–1235.
Davis, Lewis S., 2003a. The division of labor and the growth of government. Journal of Economic Dynamics and Control 27 (7), 1217–1235.
Davis, Lewis S., 2003b. Toward a unified transaction cost theory of economic organization. Journal of Institutional and Theoretical Economics 159 (3), 571–593.
Davis, Lewis S., 2006. Growing apart: the division of labor and the breakdown of informal institutions. Journal of Comparative Economics 34 (1), 75–91.
de Soto, Hernando, 2000. The Mystery of Capital. Basic Books, New York.
Djankov, Simeon, La Porta, Rafael, Lopez-de-Silanes, Florenciao, Shleifer, Andrei, 2002. The regulation of entry. Quarterly Journal of Economic 117 (1), 1–37.
Djankov, Simeon, Glaeser, Edward, La Porta, Rafael, Lopez-de-Silanes, Florenciao, Shleifer, Andrei, 2003. The new comparative economics. Journal of Comparative Economics 31 (4), 595–619.
Easterly, William, 2006. Planners versus searchers in foreign aid. Asian Development Review 23 (2), 1–35.
Easterly, William, Levine, Ross, 1997. Africa's growth tragedy: policies and ethnic divisions. Quarterly Journal of Economics 112 (4), 1203–1250.
Easterly, William, Levine, Ross, 2003. Tropics, germs and crops: how endowments influence economic development. Journal of Monetary Economics 50 (1), 3–39.
Giavazzi, Francesco, Tabellini, Guido, 2005. Economic and political liberalizations. Journal of Monetary Economics 52 (7), 1297–1330.
Gimond, John, 2002. What ails Japan. The Economist, April 18.
Greif, Avner, 1994. Cultural beliefs and the organization of society: a theoretical reflection on collectivist and individual societies. Journal of Political Economy 102 (5), 912–950.
Greif, Avner, Milgrom, Paul, Weingast, Barry, 1994. Coordination, commitment and enforcement: the case of the merchant guild. Journal of Political Economy 102 (4), 745–776.
Hall, Robert E., Jones, Charles I., 1999. Why do some countries produce so much more output per worker the others? Quarterly Journal of Economics 114 (1), 83–116.
Hayek, Friedrich A., 1960. The Constitution of Liberty. University of Chicago Press, Chicago.
Kandori, Michihiro, 1992. Social norms and community enforcement. Review of Economic Studies 59, 63–80.
Knack, Stephen, Philip, Keefer, 1995. Institutions and economic performance: cross-country tests using alternative institutional measures. Economics and Politics 7, 207–227.
Kranton, Rachel, 1996. Reciprocal exchange: a self-sustaining system. American Economic Review 86 (4), 830–851.
Kremer, Michael, 1993. The O-ring theory of economic development. Quarterly Journal of Economics 108 (3), 551–575.

Kuran, Timur, 2004. Why the middle east is economically underdeveloped: historical mechanisms of institutional stagnation. Journal of Economic Perspectives 18 (3), 71–90.
Lamoreaux, Naomi R., Rosenthal, Jean-Laurent, 2005. Legal regime and contractual flexibility: a comparison of business's organizational choices in France and the United States during the Era of industrialization. American Law and Economics Review, 28–61.
La Porta, Rafael, Lopez-de-Silanes, Florenciao, Shleifer, Andrei, Vishny, Robert, 1999. The quality of government. Journal of Law, Economics and Organization 15, 222–279.
Mauro, Paolo, 1995. Corruption and growth. Quarterly Journal of Economics 110 (3), 681–712.
Milgrom, Paul, North, Douglas, Weingast, Barry, 1990. The role of institutions in the revival of trade: the law merchant, private judges and the champagne fairs. Economics and Politics 2, 1–23.
North, Douglas C., 1981. Structure and Change in Economic History. Norton, New York.
North, Douglas C., 1990a. Institutions. Institutional Change and Economic Performance. Cambridge University Press, New York.
North, Douglas C., 1990b. A transaction cost theory of politics. Journal of Theoretical Politics 2 (4), 355–367.
North, Douglas C., 1991. Institutions. Journal of Economic Perspectives 5 (1), 97–112.
North, Douglas C., 1995. Institutions and economic theory. In: John Harriss, Janet Hunter, Lewis, Colin M. (Eds.), The New Institutional Economics and Third World Development. Routledge, New York.
North, Douglas C., Thomas, Robert, 1973. The Rise of the Western World: A New Economic History. The University Press, Cambridge.
Olson, Mancur, 1982. The Rise and Decline of Nations. Yale Univ. Press, New Haven, CT.
Ostrom, Elinor, 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, New York.
Ostrom, Elinor, 2000. Collective Action and the Evolution of Social Norms. Journal of Economic Perspectives 14 (3), 137–158.
Parente, Stephen L., Prescott, Edward C., 1994. Barriers to technology adoption and development. Journal of Political Economy 102 (2), 298–321.
Parente, Stephen L., Prescott, Edward C., 1999. Monopoly rights: a barrier to riches. American Economic Review 89 (5), 1216–1233.
Persson, Torsten, Tabellini, Guido, 2006. Democracy and development: the devil in the details. American Economic Review 96 (2), 319–324.
Persson, Torsten, Tabellini, Guido, 2009. Democratic capital: the nexus of political and economic change. American Economic Journal: Macroeconomics 1 (2), 88–126.
Posner, Richard, 1977. Economic Analysis of Law. Little, Brown, Boston.
Posner, Richard, 1980. A theory of primitive society, with special reference to the law. Journal of Law and Economics 23, 1–54.
Pistor, Katharina, Keinan, Yoram, Kleinheisterkamp, Jan, West, Mark, 2003. Innovation in corporate law. Journal of Comparative Economics 31 (4), 676–694.
Przeworski, Adam, Limongi, Fernando, 1993. Political regimes and economic growth. Journal of Economic Perspectives 7 (3), 51–69.
Qian, Yigyi, Xu, Chenggang, 1993. Why China's economic reforms differ: the M-form hierarchy and entry/expansion of the non-state sector. The Economics of Transition 1 (2), 135–170.
Qian, Yigyi, Roland, Gerard, Xu, Chenggang, 2006. Coordination and experimentation in M-form and U-form organizations. Journal of Political Economy 114 (2), 366–402.
Rivera-Batiz, Francisco L., 2002. Democracy, governance and economic growth. Review of Development Economics 6 (2), 225–247.
Rodrik, Dani, 1999. Where did all the growth go? External shocks, social conflict, and growth collapse. Journal of Economic Growth 4, 385–412.
Rodrik, Dani, 2000. Institutions for high-quality growth: what they are and how to acquire them. NBER Working Paper No. 7540.
Romer, Paul M., 1994. The origins of endogenous growth. Journal of Economic Perspectives 8 (1), 3–22.
Rosen, Sherwin, 1983. Specialization and human capital. Journal of Labor Economics 1 (1), 43–49.
Rosenberg, Nathan, Birdzell, Luther E., 1986. How the West Grew Rich: The Economic Transformation of the Industrial World. Basic Books, New York.
Rubin, Paul H., 1982. Common law and statute law. Journal of Legal Studies XI, 205–223.
Sokoloff, Kenneth L., Engermann, Stanley, 2000. Institutions, factor endowments, and the path of development in the new world. Journal of Economic Perspectives 51 (2), 437–464.
Tamura, Robert, 1992. Efficient equilibrium convergence: heterogeneity and growth. Journal of Economic Theory 58, 355–376.
Tamura, Robert, 1996. Regional economies and market integration. Journal of Economic Dynamics and Control 20, 825–845.
Tamura, Robert, 2002. Human capital and the switch from agriculture to industry. Journal of Economic Dynamics and Control 27 (2), 207–242.
Tamura, Robert, 2006. Human capital and economic development. Journal of Development Economics 79 (1), 26–72.
Taylor, Michael, 1987. The Possibility of Cooperation. Cambridge University Press, Cambridge.
Tiebout, Charles M., 1956. A pure theory of local expenditures. Journal of Political Economy 64, 416–424.
Yang, Xiaokai, Borland, Jeff, 1991. A microeconomic mechanism for economic growth. Journal of Political Economy 99 (3), 460–482.